DISTRIBUTION OF NUTRITIONAL DEFICIENCY DISEASES IN CENTRAL GANGA-GHAGHRA DOAB IN RELATION TO ENVIRONMENTAL FACTORS

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ABSTRACT

The present work is an attempt to study the distribution of deficiency diseases in relation to environmental factors in the Central Ganga-Ghaghra Doab. The entire work is divided into five chapters. The first chapter comprising the physical and cultural setting of the region deals with geographical factors which throw light on the nature of crops produced and distribution of rural population. This chapter includes A) Relief, B) Climate, C) Soil, D) Irrigation, E) Agriculture and F) Population. Part A; Central Ganga-Ghaghra Doab forms part of the Indo-Gangetic plain of alluvial formation, kankar and reh or saline afflorescence are seen along the river beds and in ussar lands in low lying tracts. Alluvial deposits may be broadly classified as bhangar and khadar. Drainage of the area is very simple and may be classified in two parts. First part deals with the rivers and second with the lakes and ponds. Main rivers are the Ghaghara, the Gomati, Tons and Sai. Part B; climate of the region is, on the whole, healthy and divided into three climatic seasons; cold, hot and seasons of rainfall. Part C; deals with the soil and there distribution in the entire area. Fertile alluvial soils are dominant with the less fertile khadar tract and ussar infected with saline afflorescence known as reh is left
barren. Part D; irrigation facilities show that construction of tube-wells are going well ahead of canals as they irrigate 228,635 hectares of land whereas canals cover only 118,279 hectares. The main canals of the area are the Ghaghra, the Sarda and the Tanda canals. Part E; relates to agriculture, land utilization in the kharif the rabi seasons, production and average yield. Part F; deals with population and its growth.

The second chapter deals with definition and scope of the subject; it has two parts; Part (A) Nutrition, mal-nutrition and under-nutrition, and Part (B) Communicable and deficiency diseases. The scope of nutrition is so great that it is impossible for an individual to encompass the entire field. But in the study of human nutrition, geography is as important as any other natural science. It is evident that we need to know what sort of vitamins, minerals our body needs and what happens if we do not get enough of any one. It is equally necessary that we know something about economics and geography of food production and its distribution/availability, attitude of a group or an individual towards food (dietary habits). The need to know it has steadily increased over the past decade due to changes in food supply and dietary habits. The author therefore is firstly interested to determine the prevalence of nutritional deficiency diseases in the area and secondly, to know the factors determining the
food choices and degrees of variations in such patterns to re-evaluate food, which has its direct effect on health.

Mal-nutrition produces leads to ill health and lowers the resistance and physical efficiency, which is more important than the disease itself. In the area under-study about 70 per cent of the population suffers from mal-nutrition. This is the result of insufficient food or of inadequately of protective food essential for a healthy life or a combination of both.

Areas like Ganga-Ghaghra Doab have dual disadvantage of heavy population load to be fed and slender food resources through domestic production. It is however very unfortunate that the present socio-economic conditions of the villagers are such that they often get only one meal even in these days of 'green revolution'. Such type of chronic condition results in under-nutrition. An average Indian needs about 2400 calories per day, but about 30 per cent get less than 1700 calories. In case of other nutrients the situation is more pathetic.

The study of geography of diseases forms an important part of medical geography. It tries to analyse the environmental conditions coupled with other factors under which various categories of diseases spread geographical factors have for the most part only an indirect effect on
the causation of diseases. Diseases like cholera, plague, typhoid fever and smallpox, are communicable diseases in human society and are the result of interaction between the pathogens and the human organism under specific environmental conditions. Besides communicable diseases, there are other type of diseases of which the writer is presently concerned with nutritional deficiency diseases only. Most forms of mal-nutrition or under nutrition are caused by a deficiency of some essential nutrients either in quantity or quality of food taken by an individual. Main deficiency diseases prevalent in the area are kwashiorkor/marasmus, eye diseases, retarded/stunted growth, beri-beri, pellagra, anaemia, scurvy/tooth and gum diseases, rickets, osteomalacia, urinary-culculi and goitre.

Chapter third deals with environmental factors affecting human health. This chapter includes four parts. (A) Physical factors; relief, climate, soil and drainage. (B) Socio-cultural factors; population distribution, standard of living, housing, clothing, sanitation, income, communication, agricultural production, its distribution, diet, religion, superstition and drugs (C) Biological factors, vegetable life, animal life, human and animal diseases. (D) The relationship between environment and deficiency diseases; how the man's energy, natural energy inputs affect or work through the medium of land to produce energy (output) and its role in the spread of deficiency diseases.
Chapter four relates to the technique and methods adopted in the selection of villages, and the diet and deficiency disease survey carried out in three different seasons in twelve villages of the region. While making selection of villages for detailed study of various deficiency diseases, the author has tried to visit a large number of villages spread over in all directions of the area under study. Out of the numerous villages visited, twelve villages have been selected for the present work. These villages are Mumtaz Nagar, Dhanipur, Unchegoan, Ariya, Kichaucha, Dasrathpur and Gaura-Baramau, Ramnathpur, Sonbarsa, Khizrabad, Mullathi-Barasin and Jakha-Sheopur. Many of these villages, as has been observed, show a concentration of various deficiency diseases which the author desires to study. Since the study area lies in a homogeneous level plain, it has become almost an easy task for the researcher to select villages adopting the technique of purposive sampling. The description of each village includes classification of the village community on the basis of their monthly income into three categories, viz., (A) high income group, (B) medium income group, and (C) lower income group. An evaluation of each category has been worked out to ascertain their nutritional status or intake and the percentage of departure from the standard requirement is calculated to find out the general level of nutritional intake besides taking into account the different deficiency diseases found among the rural community of the selected villages.
The data of nutritional deficiency diseases is based on personal survey, and the records obtained from local doctors, near-by dispensaries and district hospitals.

Chapter five dealing with the conclusion and suggestions summarises the findings relating to the present work and also presents suggestions for the future improvement in the agricultural practices and dietary habits. The study of the selected villages shows that the pressure of population on the land is considerably high. The percentage of unproductive land is greater in agriculturally non-prosperous villages than to agriculturally prosperous villages due to various reasons. Food habits are generally related to types of food products available to the villagers under the existing geographical environments. Most of them are ignorant about the nutritive value of the daily diets. Some of the nutritional diseases e.g. endemic goitre, dental caries and fluorosis having their direct connection with environmental factors. A survey related to morbidity, and mortality and deficiency diseases disclosed that the rate is generally high where the intake is low. The author has noticed that villages which are agriculturally prosperous have better food distribution in comparison to the non-prosperous villages, which recorded low caloric intake, and higher morbidity/mortality rate. There is no village, where the mortality rate is nil.
In the opinion of the author the solution of the present problem lies not only in the increase of productivity of agricultural crops but also in proper distribution, family planning, social uplift, relevant modification in the food habits to suit middle and low income group, change in cropping pattern to cultivate such crops which could give them some essential food nutrients e.g., protein from pulses and vitamins and calcium through leafy vegetables.

The present work done may be, by and large, termed as original contribution in the field of medical geography which has been attempted for the first time in this area of the Ganga-Ghaghra Doab.
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(Syed Waseem Ahmad)
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INTRODUCTION
In the study of human nutrition, geography occupies as important a position as any other branch of natural science. Nutrition has assumed so much significance in the present era that its study imperatively invites the attention of the reader taking interest in knowing its quality for maintaining good health and preserving the body from the bad effects of external and internal diseases. Hence, this study calls to know what sort of vitamins, other nutrients and their quantity should be supplied to human bodies for normal growth and protection from ailments. This depends very much on the nature of food produced and its proper distribution in the rural areas. Here the question arises as to what sort of food should be produced that has nutritive value and what method of distribution should be adopted so that it could be within easy reach of each individual of the locality. It is, however, very unfortunate that the present socio-economic condition of the villagers is such that they cannot realize the importance of those food crops which have sufficient quantity of nutrition. Whatever food is produced in the country, its major portion is consumed locally and its proper distribution cannot be ensured. The rich get richer and fatter, and the poor get poorer and thinner. Even in these days of the 'Green Revolution' there is continued under-nutrition in some areas. Nutrition scarcity areas do not get sufficient supply from the nutritionally excessive or normal areas. This phenomenon
causes great hindrance in the way of maintaining good health. Further, the dietary habits of the rural population are determined by the physical and social environment and as such their foods lack in nutritive value.

However, in the recent years some awakening with regard to changes in the nature of food supply, dietary habits and standard of living has been witnessed among the rural communities. Once the benefits that accrue from nutritive diets are known to the farming community a change for better health programme is bound to take place. The rural development schemes envisaged by the various State Governments, will surely go a long way in educating the village people about the value of nutritive diets and a good health.

It is axiomatic that the destiny of a nation lies more in healthy population, but many of us will rarely appreciate the fact that a vast majority of our population is ill-fed, ill-clad, ill-sheltered and unhealthy—both physically and mentally. A man with poor health is a liability for the community and a community burdened with ill-health is an impoverished and sick community because ill-health and poverty often go together. The vicious circle of disease—low production—low income—poor health services—more diseases and more poverty not only poses a problem of health and sanitation but also of social welfare and social justice.¹

Mal-nutrition is one of the most important health problems of the country. It is estimated that about 70 per cent of the country's population suffers from mal-nutrition. This is the result either of chronic insufficiency of food or of inadequacy of the protective foods necessary for a healthy life or a combination of both. Thus, general hunger or hunger for specific essential nutrients produces adverse effects which are of far reaching nature.

Infants born of mal-nourished mothers start life with a handicap. In a few months or a year, many of them die of mal-nutrition alone or due to mal-nourishment they succumb easily to gastro-intestinal and respiratory infections. The prevalence of various communicable diseases in the areas of hunger and mal-nutrition makes the situation still more serious.

The area under study lies in the eastern Uttar Pradesh and comprises the districts of Faizabad and Sultanpur situated in the Central Ganga-Ghaghara Doab. This area is relatively less developed in the spheres of industries, agriculture, health and urbanization. Areas like this have dual disadvantage of heavy population load to be fed and slender food resources through domestic production. As a result of neglect on the part of the successive State Governments, local population is confronted with several problems e.g., availability of work, reduction of poverty, ability to buy enough food, reduction of inequality, social and economic, which need solution in
reasonable time. These problems relate to the prevalence of nutritional deficiency diseases with which the author is concerned in the present research work. It is to be studied in relation to the environmental factors.

The Central Ganga-Ghaghra Doab, comprising the districts, of Faizabad and Sultanpur lies between 26° and 26°52′00″ north latitudes and 81°32′00″ and 83°10′00″ east longitudes. It covers an area of 89,467,952 sq km (Fig. 0.1). The total population of the area is 4,425,293 giving a density of 492 persons per sq km.

It appears from the available records that the area under cultivation in the Central Ganga-Ghaghra Doab accounts for about three-quarters of the total area and has encroached in some parts upon the land needed for fodder or pastures. The percentage is low where the large usar land exists as is seen in Akbarpur. As a part of the green revolution, much attention is devoted to intensive and extensive cultivation of foodgrains. While increasing the present rate of production is the immediate need of the hour, proper selection of food crops is equally important. Where one is keen on obtaining maximum nutritional benefit from any food stuff, its nutritive value should be the chief consideration. Other consideration should be of secondary and tertiary importance. In this effort it is important that all factors which can adversely affect the total yield of food crops are to be kept under control.
There has now been intensive efforts to introduce multiple cropping systems, relay cropping, inter-cropping and multiple cropping systems appropriate to each region as these measures have dual advantages of improving soil fertility through introduction of leguminous crop in the cycle and also improving the nutritional level of the population through diversification of diet and increased availability of millets, pulses and oilseeds. There has been enough encouragement in increasing oilseeds through the introduction of high yielding varieties.

But side by side there has been a disturbing trend in pulse production which is the rich source of protein, particularly after the introduction of HYV of cereals, through greater area coming under cereals at the cost of pulse crops.

Nutritional dimension in HYV has been taken care of. All HYV varieties of crops are screened for nutrient composition before release. High yielding varieties with higher protein, high lysine, high B-crotene, high iron in cereals and millets have been identified.

It is true that undernourished human population tends to survive by avoiding expenditure of energy, leading to lethargy, lack of initiative and drive. Thus mal-nutrition affects level of national productivity by placing limits on individual productivity.
As a result of limited resources for obtaining the required quantity of nutrition in the area under study, there is ample evidence of malnutrition and under-nutrition, followed by multiple deficiency diseases (anaemia, beri-beri, kwashiorkor/marasmus, scurvy, eye diseases, retarded growth, osteomalacia and pellagra, etc.).

It may be agreed that improvement in nutritional level in the area is not a complete solution to the problem. It is closely linked with the ecological constraints as human malnutrition and associated diseases are ecological problems resulting in several over-lapping and interacting factors in the communities. Further, malnutrition is closely related to the more complex problem of poverty, religion and socio-economic inequality. It cannot, therefore, be successfully solved in isolation but will have to be tackled through an integrated approach to the study of the ecological factors along with socio-economic development. Moreover, a clear understanding of the various causative or co-existing factors is also necessary.

The planning for an adequate food supply, satisfactory diet, favourable environmental conditions and the eradication of the related deficiency diseases emphasise the need for a careful detailed survey of the dietary habits and the deficiency diseases prevalent in the area.
The precise knowledge of the factors controlling or determining the existing health conditions may enable one to obtain a correct picture of the total intake of different nutrients per head per day.

In the present work an attempt has been made by the author to study the dietary habits of the village community and the spatial distribution of nutritional deficiency diseases in the Central Ganga-Ghaghara Doab which are related to environmental factors. Field studies relating to representative villages of the area have been undertaken by the author and the distributional pattern of the nutritional deficiency diseases has been investigated. Based upon this enquiry, relationship between the environmental factors and the spread of such diseases, some valuable conclusions have been drawn.
CHAPTER I

PHYSICAL AND CULTURAL SETTING
The Central Ganga-Ghaghara Doab structurally forms part of the Indo-Gangetic plain, varying in width from 144 km to nearly 480 km and has a length of 2400 km forming a part of north Indian peninsula. The geology of the area does not reveal anything striking except the ordinary Gangetic alluvial formation of Pleistocene to sub-recent alluvial deposits of the rivers. The only mineral of some importance in the area is kankar, found in great abundance all along the bed of the rivers. Reh or saline afflorescence is found on usar lands specially in the lowlying tracts. The thickness of the alluvium has been assessed from borings, and reported to be nearly 300 m below the sea level. Beds were found of the same characteristics, alternation of sand and silt, followed by the occasional bands of kankar and coarse sand in the bottom of the bore. On the basis of the gravity results obtained from different stations in the plain, Glennie has calculated the depth as 1981.2 m. Figures calculated by another scientist conform to the geodetic data, though not with geological facts. It cannot be regarded as reliable and may be higher.

3 Wadia, D.N. and Auden, J.R., 'Geology and Structure of Northern India' Memoirs of Geological Survey of India, Vol.73, Delhi 1939, p.139.
On the whole, the alluvial deposits may be classified into two distinct categories. Firstly, bhangar or older deposits and secondly, khadar or the newer deposits. Bhangar is usually rich in concretions and covers the elevated portion of the plain (above the flood level). In general, bhangar lands are found at a height of 4.57 to 6.09 m above the flood level of the river. Beds of the Ghaghara and the Ganga have enough deposits of kankar, derived from older rocks of different categories or from fragments of limestone contained in the alluvium.  

Alkaline, afflorescence patches, which are due to general slope of the land and the composition of the alluvium show the general character of the bhangar lands. Alkaline formations are explained by the fact that the dominant constituent of the old alluvium is clay and sodium clay, reacting with the kankar nodules, is turned into calcium clay, liberating sodium carbonate.  

But the slope at several places is not more than a 30.48 cm per 1.609 km and the gradient of the water table associated with these gentle slopes is also small. These low gradients lead to a sluggish movement of the ground and surface water and results in the


leaching of mineral nutrients. They are washed and deposited in deeper horizons of the soil during the monsoons, but the rate of leaching is almost stopped in summers, and extensive evaporation exerts a capillary pull on the solution in the pore spaces of the soil on reaching the ground.

Khadar lands occupy a lower level in comparison to bhangar and is liable to inundation during the floods. Its level is in conformity with the principle; as the river gets older, its deposits will be younger and with the sinking of the bed, these deposits occupy a level lower than the earlier (Fig. 1.1). These deposits in turn lead to the depletion of soil fertility, as the Ghaghara khadar is less fertile than the Gomati khadar. Khadar lands are free from kankar and reh. However, there are considerable variations in the deposits of the Ghaghara, the Ganga and the Gomati. In the deposit of the Ghaghara, which is more violent in nature, brings more sand, whereas the Ganga and the Gomati pile up mud. Floods in the Ganga are useful to the cultivators, though they often destroy the standing crops. However, they increase the fertility of the soil by adding fertile silt, but flood in the Ghaghara is undesirable and ruins the standing crops and soil both.

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DRAINAGE

The drainage of the area is closely related to its slope. Except the Ghaghara, which is almost straight, rest of the rivers have tendency to follow zig-zag courses, across the plain, forming meanders and ox-bow lakes. Surface drainage is divided into two parts; first part deals with the rivers and the second with the lakes, ponds and jhils. Main rivers of the area are the Ghaghara, Gomati, Tons and Sai. Except the Ghaghara, the rest of the rivers have their origin in plains. Distribution of water in tributaries varies from nothing in hot seasons to thousands of cubic centimeters during the monsoons.

The Ghaghara is the biggest and most important river of the area, forming the northern boundary of the district Faizabad, touching the district at the village Pasia, lying in the northwest of Faizabad and leaves it at the extreme east end of pargana Birhar. It has the tendency to change its course frequently. Right bank of the river is strong and high enough to face the danger of flood, but the left bank is pliable. Width of the river varies from 3.20 km to 4.80 km during the rains. It is a perennial river as it takes its water from the Tibetan mountain.

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The chief water streams, which join the Ghaghara, are Thirwa, Pikia, Saryu and Tonri, flowing in different directions and are helpful in agricultural pursuits, but off and on, they also prove to be disastrous for the standing crops in the catchment areas or near-by during the period of floods or heavy rain. Their volume of water varies from little in summers to full with the onset of the monsoons.

Tons

It is the next important river of the district Faizabad. It is a perennial stream; its water decreases in summers, but during the monsoons, it attains a good size and often causes damage to life and property.

Gomati

It flows in the extreme south-west for a short distance in the district of Faizabad, but it is the main river of district Sultanpur. It joins the district Sultanpur near the village Majhgoan. Its channels are fairly well-marked and beds are considerably deep. Two rivers join the Gomati; one is the Sai on the left bank and the other is Nand, which joins Gomati, before it merges itself in the Ganga.

Lakes

Apart from the rivers and their tributaries, the role played by the lakes and other water bodies in the area is also considerably important. They are divided into two
classes according to their origin. Firstly, those which are the out-come of meandering action of the rivers and generally work as a reservoir for the surface drainage as well as the rain water either brought by the seasonal drainage or deposited directly, emptying its excess water into the river so long as the rivers themselves do not attain flood levels. Such lakes are found in the vicinity of the rivers Gomati, Bisui and Tonri, whereas the second category of lakes consists of those depressions, which are isolated and collect water during the rains e.g. Tal Masian, Chitan Tal, Karhua Jhil, Raja Ka Bandh etc.

Physical Divisions

On the basis of relief and surface drainage, the area can be divided into three physical divisions (Fig.1.2).

1. The Khadar
2. The Bhangar
3. The Region of the Lakes

1. The Khadar: The Khadar occupies a tract of different width and length along the rivers Ghaghara and Gomati. It is characterised by general moist conditions, so much so that in rains, it may even turn into swamps, but in winters, upper soil gets dry while the sub-soil remains moist and water can be found just by digging a few feet deep. The kharif crops of these areas are subject to flood conditions, while rabi crops experience the deficiency of surface
moisture. In short, the agriculture of the area is completely on the mercy of rains and river action. Sometimes river action captures a little portion of the fertile land by cutting channels across it, on the other hand it may deposit layers of fertile silt on what was formerly poor soil.

The Ghaghara Khadar is somewhat different from the Gomati khadar. It is also known as Manjha and marked by large expanse of waste land, covered with a thick wild growth of Jhau (Tamarisk) and Kasehri (Thatching grass), giving shelters to wild life.

The Gomati Khadar is also known as tarai, less vulnerable to floods in comparison to the former and presents a continuous tract throughout the bank and is dissected by ravines at several places, affecting the drainage of the area especially between Sultanpur and Aldeman. Gomati Khadar also formed a narrow strip between upland region and Lake region in the south, north and north-west, providing rich soil with restricted drainage suited to the cultivation of transplanted rice.

2. The Bhangar: It occupies the north and south-west portion of river Gomati. The portion laying north of Gomati

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8 Final Settlement Report, op. cit., p. 4.
9 District Gazetteer of Sultanpur, Allahabad, 1903, p. 15.
contains three main types of soil, viz., sandy, loam and clayey loam, but their concentration is rather in patches, and it is difficult to mark them on the map. Sandy soil is generally found in the south-west of Gomati as well as on the right bank of the Ghaghara. Its width varies from 1.5 to 5 km, but the predominant soil is sandy-loam, containing enough moisture. The chief crop of this area is *arhar*, but is vulnerable to frost. The central part between sandy soil area to the north and south of this area is covered with loam, good for agricultural practices, coupled with easy irrigation facilities. Clayey-loam is found near the lake region in the south-east corner and also in the central part in patches, containing lakes and depressions. Between *Gomati khadar* and south lake region exists the narrow strip with fertile soil, devoted to transplanted rice, traversed by numerous small streams, which join Gomati. Watertable of this area is said to be at a depth of 6 to 8 m but in the monsoon season it comes a little up.

3. **The Region of Lakes**: It covers the south and south-west along with the south-eastern corner of Sultanpur district (Fig.1.2). South and south-west portion is agriculturally poor owing to *usars* and *swamps*, coupled with numerous lakes

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and 
tals. Only rice can be cultivated on profitable basis. The south-eastern portion is covered by clayey soil, but it has also patches of barren land and alike southern portion, here too 
usar lands exist. Due to the presence of 
reh, even the cultivated patches give poor results. Water-logging, due to bad drainage in the rainy season, leads to the formation of 
usar land in this area, while the flooded water hits the standing crops and leaching the fertile layer of the soil in the form of sheet erosion.

CLIMATE

The climate of the region is, on the whole, healthy, except in the swampy low-lying tracts. Tropical in nature, winds blow from land to sea in one season and opposite in the other season. Meteorologist divide the whole year into two parts, based on monsoons.

(a) The season of north-east monsoons.
(b) The season of south-west monsoons.  

(a) The season of north-east monsoon is further sub-divided into two parts: (i) cold weather season lasting from January to February (ii) hot weather season, begins with March and lasts till mid-June.

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11 Kendrew, W.G., 'The Climate of the Continents', Great Britain, 1961, p.155,
(b) The season of south-west monsoon is also sub-divided into two parts: (i) the season of general rains, from mid-June to October. (ii) The season of retreating monsoon, commencing from November to December. Cold season refers to the period of rabi crops, whereas kharif crops coincide with the rainy season.

Broadly speaking, the climate of the area is divided into three distinct seasons.

(i) The cold weather season (November to February).
(ii) The hot weather season (March to mid-June).
(iii) The season of rains (Mid-June to October).

The Cold Weather Season: During the early November, almost half of the high pressure belt moves from northwestern India, covering the whole Ganga-Ghaghara Doab. The direction of the winds from west to east is the result of pressure distribution in general and partly influenced by the Himalayan relief.¹² The mean monthly temperature in the month of December at Faizabad was 15.6°C whereas at Sultanpur, it was recorded as 16.4°C, but the lowest temperature of the year was recorded as 3.4°C, whereas the highest temperature touched 46.0°C in the Central Ganga-Ghaghara Doab.¹³ The days are fairly warm, while the nights are cold. January

¹³ The Climatological Tables, 'Indian Meteorological Department, New Delhi, 1981.'
is considered to be the coldest month of the year, accompanied by mist and fog, known as 'kohra', often reduces the visibility to almost nil. Frost is also noticed frequently, but its intensity varies. Often crops are affected. February is the month of clear sky with increasing temperature, but still remains colder than November. During the span of December to February, thunder storms move through this area and early light rain in this season is expected which is a boon to the crops, but rains accompanied by hailstorms are fatal to the standing crops. Relative humidity varies between 64 per cent and 69 per cent at Faizabad while between 52 per cent and 53 per cent at Sultanpur.¹⁴

The Hot Weather Season: Months of March, April, May and half of June, constitute rest half of the dry monsoon. Sharp rise in temperature occurs in March; in this month, the mean monthly temperature rises to 24.0°C, while the mean maximum temperature remains 32.0°C, and the mean minimum temperature 15.0°C (Fig.1.3). Increase in temperature continues upto the month of May. The thermometer registers a high temperature and the mean monthly temperature in May at Faizabad and Sultanpur remains 31.9°C and 33.8°C respectively, but the relative humidity drops to 29 per cent and 23 per cent at Faizabad and Sultanpur respectively.¹⁵

The days are hot, while the nights are warm, though the mean diurnal range of temperature is as high as in March.

¹⁴ ibid.
¹⁵ ibid.
MEAN MONTHLY TEMPERATURES

FAIZABAD

SULTANPUR


FIG 1.3
May experiences the highest temperature of the year. The mean maximum temperature during this month are 31.4°C and 34.1°C respectively, while an absolute maximum of 40°C is not uncommon. The excessive heat has a desiccating influence on the vegetation, and the surface becomes parched. May and half of June is the period of intense hot dry westerly winds, locally known as loo. Sometimes it becomes so vigorous that humidity comes down to two or three per cent between 12 noon and 4 p.m.

Due to strong local disturbances, some sporadic, short lived rain can be seen; it may be repeated frequently also. The barometric oscillations during a storm are rapid and considerable, but are largely due to local causes.

The total average rainfall in hot weather season varies between 35.8 mm and 34.3 mm, but the number of days and the amount of rainfall is higher in May with 51.8 to 42.7 mm, whereas the lowest recorded rainfall in April in case of Faizabad is 24.7 mm and 26.4 mm in case of Sultanpur during March. These rains are good for the maize and

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fodder crops of the area. It has the tendency to decrease from east to west, due to the increasing sea distance as the air gets drier and gradually easterlies are replaced by the westerlies, reducing the precipitation accompanied by the storms. Rainfall received during hot weather season gives temporary relief from heat as well as helps in sowing of early rice crop. However, rains with violent winds cause damage to the trees and buildings etc.

The Season of General Rains: The climate of the area closely resembles that of the rest of Ganga-Ghaghara Doab and calls for no special comment. The wet monsoons normally start from the middle of June and last till October. The rainfall in the area is distinctly heavy, when compared with the other districts, but the average is not higher than that recorded in the trans-Ghaghara districts to the north, which lie closer to the hills. With the arrival of monsoon in the area, a drastic change in temperature and humidity conditions is noticed. Rainfall alternating with rainless gaps of a day or two is common in the months of July and August and these are the rainiest months of the year as they receive more than 50 per cent of the total annual rainfall. The month of September is the period of long rainless gaps with the slight rise in day temperature. Humidity, however, remains high with no motion in air. The average rainfall of these two districts viz., Faizabad and Sultampur in this month is recorded as 196.7 mm and 184.9 mm (Fig.1.4)
respectively, while in June alone both the districts received 106.5 mm and 82.2 mm respectively. High humidity with close weather conditions makes the heat intolerable and creates a number of problems for health. The time between September to half of October is considered to be the most unhealthy period of the year. October is the month of retreating monsoon, but the mean maximum temperature remains as high as in September. Rainfall, though little, is useful for the rabi crops and for the maturity of late rice. Rainfall in the months of June and September is irregular, affecting the agricultural practices of kharif and rabi seasons, whereas continuous rainfall for several days leads to flood conditions, resulting in sheet and gully erosion, and destruction of crop and dwellings.

**Annual Variability**

Annual variability means the percentages of mean variations from the average, half the difference of the two means; firstly, for the years of excess rainfall to the average, secondly, for the years it has short of the average rainfall, calculated by the writer with the help of rainfall data for 50 years 1931-1981.

\[ \frac{UQ - LQ}{M \times 2} \]

Where,

- **UQ** = Upper quartile
- **LQ** = Lower quartile
- **M** = Median
It can be seen from the (Fig. 1.5) that the mean annual variability of rainfall is greatest in the north-western part of the area i.e. from Tanda towards Bikapur and is least in the east. It is noticed that variability is high, where the rainfall is low and with high rainfall, variability is low of course with some exceptions. Twenty-two per cent variability is noticed at Musafir Khana, where the rainfall is 956.7 mm. Whereas 17 per cent is reported at Khadipur with the rainfall of 1086.7 mm. It is good that variability at no station is recorded below 17 per cent as 12 per cent or below, variability is said to be susceptible to famine. The driest years known were 1876 and 1877 with 530.35 and 519.43 mm of rainfall respectively, a deficiency which resulted in famine of some intensity.20

**Variability in the Wet Monsoon** (June to October)

Agricultural activities are much dependent on variability in the wet monsoon than the annual variability. Timely distribution of rainfall is more important, even if the average rainfall is below the normal. If the rainfall is in time, the crops will not be much affected. Such as heavy or scarcity of rainfall in June affects the sowing of the early *kharif* crops and also their output. Sufficient amount of rainfall in July and August is harmful for rice

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20 Faizabad, op. cit., p.16.
crop. Deficiency in rainfall in the months of September and October delays sowing of winter crops and adversely affects the yield and quality of the late kharif crops. Heavy rainfall during these months leads to waterlogging, while premature cessation of the rains may cause postponement or restriction to the sowing of the rabi crops.

Table I

Showing the Percentage Mean Monthly Variability at Selected Stations*

<table>
<thead>
<tr>
<th>Station</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faizabad</td>
<td>59</td>
<td>31</td>
<td>24</td>
<td>49</td>
<td>351</td>
</tr>
<tr>
<td>Akbarpur</td>
<td>47</td>
<td>35</td>
<td>30</td>
<td>38</td>
<td>255</td>
</tr>
<tr>
<td>Bikapur</td>
<td>35</td>
<td>27</td>
<td>23</td>
<td>40</td>
<td>312</td>
</tr>
<tr>
<td>Taula</td>
<td>55</td>
<td>29</td>
<td>26</td>
<td>36</td>
<td>213</td>
</tr>
<tr>
<td>Jalalpur</td>
<td>53</td>
<td>26</td>
<td>32</td>
<td>50</td>
<td>132</td>
</tr>
<tr>
<td>Sultanpur</td>
<td>55</td>
<td>30</td>
<td>21</td>
<td>46</td>
<td>313</td>
</tr>
<tr>
<td>Amethi</td>
<td>80</td>
<td>35</td>
<td>25</td>
<td>46</td>
<td>146</td>
</tr>
<tr>
<td>Kadipur</td>
<td>40</td>
<td>37</td>
<td>27</td>
<td>38</td>
<td>184</td>
</tr>
<tr>
<td>Musafir Khana</td>
<td>54</td>
<td>28</td>
<td>27</td>
<td>45</td>
<td>111</td>
</tr>
</tbody>
</table>

* Calculated on the basis of monthly rainfall Statistics of 50 years (1931-81) for the selected Stations, Published by Government of India, Monthly and Annual Rainfall Table of Uttar Pradesh, Lucknow, 1985.
It is clear from Table I that the variability is least in the months of July and August, but is higher in the rest of three months. In the months of July and August, variability is below 35 per cent, with exception at Khadipur (37 per cent) and the lowest is reported at Sultanpur with 21 per cent. In June, variability fluctuates between 40 and 59 per cent; with the exception at Bikapur, where it is 35 per cent while at Amethi it is 80 per cent. The month of October experiences very high range of variability i.e. (111-351), whereas in September and June it ranges between 38-80 per cent (except at Bikapur and Tanda 35, 36 per cent respectively).

The present study has, thus, shown that rainfall is most variable in October and less variable in the months of September and June. Variability is high at the time when its regularity is most required in the Central Ganga-Ghaghara Doab. Such conditions may lead to uncertainties in the agricultural programme.

SOILS

Data based on scientific classification of soils are not available. However, we have some information about the soils of the area which is based on the settlement reports and the District Gazetteers. The main considerations in such classification were texture, colour, availability
of water and the level of land. Local names were given to each type of soil and are still accepted in the Central Ganga-Ghaghara Doab. Recently, some regional soil laboratories have been established by the State Government with a view to preparing a detailed soil maps, based on chemical analysis of the soils. This area comes under the jurisdiction of Varanasi soil laboratory but this laboratory has not been able to prepare relevant soil maps of the area under study so far. Most of the soil maps concerning the area prepared by different authorities present a rough picture of the soils. The Government of Uttar Pradesh has also started sample soil survey scheme, based on Stewart's report, and has prepared a map exclusively of Varanasi district. On the basis of mechanical classification of soils, introduced in 1860, soils are classified as loam (doras or dumat locally known) clay (matiyar) and sand (bhur). Later on, this system was changed and a new mode of classification based on productivity and fertility was adopted according to which the soils of the area are grouped into three categories: (i) Goind, (ii) Miyana and (iii) Palo.

22 Shafi, M., op. cit., p. 40.
Geologically, the soils of Central Ganga-Ghaghara Doab fall in two parts: (i) khadar or new alluvium and (ii) bhangar or old alluvium.

(i) The Khadar lands are found on either side of the Ghaghara and Gomati banks, and their texture varies from clay to sand or silty sand. River in spate carries large quantities of materials of all sizes from coarse sand to fine silt and with the retarded speed coarser sand is deposited. As the distance increase from the banks, texture improves with greater percentage of clay and silt.

(ii) Bhangar lands: They are found along the high bank of the river Ghaghara in the north and its belt varies from about 2 km to 5 km in width. Such lands are generally free from floods as they occupy the higher parts of the area. Five varieties of soils are found in the entire bhangar lands. They are (i) Sandy soils, (ii) Sandy loam, (iii) Loam, (iv) Clayey loam and (v) Clay. Such soils are evenly distributed in the bhangar lands of the area (Fig.1.6).

Usar Soils: The term usar is also in common use, applied to the barren lands infected with saline afflorescence known as reh. It has a very irregular distribution in the Central Ganga-Ghaghara Doab and is not possible to mark

24 Final Settlement Report..., op. cit., p.4.
their exact areas on soil map. However, their good portion is found in the south, east and south-west areas of the district Sultanpur, whereas in Faizabad district, it is confined to a few patches. Its formation is due to the presence of the afflorescence of Sodium Carbonate and Sulphate, found in abundance in the alluvial soils of the Indo-Gangetic plain.

Such soils carry much alkali salts, and this salty crust on the alluvium is known as reh. These salts affect the growth of the crops, and the areas infected by such salts become unfit for agricultural purpose.

Reclamation of Usar Lands

It is possible to reclaim usar lands by removing the excess salts from the soil by means of improved drainage. Application of heavy organic manure is much helpful in controlling and improving the condition of usar lands. The use of green manures and gypsum is proved to be most effective, and produced encouraging results in Uttar Pradesh in case of usar lands. Such soils are to be treated with specific quantities of well-powdered gypsum and filled with water. Thereafter, water is to be drained out and crops of dhaincha is sown as a green manure at the rate of 40 kg per acre.


26 Agarwal, R.P., 'Progress of Recent Researches in the Section of Agricultural Chemistry, Kanpur, 1953, p.20.
IRRIGATION

Irrigation plays an important role in the promotion of agriculture. It is one of the many measures to increase output and to make full use of the land by growing second and third crop in the same field. It is extremely essential for cash crops and vegetable. Naturally, in the absence of good irrigation, one has to depend upon the nature and the amount of rainfall which often falls short of the requirement coupled with unevenly distribution and irregularities and compels the farmers to produce merely single crop. Most of the agricultural lands of the area receive fair supply of irrigation water, but security and timely supply depends rather on the nature of the sources from which water is obtained.

The area with the annual rainfall of 1004 mm, 587 mm in the rainiest months (July and August) of the year\(^{27}\) needs adequate irrigation facilities, both from tubewells and canals. The available sources i.e., wells, tanks and ponds cannot meet the full requirements of the two seasons. With a view to safeguard against risks, adequate facilities should be provided.

Total area covered by various canals is about 118,279 hectares (32.3 per cent) i.e. Ghaghara, Sarda, Tanda Canals. Construction of tubewells has started in recent years. Till 1946, there was only one government tubewell in the whole area, but its number increased to 245 in 1958, 267 in 1963, and touched 22,930 in 1984-85, while in Sultampur the numbers were 75 and 91 respectively in the corresponding years but has increased to 13,266 in 1984-85. Total area irrigated by these tubewells has crossed the limits covered by canals and other systems of irrigation and accounts for 62.4 per cent of the total irrigated area of 228,635 hectares in the districts. Construction of private tubewells has also increased tremendously to 150,999 in Faizabad, followed by Sultanpur district with 73,267 during the year 1984-85. Construction of wells has almost stopped and its utility has also decreased. Tanks and ponds still continue to be some source of water supply but their use in agriculture has been reduced with the introduction of more and more tubewells and expansion of canal system during 1973-74. Total irrigated land (wells) was 150,029 hectares which is reduced to 11,590 (-88.96 per cent) hectares. Whereas ponds, tanks and lakes covered 51,409 hectares in 1973-74 but reduced to 6,639 (87.08 per cent) hectares in 1984-85 in both the districts.

Irrigation is practised in both the seasons i.e. kharif and rabi. However, crops of the rabi season depend almost on irrigation water. Total area irrigated during the kharif season in both the districts was almost 52,086 hectares during 1973-74 whereas it is 62,550 (+20.1 per cent) hectares in 1984-85. While the total area in both the seasons accounted for 288,792 hectares (1973-74) and 402,399 (+39.3 per cent) hectares (1984-85). Total area including zaid crops is estimated to be 423,660 hectares; this includes also the area irrigated more than once.

In 1984-85, about 76.1 (40.6 per cent in 1973-74) per cent and 86.1 per cent (37.3 per cent in 1973-74) of the total area under cultivation is irrigated in the districts of Faizabad and Sultampur respectively in the rabi season. This being the rabi crops may not be grown without sufficient water with chemicals fertilizers. Total area irrigated in the rabi season, under different crops is estimated at 339,849 hectares in 1984-85.

On the whole, the existing irrigation facilities although increased to two times of the figures for 1973-74, yet more development is needed in the sphere of irrigation incase better yield per hectare is desired and also to ensure more foods to the growing population.
AGRICULTURE

Agriculture being the most important occupation in Uttar Pradesh, a large percentage of the population of this area (approximately 80 per cent) depends on it. There is a rapid increase in the growth rate of population not only in the area under study, but in the entire country, whereas the rate of productivity is relatively low with the result that adequate food supplies cannot be ensured for the entire population. Moreover, on account of unstable economy, people cannot afford to eat such foods which can supply them with essential nutrients. So that they may not fall easy victim to various deficiency diseases. The writer is of opinion that the present situation can be improved to an appreciable extent with the application of modern techniques based on a scientific survey of agricultural lands and suitability of crops to different types of soils.

Agriculture in the Central Ganga-Ghaghara Doab attains a satisfactory position in comparison to other districts of eastern Uttar Pradesh. The area is endowed with very good soils, suitable climate for a variety of agricultural productions and some irrigation water. Despite these facts, the cropping intensity is low and the population of the area finds it difficult to get proper and adequate food supplies. Recent trends have shown that continuous efforts are being made to put more and more lands under cultivation and to
produce variety of crops with increased output with the help of modern techniques, seeds and fertilizers etc.

The system of agriculture in no way differs from that in the surrounding districts and the crops are sown in the customary rotation; the produce is more or less the same in value as that obtained in similar lands elsewhere. With the abolition of bonded labour, introduction of consolidation scheme and ceilings on land holdings, the interest in agriculture has increased as it makes way for better planning by using tractors, tube-wells and other techniques.

The different geographical environments prevailing in different regions makes it almost impossible to find out any agreed solution to any one problem on State level. Each region has its own individuality and therefore needs separate treatment. Regional diversities affect the agricultural land use too. With a view to assess the agricultural potentialities of the region, it is essential to embark on a plan which takes into account soil, climate and socio-economic factors of the area. Table II gives a detailed picture of land utilization in the area. About 66.9 per cent i.e. 588,626 hectares of the total reported area is cultivated

29 Ahmad, S.W., Distribution of Nutritional Deficiency Diseases in Relation to Environmental Factors in Central Ganga-Ghaghara Doab, Dissertation submitted for M.Phil Degree, Aligarh, 1975, p.15.
Table II

Land Utilization in the Central Ganga-Ghaghara Doab in the year 1973-74 and 1984-85

<table>
<thead>
<tr>
<th>District</th>
<th>Year</th>
<th>Utilized Land</th>
<th>Forest Use</th>
<th>Land in Other Uses</th>
<th>Cultivable Waste</th>
<th>Pastures</th>
<th>Groves</th>
<th>Fallow Land</th>
<th>Other Fallow Land</th>
<th>Actual Sown Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faizabad</td>
<td>1973-74</td>
<td>437,760</td>
<td>1,394</td>
<td>10,643</td>
<td>50,235</td>
<td>23,520</td>
<td>495</td>
<td>27,252</td>
<td>15,483</td>
<td>9,383</td>
</tr>
<tr>
<td></td>
<td>1984-85</td>
<td>439,916</td>
<td>1,234</td>
<td>7,750</td>
<td>58,034</td>
<td>12,778</td>
<td>2,010</td>
<td>21,522</td>
<td>26,324</td>
<td>13,788</td>
</tr>
<tr>
<td>Sultanpur</td>
<td>1973-74</td>
<td>445,370</td>
<td>1,643</td>
<td>27,348</td>
<td>40,209</td>
<td>20,601</td>
<td>517</td>
<td>19,702</td>
<td>13,932</td>
<td>11,122</td>
</tr>
<tr>
<td></td>
<td>1984-85</td>
<td>439,849</td>
<td>1,848</td>
<td>18,665</td>
<td>44,836</td>
<td>17,126</td>
<td>2,071</td>
<td>8,470</td>
<td>30,093</td>
<td>24,590</td>
</tr>
<tr>
<td>Total</td>
<td>1973-74</td>
<td>883,130</td>
<td>3,037</td>
<td>37,991</td>
<td>90,444</td>
<td>44,121</td>
<td>1,012</td>
<td>46,954</td>
<td>29,415</td>
<td>20,505</td>
</tr>
<tr>
<td></td>
<td>1984-85</td>
<td>879,765</td>
<td>3,082</td>
<td>26,415</td>
<td>102,870</td>
<td>29,904</td>
<td>4,081</td>
<td>29,992</td>
<td>56,417</td>
<td>38,378</td>
</tr>
</tbody>
</table>

in 1984-85 which is short by 2.13 per cent in comparison to 1974-75, 69.03 per cent i.e. 609,651 hectares. This is also obvious from this table that the total cultivated area of Faizabad (68.4 per cent) was relatively less than that of Sultanpur (69.3 per cent) in 1973-74. However in 1984-85, the reported area of Faizabad increased from 437,760 to 439,916, 0.49 per cent while the sown area decreased from 68.4 per cent to 67.4 per cent. Comparing the figures for the two districts, it is obvious that despite decrease in the Sown area in the case of Faizabad, the percentage is still higher than that of Sultanpur. However with reclamation of usar lands and using the cultivable waste land including fallow land, more areas can be added to the existing cultivated land. Thus more food can be made available to the local population of this area.

The main purpose of soil classification is to determine the nature of crops to be grown in the area under study. Cropping patterns that have evolved under the present soil condition reflect a close relationship between the physical environment and the socio-economic conditions. The existing cropping pattern reveals that sugarcane is the most important cash crop, while rice, wheat, barley, gram, peas etc. are other important crops. The main rabi crops are wheat, barley and peas, gram and pulses. Among kharif crops rice is the leading crop followed by millets and maize.
Table III shows that the most important of all kharif crops is rice, which covers major portion of the net sown area of 278,139 hectares (1984-85), 11,751 hectares (+4.41 per cent) more than the area reported during 1973-74. The increase in rice cultivation is appreciably high in Faizabad (66.6 to 92.9 per cent). In case of Sultanpur, the position is just the reverse. Cultivation of rice decreased from 126,185 (1973-74) to 103,308 hectares (-18.2 per cent) in 1984-85. Briefly speaking, the area devoted to rice in Faizabad (92.9 per cent) is much more higher than the area under rice in Sultanpur (56.6 per cent). Production also has increased from 105,414 metric tons to 263,534 in Faizabad district whereas in Sultanpur district increase is merely to the tune of 7,562 metric tons. The main reason for this difference is due to better soil and drainage. The average yield of rice is more than 50 per cent higher in Faizabad than in Sultanpur (15.07 and 9.30 quintal per hectare). The survey conducted by the author indicates that the bulk of population eat rice and the coarse grain produced in the two agricultural seasons.

Wheat is the main rabi crop, which constitutes the main diet of well-off inhabitants, followed by other crops e.g. gram, barley, peas, in both the districts. Wheat is sown alone as well as in combination with other crops e.g. barley and gram, but the most popular combination is with
<table>
<thead>
<tr>
<th>Crops</th>
<th>Year</th>
<th>FA I Z A B A D Area</th>
<th>Production</th>
<th>Yield</th>
<th>SULTANPUR Area</th>
<th>Production</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>1973-74</td>
<td>140,203</td>
<td>105,414</td>
<td>7.43</td>
<td>126,185</td>
<td>88,511</td>
<td>7.07</td>
</tr>
<tr>
<td></td>
<td>1984-85</td>
<td>174,831</td>
<td>263,534</td>
<td>15.07</td>
<td>103,308</td>
<td>96,073</td>
<td>9.30</td>
</tr>
<tr>
<td>Jowar, Bajra</td>
<td>1973-74</td>
<td>9,180</td>
<td>6,332</td>
<td>7.02</td>
<td>40,565</td>
<td>11,091</td>
<td>7.02</td>
</tr>
<tr>
<td></td>
<td>1984-85</td>
<td>8,674</td>
<td>9,921</td>
<td>13.74</td>
<td>30,140</td>
<td>42,286</td>
<td>14.80</td>
</tr>
<tr>
<td>Maize</td>
<td>1973-74</td>
<td>9,932</td>
<td>2,922</td>
<td>2.94</td>
<td>6,388</td>
<td>1,880</td>
<td>2.94</td>
</tr>
<tr>
<td></td>
<td>1984-85</td>
<td>4,312</td>
<td>2,965</td>
<td>6.08</td>
<td>2,918</td>
<td>1,649</td>
<td>5.65</td>
</tr>
<tr>
<td>Sawan, Kodon</td>
<td>1973-74</td>
<td>13,932</td>
<td>7,429</td>
<td>5.26</td>
<td>11,045</td>
<td>5,425</td>
<td>5.26</td>
</tr>
<tr>
<td></td>
<td>1984-85</td>
<td>1,977</td>
<td>891</td>
<td>4.86</td>
<td>3,699</td>
<td>2,635</td>
<td>6.76</td>
</tr>
<tr>
<td>Arhar (Pagon)</td>
<td>1973-74</td>
<td>5,787</td>
<td>7,270</td>
<td>12.56</td>
<td>14,695</td>
<td>30,348</td>
<td>20.65</td>
</tr>
<tr>
<td></td>
<td>1984-85</td>
<td>9,563</td>
<td>9,046</td>
<td>9.46</td>
<td>12,425</td>
<td>26,751</td>
<td>21.53</td>
</tr>
<tr>
<td>Pulses (Urd, Moong, Moth)</td>
<td>1973-74</td>
<td>1,352</td>
<td>384</td>
<td>-</td>
<td>5,852</td>
<td>1,633</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1984-85</td>
<td>1,002</td>
<td>218</td>
<td>2.66</td>
<td>3,335</td>
<td>820</td>
<td>2.66</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>1973-74</td>
<td>21,913</td>
<td>629,216</td>
<td>287.14</td>
<td>9,713</td>
<td>303,529</td>
<td>312.50</td>
</tr>
<tr>
<td></td>
<td>1984-85</td>
<td>20,436</td>
<td>840,083</td>
<td>411.08</td>
<td>7,791</td>
<td>297,554</td>
<td>381.82</td>
</tr>
</tbody>
</table>

31. ibid., pp.31, 34, 38, 42, 46, 87.
barley. Wheat alone accounts for 80.4 and 67.6 per cent of the cultivated land in the rabi season during the year 1984-85 with an average yield of 21.08 and 18.04 tonnes in the districts of Faizabad and Sultanpur respectively (Table IV). In Faizabad, the area under wheat has doubled in the last eleven years whereas in Sultanpur, it is up by 125.4 per cent and increased in production by 140.5 per cent (67,419 to 229,601 metric tonnes) whereas Faizabad with only about 100 per cent increase of land has produced more than 164 per cent of wheat (98,164 to 358,153 metric tonnes) followed by gram, peas and potato, the other important crops of the rabi season.

**POPULATION**

According to the 1981 census, the total population of the two districts viz., Faizabad and Sultanpur was 425,293. Further, about 89 per cent and 96.7 per cent respectively of the total population lived in the villages. There has been slight decrease in the rural population. It has decreased to the tune of 4.3 and 2.5 per cent in the districts of Faizabad and Sultanpur from 1971 to 1981. But the overall increase in population is positive as it is evident from the Table V.

Table V shows that after 1901 onward till 1981, there has been regular increase in the population of this area, except in the year 1911 and 1921 when the area witnessed emigration from here to Burma, West Indies, Fiji Islands,
Table IV

Production and Yield of Crops in the Rabi Season in 1973-74 and 1984-85

<table>
<thead>
<tr>
<th>Crops</th>
<th>Year</th>
<th>Area</th>
<th>Production</th>
<th>Yield</th>
<th>Area</th>
<th>Production</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1973-74</td>
<td>1984-85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barley</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1973-74</td>
<td>1984-85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gram</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1973-74</td>
<td>1984-85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1973-74</td>
<td>1984-85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masur</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1973-74</td>
<td>1984-85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potatoes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Area in hectares
Production in metric tonnes
Yield in quintals per hectare

32. Ibid., pp.51,55,59.
Malaysia and Singapore etc. in search of employment and also a large number of people died of epidemic diseases during the said period.

Table V

Distribution of Population, its Growth (percentage) during the Period of 1901-81

<table>
<thead>
<tr>
<th>Year</th>
<th>Population FAIZABAD</th>
<th>Growth</th>
<th>Population SULTANPUR</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901</td>
<td>1,221,894</td>
<td>--</td>
<td>1,092,273</td>
<td>--</td>
</tr>
<tr>
<td>1911</td>
<td>1,150,843</td>
<td>- 5.81</td>
<td>1,056,550</td>
<td>- 3.27</td>
</tr>
<tr>
<td>1921</td>
<td>1,168,617</td>
<td>+ 1.05</td>
<td>1,012,050</td>
<td>- 4.21</td>
</tr>
<tr>
<td>1931</td>
<td>1,201,384</td>
<td>+ 2.80</td>
<td>1,060,055</td>
<td>+ 4.74</td>
</tr>
<tr>
<td>1941</td>
<td>1,315,728</td>
<td>+ 9.52</td>
<td>1,110,433</td>
<td>+ 4.75</td>
</tr>
<tr>
<td>1951</td>
<td>1,477,662</td>
<td>+12.31</td>
<td>1,292,949</td>
<td>+16.44</td>
</tr>
<tr>
<td>1961</td>
<td>1,633,359</td>
<td>+10.50</td>
<td>1,412,984</td>
<td>+ 9.28</td>
</tr>
<tr>
<td>1971</td>
<td>1,925,998</td>
<td>+17.82</td>
<td>1,641,900</td>
<td>+16.20</td>
</tr>
<tr>
<td>1981</td>
<td>2,382,515</td>
<td>+23.70</td>
<td>2,042,778</td>
<td>+24.41</td>
</tr>
</tbody>
</table>

The entire population of the area is divided into cultivators, agricultural labourers and people engaged in house-hold industries and other activities, of which 63.15 per cent are cultivators followed by 20.8 per cent agricultural labourers. Only 3.76 per cent of the population is engaged in

33 Census of India 1981, Series 21, New Delhi.
in household industries and the rest is engaged in non-agricultural activities. What is striking a noteworthy is that an appreciable percentage (38.2) of the female population participates in agricultural pursuits. Percentage of workers engaged in agriculture is higher in Sultanpur (86.7 per cent) than in Faizabad (81.2 per cent). Despite all the efforts made to step up agricultural productivity under the existing environmental conditions, food problems have been solved to a limited extent. However the solution does not lie only in meeting the total food requirement of the population in the area but to ensure nutritive diets as well for them.
CHAPTER II

DEFINITION AND SCOPE
The science of nutrition is a very defused subject, since it cuts across a number of disciplines. The scope of nutrition is so great that it is impossible for an individual to encompass the entire field. But in the study of human nutrition, geography is as important as any other natural science. It is evident that we need to know what sort of vitamins, minerals our body need, its quantity and what happens if we do not get enough of any one. It is equally necessary that we know something about economics and geography of food production, its distribution, attitude of a group or of an individual towards food. People need to know, because nutritional health is fundamental to normal general health and the prevention or reduction in the severity of disease. The need to know has steadily increased over the past decade due to tremendous changes in the nature of food supply and in the eating habits of the Indians. There need not be any inherent undesirable nutritional status of the local population in the first place and of the impact of their changing habits and life style on the nutritional health. Once nutritional status determined, the information can be used as a starting point and scientific base for efforts to encourage and suggest people to improve their nutritional status where needed, and to continuously monitor for changes in the future.

The academic researcher is firstly interested to determine the prevalence of nutritional deficiency in any particular area on the basis of geographical location, type of community, season, agricultural practices, income level and secondly, has to highlight the underlying factors determining the food choices and degrees of variations in such patterns to re-evaluate food, which has its direct effect on health.

Nutrition and diet are not synonymous though they are popularly used in that fashion. Diet consists of various articles of food which are ingested and converted for use in the body for building up and maintaining it in a vital condition. Nutrition is the end of the process by which these are assimilated and produce the desired result. While nutrition is a science that deals with all the various constituents of which food is composed and the way in which proper nourishment is brought about. The modern public health movement is neither concerned with the prevention of diseases nor with nutrition. It has the broader aim at creating an environment in which each individual can develop his potentialities to its full. This is particularly true as regards nutrition. Malnutrition produces state of ill-health and lowers the resistance and physical efficiency,

which are perhaps more important than the disease itself. Numerous investigations among school children in India have shown that a large percentage of children are in poor state of health. Again in the adult population, the ill-effects of mal-nutrition are widely evident in the shape of a low general health and reduced capacity for work. The problem of proper nourishment is assuming importance day by day as recently the United Nations (FAO) survey has revealed that the number of mal-nutritioned people in the world has risen from about 455 million in 1974 to nearly 517 million in 1989. Preschool children, younger women and school age children suffer most often from poor nutrition, and it has accounted for 25 to 50 per cent in developing countries. The survey has found wide disparities, not only between rich and poor nations like India but also between and within individual developing countries, largely due to distribution of available food.

Therefore, a positive aspect of the campaign for improved nutrition must be strongly emphasized. Freedom from disease is one thing; abundant health is another. The goal to be aimed at is the creation of a healthy and vigorous population.

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5 The Times of India, New Delhi, April 7, 1978, p. 2.
People often ask: do potatoes make people fat or does spinach supply human beings with iron? Fish is primarily a brain food, or an apple a day keeps the doctor away; even the apple growers get sick and call the physician. It may, therefore, be concluded that none of the basic nutrients e.g., carbohydrates, fat, protein, vitamins or minerals can alone promote a healthy growth, but a proper combination of all these nutrients is essential. It is a well known fact that the average Indian diet consists of cereals and pulses which together account for nearly three-fourths of the caloric intake. In the case of a large number of people with lower incomes, this proportion goes up. Cereals and pulses are so important in our diet that they supply roughly 86 per cent of protein, most of thiamine, niacin and major portion of iron content. Besides one-fourth of fat, half of calcium and riboflavin and some proportion of vitamin-A, C and D, rest is to be derived from other sources. However, other sources contribute almost negligible amount e.g., fruits, green vegetables, milk and animal products. How much of each of the nutrients is required for an individual has been recommended by the nutritional experts on the basis of ethnic, climatic and socio-economic consideration as well as the type of activity e.g. sedentary, moderate and hard worker. The suggested meal based on such considerations is known as ‘balanced diet’; whenever there is any deviation from the suggested daily diet for the population, undesirable result is bound to occur.
This may be in the form of mal-nutrition or under-nutrition. Balanced diet may ensure healthy growth of men and women.

A balanced diet is defined as one which contains correct proportion of all the nutrients needed by the individual. A person is said to suffer from mal-nutrition when the daily diet does not contain essential nutrition in the proportion suggested by the experts of nutritional sciences. Mal-nutrition is one of the most important health problems of the world in general and of India in particular. It is estimated that between one-half and two-third of the world's population suffer from it. This is the result of either chronic insufficiency of food or of inadequacy of the protective foods necessary for a healthy life, or a combination of both situations. It may result in serious disorder like anaemia in women and blindness among the children. This general hunger or hunger for specific nutrients does a lot of damage, the effect of which are far reaching. Infants born of mal-nourished mother start life with a handicap. In the first or two years, many of them die of mal-nutrition alone or due to their state of mal-nourishment, succumb easily to gastro-intestinal and respiratory infections. The prevalence of various communicable diseases in the area which is confronted with the spectre of hunger makes the situation still more serious, for resistance to infections among the population of the area is low.

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Considering the causes of mal-nutrition, it may be said that the main reasons are the prevailing poverty among the down-trodden societies and short supply of foods. But there are some more reasons also which play equally important role i.e., ignorance, traditional foods, lack of knowledge regarding proper foods and its effect on health. According to Maxim, Dixitt and Mudambi, health depends upon (i) adequate food (ii) quality of food (iii) appropriate balance in regards to essential food constituents.\(^8\)

According to May, most of the patients are from the poor classes of people living on diets that are both qualitatively and quantitatively inadequate. Corwin accepted the diets of the villagers adequate for the most part, but an adequate diet does not, of course, ensure adequate nutrition,\(^10\) and the diets of poor nutrititional quality are directly responsible for the occurrence of specific diseases.\(^11\)

**NON-NUTRITIONAL CAUSES OF MAL-NUTRITION**

Though diet plays an important role, even then when diet is proper from nutritional view point, mal-nutrition may occur due to non-nutritional causes, because the causes of mal-nutrition are always complex. It is important to realise

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this complex position, for the same type of mal-nutrition may be caused by different factors and it is essential to find out such factors to plan a preventive programme relevant to local conditions. In recent years, the role of infections and infestations in the causation of mal-nutrition coupled with helping environmental conditions have been well documented. Indian villages are among the main sufferers due to their gloomy physical conditions, certain state of mal-nutrition can not be diagnosed until fully developed, which does not show sign until developed fully. Many infections occur more easily, persist longer and cause much higher mortality in mal-nourished children.

Infectious diseases play an important role in the initiation of mal-nutrition itself. Deep-rooted cultural beliefs, customs and dependence on out-modeled and traditional bound methods of treatment play a definite part in the causation of mal-nutrition. The crude and unscientific methods may resort to not only harmful in themself but also pose great danger by preventing people to seek immediate medical attention by qualified personnels.

MAL-NUTRITION

Single deficiency almost apparently never occurs in human beings because even simply unrefined foods e.g., milk

might supply forty nutrients, may be roughly enough. A person whose diet is faulty suffers from multiple and overlapping deficiencies simultaneously. A single deficiency can, however, predominate over the other deficiencies. All energy is produced by means of enzymes, organic substances, whose principal component is protein. Vitamins are important only because they are part of certain enzymes. When protein is inadequate, however, none of the enzymes can be found in adequate quantities. Under normal circumstances, the liver produces protein known as gamma globulines or anti-bodies, whose purpose is to combine with and make various harmless bacterias, bacterial toxins and viruses. Therefore its under-supply may encourage them, besides not allowing body fluids from becoming more acidic or alkaline or blood clotting. Protein mal-nutrition is found in all sections of population among the economically underdeveloped countries of the world.

In fact, the condition, particularly in its less acute form is now usually referred to as 'protein-caloric mal-nutrition'. During the last few decades its wide, almost epidemic, explosive spreading has been noticed especially among the young children of developing countries. This metabolic-dietary diseases in infants and young children were known and extensively studied in Europe, particularly

14 ibid., p.20.
in Germany in the first decade of 20th century. They are related to a greatly reduced protein, carbohydrates ratio and were called 'starchy food dystrophy' occurring in dry (Marasmus) and in 'Edematous' from which Cicely Williams termed 'Kwashiorkor'. These designations are still in use, but without the emphasis that both forms are based on an absolute protein intake usually far below the requirement. Kwashiorkor and Marasmus are a nutritional syndrome confined to the period of late breast feeding, weaning and post weaning phases of the child's life due to deficiency of enough protective food like protein of high biological value, vitamins and other substances that would augment active growth. The word 'Kwashiorkor' is the name given to the disease by Accré people of 'Gold Coast' and was introduced to the medical world in 1935 'the disease the child gets when the next baby is born i.e., the sickness of the deposed child'. In countries with low economic standards like India, scarcity of fatty food in the market and old customs, fat intake of a large percentage of the population is usually low. Before completing weaning period, fat is available to young infants from the breast milk of the mother. Human milk is superior to any other milk due to presence of the essential, unstalked fatty acid. That is


why in many countries today breast feeding is on the decline and Marasmus show upward trend. Besides protein-caloric mal-nutrition, another disease often found in conjunction with protein-caloric mal-nutrition is Avitaminosis-A. This deficiency disease which in its most severe form, manifests itself by drying of the membranes of the eye (Xerophthalmia) and other changes (Keratomalacia) that cause destruction of the eye and total blindness occurs frequently but not constantly in association with protein-caloric mal-nutrition. The agent in this case is a deficiency of vitamin-A, and the victim most frequently is the young pre-school child, though people of all ages may be affected. In India, about five million persons are visually handicapped and every fifth blind in the world is an Indian. Blindness in the majority of cases is due to mal-nutrition, or due to poor absorption of vitamin-A. Its deficiency affects the skin before any organ. The skin becomes dry, rough, thick and scaly (Xeroderma). Thiamine, Riboflavin and Niacin mal-nutrition. Generally, vitamin-B occurs together in food, no person can be deficient in any one of this group without being deficient in another. But there are degrees of variations as there are different individual. Formerly the disease Beri-Beri was thought to be the result of Thiamine deficiency and Pellagra due to lack of niacin. In

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fact, these diseases result from multiple deficiency of all the vitamins of this group, the lack of thiamine or niacin being only dominant. Its deficiency mainly affects tongue by fusing the taste buds and in severe cases it may be cut by grooves and fissures that it looks like a relief map of the grand canyon and surrounding territories. All these vitamins together related to energy metabolism and their requirement are directly related to energy expenditure.

Vitamin-C

The relationship of faulty diet to disease is an old story. James Lind's famous 'treatise on scurvy' was published in 1753. What was new of the 1963 nutritional congress was the debate on dietary factors in the causation of Cardiovascular diseases. Scurvy has played an important role in history. Survey shows that three-fourths of our population get less than the required quantity of vitamin-C. Vitamin-C helps to form and maintain a strong cement-like material, known as Collagen, which holds together all the cells of the body and uses about one-third of all the body protein, except that the 'concrete' in healthy body is in the form of stiff jelly. The base of the bones and of the developing teeth gives all these structure strength and elasticity. Its under-supply

18 Schifferes, J.J., op. cit., p.95.
19 Davis, A., op. cit., p.123.
allows the tissues to break down and lack of calcium allows it to weaken against external agents.

**Vitamin-D and Calcium**

Nutrition is closely related to the normal processes of bone formation, growth and remodelling, for the skeleton is not a static unalterable structure. It is undisputed that vitamin-D aids the absorption of calcium, favours its retention and improves its utility. Besides, it relaxes nerves, induces sound sleep and decreases sensitivity to pain, while calcium helps in the transformation of nerve impulses, when difficult nerves become tense, grouchy, wastage of energy etc. Its under-supply becomes an air-swallower, indigestion coupled with insomnia and blood clotting. Rickets is a disease of those deprived of sources of vitamin-D or of the sun-light and is more severe in those whose diet includes inadequate amount of calcium containing foods, particularly milk.

**Osteomalacia** occurs in adult, particularly women during pregnancy and lactation, for during these times, mother's body must supply the essential nutrients for the child as well as for herself. Besides this, during lactation, women excrete more calcium than absorbing it. Therefore, vicious circle of osteomalacia has been vividly described as with each child the condition takes a step forwards as the body further drained of its minerals and vitamins. And with each child the condition becomes more piteous, the mother is more imprisoned
in the house due to pain and deformities, her chances of earning more money, of getting more food and more sunlight are curtailed.\textsuperscript{20}

**Iron**

Nutritional \textit{anaemia} has been recognised for some time as a common deficiency state. It can be the result of inadequate protein, iodine, cobalt, copper, vitamin-B or due to any of the B-vitamin deficiency as every nutrient has a role in building healthy blood. Much anaemia does exist, however, which can be correlated with iron.\textsuperscript{21} Iron, as a cause of nutritional anaemia, seems to be true in case of India and adjacent tropical countries.

In tropical countries e.g., India, dietary intake generally ranges from 15 to 30 mg but the amount of available iron for absorption appears much less, poor absorption from food stuffs of vegetable origin. Therefore, it will be difficult to achieve a satisfactory level of iron ratio in the population at large. Many factors like the decrease in physical activity and caloric intake, the change in man from hunting to agricultural pursuits and lastly due to refinement in food preparation associated with decrease in contamination iron and increase in activities such as phosphates and energy,

\textsuperscript{20} Bicknell, P. and Prescott, F., 'The Vitamins in Medicine', London 1953, p.35.
\textsuperscript{21} Davis, A., op. cit., p.177.
vitamin-D, thiamine and vitamin-A have reduced the iron availability.

**Iodine**

A great amount of existing research has centred around iodine. In many mountainous regions of the world, especially in limestone areas, troubles with the thyroid gland have been endemic.\(^\text{22}\) Endemic goitre is associated with an insufficiency of iodine in food and water.

**Under-Nutrition**

This form of mal-nutrition refers to the state of chronic under-nutrition and its full effect is probably immeasurable at the present moment. It has been the 'normal' state for so many years among a large section of the people in the world. Its physical effects vary with the victim according to age and condition.

A comparison of the food eaten in India and in other parts of the world clearly brings out the fact that our food is deficient in many respects. Indians eat more cereal than people in more developed countries and they eat far less of animal products than our counterparts. Thus, our food is short of animal protein and fats. An average Indian needs about 2400 calories per day to keep the body

fit, but about 30 per cent gets less than 1700 calories; about 40 per cent gets between 1700-2300 calories and the remaining population gets more than this. In case of other nutrients, situation is more pathetic. In general, Indian diets lack in more than one nutrient. This results in lethargic condition which is a common feature among the low income group people.

**DISEASES**

The study of geography of diseases forms an important part of medical geography. It tries to analyse the environmental conditions coupled with other factors under which various categories of diseases spread. Geographical factors have far the most part only an indirect effect on the causation of diseases.

The discipline, which is associated with diseases like cholera, plague, typhoid fever and small-pox is called 'Epidemiology' or may be defined as the ecology of the pathogenic organisms of communicable diseases in human society and are the result of interaction between the pathogen and the human organism under specific environmental conditions.

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23 Misra, R.P., 'Medical Geography of India' New Delhi, 1970, p.159.
24 Zhdanov, V., 'Epidemiology', Moscow, pp.7-8.
On the basis of mode of their transmission, communicable diseases may be classified as follows:

1. Oro-nasal
   (i) Tuberculosis
   (ii) Small-pox
   (iii) Chicken-pox
   (iv) Measles
   (v) Diphtheria

2. Oro-fecal
   (i) Diarrhoea and Dysentery
   (ii) Cholera
   (iii) Typhoid
   (iv) Food Poisoning
   (v) Infective Hepatitis
   (vi) Poliomyelitis

3. Soil Transmitted Diseases
   (i) Round Worm
   (ii) Hook Worm
   (iii) Trichuris Trichura
   (iv) Tetanus

4. **Skin Contact**

   (i) Leprosy  
   (ii) Scabies  
   (iii) Genetal Contact V.D.

5. **Arthropods**

   (i) Malaria  
   (ii) Filaria  
   (iii) Dengue fever  
   (iv) Yellow fever

6. **Zoonoses**

   (i) Brucellosis  
   (ii) Rabies  
   (iii) Plague

7. **Miscellaneous**

   (i) Trachoma  
   (ii) Blindness  
   (iii) Tracontiasis

Besides communicable diseases, there are other types of diseases which take a toll of human life annually. Among others, the writer is presently concerned with nutritional deficiency diseases. According to J.M. May, who worked on the ecology of mal-nutrition, most forms of mal-nutrition or under-nutrition are caused by deficiency of some essential nutrients either in quantity or quality of
food taken by an individual with the result that certain deficiency diseases occur. The main deficiency diseases prevalent in the country are, Kwashiorkor, Marasmus, Avitaminosis-A (Xerophthalmia, Keratomalacia, Nightblindness), Beri-Beri, Pellagra, Ariboflavinosis, Anaemia, Scurvy, Rickets, Osteomalacia and Goitre etc.

Kwashiorkor: Kwashiorkor appears to be a multiple deficiency syndrome (niacin, riboflavin, protein etc.). Its first symptoms are marked by irritability, attacks of diarrhoea and light swelling of wrists, hands and feet. The skin of the entire body loses its glistening and becomes reddish or muddy.26

It is difficult to give the spatial distribution of it due to its different names in different parts of the world. According to Trowell (1949), it is widely distributed in tropical Africa, India, Sri Lanka, Malaysia, Indo-China, Java, Cuba, Central America and Southern Brazil.27 In South India, for example, a survey was carried out in four states, where 85 per cent of the population live in small rural villages and have monthly income of less than 500 rupees. Here about one per cent of the children aged, 1-5 years showed signs of Kwashiorkor.28 In addition, for every one case of it, two

cases of marasmus 3-5 cases of vitamin deficiency and five of anaemia were found (Fig. 2.1).

**Marasmus**: It differs from kwashiorkor in various ways, the marasmic child is wasted not swollen. His hair is dull and dry, but not discoloured. He has thin and wrinkled skin with lost elasticity, but does not break down. The child does not refuse food and shows less resentment unlike kwashiorkor. Terrible wasting makes the eye look enormous and staring etc. Why marasmus develops instead of kwashiorkor is not clearly understood.

**Avitaminosis**: This deficiency disease which in its most severe form manifests itself by drying one of the membranes of the eye. There is general agreement that dryness of the conjunctiva which is called *Xerosis* or *Xerophthalmia* is a common symptom of vitamin-A deficiency. Whitish foamy patches (Bitot's spots) may appear and ulceration, infection can ensue. Photophobia has been noted in some cases. *Keratomalacia*, brings certain changes that causes destruction of the Eye and may lead to total blindness. Keratotic follicular lesions of the skin (Phrynodema) apparently can be caused by deficiency of either A or vitamin-C, but the later results in haemorrhage, because of vitamin-C deficiency. It may be the result of severe dysentery coupled with less elements of vitamin-B complex. Defective dark adoption (night-blindness) is generally thought to be a very common, an early sign of vitamin-A deficiency. 'Kruse', believed that
NUTRITIONAL DEFICIENCY SIGNS IN PRE-SCHOOL CHILDREN PERCENTAGE PREVALENCE

- CORNEAL XEROSIS (0.1)
- CONJUNCTIVAL XEROSIS (4.3)
- BITOT'S SPOTS (3.1)
- ANGULAR STomatitis (50)
- RICKETS (0.7)
- SPARSE HAIR (3.8)
- DISCOLOURED HAIR (5.3)
- EASY PLUCKABILITY OF HAIR (0.9)
- MOON FACE (2.5)
- OEDEMA (0.9)
- MARASMUS (1.3)


FIG. 2.1
Xerosis may precede the development of night-blindness. According to Passmore, Xerophthalmia and Keratomalacia is probably the most frequent sign of mal-nutrition which occurs in India. The victims are frequently the young pre-school children, though people of any age may be affected. The children of South-India, Sri Lanka, Burma, Malaysia and above all Indonesia are those most stricken.

**Beri-Beri:** Beri-Beri is usually recognised as 'dry beri-beri', 'wet beri-beri', mixed and infantile beri-beri, caused due to the lack of vitamin-B, (Thiamine) in the diet. In adults, vitamin-B deficiency is a much more chronic condition leading to dry beri-beri, wasting and paralysis of the limbs and in wet beri-beri to dilatation, impoised functioning and some-times failure of the heart, accompanied by Oedema (dropsy). In 'mixed' cases, prodromal symptoms of beri-beri resemble those of neurasthenia. Physical weakness and anorexia and irritability may be accompanied by vague digestive disturbances. Loss of the speaking voice or Hoarseness is not uncommon in adults and even more frequent in infants. Infantile beri-beri affects men and women at all ages, especially the expectant and post-natal mother, but it strikes the breast fed infants between first to fifth months of its life due to less availability of thiamine in the breast milk.

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Beri-Beri has been a scourge to the rice eating peoples of Southern China, Japan, the Philippine Islands, the Dutch east Indies, Malaysia and India. Besides, tropical parts of Africa and South America and West Indies also suffer from this disease.  

Pellagra: It is not sharply defined. The principal manifestations of the disease in the advanced stage are of several kinds, viz., a dermatitis having special features, digestive disorders, degenerative lesions of the spinal cord and psychoses of the confusional type. The syndrome is ascribed principally to deficiency of niacin and partly to deficiency of other elements of the heat stable portion of the vitamin-B complex.

Data on the world distribution of pellagra were compiled and tabulated by Sobrell. The data then and still available is far from complete. Sporadic cases of pellagra may appear almost everywhere in the world. Pellagra is common in the Bombay presidency and the increasing recognition indicates that the disease is fairly common in India.

Ariboflavinosis: It is found generally among maize eaters like pellagra but also in communities with staple rice

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31 Shattuck, G.C., op. cit., p.650.
diet. It is somewhat like pellagra, but the more characteristics signs attributed to it are ocular signs and symptoms like itching, burning and a sense of roughness of the lids combined with mild photophobia (dimness of vision in poor light and partial blindness are less frequent), angular stomatitis (by fissures at the angles of mouth). The lips may be abnormally red, cracked and scaling (particularly lower lips) coupled with lethargy, mental tension, depression, retardation etc., due to the deficient amount of niacin in diet.

Like pellagra, this is found all over the world. In India signs of ariboflavinosis have been observed by Aykroyd and others. The disease is common in South India. Thomson and Freeman described an outbreak of it in Indian soldiers on the north-west frontier.

Anaemia: Due to continued deficiency of either iron or protein in the diet, the reserves and adaptation mechanisms are unable to maintain the level of circulating haemoglobin within normal limits. The resulting fall in the haemoglobin concentration and oxygen-carrying capacity of the blood, produces the condition of Anaemia. Nutritional anaemia caused by dietary deficiency or by failure to absorb substances

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essential for nutrition, fall into three principal categories viz., the hypochromic, the macrocytic and the dimorphic or mixed type.

Microcytic anaemia, which were regarded as essentially of nutritional origin have been seen in Bombay by Wills, in Calcutta by Napier and by Edwards in Assam. Many of the cases occurred in pregnant women. Other cases were observed by Taylor and Chuttani in native Indian males, particularly vegetarian. The other two types of anaemia are not of nutritional origin.

Scurvy: Scurvy is characterised by increasing weakness, lethargy accompanied by irritability, dizziness, loss of appetite and craving for salt. In latter stages haemorrhage is noticed into skin and subcutaneous tissues. Dryness of the skin is also common with spongy bleeding purplish gums. Sporadic cases of scurvy in infants or adults may be encountered in India and such cases have been numerous during the times of food scarcity.

Rickets and Osteomalacia: Rickets is known as 'English disease'. It is a disease that is caused due to

lack of vitamin-D. It affects not only legs and hands but also the pelvic and chest region may become malformed.

In rickets there is a failure to deposit calcium and phosphorus in the growing bones. Corresponding disease in the case of adults called Osteomalacia, the bones soften due to withdrawal and excretion of the deposited calcium and phosphorus in the body. It is common in pregnant women, who get less sun-shine. In the past, rickets was thought to be rare in tropical countries due to environmental asset. The disease is more frequent in urban areas than in the rural settings. In Calcutta and Bombay, children showing signs of rickets have been seen. One area in Kangra valley in the Punjab is unique in India in having an unusually high prevalence of rickets (56 per cent of 156 children examined). The average figure for other parts of India being between 0.2 and 3.2 per cent.\textsuperscript{40} Osteomalacia is found almost in many parts of India.

Goitre: As old as history itself is the incidence of Goitre in the human race. Enlargement of thyroid glands results due to long term deficient supply of iodine. When the iodine supply is very low even the enlarged gland can not produce enough thyroxin, and the energy metabolism will

\textsuperscript{40} Patwardhan, V.N., 'Nutrition in India'
be slowed down. The person becomes sluggish and very sensitive to cold, the muscles become flabby and the mental processes are also slowed down. It is quite different from other deficiency diseases so far described, as it is neither confined to the developing nations in the tropical and sub-tropical regions nor to the population suffering from poverty. Mountainous and sub-mountainous regions - the Himalayas, the Alps and the Andes - are the classical sites where endemic goitre is found. It also occurs in the plains and even along coastal regions. It has been estimated that there are some 200 million people suffering from goitre in the world.
CHAPTER III

ENVIRONMENT AND HEALTH
Natural environment plays an important role in controlling the health of human beings. Its effect is very often felt through air and water. Pollution of any one of these may result in the spread of various diseases. Impurities and lack of certain nutrients in the drinking water may lead to deficiency diseases. The other elements of natural environment are equally important and have their effect on the human health.

Every character is subject to two types of effect and what is more explanatory is that genetic and environmental agencies may produce variations, which cannot be distinguished from one another by inspection. The individual may develop poorly because of inadequate nutrition or due to poor genes and only appropriate observations of relations on different planes of nutrition can finally distinguish these causes.\(^1\) While it is true that in a formal sense each of us may be regarded as reflecting the influence of the genes he bears and of the environment in which he has developed, that environment has certain peculiarity depending on his family and the community or society to which he belongs. These will altogether determine to a great extent not only his physical environment, but also the education he receives, the ideas he imbibes, the convention or customs to which he will

\(^1\) Mathur, K., 'Human Diversity', London, 1946, p.11.
conform (or against which he will rebel) and the activities he will pursue.

Human characters and characteristics are affected by the environment. Each of us requires from his environment food stuffs of an appropriate kind and shelter. The effects of change in these environmental agencies are too striking and too well known. With the discovery of vitamins, the elucidation of dietetic needs and improvement in the availability of food supplies, the nutritional status of the population especially in western countries, where health is better, deficiency diseases are rare and the rate of growth greater. In contrast, the case of some of the Asian countries may be quoted, where the people are still living at a bare level of subsistence and whose physique and rate of growth display their low nutritional status. Improvement in nutrition has been accompanied by similar changes in general standards of clothing and housing, as well as in the development of adequate level of sanitation. The success in improvement in nutrition, housing and the control of disease brings its own problems. The immediate effect of these measures is the reduction in the death rate. Then, unless the birth rate falls correspondingly, there must inevitably be a rise in total population. Our improvements in nutrition, housing and the control of disease have upset the biological balance upon which depends population size. We must expect man to show some genetical diversity in disease resistance and we
have, in fact, direct evidence that relation tends to resemble one another in their resistance or susceptibility to disease.

In general, however, the variety, diversity, intensity and geographical spread of environmental change by man is accelerating and as problems of pesticide contamination, climatic change or water pollution, mal and undernutrition worsen, they demand our attention. The greatest, but still only partial, exception to this situation are found in the fields of ecology and physical geography. Ecology as defined by many advocates is the science of man and environment and tries to study the relationship between organisms and their environments. Geography, on the other hand, studies the relationship between man and his environment with emphasis on the spatial manifestations of this relationship. Unlike ecologists, geographers have tended to study broad spatial patterns and relations between man and landscape. But the tradition of considering man's influence and of relating numerous varied aspects of the environment to one another are longstanding, going back to the works of Alexander Von Humboldt and Karl Ritter, early in the nineteenth century.

Geographers should provide the emerging science of environment with an appreciation of scales and maps and valuable methods of analysis as well as the integrative interdisciplinary view points mentioned above. The
contributions of other sciences have generally been limited in their approach. It can, therefore, be said that in the study of environment, geography is as important as any other natural sciences.

In a historic sense, there is little that is new, though perhaps something is to be considered in the concept of a casual relationship between the environment in which man lives and the state of his health. The German physician Alfred Grot John wrote early in this century that social conditions (a) may create or favour a predisposition for a disease, (b) may themselves cause disease directly, (c) may transmit the causes of disease and (d) may influence the course of a disease.\(^2\) (A) There is enough evidence that mal-nutrition, extreme fatigue and exposure to cold and dampness are among the conditions that may create or favour a predisposition for a disease. (B) Occupational diseases and accidents are some among a large group of illness that may be traced quite directly to the causative force, wholly or in part, of social conditions. (C) The so called crowding and filth, education, income, may result or influence the course of a disease.

Environment appears to affect man in two ways. It may reach man and affect his health; it may act upon or within

his body as a material agent or upon his mind and emotions as a non-material agent, although sooner or later this very well produces a material effect.\(^3\)

Disease is a multiple phenomenon which occurs only if various factors coincide in time and space. We have to study the relationship between them - the pathological factors and the geographical factors, which have been termed as 'pathogens' and 'geogens' by May.\(^4\) Some of the relationships are well known, but many have not been yet explored fully.

Pathological factors: (A) Causative agents
(B) Vectors (C) Intermediate hosts (D) Reservoirs (E) Man.

Geographical factors: (A) Physical (climate, latitude, rainfall, humidity, temperature, pressure, sun-shine, clouds, wind and its direction, velocity, radiation, relief, soil and hydrology).
(B) Human and social or socio-cultural (population distribution and density, standard of living, housing, diet, clothing, sanitation, income, communication, religion, and superstition, drug addiction).
(C) Biological (vegetable life, animal life on earth and water, parasitism, human and animal prevalent diseases, dominal blood groups).

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3 Rogers, E.S., op. cit., p.169.
Many writers have focused their attention and tried to establish and illustrate the relationship between the man's health and his environment under different headings (e.g. material and non-material environment, biotic community and ecosystem, relationship between pathogens and geogens etc.). The human group must be considered in stable equilibrium not merely with reference to temperature, humidity, sun-shine, altitude etc., but also to their indirect effects, the interwoven chain of biotic communities to which it is inextricably linked the plants it cultivates, the animals it breeds and even the insects which are indigenous to the region.

Human diseases can be said to be the net result of the "convergence in time and space within the person of the patient of environment stimuli, organic, inorganic or socio-cultural. These stimuli are a challenge which includes a tissular response, that is, disease (communicable, degenerative or behavioural) which in turn eventually results in ecologic adaptation and survival or in total maladjustment and death. Disease is thus "that alteration of the living tissues which jeopardises survival in their environment and which result

6 Marti-Ibanez, F., Foreword to Ecology of Human Diseases, American Geographical Society, 1958, p.17.
from an accidental collision between two or more forms of life, each pursuing its own destiny."  

The two forms of life which collide with each other to create human diseases are human beings and pathological factors (causative or organic agent, viruses, rickettsias, spirochetes, bacteria, fungi, protozoa and metazoa), causing disease, their nature is still under discussion. A definite correlation seems to exist between a number of these viruses and temperature and humidity. It has been noticed that the low temperature delays the onset of epidemics of sand-fly fever in India, whereas early warm weather usually accelerates outbreaks.

Spell of cold weather might affect the course of epidemics, it acts on both, vector and virus, but experiments proved that exposure to high temperatures may hasten the multiplication of the viruses of jungle yellow fever, in the mosquito. Rickettsias and the living organisms, completely parasitic, cannot exist outside living cells and can be differentiated in these main geographical groups, linked with ticks (North America and Brazil, South Africa and Asiatic groups, etc.) closely linked with mili-borne infections (Japan, South Asia, etc.), third group, more widespread is found in Europe and Central Asia is linked with fleas and

7 ibid., p.17.
lice, former causing epidemics and the latter epidemic typhus.

**Spirochetes**, are found worldwide but certain species seem to have definite geographical associations, some live in blood of man, transmitted by the bite of lice or ticks, another group passes directly from rodents, when man ingests food or water contaminated with the urine of an infected animal (infection jaundice). Next group needs rat bite (rat bite fever).

**Bacteria** are a vegetable origin comprising a large number of agents of human disease, throughout the world (endemic and epidemic). Cholera has been observed all over the world in an epidemic form. But endemic foci of cholera from which epidemics spread out are few, limited to certain spots in India and possibly in China.

**Fungi**, are group of plants related to bacteria, their existence is governed by various factors, e.g. humidity and temperature, a correlation that may explain their geographical distribution.

**Protozoa** and **Metazoa** are also subject to geographical condition that favours their development. Protozoa are a large group of unicellular animals, cause most widespread tropical diseases e.g. malaria (whose causative agent, a plasmodium, is dependent on both man and mosquito for its
existence) and amoebic dysentery etc. Metazoa are more complicated. They grow to be visible to naked eyes and comprise all the helminths that inhabit the tissues, the bowels (as carides, hook worms), the circulatory system (schistosomes, filaria) and the viscera (liver flukes etc.) of man. Their eggs need certain soil conditions to hatch, intermediate hosts to develop the larva and certain vectors and circumstances to reach their permanent hosts. All these stages are subject to powerful geographical influences.

Vectors

The life and activity of these vectors are also the subject of geographical influence e.g. Glossina palpalis, for instance the most important vector of African sleeping sickness, require a relatively dense wood or thicket of a more or less ever green type and the larva need a certain kind of sand in which to develop. In the same way, species of anopheline mosquitoes require various breeding habitants (fresh or saline water, water in the cells holes). The causative agents reach man in various ways, directly or indirectly. Some attack through respiratory passages e.g. viruses of measles, mumps, smallpox and the respiratory diseases. Other are swallowed with food, as in cholera, typhoid fever, amoebic dysentery; next, through skin as in ancylostomiasis. Other may transfer the germs superficially (flies, cockroaches, beetles etc.).
Intermediate hosts enter into the pathological complex as a part of organism essential to the life cycle of the agent (human fluke infections, broad tape worm etc.). Next to this comes the Reservoirs and carry on the infection in nature, when man is unavoidable or suitably protected and also as supplement to man. Agent spends parts of his life in the cycle, until picked up by the vectors, sometimes expelled by the host. Lastly, comes the man as a pathogen and works as infection carrier.

GEOGRAPHICAL FACTORS AFFECTING HEALTH

The various geographical factors should be correlated individually with the human health and diseases. Health is often defined as a state in which the mental and physical activities of the body are adjusted satisfactorily to the environment. It is said that they are influenced by two aspects, firstly, nature (inheritance) and secondly, nature (environment). Therefore disease which is the result of disturbed equilibrium, between external (biological, physical, and socio-cultural) and internal forces is caused by the interaction of patient, agent (causative organisms) and the environment. So it is clear that maladjustment of a person to his environment may lead to ill health. Here, geographical environment does not mean only the physical conditions of any particular place, but it includes, totality of the environment as indicated here.
A. Physical Environment

Environmental factors with a possible effect on man can be classified as stable factors of the natural environment, which are not subject to major change e.g. solar constant, gravitation, the composition of atmosphere, relief, climatic conditions and the general order of magnitude of temperature etc. These factors determine the conditions of phylogensis, the mechanism of morpho-physiologic adaptations, that is the connection with the external environment in general. The main periodically changing environmental factors include the seasons of the year, hours of the day. The secondary variables include seasonal and diurnal changes in atmospheric conditions. These factors are reflected in the rythm of life of living things.
From the environment a human being needs certain chemicals e.g. vitamins, proteins, minerals and other substances are mitral in their effect on the physiology of man. At the same time, a beneficial substance may become detrimental depending upon the amount. All of these inorganic factors challenge in many ways the living cells, ability to cope with the environment.

Among the inorganic factors which affect health of man, topography has a relatively indirect influence. Topography includes all the characteristics which give a piece of land its individuality in terms of elevation, relief, scope, rock types, soils and minerals and water contents. To a considerable extent, topography determines the capacity of an area to produce things needed for the survival of all living things, including the viruses which cause diseases. Areas having plains formed by rivers are good to produce many crops; mountain areas produce less as they have less extensive level lands with good soils.

Relief has bearing on the onset and end of several epidemics in an area. It is often noted that cholera ends with the onset of rains in well drained areas. Malaria is common where relief provides opportunity for water to stagnate.

A detailed study of different categories of soils has led scientists to believe that there is a close relationship
between soil, human nutrition and health. The healthy growth of food plant is very much determined by the presence of required mineral constituents in the soil. Soils which lack in essential mineral constituents lead to poor growth of the plants and thus human beings are deprived of the essential nutrients from the poor crop grown in poor soil.\(^8\) Whenever we think about the problem of food supply, we can not but think of soil. It is the soil that determines not only what we shall eat, but whether we shall eat at all.\(^9\)

The key to successful operation of the cultivator lies in the balance between energy input and production of food stuffs or energy output. As man cultivates the soil, plants and weeds the crops, he is providing inputs of energy for this system, which operates through the medium of land. Concurrently, the system is receiving inputs of energy in the form of sun-shine and rainfall, which operates through the medium of land. The combined energy inputs result in an energy output from the land which is available to the agriculturist in the form of food and this output must at least be equal to man's energy input plus conversion losses, if the system is to be self perpetuating. There may be considerable energy losses, for man does not devote the whole of his available energy


to cultivation. Likewise, all energy inputs do not result in the growth of food.

Assuming natural energy inputs to be constant in any locality, man's ability to derive sufficient energy from the land depends upon two factors, his own energy inputs (the actual magnitude of energy inputs is important only in that it must be exceeded by the energy outputs i.e. food, which constitutes his future energy supplies), and the ability of the land to convert the supplies of energy to food stuffs, which will vary directly with fertility factors and agricultural techniques.¹⁰

The importance of soil to man lies in its functions as a reservoir of nutrients and as a medium of nutrient exchange.¹¹ These nutrients, which include air and water are essential for plant growth. Any action that impedes or prevents the provision of useful soil nutrients to crops is detrimental to agriculture.

Soil which lacks in certain essential food elements may cause some diseases e.g. Goiter, Tetanus, Gasgangrene. They produce (Bacteria, Parasites) diseases, when they gain access to wounds of the body.¹² Unlike most of the deficiency

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diseases, the occurrence of endemic goiter is not determined by socio-cultural factors, rather by the nature of water, soil and its content of iodine.\(^\text{13}\)

Climate generally signifies the combined effects of the sun, the atmosphere, and the earth on the biotic phenomena including human life. Its chief elements are air, temperature, pressure, humidity, precipitation (rain, snow or other forms) etc. The combined effect of all these is modified by local conditions e.g. distribution of land and water, altitude, latitude, etc.

The influence of climate is felt by all of us at all times. Several studies show a sort of direct relationship between climate and the physical and mental vitality of man.\(^\text{14}\) One of the findings brings out energy differences between the races living in warm and temperate climates, which can not be explained by differences in diet and mode of living alone. 'The man in the tropics has a lower oxygen consumption, a lower blood pressure and a lower capacity to meet emergencies than the inhabitants of the temperate zones.'\(^\text{15}\)

\begin{itemize}
\item \(^{13}\) Diell, S.H., 'Healthful Living', New York 1964, p.445.
\item \(^{14}\) Huntington, E., 'Main Springs of Civilization', New York, 1945.
\item \(^{15}\) Markham, S.F., 'Climate and the Energy of Nations', London, 1942, p.112.
\end{itemize}
Some psychologists even feel that each climate gives rise to a mentality which is characteristically its own. Several diseases are linked directly or indirectly with climate. Moreover, the climatic conditions when marked by a monotony of seasons, as we see in the tropical and sub-tropical conditions, lead to a life-pattern which does not prepare human beings to adapt themselves to changes. Then again, the influence of climate on the diet of the people is far reaching.

The climatic conditions are no doubt of primary importance in determining the distribution of human energy, since the climate of a region determines more than any other single factor, not only the health of a people but also the type and fertility of the soil and its economic utilization. In predominantly agricultural countries, like India, climate determines, to a great extent, the amount and nature of food available to people. If the rains are good, people have more and better food to eat, and if they fail, famines occur and people suffer from both under-nutrition and mal-nutrition.

It has long been recognized that the geographical selectivity of diseases like Pellagra and Beri-Beri is due to crop popularity and the dietary customs of the population. More, recently other physiological effects have also been

associated with poor nutritional habits. However, variations in the nutritional status of people living in different areas and climate may not be entirely due to improper food selection but partially to the vitamin content of supposedly adequate diet. The climatic effects on thiamine content in meats is also proved. There is a great deficit of thiamine in Panama meats, and the investigators who ate the native meat noted that the output of thiamine in their urine decreased steadily. As soon as they ate ham imported from Argentina or United States, the thiamine excretion levels were raised. So, animal proteins are by far for the most deficient element in our food. Moist climates are not favourable for animal growth, nor are they too arid and dry ones. In the moist climates the quality of the animals is poor even though there is an abundance of green fodder and grazing grounds. Disease takes a heavy lot of life there and yield of milk and meat per animal is very low.

Climatic influence on health is not only indirect. Higher temperatures and humidity tend to reduce working efficiency of man and strain the physiological conditions of our body. The best climate is that in which heat losses are balanced by heat production in the body without much strain. Climates which are too cold or too hot are, therefore, satisfactory. But a person can normally adjust himself except when he is too young, old or sick. The process of
Acclimatization to heat consists largely in leaving to sweat more volume with less salt content, and this must be accompanied by taking more water and more salt.\textsuperscript{17}

In the tropical climates, there seems to be a lowering of blood pressure, the volume of blood presumably increases, but it is more diluted, sweating takes a toll of plasma, fluid and salts which must be made up. There is decrease in gastric secretions, accompanied by constipation and impaired appetite and digestion; there is also reduced energy for work, but this may often be a sign of mal-nutrition or some other trouble. Hence, those who have a higher energy production because of an overactive thyroid are likely to become neurasthenic in the tropics. There is less oxygen per cubic foot in hot than in cold air, and this may reduce the effectiveness of all bodily functions unless the body becomes adjusted to it. Constant sweating and the increase of blood flow to the capillaries induced by warmth have a harmful effect in blood chemistry, and the tone of internal organs, lowering resistance to infection.\textsuperscript{18} Excessive heat tends to exhaust the people and create heat stocks.

Cold with reference to its severity increases the caloric requirements, high carbohydrate diets with top heavy

\textsuperscript{17} U.S. Department of Agriculture: \textit{Climate and Man}, Washington, D.C., 1941, p. 255.

protein to improve tolerance, but in hot environment energy requirement decreases as compared to temperate climate due to a diminished basal expenditure of energy or to greater deficiency in certain types of muscular work, associated with lighter clothing or to a lessened capacity for work and less motivation or to all three. Water requirements are definitely increased, when sweating is included and somewhat in proportion to the amount of sweat secreted. During intense sweating thirst is not an adequate guide to water requirements. Salt requirements also increase, small losses in vitamins in the heat may increase slightly due to losses in minerals in the sweat and in the case of calcium, to fairly consistent increases in fecal losses in a hot environment, man's requirement for iron, and loss certainly for calcium may be increased in tropical environment.

The geographical differential which is most likely to suggest itself, particularly in a discussion of the variations in disease between warmer and cooler regions, is climate. The possibility that climate is an etiological agent of disease has been the matter of interest since the time of Hippocrates. It is not possible to test the specific relationship between climate and disease in a laboratory, but may be analysed with regard to difference in the prevalence of certain diseases in a particular geographical area.

It is said that not only does the lower metabolic level of people living in warm climates make them more
susceptible to disease than those in temperate zones, but the variation in mental alertness also plays an important part in the geographical distribution of diseases—parasitic and infectious and mal-nutrition are their greater disease problems.

On the basis of studies made so far, it can be said that there is a rather close relationship between changes in the weather and certain diseases e.g. common cold, pneumonia, infantile paralysis, cholera, smallpox, dysentery, etc. The greatest number of common cold occurs in winter while the cases of infantile paralysis, cholera and smallpox are maximum in the summer months. A close relationship is thus found between changes in the weather and acute respiratory and rheumatic infections. Impurities in the atmosphere also increase the susceptibility to infections.

It really matters little whether climate is directly responsible for the occurrence of a variety of infectious diseases or not, what is important is the fact that such diseases do exist, and they exist in tropical climates more than elsewhere. It is also important to note that the widespread incidence of debilitating, incapacitating, and life-shortening disease must seriously reduce both the desire for work and the efficiency of performance, and that these effects will, in turn, increase the likelihood of mal-nutrition
and decrease the efficacy of preventive measures in a self-perpetuating cycle of poverty and disease.\textsuperscript{19}

\textbf{B. Socio-cultural Environment}

In the foregoing pages the influence of natural environment on the health of the people has been discussed. This chapter intends to study the influence of socio-cultural factors on health. The importance of these factors in matters of health has been recognised recently. A study of the interaction between human, socio-cultural environment and health is specially important in the under-developed countries like India, for people in countries characterised by a slow rate of change have adopted certain traditional lines. What often appears to be a dogged adherence of conservative people to harmful ways is not pure stubbornness - it is just that the new changes advocated do not make sense to them. There can be no escape from facing and solving the cultural equation of medicine, health, illness and treatment.\textsuperscript{20}

The term socio-cultural as used here includes population, its density, standard of living, income, housing, food habits, agriculture, size of holdings, government policies,


clothing, sanitation, communication, religious and social customs- values, beliefs, practices, superstitions and drug addictions. In a country like India where a great majority of the people live in rural areas, Indian culture may be termed as rural culture.

Man, being a social organism, is subject to complex social and economic order. It is equally essential for him to adjust himself to non-social surroundings, and it is due to mal-adjustment to social and non-social environment that many diseases are born. Abnormal demand often affects physiological system as well as organic relationships of the primary groups and the rhythm of social routine that moulded and shaped his mental development for successive generations, prior to the present industrial age. Therefore 'an optimum relationship between the rhythm of life and the rhythm of machine as well as the tempo of work has to be established for the safety and stability of the man'.

Disease has been defined as mal-adjustment of living cells to their environment. It is for us to see how challenges arise from the environment and how the factors controlling the responses to those challenges in individual and in groups react. There is an important aspect of this reaction, challenge versus response that has not been considered i.e.

21 Rehman, J., 'Health and Environment'
the circumstances that bring together the challenger and that challenged, stimulus and the response, disease and the host. It is realised that when man is concerned these intermediate factors that either bring together or keep apart stimulus and individuals are summed up in the word 'socio-culture'. Socio-cultural factors are defined as the sum total of the concepts and techniques that human groups use and abide by in the environment in which they are placed in order to survive.

Socio-cultural factors influence disease occurrence in three main types:

(i) By linking or separating challenges of the environment and host
(ii) By challenging the environment
(iii) By challenging the host population

1. By linking and separating challenges and host, people built their houses with the material supported the environment, dress with the material procured from the nearest market and the cheapest place, eat the diet, the soil under their feet yields when treated by the techniques they know. They believe what their parents believed to be true. Then they transmit to their offspring their way of life and this becomes part of their culture. Does it mean that a given culture at a given point is a best method for survival? Under changing circumstances it may even become detrimental. From the type of housing they are forced to
adopt they get their plague and typhus and from the food which the soil, temperature and rain produce their protein deficiency. The relationships between socio-cultural factors and diseases are worth-noting.

2. Cultural influences disease pattern bringing about environmental changes; building a dam for irrigation and canals for drainage, erecting houses, planting rice adding pesticides/gypsum to the water, all such changes carry with them host of inter-locked reactions.

3. Finally, cultural circumstances bring about changes in population genetic make up, thus changing the response of tissues to environmental changes. New agricultural techniques were developed.

It is axiomatic that at the present population level, more people means more environmental problems. According to experts, the earth's ultimate 'carrying capacity' or ability to support man is probably 30 billion people, but at a level of near starvation for the great majority. However, the distribution of food and other resources is uneven and hence widespread famine appears imminent.\(^{22}\) With a total population of over 665 million, India is the second largest country of the world. The absolute growth of population in the country

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is so high that India adds to its population the equivalent of a town of almost 20,000 inhabitants every day. If this increase continues, there may well be 900 million people by 1991 and a clear 1,000 million by 2000 A.D.

The alarming decennial growth rate of population, +25.5 in Uttar Pradesh, +23.70 and +24.41 in the districts of Faizabad and Sultanpur respectively, poses serious problems for social and economic development. It nullifies all efforts to improve the admittedly low standard of living of the people. The plans to increase the production of food and other commodities and to improve the services through welfare measures are either deferred or frustrated, because the increasing population overtakes the increase in agricultural productivity as also the improvement in education, public health and sanitation, etc.

Many of the problems like under-employment, subdivision of holdings, lack of capital, and indebtedness occur together in under-developed countries, that is the condition in which any further increase in population will result in a decrease in the income level. Malthus first publicized the spectre of over-population in his book 'Principles of Population' (1798) and claimed that population increase occurred geometrically while agricultural output could only be raised arithmetically.23

The race between food production and growth of population is too clear. The existing and impending crises in human nutrition and living conditions are well-documented but not widely understood. As a result of improved methods of surveillance and control of disease, particularly communicable, and changes in environment, the country is caught up in the vortex of population explosion, one of the most ecological factors that has the capacity to lead to the so called 'ecocatastrophes' if not checked promptly. In India, by the year 2000 A.D. at the existing level of population growth rates, the food production will have to be doubled just to maintain the same levels of inadequate nutrition as of today and tripled if nutrition is to be brought up to the minimum requirements as recommended by nutrition experts.

Population growth, poor nutrition, high infant and child mortality and low incomes form a vicious circle. Mortality among infants and toddlers is high largely due to the high prevalence of malnutrition and associated childhood infections. One of the causes attributed to the failure of family planning is that malnutrition contributes to a high

death rate among the children and that this in turn acts as a disincentive for the parents to limit the number of births in family. If this general experience of losing children were to change for the better, many more parents might be willing to limit their family.

Increasing population pressure also brings about re-distribution and migration of population from rural to urban areas. One of the phenomena that occurs during such a process of urbanization is changes in the dietary practices like preferring artificial feeding to breast milk, etc. In fact, surveys carried out revealed that the nutritional status of the urban poor (slum dwellers) is worse than their rural counterparts.

Population Density

A study of the density of population per sq. km gives some clues to the understanding of the state of health of the people. More closely populated areas usually have adverse man-land ratio and hence poorer standard of living which in turn to poor health. This is especially the case in a country like India where a great majority of the people depend on agriculture for their livelihood. Densely populated areas have poorer sanitation and people living there are more susceptible to epidemic and other diseases than others.

The mean density of population in India (1981) was 221 persons per sq km. A very heavy concentration of
population is found in the belt consisting of the irrigated Ganga Plains. More than a half of the country's population is concentrated in one-fifth of its area. In contrast to the plains of the country, peninsular India in general has a relatively low density of population. However, many persons live in relation to the available land resources in the middle and lower Ganga Valley. About 25 per cent of the farmers of the country live in this area with the average holding per household as low as 4.3 acres. When we compare the density of population in India with that of other countries of the world, the situation does not appear to be really bad. But when we analyse the inter-state and inter-district differences in density, we do see some areas facing heavy population pressure. To get the real picture, it is essential to relate the density to land capability, which gives the degree of over-populated or under-populated, is to be calculated on the basis of land capability. Non-irrigated rice producing areas of the country are extremely over-populated. This includes east Uttar Pradesh (though whole of Uttar Pradesh itself has the population density of 377 persons per sq. km, whereas in east Uttar Pradesh e.g. the districts of Faizabad and Sultampur, have the density

of 525 and 459 persons per sq. km respectively). Here the population density is more than what the land can support.

A study of pressure of population on land gives us clues to the degree of under and mal-nutrition which exists. The areas which are over-populated are likely to have food scarcities at least at local levels, and hence are likely to suffer from under-nutrition. Geographic conditions influence the economic and social development of the people by the abundance, paucity or general character of the natural resources, by the local case or difficulty of securing the necessaries of life, as by the possibility of industry, commerce, agriculture afforded by the environment.

**Income Levels**

Poverty is still a major problem of our masses. Nearly one-third of the total population live below the poverty line. A great majority of infant deaths takes place in families having a low income and hence low standard of living. The economic status of the parents determines the diet, housing, sanitation, medical attention and general care that the child gets. Whether these people live in rural or urban areas makes little difference. The incidence of mortality is always higher than the higher class residential

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areas. Sydenstricker has rightly said that 'it is difficult to escape the conclusion that the major determinant in the mortality of infants over one month of age is a complex of environmental conditions among which the economic status of the family is a dominant factor'. As per the census 1981, a great majority of the people in India are engaged in agriculture. They practise subsistence farming and lead a very precarious life. The income of such people is not assured, and frequent visitations by famines and floods have almost broken the economic backbone. The average income per head of the agricultural people is as low as Rs. 1152 per annum and their expenditure per head on all necessities of life is scarcely more than 6 rupees per day. Conditions are steadily improving no doubt, but the gap between that and what ought to be is still so wide that it will take several decades before the low income people in India will be able to afford to have real good food, clothing, shelter and lead a happy life. The poorest will not be able to buy for themselves with their earnings all the essentials for a minimum standard of living; their complete earnings are spent on food alone, and still they are not able to get the required nutrients, with a per capita income of about 797 rupees per annum it is not possible to provide enough food, what to say about

nutritious food. In view of the very low purchasing power, bulk of our population depends solely on cereals and negligible amount of pulses for their calorie and protein needs. Studies revealed that as the income levels go up, consumption of quality foods like milk, vegetable and fruits goes up and dependence on cereals is reduced. At the existing level of per capita incomes, we need all the land available to produce grains simply for minimal calorie intake. The income should at least rise to eight to tenfold — which at current rates of growth may take nearly a century — if one were to include reasonable amount of animal foods in the diet.

In many cases, the ailment of the infant has a relationship with the health and diet of the mother. Poor families are unable to feed the infants properly, as they are unable to generate enough milk and secondly they often left their children half fed as they have to go out for work. There are cases where infants at the early age are given cereals meant for adults. This results in bloated bellies and anaemic looks — it is the common sight in our rural parts.

Beri-Beri is the disease which mostly affects the poorer who, for one reason or other, cannot afford variety foods which would balance the lack of vitamin in the rice that they consume daily. Next important disease associated mainly with poverty is Anaemia that occurs wherever poverty and mal-nutrition exist, and an insanitary environment increases risk. Infections and infestations, absorption
defects of the bowel, the character and composition of the diet itself, the place of growth and the nutritional need of an individual, the customs as regards marriage and child birth; and the foods permitted to pregnant and lactating women, are all immediately involved. Severe anaemia adversely affects the working capacity of the rural population and a country's economic loss due to this form of mal-nutrition is probably very great.

Agriculture, food and nutrition are inter-linked. Since independence, India has witnessed revolutionary changes in the industrial, agricultural and health spheres. Several major policies have been formulated and new strategies applied on the food and agriculture front. As a part of the Green Revolution in Indian agriculture, much attention is devoted to intensive and extensive cultivation of food grains. In this effort, it is important that all factors which can adversely affect the total yield of food grains are to be kept under control. While increasing total food production is important, proper selection of foods is another important aspect. When one is keen on obtaining maximum nutritional benefit from any foodstuff, its nutritional value should be known first. The pattern of agricultural activities in any community is dynamic, that is, agricultural activities are constantly adjusting to the environment, whether the environmental changes are physical, economic, political or cultural. Changes in the use of agricultural lands are part
of the overall adjustment and vary considerably in time and place. Changes in the crop land use have been made with a view to introducing multiple cropping systems appropriate to each region, to intensify the introduction of relay cropping, inter-cropping and multiple cropping systems. These measures have dual advantages of improving soil fertility through introduction of a legume crop in the cycle and also improving the nutritional level of the population of the region through diversification of diets and increased availability of millets, pulses and oilseeds and also to give increased income to the farmer per unit area of land. Nutritional dimension in higher yielding varieties has been adequately cared, crops screamed for their nutrients composition. High yielding varieties with higher protein, high lysine, high B-carotene, high iron in cereals and millets have been identified.

**Food and Food Habits**

Food is the urgent and recurrent need of an individual. It dictates his activities in relation to his land at every stage of economic development, fix in the locality of the encomponent or village and determines the size of the territory from which sustenance is drawn. The length of residence in one place depends upon whether the springs of its food supply are perennial or intermittent, while the abundance of their flow determines how large a population a given piece of land can support.²⁹

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²⁹ Sample, E.C., op. cit., p.61.
Food shortage in India means millions of children may die before the next eight or nine months have passed. Even with a normal harvest, nearly half the Indians live on less than 1600 calories per day and consequently a partial crop failure reduces the diet of many poor persons to disastrously low levels.\(^30\) Besides, the overall quantity of food (chiefly wheat, rice, and other cereals), the total calories, it is essential to think of quality and quantity of proteins, one of the most serious health problems today the countries are facing, what the nutritionists call protein-calorie malnutrition. It is estimated that every year millions of children die and many more are retarded physically and mentally, because of inadequate protein. The mal-nourished retarded survivors will be major handicaps to the future social and economic development of the country.

Food habits of the people vary from culture to culture. It has been seen that usually people living in isolated rural community use only those, but not all, foods which are locally produced. What people are willing to eat is determined by a complex system of attitudes, ideas and assumption that form the local culture, including religious restrictions, taboos and ideas pertaining to the merits and demerits of food and past practices. Food habits are, therefore, the product of the people's present environment.

and past history. These two factors also determine the meal pattern and methods of eating.

In India, food habits are not desirable. Firstly, for a great majority of our people, food is only a means to fill the belly; in such conditions one cannot even think in terms of nutrition. It is difficult for the people to pay for a wholesome meal. Secondly, even those who can afford it, do not do so. They use items of food which is considered to be prestigious e.g. people consume polished rice because it looks better, although gives them beri-beri. Thirdly, the method of cooking is so unscientific that most of the nutrients are wasted before it is eaten. Finally, there are certain restrictions (religious, socio-cultural) which inhabit people from taking certain food items. In many families only vegetarian meals are allowed, other families make distinction between pork and other meat, or beaf and other meat. As a result, it has been seen that a large number of people suffer from mal-nutritional deficiency diseases as well as from mal or under-nutrition. Food eaten in India differs from area to area, and the diets are generally deficient in vitamin-A, suitable proteins and certain salts (Fig.3.1).

Rice is the most important grain in the diet of more than half of the human race, especially in the wet parts of the world. In India rice constitutes the main diet of the people in Andhra Pradesh, Bihar, Himachal Pradesh, Jammu and Kashmir, Kerala, Tamil Nadu, Maharashtra, Mysore, Uttar Pradesh
FIG 3.1

UTTAR PRADESH
CONSUMPTION PATTERN OF DIFFERENT FOOD STUFFS

AVERAGE DAILY CONSUMPTION PER PERSON (Gms)

RECOMMENDED ALLOWANCE (Gms)

Among village people of Uttar Pradesh it is taken unpolished, known as red rice, but it is usually treated so as to lose a large part of its germ. The loss results from pounding of the kernal in rude mortars. The brainlayer, which is richer in mineral salts and the endosperm of the seed is retained in this process. Mc Cairison (1923) concluded that vitamin-A is present in paddy before it is milled. According to Dr. Ansari, of all cereals, rice is the richest in starch, of which it has nearly 50 per cent, the starch in rice has further advantage of being present in small and easily digestible grains. If boiled in excess water and it is thrown away, it will deprive of water soluble vitamin-B. In the process of polishing, all outer coverings of the grain are removed consisting of the husk as well as the pigmented covering containing vitamin-B, fat and protein, necessary for health and growth. It has been proved that the absence of vitamin-B from the polished rice has been instrumental in causing beri-beri. The unpolished rice, par boiled, hand pounded, is superior to the unpolished rice turned from the mills.

Next to rice, comes the wheat, second most important of cereals foods in India. Although, it constitutes main

32 Gandhi, M.K., Diet and Diet Reform, Ahmadabad, 1949, p.43.
33 ibid., p.44.
diet only in the states of Madhya Pradesh, Punjab, Haryana, Rajasthan and Western Uttar Pradesh. Wheat grain consists of

brain or outer envelop, mainly composed of cellulose, the Kernel consisting of starch and the germ consisting of

soluble starch, protein and some fat. But again milling is

the subject of loss, as it rejects the brain, discards some

of the most useful chemical constituents of the wheat, for

with the germ considerable amount of protein, fat lost with

some mineral matter. More refinement often decreases the

nutritive value e.g. unrefined sugar (Gur) is 33 per cent

superior in nutrients than that of refined sugar.

Variation in Diet

Variations are related to natural resources, traditional culture and economic status. The poor classes have a fondness for a mixture of flour made of parched cereals called Sattu, etc. Considering dietary variations, however, within the range of social classes, well-to-do families have of course/larger variety of diets than the poorer ones. Their increased adequacy is not the result of a seasoned dietetic efforts but the accidental outcome of their greater purchasing power. As one rises in economic level, the amount of animal proteins (fish, meat, milk) increases, but wealthy families represent very two percentage in India.
Nutrition and Palatability

These two situations in which food may lead to inferior nutrition - the avoidance of existing foods and the poor acceptability of new foods are well recognised. With the release of economic pressure, and in the absence of social pressure people tend to eat diets with increasing amounts of animal foods. This implies that these protein-rich foods are more palatable than the Starch rich vegetable foods, our preference for the animal foods, their high palatability is good in its nutritional value. But this is not universal. There are exceptions in both directions. There exists foods of low palatability but of high nutritional value, and conversely foods of high palatability but of low or even undesirable value. The same attitude accounts for the view that sugar is good, especially for children, because they like sweets. This is the most important example of the dissociation between palatability and nutrition, and are of the main reasons why the nutritional studies are so connected with the changing food habits.

Social, economic and geographical factors determine the diet of a region. The faults determine the types of diseases, e.g. Pellagra is associated with diets lacking necotinic acid, beri-beri is associated with rice eating population and so on.
The roots of our environmental troubles are largely religious, according to Lynn White J.R., the attitudes and actions of modern technological man contradict the reality that man is part of nature, not rightful master over nature.  

Religious and social customs not only hinder agricultural development, but also restrict the population in their dieting habits. In Indonesia, milk is not given to children because it is considered unhealthy for them. In Malaysia, children are doubly handicapped, they are not given fish and meat as they are supposed to give them worms. It is tempting to suppose that many of the customs which restrict the consumption of foods, mostly of the protein-rich and more expensive food e.g. meat, eggs, milk had their origin in economics. However, it is interesting to note that restrictions are mostly on mothers and children who need it more than men. Among Muslims, however, are restricted to rice only, for forty days after the birth of a child, besides the distinctions between vegetarian and non-vegetarian and the diets prescribed for different physiological conditions. As a result, we find a large number of mal-nutrition and deficiency diseases arising to these factors. These factors also affect directly the infant mortality.

34 Detwyler, T.R., op. cit., p.27.
C. Biological Environment

Another approach to the study of the geographical distribution of diseases could be based on the relationships between certain diseases and certain diets. The diseases could be, of course, caused by parasitic infection, by the nature of the food ingested, or both such as milk, fish.

Rice is the food consumed by the majority in India, in certain regions together with other foods in most regions. The diseases associated with rice can be classified in two groups; firstly, related to cultivation and secondly, those related to consumption. The prevalence of malaria is closely associated with the cultivation of rice. Although this statement is true in general, it is qualified by the fact that each region has its own malaria vector and each vector has its own living habits. The vector which breeds in the stagnating water of the field, is a weak carrier, and it has, therefore, been through possible to combat malaria in the islands by developing rice culture.

Many other diseases directly related to the intake of food result from (i) food-borne intoxication or (ii) food-borne infection. In the latter category come diseases like salmonellosis including typhoid fever, diphtheria, shigellosis, amoebiasis, tuberculosis, brucellosis, scarlet fever, helminthiasis, etc.
Water Supply

Water for drinking or for domestic use influences the public health. Some diseases are water-borne, directly or indirectly. This being the importance of water for survival, man has tried from time immemorial to have a dependable clean water supply. Earlier people believed that 'it is good to keep water in copper vessels, to expose to sunlight and filter through charcoal'\textsuperscript{36}. Today not more than 25 per cent of urban centres and 10 per cent of the rural settlements have the benefit of protected water supply.

Man gets drinking water from various sources, e.g. from wells, springs, rivers, lakes, pools, ponds and rains. Related to each of these sources are factors producing or inhibiting disease. Lack of iodine in water causes goiter, the flourine content of water governs several pathological conditions. If its content is lower than one part per million, dental carries is common; if much higher, nevetted enamel (dental fluorosis) occurs. Calcium deficiency in water may result in the causation of rickets and osteomalacia or at least combines with other factors to produce them. Excess of it with phosphate disturb gastro-intestinal setup and facilitates the production of stones. Calcium deficiency not only exists in water but also in the vegetable grown.

\textsuperscript{36} Kawata, K., 'Environmental Sanitation in India', Ludhiana, 1963, pp.9-10.
There are a number of other diseases which can be caused due to sewage pollution in water supply. Wells in the villages are rarely covered and hence leaves and dust have unhindered entry into them. When the leaves rot in water, they not only create a foul smell but also give rise to organisms which, when swallowed with water by men or animals, give rise to several diseases.

It has been realised that environmental sanitation contribute much to environmental health. In ancient period the basis of their civilization was the sanitary installations. The need for a healthful environment is common to all people; it cuts across boundaries of occupations, races, classes and politics. It differs from neighbourhood to neighbourhood and from region to region, not in fundamental but in complexity. It is difficult to improve the whole country at the certain level of standard by propagating environmental health programme throughout the communities. The agriculturists in the rural areas of the west are facing somewhat different problems in comparison to the agriculturists in the rural areas of the east. Such regional variations in environmental conditions have been observed in other communities of the country. These variations lead to different

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types of environmental diseases, deficiency as well as communicable.  

House and city planning also exerts its effect on the community health. We have to think much of disease than of health, from this viewpoint all the factors which affect health, housing problems come to forefront. As the slum of the day is no longer a hot bed of cholera but it will remain, however, a major source of pollution of physical environment. The dwellers in poor housing are subjected to many-fold problems, i.e. low income, mal-nourishment, limited education. In due course of time, these complex problems beget ill health among the dwellers in the poor housing areas. The sun-shine must reach the skin, and its avoidance encourages rickets and osteomalacia among the dwellers. The high incidence of rickets is found in the Kangra valley of Punjab, due to combination of high population pressure on the cultivated land, itself poor in lime and phosphorus and diet excessively cereal based with improper housing.

**CO-AELATION BETWEEN DEFICIENCY DISEASES AND ENVIRONMENTAL FACTORS**

Human beings are involved in many economic activities to gain a livelihood, but none of these activities are so

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38 Ahmad, S.W., *Distribution of Nutritional Deficiency Disease in Relation to Environmental Factors in Central Ganga-Ghaghra Doab*, Aligarh, 1975, p.43.
fundamental to his existence as agriculture because it provides sustenance to nearly 85 per cent of the total population in the area. Consciously used, the natural environment provides habitat for his crops and animals.

Here the natural environment is the 'Land', which is the basic resource of the farmers. The inherent qualities of the land, the growing population pressure, the degree of socio-cultural advancement are important factors, restricting farmer's choice and response. Any crop which is produced in the field requires labour and capital inputs in varying proportions and intensities and the output is consumed by the rural community as well as the non-agriculturist.

The forms of agricultural activities found in any region are response to four groups of environmental factors: (i) Physical, (ii) Socio-cultural, (iii) Economic and (iv) Political.

The physical factors relate to climate, geomorphology, vegetation and soil which combine to provide the ecological limits within which particular crops may be grown on a profitable basis. They provide essential nutrients and minerals which are important for human beings e.g. iodine but unfortunately it is deficient in the area under study.

The socio-cultural factors are related to the activities of the people through ages, and may condition acceptance of change in agricultural and dietary habits.
They also include religion and social organisations which impinge upon farming activities and group the entire population into vegetarian and non-vegetarian categories. They very often put certain restrictions under which one community can take certain items of food while the other cannot. Different communities observe different cultures e.g. Muslim women after delivery remains confined to their houses for about forty days while the other communities do not follow such restrictions.

Economic factors are related to the relative profitability of the crops produced, its availability, distribution among the rural community, purchasing power of the farmers to buy modern machinery/fertilizers, water for irrigation and new varieties of seed etc. for the improvement of their agriculture and also to buy from the market if necessary, enough food to enable them to maintain sound health. Political factors very often play important role in so far as the availability, distribution, price support or crop subsidies have to be decided by the district officials dealing with such problems.

Further political factors are related to the government plans, decisions aimed at assisting or retarding agricultural development and measures in respect of community health programmes e.g., direct subsidy, acreage limitations, provision of scientific research in agricultural
development and health awareness programmes, family planning and programmes relating to dietary habits and health...

In the developing countries like ours where farming techniques are not mechanized and system relating to exchange of commodities is not well-developed, physical and socio-cultural factors generally determine the agricultural activities. The success of this system depends on a balance between the two i.e. energy input and production of food stuff or energy output. As the farmer clears the land, cultivates the soil, sows seeds and weeds the crops, he is providing inputs of energy for the system, which operates through the medium of land; also the system is getting inputs of energy through natural resources i.e. sun-shine, rainfall, which also operates through the medium of land. The combined energy inputs result in an energy output from the land in the form of food, which gives human being the essential nutrient required to avoid deficiency diseases and to maintain normal health. So the output must be equal to man's energy inputs plus conversion losses if the system is to be self-perpetuating. There may be appreciable loss of energy in religious, social and ceremonial activities, and clearing weeds or secondary wild growth which are important competitors of the food crops and other such agricultural and non-agricultural activities. Nor do all natural energy result in food growth i.e. weeds and secondary wild growth. The food stuff thus
produced, if not enough to satisfy the hunger or equal to
the inputs, the system cannot continue its cycle successfully.

Assuming natural energy input (constant) in any
locality, man's ability to drive sufficient energy from the
land depends upon two factors; his own energy inputs and
ability of land to convert the supplies of energy to food
stuff, which will vary directly with fertility factors and
agricultural techniques. Reduction in soil fertility
decrease the efficiency of man's energy inputs with constant
higher energy losses and reduced supply of energy to man
via food supply (Fig.3.2). Reduced supply of food will
result in reduced conversion to exchange value, reduced
capital input and reduced supply of essential food elements
i.e. protein, fat, carbohydrates, calcium, iron, vitamins and
calories, which are essential for a normal health. Naturally
the reduced output of food elements results in increased
morbidity rate and exposed the rural community to different
nutritional deficiency diseases like; Anaemia, Beri-beri and
gastronutritional disturbances, eye diseases and related
diseases, goiter, kwashiorkor/marasmus, osteomalacia, pellagra,
rickets, scurvy/tooth and gum and urinary calculi. Increased
morbidity rate reduces the input of energy because a sick man
cannot perform equal to healthy man. Further, more
environmental factors discussed earlier may be termed as
bottle neck, reduces the flow of energy input to the land
and these variations ultimately affect the outputs. The
CORRELATION BETWEEN DEFICIENCY DISEASES AND FACTORS OF ENVIRONMENT
AFTER P. LAUT, AGRICULTURAL GEOGRAPHY, MELBOURNE, NELSON, 1968.

Fig. 3.2
environmental factors which are affecting agricultural production are also responsible for the farmers health as whatever food stuff is available to the farming community and obtained from the market through exchange are not equally distributed and the community cannot eat what they have to eat. Thus an agricultural labour is not having the privileges which a farm owner has or what one sect is eating another cannot; that makes the situation more worst. The constant energy inputs may not be the same variation in total energy input may be allowed. Man is trying to grow as much as possible to maintain balance by adopting all the possible means to improve production, even a minor irregularity in inputs, e.g., adoption of new techniques, new crops or shortened fallow period due to increasing population makes the situation precarious.
CHAPTER IV

CASE STUDY OF THE SELECTED VILLAGES
METHODOLOGY AND COLLECTION OF DATA

While making selection of villages for detailed study of various deficiency diseases, the author has tried to visit large number of villages spread over all directions of the area under study, taking into consideration the time allotted and the total funds available to the author. Out of the numerous villages which the author visited, twelve villages have been selected for the present project (Fig.4.1). Many of these villages, as it has been observed, show a concentration of the various deficiency diseases which the author desires to study. Since the study area lies in a homogeneous plain level land with little variations in the topographical features, agricultural practices, types of crops produced, level of economic status, dietary habits and environmental conditions, it has become almost an easy task for the researcher to select villages adopting the technique of purposive sampling. Under the existing conditions the present technique will not lead to any kind of generalization of results, rather it is bound to convey the real position with regard to the existence of various deficiency diseases with which the rural communities are confronted. Moving from one village to the other, it is possible that one may come across such cases wherein the selected villages may reveal variation in the occurrence of various deficiency diseases which the author has to study. Some villages may exhibit all the diseases while others may have only a few of such diseases. Any how this technique will go a long way in solving the problem at hand.
The author while collecting the data relating to the various deficiency diseases, has noticed that there are certain villages where the number of such diseases is relatively small, are agriculturally prosperous, having better literacy, soil, irrigation facilities and also having better socio-economic environments. The other category of villages having meagre facilities relating to irrigation water, fertilizers, literacy and sources of income exhibit larger number of such diseases. Such villages may be classed as agriculturally non-prosperous. Having selected the villages, the next task of the author is to adopt a methodology which may ensure a satisfactory conduct of deficiency disease survey. For this purpose, the total population of the selected villages have been classified in three economic groups i.e. A, B, C. and detailed dietary and disease survey in these three economic groups of people was conducted with a view to assess their nutritional status. Such groups have been made after assessing their total income from all sources. This income stratification gives a clear indication of the economic status of the village community. The stratification as suggested by the author is based on the actual survey of the villages under study and may be stated as under:

A. Group/category (Above Rs. 400/- per head per month)
B. Group/category (Rs. 200/- - 400/- per head per month)
C. Group/category (Below Rs. 200/- per head per month).
This survey is spread over three climatic seasons and covering two agricultural seasons of the year as the villagers depend for their daily food on the crops produced in the kharif and rabi seasons and to assess the effect of seasonal variations in food intake and daily availability of nutrition from the food and other eatables and drinks. The village communities were asked to recall all the foods they had consumed on the previous day and the frequency of consumption of various foods during the last week and the entire month. The survey was conducted for a week in each season in each of the villages, without prior information to the rural community, so that any cautions deviation from the rural daily intake could be avoided. The information so gathered had been processed and a food balance sheet was prepared. This helped in getting information regarding calories intake together with other important nutrients in their diets. Further, it was found that, in general, people suffered from under and mal-nutrition both.

Regarding the prevalence of deficiency diseases, the patients in the selected villages with developed and semi-developed symptoms were interviewed by the author during the door to door survey and discussed the problem at length with local doctor's, checked their records and the records of state government hospitals as well in respect of these diseases.
Before taking up individual villages for detailed study of nutritional deficiency diseases, it will be worthwhile to consider the food articles available to the rural population from within and as well as from outside the villages under study. There are two main crop seasons i.e. *kharif* and *rabi*. In the *kharif* season, rice, millets (small and large), maize, are the main crops while in the *rabi* season, wheat, barley, gram, peas, arhar (pulses) and groundnuts are cultivated. Besides these, moong, urd, masur (all pulses), oilseeds linseed, potatoes and sugarcane are also grown. These crops form the basic items of food for the rural population. The entire caloric intake derived from these sources except in some villages where the population is economically well-off, and can afford to purchase some fruits and other nutritive articles of food.

So, on the whole, the main sources of getting daily foods in the rural areas are agriculture. If the agricultural returns are good, their economic condition will be better and they are expected to have better diet, and health. In the non-prosperous villages, on account of poor diets, people mostly have ill-health. Besides these, some other important environmental factors have to be looked into: Birth; customs relating to birth are simple in all castes and communities but not good for health. When women conceive, there is no proper care about her diet and health. She has to live on ordinary diets throughout the period of pregnancy.
She is in most cases confined to a dark and dingy room where the baby is being kept. She is not provided with nutritive diets which a mother giving birth to a child needs. However in some well-to-do families, some nourishing diets are given to such mothers only for a week or so. In most cases she is not exposed to the sun, she is not exposed to fresh air and in most of the cases, damp, dark small mud-room with smoke is considered highly unhygienic for the mother and the baby.

House types: The structure and type of dwellings and the quality of construction material in the rural areas usually lead to unhygienic conditions. Wherein the rural communities have to pass their lives. Most of the dwellings are made of mud with tiles on the roofs. These tiles are placed on bamboo or wood logs, which rest on the two ends of the walls and have downward slope. Mud is also used for roofing in Sultampur district. An average house has a thatched or tiled varandah, enclosed courtyard along the side of which are built one or two kothries (small rooms), without proper ventilation and sometimes without it. The cattle are kept in the front enclosed varandah through which main entrance is usually found. The well-to-do families have very often separate place made of bricks and cement with good accommodation.

Though, the mud houses are simple and economical yet uncomfortable and unsafe during the rainy season. They
very often leak when torrential rain occurs and unsanitary conditions prevail. These houses are without urinals, latrines and bathrooms. The villagers are used to go to nearby fields to answer the call of nature. As mentioned earlier kotheries (small rooms) often dark without ventilation are often used for bath by the young women and girls. All the houses have to drain out filthy water into the lanes, making movement difficult. They have limited resources for improvements in their living conditions.

**Food and Drinks:** There is not much difference in the pattern of food consumption; majority of the people eat coarse grain. They take pulses or vegetables with the principal meals. Sometimes they take only one food stuff (peas or gram) in both the diets. The use of wheat flour is either confined to upper strata and to some extent middle strata and that too on festivals. Rice is the staple item of the diet; vegetables are generally produced locally and are available on market days. Non-vegetarian foods are not consumed regularly even by the non-vegetarians but like vegetables, weekly markets provide non-vegetarian items if and when available.

Milk and ghee are generally costly items and are not available to the majority of rural population due to economic reasons. The villagers eat melons, water melons, cheap variety of mango, mahua, during summer and rainy season as supplementary diet. Sweets are prepared occasionally. The use of refined sugar is rare but gur (raw sugar) is
largely consumed. Tea is confined to a small section, though in winters, its use gets wider. Smoking is a special feature of the rural community and some of them also use betal leaves and country made liquor. Out of the total households surveyed, only 25 per cent take food three times a day, 68 per cent two times and 7 per cent one time a day. The frequency of meals depends on the economic status of the household. The absence or lack of milk, ghee, animal food and vegetable makes the daily diets sub-nutritious. The intake of calcium, protein, fat, vitamin-A, C and other nutrients are not satisfactory. So in the absence of protective foods, better health conditions cannot be expected.
The village Mumtaz Nagar lies at a distance of 7 km from Faizabad town on the bank of river Ghaghra at 26°00'47" north latitude and 82°04'56" east longitude. The district has two category of soils viz., the khadar and the bhanger. Though it has two soil groups, khadar soil occurs, in the immediate neighbourhood of the river Ghaghra and bhanger soil is found across the road on higher lands. Bhanger is devoted to double cropping and gives higher returns per acre whereas khadar is mainly devoted to one crop either cereal or pulses but often put to said cash crops too e.g. melons, water melons etc. Vegetables including potatoes are also cultivated in the village but on a very small scale.

The population of the village in 1989-90 was 965, consisting of 451 males, 347 females and 167 children. It is not purely a vegetarian village. About 40 per cent of the residents are non-vegetarian under A, B, and C categories, but the supply of the essential nutrients are inadequate in both the groups in the above said categories, with the

* Categories A, B, and C have been formed on the basis of economic conditions determined by the size of holdings, type of land, rate of productivity, extra income and the number of family members. A, refers to such villagers whose total monthly income is above Rs.400/-, B, refers to those which fall between Rs.200-400/- and C, represents under Rs.200/- monthly income per head of the village population.
caloric intake of 1698 in category C to 2503 in A category per head per day. The main sources of calories are cereals but about 80 per cent of the population does not get the standard requirement of 2400 calories from all sources per head per day, with the result that about 14.2 per cent of the rural population is liable to varies deficiency diseases. The most common among the deficiency diseases is goitre, which claims the higher percentage of about 13.5 per cent. Although goitre is not a killing disease, yet it creates problems for the patients, who feel physically inactive. This is of Tarai origin and often found in the khadar areas. On the whole, death due to the deficiency diseases found among the villagers accounted for about 2.7 per cent of the total deaths in this village during the year 1989-90.

It is clear from the Table VI that the nutritional positions of the inhabitants is not satisfactory and people are exposed to various deficiency diseases. Moreover the supply of various nutrients are not uniform in all these categories viz., the supply of iron, carbohydrate, thiamine and to some extent protein and niacin is fairly high in all the three categories in comparison to the supply of fat, calcium, vitamin-A and C which are deficient to the tune of -26.2, -22.2, -19.7 and -59.8 per cent respectively among the people of category A, while in the case of categories B and C, they are deficient to the tune of -55.6, -31.2, -70.0, -65.1 per cent and -76.4, -58.9, -70.7, -67.6 per cent.
<table>
<thead>
<tr>
<th>Elements of Food</th>
<th>Standard Requirement</th>
<th>Actual Intake</th>
<th>Actual Intake</th>
<th>Actual Intake</th>
<th>PDSR</th>
<th>PDSR</th>
<th>PDSR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Protein g</td>
<td>68</td>
<td>66.6</td>
<td>46.9</td>
<td>32.0</td>
<td>-2.1</td>
<td>-31.0</td>
<td>-52.9</td>
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<tr>
<td>Fat g</td>
<td>50</td>
<td>36.9</td>
<td>22.2</td>
<td>11.8</td>
<td>-26.2</td>
<td>-55.6</td>
<td>-76.4</td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>440</td>
<td>450.6</td>
<td>460.8</td>
<td>472.9</td>
<td>+2.4</td>
<td>+4.7</td>
<td>+7.5</td>
</tr>
<tr>
<td>Calcium g</td>
<td>700</td>
<td>544.3</td>
<td>481.5</td>
<td>287.5</td>
<td>-22.2</td>
<td>-31.2</td>
<td>-58.9</td>
</tr>
<tr>
<td>Iron mg</td>
<td>22.5</td>
<td>53.8</td>
<td>59.9</td>
<td>47.9</td>
<td>+138.8</td>
<td>+166.3</td>
<td>+112.8</td>
</tr>
<tr>
<td>Vitamin-A I.U.</td>
<td>3500</td>
<td>2809</td>
<td>1049</td>
<td>1024.6</td>
<td>-19.7</td>
<td>-70.0</td>
<td>-70.7</td>
</tr>
<tr>
<td>Thiamine mg</td>
<td>1.12</td>
<td>2.0</td>
<td>2.1</td>
<td>2.2</td>
<td>+78.5</td>
<td>+87.5</td>
<td>+93.8</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.46</td>
<td>2.2</td>
<td>1.05</td>
<td>1.2</td>
<td>+50.7</td>
<td>-28.1</td>
<td>-17.8</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>19</td>
<td>24.6</td>
<td>19.6</td>
<td>15.6</td>
<td>+29.4</td>
<td>+3.1</td>
<td>-17.9</td>
</tr>
<tr>
<td>Vitamin-C mg</td>
<td>43</td>
<td>17.3</td>
<td>15.0</td>
<td>13.9</td>
<td>-59.8</td>
<td>-65.1</td>
<td>-67.6</td>
</tr>
<tr>
<td>CALORIES</td>
<td>2400</td>
<td>2503.0</td>
<td>1931</td>
<td>1698.6</td>
<td>+4.2</td>
<td>-19.5</td>
<td>-29.2</td>
</tr>
</tbody>
</table>

PDSR - Refers to percentage of departure from standard requirement.
- Deficiency
+ Surplus
respectively per head per day. The supply of riboflavin is also short by -28.1 per cent in case of B category, riboflavin along with niacin are deficient in category C, by -17.8 and -17.9 per cent. Whereas these two nutrients were fairly supplied among the families of category A.

The supply of iodine though uniform among the different categories is deficient and has created many health problems. Deficiency of iodine in water available for drinking has been observed and no alternative arrangement to make up the deficiency is possible.

Table VI have been prepared on the basis of data collected by the author regarding the diets of the villagers in three different seasons. This table show the per head per day intake of calories and other essential nutrients of food, together with the standard requirement and their percentage of departure from the standard.

Out of the total population of 965 about 21.6 per cent (208 persons) are sick, among which 65.7 per cent are deficiency patients and majority is from C category. Goitre, Scurvy

* Nutritive value of the different foods and their standard requirements have been calculated with the help of the table given in "The nutritive value of Indian foods and planning of a satisfactory diet" by Aykroyd, W.R. (I.C.M.R., New Delhi, 1962), and Nutritive value of Indian foods by Gopalan, C. et al., Hyderabad 1977.

* Goitre: Enlargement of thyroid glands due to long term deficiency of iodine.

* Scurvy: Vitamin-C deficiency characterised by great debility, anaemia, mental apathy, spongy conditions of the gums and tendency to hemorrhages into the subcutaneous tissues and from the mucasis surfaces.
together with tooth and gum diseases and Beri-Beri* accounted for the large percentage of the patients. Due to acute deficiency of iodine about 13.5 per cent of the total patients suffered from goitre alone while scurvy, tooth and gum diseases and beri-beri account for 13.7 per cent and 15.6 per cent respectively. Vitamin-A deficiency claims 11.7 per cent out of the total deficiency patients, leading to night blindness*, keratomalacia*, xerophthalmia* (Fig.4.2).

Deficiency of thiamine, riboflavin and niacin helps in promoting conditions for gastro-intestinal disorder, colitis, pellagra. Thiamine is not deficient but deficiencies of other nutrients may check the proper absorption of this nutrient. The shortage of riboflavin, niacin and vitamin-C together makes the situation a bit more complicated, specially

* Beri-Beri: Produced by the too excessive use of polished rice, white wheat flour and certain other carbohydrate staples. Characterised by degenerative changes in the nervous system including a multiple peripheral neurities, which may exist alone (dry beri-beri), but often it combined with generalised edema and serious effusions (wet beri-beri) and by tendency to cardiac failure. Dry beri-beri is associated with the complicated deficiency of thiamine, B-complex with A and E characterised by swelling in limbs and trunk. While wet is due to thiamine deficiency alone. It is common in rice eating regions.

* Night-blindness: Inability to see in dim light, especially when suddenly exposed to bright light.

* Keratomalacia: Softening of the cornea, as the result of severe deficiency of vitamin-A in the body.

* Xerophthalmia: Failure of the tear glands, followed often by dryness, bacterial growth and ulceration of cornea.
MUMTAZ NAGAR
NUTRITIONAL DEFICIENCY DISEASES

PERCENTAGE REFERS TO TOTAL NUMBER OF PATIENTS

- XEROPHTHALMIA
- URINARY CALCULI
- SCURVY TOOTH & GUM DISEASES
- RICKETS
- PELLAGRA
- OSTEOMALACIA
- KWASHIORKOR
- MARASMUS
- GOITRE
- EYE DISEASES & RETARDED GROWTH
- DIABETES
- BERI-BERI & GASTRO INTESTINAL
- ANAEMIA

FIG. 4.2
among the rural communities belonging to category C. Pellagra is purely a disease of lower income group, which is caused by niacin alone. This disease accounted for 3.7 per cent of the total deficiency patients in the village. Combined deficiency also causes muscular wasting and enlargement of heart in severe cases.

Vitamin-D, is also scanty with the result that some of them are prone to specific disease caused due to deficient supply or availability of vitamin-D to an individual. Its deficiency also checks the absorption of phosphorus. The disease associated with this is known as 'Rickets' and accounts for 14.2 per cent of death. Best way to get this vitamin is through the sun. It is more prevalent among children and women, who are generally confined within four walls of their houses.

The supply of iron is in surplus almost in every category, but due to non-absorption of iron in the body or loss of blood on account of injuries etc., anemic conditions result, particularly among women and children. According

*Pellagra: Primarily due to specific deficiency and manifests itself in symptoms affecting chiefly the skin, the elementary track and the nervous system followed by depression, dermatitis and diarrhea.

*Rickets: Characterised by disturbed metabolism, an impaired nutrition of the entire body and attraction in the growing bones, highest percentage of occurrence between November–May.

to Srikantia, pre-school children and women in the reproductive age are the worst sufferers of anaemia. A sample survey conducted on all India level, reveals that 40 per cent of the children and every second women in the country suffered from the disability, resulting in morbidity, illness and mortality. Further, iron deficiency in the body is mainly responsible for this, though iron is adequately present in the diet, it is not absorbed due to various reasons.

Protein supply is a world wide problem and is more acute in developing countries, where the average income is very low. Level of protein supply in the village is also not satisfactory; it is short supplied by -2.1, -31.0, -52.9 per cent in the A,B,C categories respectively. It is clear from the given table that the deficiency is more severe in the case of category C. Naturally the highest percentage of patients suffering from Kwashiorkor is from lower income group and accounts for 5.5 per cent of the total deficiency patients. What is required for a good diet is not just any

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* Kwashiorkor: It is confined to children, especially upto five years of age, characterised by a subnormal weight, mental apathy, muscular wasting, changes in hair and skin pigments, followed by fatty liver, respiratory infections etc.
protein, but one that is well-balanced in amino-acids and has a higher biological value and protein efficiency ratio? Kwashiorkor is found in Africa, India, Indonesia, Central and South America and Fiji Island etc.

Besides these diseases, diabetes and urinary-calculi, osteomalacia is found in the village at the rate of 8.2, 1.3 and 2.4 per cent respectively. Excessive use of raw sugar (gur), hampers to produce insulin and results in diabetes. Urinary-calculi begins with the deficiency of fat soluble vitamins, calcium and phosphorus, while the last noted disease spreads with the deficiency of calcium, phosphorus and vitamin-D. As discussed earlier, the supply of these elements in food in the village community under study is far from satisfactory, and results in several deficiency diseases in the various categories but most affected people are the low income group of rural population.

Dhanipur

This village lies at a distance of about 20 km west of Faizabad town in the sandy loam soil and is located in 82°58'30" north latitude and 26°45'28" east longitude. It is by and large vegetarian village and has a small population of 666. Land holdings are not big; means of livelihood of the rural community is agriculture but, on the whole, the rural community is large enough which cannot be fed on the existing land. The agricultural efficiency is also low, with the result that most of the young males specially during off season go to the nearby towns for earning their livelihood while womenfolk work in the agricultural fields. Wheat, rice (transplanted and broadcast), peas, barley, pulses (arhar, masur), some coarse grains, melons, potatoes are the main cash crops.

The detailed survey in the different economic groups of people of the village is conducted with a view to assess the nutritional status of the rural population. This survey is spread over three seasons corresponding to summer, winter and third the rainy season.

Stratification relating to income reflects poverty level. During the dietary survey, participants were asked to recall all the food they had consumed on the previous day and frequency with which certain items were consumed during the month. Survey is conducted without giving prior information
to avoid conscious deviation from the usual daily intake. The information so gathered is processed and a food balance sheet per head per day is prepared (Table VII). Further, this type of survey has revealed the extent to which food is under-nutritive or mal-nutritive. It is found that the population is suffering from mal and to a larger extent from under-nourishment.

Table VII reveals the extent of caloric intake per head per day from all sources during the year 1989-90. It is observed that like other villages here too residents of category (A) take 2353 calories per head per day while the intake for categories B and C is 2267 and 1777 respectively. There are, however, a few families in every village which depend on pulses only. It is observed that the main sources of calories are rice, wheat, pulses few roots and green vegetables; egg, butter, milk contributes a little, generally in categories B and C. Table VII further reveals that the total amount of various food elements consumed by an individual per head per day is unsatisfactory except in the case of iron and thiamine (+109.3, +103.6, +63.4 and +105.3, +101.8, +47.3) respectively. For a healthy growth, it is essential to have a balanced diet which should contain all the essential nutrients in their appropriate preparation e.g. protein, fat, carbohydrates, vitamins and minerals.

Protein is essential for normal body functioning and repair. It can be used for energy at the time of low
Table VII
Dhanipur

Supply of Different Nutrients per head per day in Categories A, B, C and Percentage of Departure from Standard Requirement

<table>
<thead>
<tr>
<th>Elements of Food</th>
<th>Standard Requirement</th>
<th>Actual Intake A</th>
<th>Actual Intake B</th>
<th>Actual Intake C</th>
<th>PDSR A</th>
<th>PDSR B</th>
<th>PDSR C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein g</td>
<td>68</td>
<td>62.4</td>
<td>68.7</td>
<td>49.8</td>
<td>-8.3</td>
<td>+1.0</td>
<td>-26.8</td>
</tr>
<tr>
<td>Fat g</td>
<td>50</td>
<td>52.8</td>
<td>47.2</td>
<td>33.6</td>
<td>+5.6</td>
<td>-5.6</td>
<td>-32.9</td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>440</td>
<td>400.6</td>
<td>392.0</td>
<td>318.0</td>
<td>-8.9</td>
<td>-10.8</td>
<td>-27.8</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>700</td>
<td>487.5</td>
<td>383.2</td>
<td>259.9</td>
<td>-30.3</td>
<td>-45.2</td>
<td>-62.8</td>
</tr>
<tr>
<td>Iron mg</td>
<td>22.5</td>
<td>47.1</td>
<td>45.8</td>
<td>36.8</td>
<td>+109.3</td>
<td>+103.6</td>
<td>+63.4</td>
</tr>
<tr>
<td>Vitamin-A I.U.</td>
<td>3500</td>
<td>1856.0</td>
<td>1654.3</td>
<td>1569.2</td>
<td>-46.9</td>
<td>-52.7</td>
<td>-55.2</td>
</tr>
<tr>
<td>Thiamine mg</td>
<td>1.12</td>
<td>2.30</td>
<td>2.26</td>
<td>1.65</td>
<td>+105.3</td>
<td>+101.8</td>
<td>+47.3</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.46</td>
<td>1.56</td>
<td>1.35</td>
<td>1.1</td>
<td>+6.9</td>
<td>-7.5</td>
<td>-26.7</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>19</td>
<td>20.1</td>
<td>35.0</td>
<td>16.1</td>
<td>+5.8</td>
<td>+84.3</td>
<td>-15.3</td>
</tr>
<tr>
<td>Vitamin-C mg</td>
<td>43</td>
<td>19.7</td>
<td>26.0</td>
<td>29.8</td>
<td>-54.2</td>
<td>-39.4</td>
<td>-30.7</td>
</tr>
<tr>
<td>CALORIES</td>
<td>2400</td>
<td>2353</td>
<td>2267</td>
<td>1777</td>
<td>-1.9</td>
<td>-5.5</td>
<td>-26.0</td>
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</table>
caloric intake. It is therefore essential that the required quantity of protein should be taken each day by every individual. It has been observed that except category (B) people (+1 per cent), the remaining two categories have below average (A) -8.3 and (C) -26.8 per cent. Several important functions of metabolism depend upon fat. It helps in absorption of fat soluble vitamins as well as iron. The present survey reveals that on an average, the villagers live below the recommended quantity of 50 gm except for people belonging to category (A) +5.6 per cent; B and C categories are living on -5.6 and C -32.9 per cent respectively. Whereas the supply of carbohydrates are short in all categories to the tune of (A) -8.9, (B) -10.8 and (C) -27.8. Same is with regard to calcium; it is also deficient to the tune of -30.3, -45.2 and -62.8 per cent respectively. Next element that counts much is vitamin-D which is received in natural course from the sun rays. As it is known, that calcium is fundamental in teeth formation, while D increase the rate of absorption, and phosphorus helps in bone calcification. Rickets is severe manifestation of deprivation of all these elements, in which bones become soft and pliable; short supply of protein and calories cause, kwashiorkor/marasmus. With the result that these shortages, 15.7 per cent cases of rickets and 7.1 per cent cases of kwashiorkor/marasmus were reported from the village Dhanipur (Fig.4.3).
Vitamins are also equally important for the body e.g. vitamin-A is essential for the formation and maintenance of healthy skin and membranes and is a component that enables vision in dim light, but it is very unfortunate that the population of the village lacks such important component to the tune of -46.9, -52.7 and -55.2 per cent respectively and creates vision and related problems (17.8 per cent).

Thiamine, riboflavin and niacin are involved in energy metabolism, thiamine acts as co-enzymes in the metabolism of carbohydrates, riboflavin is essential in oxidative systems, niacin in respiratory systems of energy metabolism.\(^5\) Vitamin-C is used to provide intercellular strength necessary for the connection tissues but supply of all these vitamins with single exception of thiamine is short either in all categories or in one or two categories. This situation is due to little intake of green leavy vegetables, milk or milk products, fruits on regular or routine basis. Riboflavin is short in B and C (-7.5 and -26.7 per cent) respectively while niacin is short only in (C) category -15.3. Further, vitamin C is short in the entire village community (A) -54.2 (B) -39.4 and (C) -30.7. This is unique that its intake is relatively low in the higher category. The obvious reason seems to be that lower class is busy in producing vegetables and some other indigenous items of food like mahua, jamun and berre.

Survey also reveals various types of deficiency diseases (12.3 per cent) prevalent in the village. Beri-beri/gastrointestinal disturbances, scurvy along with tooth and gum swelling problems and anaemia (14.9, 15.9 and 13.8 per cent) followed by eye diseases retarded growth. Kwashiorkor/marasmus and rickets (17.8, 7.1 and 15.7 per cent) whereas others account for comparatively low number of patients - osteomalacia 4.6 per cent, pellagra 3.1 per cent, urinary calculi 3.1 per cent and diabetes (Fig.4.3). Goitre and xerophthalmia, 1.5, 2.5 and 1.5 per cent respectively. The mortality as a result of these deficiency diseases is lowest in (A) category and highest in lower economic strata. The probable reason for this seems to be the availability of good food and its adequate supply. Most of the (A) category people are not forced to take certain food items but they are taking by their choice as they can afford to some extent food items necessary for their health.
The village Ashrafpur Kichaucha lies at a distance of 19 km from its tahsil Tanda in district Faizabad on Tanda-Jalalpur road and is located in $82^\circ 45'45''$ north latitude and $26^\circ 25'14''$ east longitude. It is the famous site of Great Muslim Soofi Saint Ashraf Jahangir Samnani. It is inhabited by his muslim descendents and as well as by Hindus, comprising mostly of Kewats and Chamars (Harijan).

The village is very well connected by road. It still has many ponds and streams linking each other which often overflow during the rainy season, particularly western flank of the village is ill-drained and gives often one crop while the eastern flank is better and produces good rice crops, sugarcane and also wheat production is normal. Peas, gram, maize cover very little area but pulses and small millets are grown an regular basis. Besides sugarcane, potato is another cash crop which is produced on limited scale whereas in the neighbouring areas potato and sugarcane are very popular and farmers make good profit from these crops. The village has 5 tube-wells and 4 tractors but the owners are generally not holding much land that can justify the investment. Since the farmers extend such facilities to others on cash payments, their investments on these items are justified. It has been seen that tractors are used in this village on a small scale for agricultural and related works, while in off-season, they
are used for non-agricultural pursuits e.g. transportation of bricks, earth for filling depression, men and women at the time of marriage.

Approximately 40 per cent of the total population (5719) is Muslims and the rest consists of non-Muslim. About 70 per cent of the non-Muslim population is non-vegetarian. Muslim are generally land owners and their holdings vary from one acre to 6 acres. They do not entirely depend on agriculture but do some other work in order to earn extra income e.g. (A) category includes some Muslims who are considered as Peers (religious heads); they use to travel widely among their followers and get lot of money as gifts and hence they can meet their requirements even without any income from lands. But in other communities, about 70 per cent is agricultural workers (Harijans and Kewats). They work during the sowing and harvesting seasons and do some extra work in the off-season e.g. they work as rickshaw pullers, and some of them is labourers in construction work.

There is a Government Ayurvedic dispensary a market, which meets twice a week i.e. (Thursday and Sunday). On the market day meat, fish and fresh vegetables are sold.

As usual, houses of the lower strata are of mud with thatched roof or part is covered with khaprail (mud tiles); whereas the middle class has more than one room for living, made of mud and bricks covered with khaprail roofs. The
(A) category people possess large-sized rooms made of bricks and cement, some of them have electric connections too.

Majority of the population is non-vegetarian, but like other villages, supply of necessary nutrients are not satisfactory. In the first instance, where they can afford they are not aware of the concept of balanced diet; rather they go by choices based on tradition or taste. Secondly, those who cannot afford to have such diets, are not aware of their importance, otherwise they might try within their limited means at least to improve the daily intake. There are some families who are not in a position to feed their members even two times a day during difficult period of the season. The category (C) which needs much calories is getting lowest (1854). As stated earlier, the caloric intake varies according to the nature of work performed. Considering 2400 calories per head per day as the standard for this area, it is observed that the daily intake is short by 84, 256 and 546 in the three categories respectively.

Table VII shows the nutritional level of the rural communities in the three categories i.e. A, B, and C. About 7 per cent of the population still suffers from under-nutrition and the morbidity rate during the survey was assessed at 11.8 per cent with 1.4 per cent as mortality rate. Among the most prevalent deficiency diseases are beri-beri, sciatica, gastrointestinal disturbances, colitis (16.4 per cent), followed by
Table VIII

Kichaucha

Supply of Different Nutrients per head per day in Categories A, B, C and Percentage of Departure from Standard Requirement

<table>
<thead>
<tr>
<th>Elements of Food</th>
<th>Standard Requirement</th>
<th>Actual Intake</th>
<th>Actual Intake</th>
<th>Actual Intake</th>
<th>PDSR</th>
<th>PDSR</th>
<th>PDSR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Protein g</td>
<td>68</td>
<td>85.4</td>
<td>60.7</td>
<td>62.2</td>
<td>+25.5</td>
<td>-10.7</td>
<td>-8.5</td>
</tr>
<tr>
<td>Fat g</td>
<td>50</td>
<td>96.7</td>
<td>22.3</td>
<td>27.3</td>
<td>+93.4</td>
<td>-55.4</td>
<td>-45.3</td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>440</td>
<td>446.2</td>
<td>414.3</td>
<td>331.7</td>
<td>+1.4</td>
<td>-5.8</td>
<td>-24.6</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>700</td>
<td>721.5</td>
<td>722.4</td>
<td>1062.4</td>
<td>+3.1</td>
<td>+3.2</td>
<td>+51.8</td>
</tr>
<tr>
<td>Iron mg</td>
<td>22.5</td>
<td>29.3</td>
<td>29.8</td>
<td>39.8</td>
<td>+30.2</td>
<td>+32.4</td>
<td>+76.8</td>
</tr>
<tr>
<td>Vitamin-A I.U.</td>
<td>3500</td>
<td>2878.9</td>
<td>2104.5</td>
<td>3597.2</td>
<td>-17.7</td>
<td>-39.9</td>
<td>+2.8</td>
</tr>
<tr>
<td>Thiamine mg</td>
<td>1.12</td>
<td>1.34</td>
<td>1.64</td>
<td>2.33</td>
<td>+19.6</td>
<td>+46.4</td>
<td>+99.1</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.46</td>
<td>1.18</td>
<td>1.25</td>
<td>1.45</td>
<td>-19.2</td>
<td>-14.4</td>
<td>-0.68</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>19</td>
<td>23.4</td>
<td>21.8</td>
<td>18.42</td>
<td>+23.1</td>
<td>+14.7</td>
<td>-3.1</td>
</tr>
<tr>
<td>Vitamin-C mg</td>
<td>43</td>
<td>36.6</td>
<td>18.6</td>
<td>41.9</td>
<td>-14.9</td>
<td>-56.7</td>
<td>-2.5</td>
</tr>
<tr>
<td>CALORIES</td>
<td>2400</td>
<td>2316</td>
<td>2144.0</td>
<td>1854</td>
<td>-3.5</td>
<td>-10.6</td>
<td>-22.8</td>
</tr>
</tbody>
</table>
scurvy, tooth and gum diseases (18.6 per cent) and pellagra rickets (12.2, 6.8 per cent) respectively. Kwashiorkor, marasmus or fatty heirs also accounts for 6.7 per cent in the village. Anaemia, eye diseases, retarded growth, keratomalacia, urinary calculi, diabetes, osteomalacia and goitre accounts for 9.9, 10.9, 2.0, 7.1, 3.3, 4.2, and 1.9 per cent respectively. (Fig.4.4).

The supply of different nutrients are not uniformly distributed among the different categories of inhabitants; they vary from category to category, viz., the supply of first three elements protein, fat and carbohydrate is short in the last two categories to the tune of (-10.7, -8.5, -55.4, -45.3 and -5.8, -24.6 per cent) respectively. Whereas its supply is in surplus i.e. +25.5, +93.4 and +1.4 per cent in the category A people. The supply of iron and calcium is fairly good in all the categories (+30.2, +32.4, +76.8 and +3.1, +3.2, +51.8 per cent respectively). However vitamin-A is available satisfactorily in (C) category i.e. 2.8 per cent but its shortage is reported in the other two categories (A) -17.7 per cent and in (B) -39.9 per cent. The obvious reason for good supply of calcium and vitamin-A in (C) category is due to frequent use of fish and vegetables by the Kewats (schedule caste) and Muslims of the area and its low supply relatively in (A) category is caused by the absence of leafy vegetables and fish, by and large they opt for meat in place of these two items.
FIG. 4.4

KICHAUCHA
NUTRITIONAL DEFICIENCY DISEASES

PERCENTAGE REFERS TO TOTAL NUMBER OF PATIENTS

KERATOMALACIA
URINARY CALCULI
SCURVY TOOTH & GUM DISEASES
RICKET
PELLAGRA
OSTEOMALACIA
KASHMIRI MARASMUS
GOitre
EYE DISEASES & RETARDED GROWTH
DIABETES
BERI-BERI & GASTRO INTESTINAL
ANAEMIA

MORBIDITY MORTALITY

PERCENTAGE DEPARTURE FROM STANDARD REQUIREMENT

A B C

PROTEIN CARBOHYDRATE CALCIUM IRON VITAMIN A.U. RIBOFLAVIN NIACIN VITAMIN C CALORIES

FIG. 4.4
It is clear from Table VIII that the nutritional position is not very sound. It deteriorate from A to B and C. Consequently the villagers belonging to groups (B) and (C) are more prone to deficiency diseases in comparison to category (A) people. Occurrence of these diseases is closely associated with the existing supply level of nutrients.

The actual supply of vitamins thiamine and riboflavin is +19.6, -19.2 in category (A) and 46.4 and -14.4 per cent in category (B) whereas in category C, it is recorded as +99.1 and -0.68 per cent but ascorbic acid is short to the tune of -14.9, -56.7 and -2.5 per cent respectively. Niacin is again reported in better percentage in the first two categories, but is short by 2.5 per cent in the case of category (C).

Short supply of vitamins e.g. A results in eye diseases and retarded growth; calcium with shortage of phosphorus and vitamin-D causes rickets and osteomalacia. Fat which is short supplied in last two categories is the helping factor in disturbing dental health and normal behaviour of heart muscles. Its deficiency coupled with vitamin (A) caused urinary calculi. Short supply of riboflavin caused several stomach troubles and wet beri-beri, whereas niacin causes pallegra in those who consume maize frequently. Supply of iron and fat is high particularly in category (A) that it has created problem of high blood pressure; high blood pressure with short supply of vitamin (C) is more dangerous as it may hamper blood clotting and body resistance. It may cause scurvy, tooth and gum diseases.
Protein supply is short in B and C categories with the result that kwashiorkor/marasmus is common. Protein deficiency with short calories cause marasmus. So merely getting some nutrient in surplus does not mean that certain disease would not occur, their occurrence very much depends on other factors too.
The village of Unchegoan is located at a distance of approximately 5 km north of Gosaigunj town and 12 km west of Tahsil Tanda. It lies 26°37'55" north latitude and 82°42'20" east longitude in the district Faizabad.

Unchegoan is not favourably situated from the viewpoint of accessibility. There is no metalled road connecting it with any neighbouring town. However, there is one partly metalled and partly kankar (unmetalled) road which runs to the north of the village at a distance of 1.5 km in a east-west direction. During the rainy season, this road also becomes unserviceable and another unmetalled road which comes from Gosaigunj becomes almost unserviceable due to water logging. Mahboobgunj is the nearest market town 1.5 km away for daily necessities.

Unchegoan lies in a level plain which has fairly good drainage and protected from the ravages of floods and also enjoys good facilities of irrigation through nearby canal and tube-wells, wells etc. High percentage of cultivated land is irrigated in both the seasons. Good irrigation coupled with good quality land makes the agriculture profitable and easy to make full utilization of the land. Often farmers take three crops in a year. Among the cereal crops, rice comes first, followed by wheat and pulses. Under cash crops, sugarcane comes first, then comes potato, melons and sugarbeets.
Cheap grains like maize and some small millets are also grown. On the whole, the village is agriculturally rich. A good portion of land is also devoted to mango groves and guava which give good returns to the owners. The population of the village is 1186 (1981) consisting of 346 males and 351 females, and 489 children, belonging to Muslims, Hindus with majority of scheduled castes i.e. Chamar and Pasis.

Muslims are the influential group and hold good portion of land. By and large, the village is non-vegetarian and enjoys an excellent position in terms of protein, fat, calcium, iron, vitamin-A etc. except carbohydrate and vitamin-C in the families of (A) category per head per day but this position does not occur in the case of (B) and (C) categories. However this position is better in comparison to other villages. It is clear from the Table IX that, on the whole, the inhabitants are well-fed. Agriculture is the main occupation of the rural communities but at least 25 per cent of the total adults are working outside the village. Thus 75 per cent will be directly dependent on agriculture; higher percentage of outside earners are from category (A) and (B).

There is very little variation in the intake of calories among the villagers belonging to different communities but this variation is not very much viz., 2502.9 in A, 2361 in B and 2133 in C categories. However, the variation in case
of protein, fat, calcium, vitamin-A and riboflavin is remarkably different in A from those of B and C. All the five nutrients are supplied in plenty in category A, +18.5, +11.4, +91.1, +37.4 and +50.6 per cent which seem to be quite rare in other villages irrespective of their categories. As mentioned earlier, category (A) consists of generally non-vegetarian rich people who use meat, ghee, milk regularly. Whereas supply of these nutrients among the people of (B) category excluding calcium and riboflavin +52.8, +22.6, respectively the rest viz., protein, fat, vitamin-A are short to the tune of -6.8, 26.4 and vitamin-A -23.6. Carbohydrates are almost evenly distributed among the villagers and are only short by -6.7 (A), -2.5 (B) and -15.6 (C) per cent respectively. Supply of iron and thiamine is fairly in surplus in all categories +160 (A) 84.8 (B) +40.4 (C) per cent and +63.9, +49.2, +21.3 respectively where as vitamin-C (Ascorbic Acid) is short supplied in the whole village -15.5 (A) -23.1 and -56.3 per cent but it supply varies with the intake of seasonal fruits, like mango in the summer season when its supply is fairly good. Niacin is recorded in surplus only in A category +29.4 but in B and C it is short to the tune of -8.9 and -36.3 per cent. People in (C) category are not enjoy the recommended amount of protein, fat, vitamin-A and riboflavin, rather they get to the tune of -28.1, -61.6, -48.9 and -20.5 per cent respectively.
Detailed nutritional position of the village is shown in Table IX prepared on the basis of data regarding their foods consumed in a week's time in three different seasons. These three tables show the per head per day intake of different essential nutrients in the different economic groups i.e. A, B, C, together with the standard requirement and their percentage of departure from the given standard (PDSR). Also simultaneously disease survey was undertaken to record the morbidity and mortality rate in the village and the patients under deficiency diseases.

Out of the total population about 8.2 per cent is suffering from various diseases, accounting for 68 per cent as deficiency patients; majority of the patients comes from (C) and (B) categories where the supply is inadequate as compared to (A). This imbalance has ultimately led to the spread of several deficiency diseases (Fig.4.5), beri-beri, and gastrointestinal disturbances, rickets, together with tooth and gum diseases scurvy accounted for more than 40 per cent of the patients. Due to deficiency of ascorbic acid vitamin(C), riboflavin and niacin (16.8, 7.9 and 20.7 per cent respectively). Vitamin-A has got a very important role in protecting people from eye diseases as well as from dry beri-bery. Its deficient supply has created several problems for human health. Its short supply in the last two categories resulted in 11.1 per cent patients suffering from various vitamin-A deficiency diseases like, night blindness, retarded growth, xerophthalmia. Its
Table IX

Uncheangoan

Supply of Different Nutrients per head per day in Categories A, B, C. and Percentage of Departure from Standard Requirement

<table>
<thead>
<tr>
<th>Elements of Food</th>
<th>Standard Requirement</th>
<th>Actual Intake</th>
<th>Actual Intake</th>
<th>Actual Intake</th>
<th>PDSR</th>
<th>PDSR</th>
<th>PDSR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Protein g</td>
<td>68</td>
<td>80.6</td>
<td>63.4</td>
<td>48.9</td>
<td>+18.5</td>
<td>-6.8</td>
<td>-28.1</td>
</tr>
<tr>
<td>Fat g</td>
<td>50</td>
<td>55.7</td>
<td>36.8</td>
<td>19.2</td>
<td>+11.4</td>
<td>-26.4</td>
<td>-61.6</td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>440</td>
<td>410.6</td>
<td>429.2</td>
<td>371.1</td>
<td>-6.7</td>
<td>-2.5</td>
<td>-15.6</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>700</td>
<td>1337.5</td>
<td>1070.0</td>
<td>555.0</td>
<td>+91.1</td>
<td>+52.8</td>
<td>-20.7</td>
</tr>
<tr>
<td>Iron mg</td>
<td>22.5</td>
<td>59.2</td>
<td>41.6</td>
<td>31.6</td>
<td>+160.0</td>
<td>+84.8</td>
<td>+40.4</td>
</tr>
<tr>
<td>Vitamin-A I.U.</td>
<td>3500</td>
<td>4809.0</td>
<td>2672.1</td>
<td>1787.0</td>
<td>+37.4</td>
<td>-23.6</td>
<td>-48.9</td>
</tr>
<tr>
<td>Thiamin mg</td>
<td>1.12</td>
<td>2.0</td>
<td>1.82</td>
<td>1.48</td>
<td>+63.9</td>
<td>+49.2</td>
<td>+21.3</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.46</td>
<td>2.2</td>
<td>1.79</td>
<td>1.16</td>
<td>+50.6</td>
<td>+22.6</td>
<td>-20.5</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>19</td>
<td>24.6</td>
<td>17.3</td>
<td>12.1</td>
<td>+29.4</td>
<td>-8.9</td>
<td>-36.3</td>
</tr>
<tr>
<td>Vitamin-C mg</td>
<td>43</td>
<td>36.3</td>
<td>29.2</td>
<td>18.8</td>
<td>-15.5</td>
<td>-23.1</td>
<td>-56.3</td>
</tr>
<tr>
<td>CALORIES</td>
<td>2400</td>
<td>2502.9</td>
<td>2361.0</td>
<td>2133.0</td>
<td>+4.2</td>
<td>-1.6</td>
<td>-11.1</td>
</tr>
</tbody>
</table>
deficiency with fat and calcium causes urinary calculi (3.2 per cent) although the supply of calcium is not short yet its mal-absorption may have helped in these diseases.

Besides these deficiency diseases, there are colitis, pellagra and marasmus. Which are caused due to the deficiency of thiamine, riboflavin, niacin and calories. The supply of these elements are not so deficient, but the absence of other essential nutrients checks its proper utilization in the body and leads to constipation, anorexia, nervus irritability, depression. The prolonged deficiency of these nutrients helped the causation of pellagra (12.2 per cent) marasmus. Supply of protein, calories are also not satisfactory among B and C categories of people with the result that about 10.6 per cent of the total deficiency patients in the village suffered from kwashiorkor/marasmus (Fig.4.5).

Cases of anaemia and diabetes, also exist but the number of patients suffering from these are about 9.2, 8.3 per cent respectively. Vitamin-D is scantly distributed in the villages with the result that some of them are prone to specific diseases caused due to deficient intake of vitamin-D; its shortage checks the absorption of phosphorus also. It should be kept in mind that no one nutrient functions alone and its usefulness to the body may be
curtailed by the absence of other nutrients, and as only a few nutrients are stored in the body without being used because other essential nutrients are lacking in the diet. That is why about 8.2 per cent of the villagers are liable to various deficiency diseases.

ARIYA

Village Ariya of tahsil Akberpur, district Faizabad, is situated at 26°29'23" north latitude and 82°35'21" east longitude. It is located at a distance of 5.5 km from Akberpur on either side of Akberpur – Tanda road and lies on khadar land. Sarda canal passing through this village is a good source of irrigation beside three ponds, tube-wells and wells.

The village is very well connected with other villages of the surrounding area. A metalled road connects the village to the railway station lying at a distance of 1 km at Surapur. The village has a government dispensary and a market.

About 79 per cent of the total land is under cultivation, out of which 90 per cent is devoted to grain crops. Among the grain crops, wheat occupies the largest percentage. It is sown as a sole crop as well as in combination with barley and mustard. Wheat is often sown in the fields left fallow during the kharif season. Peas, gram, mustard are seldom sown as a sole crop. Rice (broadcast and transplanted) occupies major portion followed by small millets and sugarcane in the kharif season. On the whole about 70 per cent of the land is devoted to double cropping.

Cereals constitutes the major portion of food of the people like other villages and provide more than 70 per cent of their caloric intake. Total population of the village
(1287 persons) is comprised of baniyas (traders), muslims and schedule caste/tribes. Meat and fish is consumed by only muslims, but a section of non-muslims also generally go for meat in weekly market. However, mutton, eggs, fish, milk and milk products are not within the reach of every person. Vegetables (root and leafy) are the main source of vitamins and calcium. Oils and fats are not available at a satisfactory level.

Table X reveals the extent of caloric intake per head per day from all sources available during 1989-90. It is observed that categories A and B have higher caloric intake with 2696.3 and 2362 than category C, which has 1971.7 per head per day. The morbidity and mortality rate recorded in the village is 10.5 and 1.4 per cent respectively. In category A families have a surplus of all the essential nutrients except vitamin A and C which is short to the tune of -20.8 and -34.7 as is also the case of other two categories where the shortage is -53.5, -44.3, -6.9, and -26.2 per cent. It is also obvious that total amount of various food elements consumed by categories B and C are unsatisfactory except in the case of calcium, iron, thiamine, riboflavin and niacin (+16.1, +175.6, +46.4, +10.9 and +8.9 respectively) in category B. Iron and thiamine are the only surplus nutrient in the diets of category C people (+93.3 +59.8). Majority of population belongs to category C which are generally living under conditions of mal and under-nutrition. Category A
Table X

Ariya

Supply of Different Nutrients per head per day in Categories A,B,C. and Percentage of Departure from Standard Requirement

<table>
<thead>
<tr>
<th>Elements of Food</th>
<th>Standard Requirement</th>
<th>Actual Intake A</th>
<th>Actual Intake B</th>
<th>Actual Intake C</th>
<th>PDSR A</th>
<th>PDSR B</th>
<th>PDSR C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein g</td>
<td>68</td>
<td>93.6</td>
<td>65.6</td>
<td></td>
<td>+37.6</td>
<td>-3.5</td>
<td>-17.5</td>
</tr>
<tr>
<td>Fat g</td>
<td>50</td>
<td>66.6</td>
<td>37.2</td>
<td>56.1</td>
<td>+33.2</td>
<td>-25.6</td>
<td>-57.6</td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>440</td>
<td>533.2</td>
<td>389.2</td>
<td>21.2</td>
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<td>-11.5</td>
<td>-18.0</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>700</td>
<td>881.7</td>
<td>812.6</td>
<td>360.7</td>
<td>+25.9</td>
<td>+16.1</td>
<td>-43.7</td>
</tr>
<tr>
<td>Iron mg</td>
<td>22.5</td>
<td>53.8</td>
<td>62.0</td>
<td>43.5</td>
<td>+139.1</td>
<td>+175.6</td>
<td>+93.3</td>
</tr>
<tr>
<td>Vitamin-A I.U.</td>
<td>3500</td>
<td>2772.0</td>
<td>1628.6</td>
<td>43.5</td>
<td>-20.8</td>
<td>-53.5</td>
<td>-44.3</td>
</tr>
<tr>
<td>Thiamine mg</td>
<td>1.12</td>
<td>1.63</td>
<td>1.64</td>
<td>1951.1</td>
<td>+45.5</td>
<td>+46.4</td>
<td>+59.8</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.46</td>
<td>1.73</td>
<td>1.62</td>
<td>1.79</td>
<td>+18.5</td>
<td>+10.9</td>
<td>-9.6</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>19</td>
<td>21.3</td>
<td>20.7</td>
<td>1.32</td>
<td>+12.1</td>
<td>+8.9</td>
<td>-4.3</td>
</tr>
<tr>
<td>Vitamin-C mg</td>
<td>43</td>
<td>28.1</td>
<td>40.04</td>
<td>18.2</td>
<td>-34.7</td>
<td>-6.9</td>
<td>-26.2</td>
</tr>
<tr>
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<td>2696.3</td>
<td>2362.0</td>
<td>1971.7</td>
<td>+12.2</td>
<td>-1.6</td>
<td>-17.8</td>
</tr>
</tbody>
</table>
people as represent small section of population and often suffer from mal-nutrition or lack a balanced diet.

Protein is essential in normal body function and its supply although short in last two categories B and C, is not very low -3.5 in B and -17.5 per cent in C. The position of fat which is a supporting element of food is again bad with -25.6 and -57.6 per cent in categories B and C respectively. Calcium supply is exceptionally good in A and B atleast, and short in category C by -43.7 per cent. Distribution of carbohydrates is also not even as category A has positive supply +21.2 per cent, whereas last two categories B and C has negative reading -11.5 and 18.0 per cent respectively. Beside these nutrients position of vitamin-C is also bad but not as low as, it is found generally in other villages.

The status of iodine in water is deficient causing mal-functioning of thyroid glands and also affects vision and development of mind and body. In this village 1.5 per cent of the total deficiency patients are attributed to goitre.

The percentage of occurrence of various diseases is high where the intake of iodine is below the recommended level. Even in categories where the caloric intake or intake of some of the other nutrients are normal or above, the spread of nutritional deficiency disease cannot altogether be ruled out. The main diseases found among the villagers are scurvy/
tooth and gum disease (16.1 per cent), beri-beri gastrointestinal disturbance colitis, etc. (14.6 per cent). Although the supply of iron is in surplus but the cases of anaemia (11.5 per cent) are also evident, may be because of non-absorption or loss of blood due to reasons explained earlier. Eye diseases stunted, retarded growth, xerophthalmia and keratomalacia (12.8, 3.0 and 2.5 per cent), rickets, kwashiorkor/marasmus, pellagra and urinary calculi (9.2, 7.6, 6.8 and 6.1 per cent), are other diseases noticed in this village. A low percentage of diabetes (4.8 per cent), and osteomalacia (3.5 per cent) is also noted in the village (Fig.4.6). Further it has been seen that the people belonging to the middle (category B) and lower income (category C) suffer more from these diseases than those of upper strata (category A). In the present economic setup, it is rather impossible for most of the rural population to take a balanced diet.
DASRATHPUR

Village Dasrathpur lying in a well drained fertile loamy soil on Jalalpur road, 4 km away from Bikapur and to the west of Ramdaspur Majhouli is located at 26°37'15" north latitude and 82°08'59" east longitude. Its total area is 476 acres and it carries a population of 1049, Brahmans and Harijans (schedule-caste), represent 70 per cent of the total population, while the rest are Yadav and others.

Main agricultural crops of kharif season are rice, jowar, arhar, maize, chari and sugarcane and in rabi, wheat occupies first place followed by peas, gram, moong, and potato. Wheat and rice together occupy 346 acres of land of which 92 acres were unirrigated. The total wasteland extends over 7 acres, and the land not available for cultivation accounted for 55 acres. Villagers are in little touch with the modern agricultural development, and do not believe in statement of agricultural experts, rather they go by their own experience with the result, that the loss of fertiliser is common and also its concentration due to high doses may damage plant cells. Besides, the excessive water and fertiliser make the condition suitable for pests and diseases in the absence of required checks. Finally the chemicals available to combat these diseases are often given after their expiry date.

The use of high yielding varieties of seeds like sonalika, arjun janak, kalyan sona and rice of jai, saket 4,
ratna gives better results only with the help of natural and irrigation water, but transplanting must be over by 15th July, otherwise it is recommended to increase the amount of fertiliser and seedlings.

The area which is not under cultivation (usar lands) may be put to use by using gypsum, sulphur or lime with plenty of water to neutralise the salt, even if filled with water and waste mango leaves and left to rot, it will be cured but since the water table is high, it may destroy again if left uncultivated.

On the whole this village is well supplied with food requirement. The caloric consumption per head per day varies from 2452 to 2061 most of which are driven from the cereals, especially wheat and rice. Use of vegetable and milk is more frequent in category A than in the categories B and C. Oils and fats are not available to satisfactory degree and same is the case with protein except in category A (+36.2 per cent). The supply of calcium is low (-33.7, -36.2 and -58.6 per cent) in categories A, B and C and the cases of its deficiency are high with a percentage of 11.7 and 4.9. Calcium deficiency leads to rickets which are associated with children whereas osteomalacia is found among adults. Unlike protein carbohydrates are also in short supply in the categories B and C (-5.0 and -8.9 per cent) whereas it is in surplus in category A (+3.9 per cent) as shown in Table A.
Table XI

Dasrathpur

Supply of Different Nutrients per head per day in Categories A.B.C. and Percentage of Departure from Standard Requirement

<table>
<thead>
<tr>
<th>Elements of Food</th>
<th>Standard Requirement</th>
<th>Actual Intake</th>
<th>Actual Intake</th>
<th>Actual Intake</th>
<th>PDSR</th>
<th>PDSR</th>
<th>PDSR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein g</td>
<td>68</td>
<td>92.6</td>
<td>59.7</td>
<td>49.79</td>
<td>+36.2</td>
<td>-12.2</td>
<td>-26.8</td>
</tr>
<tr>
<td>Fat g</td>
<td>50</td>
<td>46.6</td>
<td>41.4</td>
<td>37.5</td>
<td>-6.8</td>
<td>-17.2</td>
<td>-25.0</td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>440</td>
<td>457.4</td>
<td>417.9</td>
<td>400.56</td>
<td>+3.9</td>
<td>-5.02</td>
<td>-8.9</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>700</td>
<td>464.2</td>
<td>446.8</td>
<td>209.8</td>
<td>-33.7</td>
<td>-36.2</td>
<td>-58.6</td>
</tr>
<tr>
<td>Iron mg</td>
<td>22.5</td>
<td>52.1</td>
<td>54.7</td>
<td>46.9</td>
<td>131.5</td>
<td>143.1</td>
<td>+108.4</td>
</tr>
<tr>
<td>Vitamin-A I.U.</td>
<td>3500</td>
<td>4421.6</td>
<td>2361.2</td>
<td>1569.2</td>
<td>+26.33</td>
<td>-32.5</td>
<td>-55.2</td>
</tr>
<tr>
<td>Thiamine mg</td>
<td>1.12</td>
<td>2.35</td>
<td>1.82</td>
<td>1.65</td>
<td>+109.8</td>
<td>+62.5</td>
<td>+47.3</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.46</td>
<td>1.95</td>
<td>1.14</td>
<td>1.40</td>
<td>+33.56</td>
<td>-21.9</td>
<td>-4.1</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>19.0</td>
<td>24.23</td>
<td>19.69</td>
<td>16.09</td>
<td>+27.6</td>
<td>+3.6</td>
<td>-15.3</td>
</tr>
<tr>
<td>Vitamin-C mg</td>
<td>43.0</td>
<td>51.3</td>
<td>36.8</td>
<td>21.04</td>
<td>+19.3</td>
<td>-14.4</td>
<td>-51.1</td>
</tr>
<tr>
<td>CALORIES</td>
<td>2400</td>
<td>2432</td>
<td>2452</td>
<td>2061</td>
<td>+1.33</td>
<td>+2.2</td>
<td>-14.1</td>
</tr>
</tbody>
</table>
Although there is a surplus of thiamine, riboflavin is short in B and C. The cases of beri-beri, angular stomatitis and chronic diarrhoea, constipation are found in this village at the prevalence rate of 16.1 per cent. This may be because of uneven distribution or extra heating or indigestion, which may have reduced its percentage in the body. Niacin is also short to the tune of -15.3 but keeping in mind the supply of this vitamin, the cases of pellagra are quite high (8.1 per cent). The short supply of protein and calories resulted in 9.9 per cent cases of kwashionkor/marasmus.

Though iron is in surplus here too, like other villages anaemia is also found (10.9 per cent). Vitamin-A and C have contributed to the eye diseases and related problems at the rate of 12.3 per cent, and xerophthalmia 2.0 per cent, while scurvy, tooth and gum diseases accounted for 14.0 per cent. These two vitamins which play an important role are both short in categories B and C. Further more vitamins-A absorption depends on fat, as it is fat soluble vitamins. Other disease recorded in this village is urinary calculi with 5.6 per cent. No iodine deficiency is reported in the year 1989-90.

Fig.4.7 shows that the village, during the year of survey has 9.6 per cent morbidity and 1.04 per cent mortality rate which though not the lowest, is low among the villages under study.
MULLATHI BARASIN

Barasin is a medium size village, about 15 km west of Sultampur, connected by a unmetalled road on which private buses ply in all weathers. It becomes slushy during the rains, and is located in 26°21'37" north latitude and 81°58'09" east latitude. The shape of the village is an irregular triangle and is subject to changes due to soil erosion caused by occasional floods. The population of Malathi is 557 consisting of 431 Hindus and 126 Muslims. Hindus are divided in four castes, namely mallah, kayastha, teli and dhobi, the last named being the only scheduled caste in the village. Mallah are in large number divided into 62 house holds. Muslims constitute about 22 per cent of the total population.

Mallahs are clustered in the centre, kayasthas live in the south-west, muslims in the north, others are congregated in its eastern part. There is in essence grouping of houses on the caste basis. The physical features of the village are truly characterised by the Ganga plain. It is situated on a raised surface and may be divided into two natural divisions. (a) The low lying in the east, inundated every year by the Gomati. Some land is annually eroded or transformed into sand soil is mostly balua (sandy) and is not good for cultivation, melons, watermelons and sweet potatoes are grown in the tract. (b) The level plan has a gradual and uniform
slope from north-west to south-east. It is most fertile and devoted to wheat, gram, pulses in the rabi and paddy, maize, bajra in the kharif seasons.

Kayasthas being better placed own 75th of the total cultivated land and are well-to-do. Mallah are in good number and are mostly sailors but their second occupation is agriculture. They are good farmers and assisted well by their women folks. Most of them are not having any land and they earn their livelihood by string making or boat rowing, getting grains at the harvest from the farmers and get a little amount in cash from the passengers. Likewise dhobi (washerman) and other community members are also directly or indirectly dependent on the local food or thing available in weekly markets e.g. meat, grains and vegetables etc. Number of vegetarians are estimated to be 55 per cent. Fish is used more commonly in the village than meat. There are two principal crops seasons i.e. rabi and kharif with zaid in the sandy areas. Paddy occupies the low lying fields and upper land is given to other crops i.e. wheat, barley, gram, a little arhar (pulses) and moong, and other small millets (kodon, sawan, kakun) but these small millets are generally sold out. Bajra, jowar, bojher are locally consumed.

The daily intake of calories varies between 1807 and 2433 and is mainly based on the supply of cereals, pulses and vegetable. Domestic animals contribute milk to the diets of
those who can afford it. Fish is easily available although meat is also consumed on weekends (market day) or after fortnight among the muslims and non-muslims. Fruits, like mangoes, guava, plums etc. are taken at negligible level on the whole.

The main source of nutrients in this village are the foodgrains, pulses, vegetable. Fish and meat are consumed to some extent in some families. Detailed picture of their nutritional position has been shown in the Table XII. However the caloric intake varies from 2,433 in case of category A to 2,163 and 1,807 per head per day in categories B and C respectively. Majority of the population is malnourished and in some cases undernourished, with the result that about 13.6 per cent of the total population is liable to different deficiency diseases among the villagers. During the year 1989-90 about 1.9 per cent died on account of the various deficiency diseases in this village.

Table XII is prepared by the author on the basis of data collected, taking into consideration the standard requirement and their percentage of departure. Negative percentage of departure from the standard requirement is an alarming signal of deficiency diseases. There is a close relationship between the supply of nutrients and the deficiency diseases to be found in particular areas.
<table>
<thead>
<tr>
<th>Elements of Food</th>
<th>Standard Requirement</th>
<th>Actual Intake A</th>
<th>Actual Intake B</th>
<th>Actual Intake C</th>
<th>PDSR A</th>
<th>PDSR B</th>
<th>PDSR C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein g</td>
<td>68</td>
<td>57.5</td>
<td>55.3</td>
<td>36.8</td>
<td>-15.4</td>
<td>-18.7</td>
<td>-45.9</td>
</tr>
<tr>
<td>Fat g</td>
<td>50</td>
<td>25.1</td>
<td>19.1</td>
<td>12.0</td>
<td>-49.8</td>
<td>-61.5</td>
<td>-76.0</td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>440</td>
<td>485.9</td>
<td>479.7</td>
<td>440.6</td>
<td>+10.4</td>
<td>+9.0</td>
<td>-0.13</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>700</td>
<td>609.1</td>
<td>354.2</td>
<td>397.6</td>
<td>-12.9</td>
<td>-49.4</td>
<td>-43.2</td>
</tr>
<tr>
<td>Iron mg</td>
<td>22.5</td>
<td>78.7</td>
<td>43.0</td>
<td>30.8</td>
<td>+150.1</td>
<td>+91.1</td>
<td>+36.9</td>
</tr>
<tr>
<td>Vitamin-A. I.U.</td>
<td>3500</td>
<td>2271.6</td>
<td>2777.0</td>
<td>2663.5</td>
<td>-35.1</td>
<td>-20.6</td>
<td>-23.9</td>
</tr>
<tr>
<td>Thiamine mg</td>
<td>1.12</td>
<td>2.04</td>
<td>0.98</td>
<td>2.03</td>
<td>+82.1</td>
<td>-12.5</td>
<td>+81.2</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.46</td>
<td>1.84</td>
<td>1.69</td>
<td>1.3</td>
<td>+26.0</td>
<td>+15.7</td>
<td>-10.9</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>19</td>
<td>20.0</td>
<td>19.7</td>
<td>19.4</td>
<td>+5.3</td>
<td>+3.7</td>
<td>+2.1</td>
</tr>
<tr>
<td>Vitamin-C mg</td>
<td>43</td>
<td>28.9</td>
<td>15.3</td>
<td>13.2</td>
<td>-32.8</td>
<td>-64.4</td>
<td>-69.2</td>
</tr>
<tr>
<td>CALORIES</td>
<td>2400</td>
<td>2433</td>
<td>2163</td>
<td>1807</td>
<td>+1.4</td>
<td>-9.9</td>
<td>-24.7</td>
</tr>
</tbody>
</table>
The supply of different nutrients are not uniformly distributed among the village communities. Fat, calcium, vitamin-A and C and protein are not supplied properly. However, the position with regard to the supply of calcium, vitamin-A is better in comparison to other villages. This is perhaps due to intake of fish and meat in B and C categories. Further, it is seen that there is surplus supply of iron, thiamine and fair supply of carbohydrate, riboflavin and niacin among the well-to-do families of the village. Among the last two categories, the supply of these elements are not adequate. They are deficient in calories as well. Supply of fat, calcium, vitamin-A and C and protein is deficient to the tune of -49.8, -12.9, -35.1, -32.8, -15.4 per cent in category A, while in case of B and C categories, it is short to the tune of -61.5, -49.4, -20.6, -64.4, -18.7 and -76.0, -43.2, -23.9, -69.2, -45.9 per cent respectively per head per-day. Some case of iodine deficiency is also reported. Out of the total patients, deficiency diseases account for about 80.1 per cent and larger percentage is reported from the last two categories.

Deficiency of vitamin-A and C, riboflavin and iodine are responsible for more than 60 per cent of the deficiency patients surveyed in the village. Acute shortage of vitamin-C, in all the three categories caused severe damage to health, in the form of tooth and gum diseases and scurvy, which accounts for 19.2 per cent of the total deficiency patients, the highest among the deficiency diseases. Next comes the beri-beri and
pellagra and eye diseases and anaemia (Fig.4.8). Due to short supply of iodin and riboflavin, niacin about 12.2 and 14.2 per cent of the deficiency disease patients are suffering from full to mild symptoms of beri-beri, gastrointestinal disturbances and pellagra.

The cases of beri-beri are mostly from B and C categories where the supply of related nutrients is not satisfactory. While eye disease and anaemia accounted for 15.9 per cent and 11.9 per cent respectively and are confined usually to C category, where the supply of vitamin-A is -23.9 per cent below the standard requirement, causing eye defects i.e., night blindness, xerophthalmia and also checks the proper growth and cause dry beri-beri. Its deficiency coupled with shortage of calcium and fat caused osteomalacia, urinary calculi 2.1, 2.3 per cent respectively. Although iron is supplied fairly, yet anaemia accounts for 11.9 per cent among which more than 8.5 per cent are women and rest 3.4 per cent are children; it may be due to mal-absorption of iron in the body or due to absence of other nutrients (Fig.4.8).

Besides these deficiency diseases, rickets, kwashiorkor/marasmus and diabetes are also noticed. Deficiency of vitamin-D, protein and insulin in the body helps in promoting these deficiency diseases and the patients suffering from these diseases are 7.3, 9.7 and 5.1 per cent respectively.
MULLATHI BARASIN
NUTRITIONAL DEFICIENCY DISEASES

FIG. 4.8
Vitamin-D is scantly available to the village population with the result that rickets are found among the children of low income strata. Its deficiency also checks the absorption of phosphorus. Protein supply is deficient in almost the entire village population. Due to excessive use of sugar, related metabolism failed in absorbing sugar, with the result that sugar passes directly in the blood and the patient suffers from diabetes due to lack of insulin in the body.
Khizrabad is a small village with total population of 212, 102 males and 110 females; total area of the village is 157 acres. The village lies in 26°11'00" north latitude and 82°22'00" east longitude at a distance of about 4 km to the north-west of Kadipur tahsil headquarter in Sultanpur district.

The village of Khizrabad is situated along the high bank of river Gomati, a perennial stream meandering towards the west and a strip of 11 acres of land goes along with it. Which is not available for cultivation due to heavy erosion. The village is also not well-connected; an unmetalled road between Dostpur and Kadipur passes at a distance of 2 km from the village.

Predominant soil of the village is sandy-loam but patches of sandy soil can also be seen. Irrigation facilities are very poor with the result that 94 out of 157 acres of land are almost left unirrigated. The existing means of irrigation are also very old. Wheat and gram are the staple rabi crops; in the kharif, 92 per cent of the land is covered by broad cast rice; next is the big millets mixed with pulses (arhar). Only one acre of land is registered as cultivable waste in 1989-90.

The village is inhabited by various communities and naturally dietary habits are also different. There are only
some (A) class families and the rest belong to (B) and (C) categories people.

Majority of the village population is mal-nourished supply of necessary nutrients in their diet is inadequate in all the categories, but varies in the amount of intake, such as the supply of calories among the people of all the three categories are short by -3.5 per cent in (A), -10.6 and -22.8 per cent in B and C categories per head per day (Table XIII). Main sources of supply are cereals and about 85 per cent of the population is unable to reach the target of the standard intake of 2400 per person per day. The supply of protein, fat along with riboflavin, niacin and vitamin-C is not up to the mark with the result that 12.7 per cent of the villagers are liable to various deficiency diseases.

The most common among them are beri-beri and gastro-intestinal, colitis etc. Deficiency diseases above account for 12.7 per cent of the total patients with 1.9 per cent mortality (Fig.4.8). As most of the deficiency diseases are not killer, even then they create problems by making the people inactive and spoiling normal functioning of the body mechanism and if prolonged, may end up with death or render inactive by paralising any part of the body.

It is clear from the Table XIII that the nutritional status of the villagers is far from satisfactory and the
<table>
<thead>
<tr>
<th>Elements of Food</th>
<th>Standard Requirement</th>
<th>Actual Intake</th>
<th>Percent Departure from Standard Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Protein g</td>
<td>68</td>
<td>60.7</td>
<td>62.2</td>
</tr>
<tr>
<td>Fat g</td>
<td>50</td>
<td>36.7</td>
<td>27.3</td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>440</td>
<td>414.3</td>
<td>331.7</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>700</td>
<td>1062.4</td>
<td>1062.4</td>
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<tr>
<td>Iron mg</td>
<td>22.5</td>
<td>39.8</td>
<td>49.2</td>
</tr>
<tr>
<td>Vitamin A I.U.</td>
<td>3500</td>
<td>3597.2</td>
<td>2104.5</td>
</tr>
<tr>
<td>Thiamine mg</td>
<td>1.12</td>
<td>1.64</td>
<td>2.52</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.46</td>
<td>1.34</td>
<td>1.64</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>19.1</td>
<td>6.2</td>
<td>18.4</td>
</tr>
<tr>
<td>Vitamin-C mg</td>
<td>43.4</td>
<td>26.6</td>
<td>18.6</td>
</tr>
<tr>
<td>CALORIES</td>
<td>2400</td>
<td>2144.6</td>
<td>1853.2</td>
</tr>
</tbody>
</table>
supply of various food elements is not uniform viz., the supply of iron, thiamine, to some extent protein, niacin, calcium and riboflavin is fairly well in all the three categories in comparison to the supply of fat and vitamin-C which are deficient to the tune of -26.5, -38.1 respectively in the families of (A) category and -55.4, -56.8 in case of (B) category whereas in (C), these figures are -45.3, -2.5 per cent respectively per head per day. While the shortage of carbohydrates is recorded only in B and C categories (-5.8 and -24.60 per cent), the supply of vitamin-A is short in category (A) and (B) to the tune of -46.3 and -39.9 respectively. Generalised use of fish and leafy vegetables and seasonal fruits which are not normally used in category A, are the main source of vitamin-C in C category.

There is no custom of taking refined table salt or bathing with seasalt, therefore the distribution of iodine and vitamin-D is almost even in all the three categories as far both they depend on nature. Out of the total population of the village, 12.7 per cent is sick, majority belongs to C and B categories. Beri-beri, gastro-intestinal problems, retarded, stunted growth and eye diseases, scurvy/tooth and gum diseases. Kwashiorkor/marasmus and pellagra together account about 64.7 per cent of the total deficiency patients. Due to the deficient supply of riboflavin, thiamine among category (C) people, 15.6 per cent of the patients registered
complaints of gastro-intestinal trouble, colitis in the age groups of old people, and young children have the symptoms of beri-beri. Sciatica is also noticed in developed and semi-developed form. While scurvy, tooth and gum problems and kwashiorkor/marasmus account for 11.6 per cent and 11.5 per cent respectively, due to acute shortage of vitamin-C in A and B categories. In adequate supply of protein, fat along with low caloric intake causes kwashiorkor/marasmus and also results in poor heir conditions. Pellagra is the disease which is associated with the niacin deficiency. Though niacin is not much short, even then 8.1 per cent kids have the developed symptoms of pellagra. Deficiency of vitamin-A and D claims for 17.9 and 12.8 per cent of patients suffering from different eye diseases, retarded growth and rickets. Short supply of fat creates hindrance in absorbing fat soluable vitamins.

The supply of iron and thiamine is surplus in all the categories. Due to non-absorption in the body or unusual discharge of blood from the body, deficiency may develop several cases of anaemia also reported (12.8 per cent). Besides these diseases, other diseases are also noticed among the rural community i.e. diabetes, urinary calculi and osteomalacia is found at the rate of 2.5, 4.0 and 3.2 per cent respectively (Fig.4.9). Although the village is not
agriculturally prosperous, yet the supply of essential food elements is better due to additional seasonal availability of wild vegetables, fruits and fish to the villagers especially of the downtrodden society. No case of goitre xerophthalmia, keratomalacia is reported from this village.
Jhakha Sheopur lies 18 km west of Musafirkhana at 26°23'10" north latitude and 81°37'40" east longitude. It is agriculturally non-prosperous as the soil is mostly sandy with patches of sandy-loam and large areas get flooded during the monsoon. Rice and wheat occupy 40 per cent only of the cultivable land, with the nominal help of private tube-wells, as the existing facility cannot irrigate the whole area. Sweet potato is the main cash crop of the village, followed by bajher, jowar, maize and small millets with little arhar (pulses). Total area of the village is 895 acres, out of which 636 acres are un-irrigated; 68 acres are recorded as cultivable waste and 86 acres are not available for agricultural purposes. 286 males and 32 females are engaged in agricultural pursuits and hence they may be called agricultural workers. The entire population of the village numbering 1485 is divided in two groups; firstly active which comprises the agricultural workers and secondly, inactive which refers to farm owners who generally do not work in the fields.

A good portion of vitamin-C is received through fruits as they use mahua (Bassia latifolia) in their daily meal from the month of April; firstly they use green mahua, and later on it is used dry with mango. They also occasionally take cereals with mahua. In the off-season potato and sweet potato constitute their basic diet. In the morning they generally use the surplus left over in the early evening.
Most of the calories are derived from cereals, pulses and vegetables. Seasonal fruits, meat and milk, all together contribute to the little amount of calories. The daily intake of calories varies from 2669, 2046.9 to 1931.1. More than 50 per cent of the population is non-vegetarian. This village has a mixed population, ghasies (milkman) are in majority followed by mallah (ferry people), dhobi (washerman), chammars (low caste Hindus), ahir (Hindu milkman) and Brahmns/Pandits (high caste Hindus). That is why milk and fish is more common in this village. Nevertheless most of the people cannot afford to buy milk, eggs, meat, fish for their daily diets. These items are either familiar with those who trade in these commodities or those who can afford to purchase them.

There is a considerable variation in the nutritional position of the villagers. Their dietary habits are also different. With the result they suffer from mal-nourishment due to continuous intake of unbalanced diet. Such diets cause several deficiency diseases among them. The relationship of faulty diet to the disease is an old story. James Lind's famous 'treatise on scurvy was published in 1753. What was new at the 1963 Nutritional Congress, was the dietary factors in the causation of 'Cardio-vascular diseases' in man. However the total number of patients in this village was 19.9 per cent out of which 73.4 per cent were suffering from

* Cardiovascular Diseases: Pretaining to Involving Heart and Blood Vessels.*
deficiency diseases viz., anaemia 13.2, beri-beri and gastro-intestinal disturbances 16.4, diabetes 4.0, eye diseases 15.6 per cent. Whereas kwashiorkor/marasmus, osteomalacia, pellagra, rickets, scurvy tooth and gum diseases along with urinary calculi account for 6.9, 6.5, 7.2, 10.4, 18.4 and 2.7 per cent and has proved a close relationship between deficient supply of nutrients and the existing deficiency diseases in the village (Fig. 4.10).

Besides the deficiency of fat, protein, calcium, the supply of calories are also deficient in categories of B and C. If the conditions are measured on the average caloric requirement of 2000 per head per day as supported by Shafi, for Eastern Uttar Pradesh, even then the supply of calories in category C is short.

Supply of thiamine, iron and carbohydrate is fair but in the absence of other nutrients, they cannot ensure a good health. Morbidity and mortality rates recorded in the village during the survey is found to be 14.6 and 1.7 respectively. Table XIV shows the supply of fat, protein, calcium, vitamin-A and C has gone down to the tune of -22.6, -22.2, -5.4, -27.8 and -36.0 per cent in the case of category A people, whereas it is short to the tune of -37.6, 33.5, -11.5,

JHAKHA-SHEOPUR
NUTRITIONAL DEFICIENCY DISEASES

FIG. 4.10
Table XIV

Jhakha-Sheopur

Supply of Different Nutrients per head per day in Categories A.B.C. and Percentage of Departure from Standard Requirement

<table>
<thead>
<tr>
<th>Elements of Food</th>
<th>Standard Requirement</th>
<th>Actual Intake</th>
<th>Actual Intake</th>
<th>Actual Intake</th>
<th>PDSR A</th>
<th>PDSR B</th>
<th>PDSR C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein g</td>
<td>68</td>
<td>52.9</td>
<td>45.2</td>
<td>39.5</td>
<td>-22.2</td>
<td>-33.5</td>
<td>-41.9</td>
</tr>
<tr>
<td>Fat g</td>
<td>50</td>
<td>38.7</td>
<td>31.2</td>
<td>21.6</td>
<td>-22.6</td>
<td>-37.6</td>
<td>-56.8</td>
</tr>
<tr>
<td>Carbohydrates g</td>
<td>440</td>
<td>472.4</td>
<td>446.0</td>
<td>429.8</td>
<td>+7.5</td>
<td>+1.4</td>
<td>-2.3</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>700</td>
<td>662.1</td>
<td>619.0</td>
<td>467.1</td>
<td>-5.4</td>
<td>-11.5</td>
<td>-33.3</td>
</tr>
<tr>
<td>Iron mg</td>
<td>22.5</td>
<td>53.4</td>
<td>38.1</td>
<td>31.2</td>
<td>+137.3</td>
<td>+69.4</td>
<td>+38.7</td>
</tr>
<tr>
<td>Vitamin-A I.U.</td>
<td>3500</td>
<td>2527</td>
<td>2474.9</td>
<td>1884.9</td>
<td>-27.8</td>
<td>-29.3</td>
<td>-46.2</td>
</tr>
<tr>
<td>Thiamine mg</td>
<td>1.12</td>
<td>2.16</td>
<td>1.66</td>
<td>1.03</td>
<td>+92.8</td>
<td>+48.2</td>
<td>-8.0</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.46</td>
<td>1.64</td>
<td>1.49</td>
<td>1.09</td>
<td>+12.3</td>
<td>+2.1</td>
<td>-25.4</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>19</td>
<td>20.6</td>
<td>18.2</td>
<td>14.8</td>
<td>+8.7</td>
<td>-4.2</td>
<td>-22.1</td>
</tr>
<tr>
<td>Vitamin-C mg</td>
<td>43</td>
<td>27.5</td>
<td>29.2</td>
<td>22.4</td>
<td>-36.0</td>
<td>-32.1</td>
<td>-47.9</td>
</tr>
<tr>
<td>CALORIES</td>
<td>2400</td>
<td>2669</td>
<td>2046.9</td>
<td>1931.1</td>
<td>+11.2</td>
<td>-14.7</td>
<td>-19.5</td>
</tr>
</tbody>
</table>
-29.3, -32.1 per cent and -56.8, -41.9, -33.3, -46.2 and 47.9 per cent in the case of categories B and C respectively. In the village under study, people belonging to low income group (category C) suffered more than other village population. From the given Table XIV, it is clear that there is little difference in the supply of essential nutrients among the categories A and B, although category A registered six pluses and B registered four. But in category C only one plus (iron +38.7) is recorded. The supply of other nutrients are inadequate, rather far below the standard requirement.

Poor availability of food and faulty diet particularly in category C has resulted in 70 per cent of the deficiency patients in this category. The labour class becomes easy victim to these problems. This village shows the highest number of deficiency disease patients.
GAURA-BAREMAU

Gaura-Baremau of block Baldirai, tahsil Musafirkhana, district Sultanpur lies at 26°28'03'' north latitude and 81°51'21'' east longitude and occupies fertile level land of bhangar soils. The village spreads over an area of 300 acres out of which 70 per cent is level and 30 per cent undulated plain. Rice is the leading kharif crop and wheat dominates in the rabi, followed by barley, gram, peas, sugarcane, and potatoe. Sweet potatoes are also grown as a cash crop in the village.

The population of this village is estimated at 1237 persons of which 20 per cent are muslims, 5.0 per cent thakurs, 2.0 per cent pandits, 26.0 per cent harijans, and the rest are ahrs and Kurmies. Agricultural efficiency of this village is good, but the supply of calories and carbohydrates is not well (+3.2, -7.7, -21.8 and -0.9, -5.5, -16.9 per cent) in the village community. Cereals are the main source of these elements. The supply of protein is good in all the three categories with the only exception of a little shortage of -1.8 in category C. The intake of fat is fairly good among the people of category A (+9.2 per cent), but it has a negative reading in categories B and C at the tune of -36.6 and -58.2 per cent respectively.

This village is not purely vegetarian. The upper strata is comprised of Muslims and Thakurs who are non-vegetarian, and therefore meat is a familiar item in the village.
There is a variation in the intake of nutritive diets among the members of different village communities as shown in Table XV, but this variation is very well marked among the rural population belonging to different economic groups. This may be explained by the fact that the supply of essential nutrients is inadequate in A than in category B, whereas in C it is far below the standard requirement. As a result of it about 9.0 per cent of the village population is liable to various deficiency diseases and accounts for 1.6 per cent of total deaths in this village.

It is clear from Table XV that the supply of protein, iron, thiamine and riboflavin is exceptionally good in all the categories. However the supply of fat, calcium, vitamin-A, niacin and vitamin-C is in surplus in category A and niacin in B category. All these elements are short in category C to the tune of -58.2, -65.5, -59.8, -10.7 and -45.9 per cent respectively per head per day.

The supply of iodine appears to be normal and no case of goitre was found during the survey. Out of the total patients, majority represents low category (C). The intake of nutrients in this group is inadequate. This imbalance has ultimately led to the spread of several deficiency diseases among the rural community (Fig. 4.11). Anaemia, beri-beri, rickets together with scurvy/tooth and gum diseases, accounted for more than 50 per cent of the patients. The cases of anaemia (12.2 per cent) are reported from all groups, whereas
Table XV

Gaura-Baremav

Supply of Different Nutrients per head per day in the Categories A, B, C, and Percentage of Departure from Standard Requirement

<table>
<thead>
<tr>
<th>Elements of Food</th>
<th>Standard Requirement</th>
<th>Actual Intake A</th>
<th>Actual Intake B</th>
<th>Actual Intake C</th>
<th>PDSR A</th>
<th>PDSR B</th>
<th>PDSR C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein g</td>
<td>68</td>
<td>73.26</td>
<td>74.00</td>
<td>66.74</td>
<td>+ 7.7</td>
<td>+ 8.8</td>
<td>- 1.8</td>
</tr>
<tr>
<td>Fat g</td>
<td>50</td>
<td>54.6</td>
<td>31.7</td>
<td>20.88</td>
<td>+ 9.2</td>
<td>-36.6</td>
<td>-58.2</td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>440</td>
<td>436.2</td>
<td>415.73</td>
<td>365.48</td>
<td>- 0.9</td>
<td>- 5.5</td>
<td>-16.9</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>700</td>
<td>508.3</td>
<td>442.2</td>
<td>241.3</td>
<td>-27.38</td>
<td>-36.8</td>
<td>-65.5</td>
</tr>
<tr>
<td>Iron mg</td>
<td>22.5</td>
<td>51.1</td>
<td>52.4</td>
<td>32.13</td>
<td>+127.1</td>
<td>+132.8</td>
<td>+42.8</td>
</tr>
<tr>
<td>Vitamin-A I.U.</td>
<td>3500</td>
<td>6189.1</td>
<td>2793.83</td>
<td>1416.4</td>
<td>+76.83</td>
<td>-20.2</td>
<td>-59.8</td>
</tr>
<tr>
<td>Thiamine mg</td>
<td>1.12</td>
<td>2.2</td>
<td>2.2</td>
<td>2.4</td>
<td>+80.32</td>
<td>+80.34</td>
<td>+96.7</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.46</td>
<td>2.1</td>
<td>1.92</td>
<td>1.97</td>
<td>+43.83</td>
<td>+31.5</td>
<td>+34.9</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>19</td>
<td>21.4</td>
<td>19.96</td>
<td>16.96</td>
<td>+12.63</td>
<td>+5.1</td>
<td>-10.7</td>
</tr>
<tr>
<td>Vitamin-C mg</td>
<td>43</td>
<td>84.3</td>
<td>31.56</td>
<td>23.26</td>
<td>+96.04</td>
<td>-26.6</td>
<td>-45.9</td>
</tr>
<tr>
<td>Calories</td>
<td>2400</td>
<td>2477.5</td>
<td>2215.9</td>
<td>1876.7</td>
<td>+ 3.2</td>
<td>- 7.7</td>
<td>-21.8</td>
</tr>
</tbody>
</table>
beri-beri/gastro-intestinal disturbances (13.5 per cent) are mainly contributed by category C, while the cases of rickets, scurvy/tooth and gum diseases account for 12.5, 13.1 per cent respectively in the village. Vitamin-A has an important role in protecting people from eye diseases, and dry beri-beri and helping them in their mental development. Its deficiency may create many-fold problems for human health. It is deficient in the categories B and C to the tune of -20.2 and -59.9 per cent, resulting in 10.6, 1.5 and 1.5 per cent of the patients suffering from night blindness, colour blindness, retarded growth, xerophthalmia and keratomalacia. Its deficiency along with acute deficiency of calcium and fat caused osteomalacia and urinary calculi (4.6, 4.1 per cent).

Besides these deficiency diseases, there are pellagra, kwashiorkor/marasmus and diabetes. Short supply of group B vitamins further leads to constipation, anorexia nervous irritability, depression, etc. A prolonged deficiency of niacin, protein and calories helps the causation of pellagra, kwashiorkor/marasmus (9.2, 10.8 per cent). Diabetes accounted for 6.4 per cent of the total deficiency patients in the village (Fig.4.11).
This village lies at a distance of 1 km from Amethi of the district Sultanpur, on the Amethi-Sultanpur road and 26°10'26" north latitude and 81°48'36" east longitude. It falls in the well-drained loamy soil, mainly devoted to double crops. It is an agriculturally prosperous village.

This village has a negligible area under usar (wasteland) or banjar (uncultivated land). Main kharif crop is rice, which occupies 60 per cent of the cultivated land and is followed by jowar (small millets), arhar (pigeon pea), chari (big millets harvested green) and sugarcane. Whereas in rabi, wheat is the dominant crop, occupying about 80 per cent of cultivated land, followed by peas, gram, barley, potato and onions for domestic use. This village has 2 private tube-wells, wells and ponds to cover their irrigation requirement. Holdings in this village are small seldom exceeding 7 acres. It has a total population of 486, comprising of mainly brahmins, harijans, ahirs (milk man) and barhai (carpenter). The first two categories (A and B) are from upper caste (brahmins) and the third (C) is shared by the rest. The population is mostly vegetarian and milk is used as a part of the diet either in category A or in families engaged in milk trade (ahirs).

The nutritional standards of the population vary and are governed mainly by the economic status of an individual family. Cereals and pulses normally contribute the basic diet
of the inhabitants, supplemented by vegetables, milk and seasonal fruits. Pulses are the main source of protein supply.

Nutritional position of the villagers has been assessed by considering the dietary habits. This is based on the supply of different essential nutrients and their percentage of departure from the standard requirement. Caloric intake of the village population per head per day varies from 2520 in category A, 2289 in category B to 1988 in category C.

More than 80 per cent of the population is unable to get the required calories of 2400 per head per day. The supply of different nutrients are not uniformly distributed among the rural inhabitants. It varies from category to category, viz., the supply of protein and fat is fair, the supply of iron, vitamin-A, thiamine, riboflavin and vitamin-C is surplus, and the supply of carbohydrates, calcium and niacin is up to some extent satisfactory in category A. The supply of protein, fat, calcium and vitamin-A is deficient in categories B and C (-21.1, -30.7, -47.9, -52.8 and -12.3, -58.6, -48.6 and -68.9 per cent respectively) whereas the supply of carbohydrates in these categories are almost satisfactory. Supply of vitamin-C is exceptionally well in this village, due to frequent use of leafy vegetables and seasonal fruits available on the roads side trees or in
village itself. Unlike category A thiamine iron, is also sufficient in B and C (+44.3, 141.7 and +68.0, 100.4 respectively). As regards riboflavin and niacin, the first is fairly available only in category A, while it is short in the categories B and C (-12.3 and -17.8 per cent). Niacin is short in categories A and B (-1.8 and -6.0 per cent). It is clear from Table XVI that the nutritional position is not satisfactory. It deteriorates from A to B and C categories. Consequently villagers of these last two categories are more prone to the deficiency diseases. This situation altogether accounted for 11.8 per cent of the deficiencies diseases patients with 1.5 per cent mortality rate (Fig.4.12).

The most common deficiency diseases in the village are beri-beri, gastrointestinal disturbances, colitis, kwashiorkor/marasmus, scurvy, tooth and gum diseases, rickets, anaemia and eye disease, which accounted for about 12.7, 12.2, 11.6, 11.3, 10.6 and 10.2 per cent respectively of the total patients in this village. Apart from these deficiency diseases pellagra, urinary - calculi, osteomalacia, diabetes and goitre are also reported and accounts for 31.4 per cent of the total patients. Due to better average supply of vitamin-A the cases of xerophthalmia and keratomalacia is not found.
Table XVI

Ramnathpur

Supply of Different Nutrients per head per day in Categories A.B.C. and Percentage of Departure from Standard Requirement

<table>
<thead>
<tr>
<th>Elements of Food</th>
<th>Standard Requirement</th>
<th>Actual Intake</th>
<th>Actual Intake</th>
<th>Actual Intake</th>
<th>PDSR</th>
<th>PDSR</th>
<th>PDSR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Protein g</td>
<td>68</td>
<td>74.3</td>
<td>53.6</td>
<td>59.6</td>
<td>+9.3</td>
<td>-21.1</td>
<td>-12.3</td>
</tr>
<tr>
<td>Fat g</td>
<td>50</td>
<td>56.8</td>
<td>34.7</td>
<td>20.7</td>
<td>+13.5</td>
<td>-30.7</td>
<td>-58.6</td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>440</td>
<td>392.3</td>
<td>425.0</td>
<td>430.3</td>
<td>-10.8</td>
<td>-3.4</td>
<td>-2.2</td>
</tr>
<tr>
<td>Calcium g</td>
<td>700</td>
<td>588.8</td>
<td>364.1</td>
<td>260.1</td>
<td>-15.9</td>
<td>-47.9</td>
<td>-48.6</td>
</tr>
<tr>
<td>Iron mg</td>
<td>22.5</td>
<td>49.8</td>
<td>54.4</td>
<td>45.1</td>
<td>+121.3</td>
<td>+141.7</td>
<td>+100.4</td>
</tr>
<tr>
<td>Vitamin-A I.U.</td>
<td>3500</td>
<td>6323.6</td>
<td>1651.2</td>
<td>1087.4</td>
<td>+80.7</td>
<td>-52.8</td>
<td>-68.9</td>
</tr>
<tr>
<td>Thiamine mg</td>
<td>1.12</td>
<td>2.1</td>
<td>1.76</td>
<td>2.05</td>
<td>+68.8</td>
<td>+44.3</td>
<td>+68.0</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.46</td>
<td>1.97</td>
<td>1.28</td>
<td>1.2</td>
<td>+34.9</td>
<td>-12.3</td>
<td>-17.8</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>19</td>
<td>18.7</td>
<td>17.9</td>
<td>22.6</td>
<td>-1.8</td>
<td>-6.0</td>
<td>+18.9</td>
</tr>
<tr>
<td>Vitamin-C mg</td>
<td>43</td>
<td>76.8</td>
<td>60.9</td>
<td>59.9</td>
<td>+78.6</td>
<td>+41.6</td>
<td>+39.3</td>
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<td>Calories</td>
<td>2400</td>
<td>2520</td>
<td>2289</td>
<td>1988.0</td>
<td>+5.0</td>
<td>-4.6</td>
<td>-17.1</td>
</tr>
</tbody>
</table>
RAMNATHPUR
NUTRITIONAL DEFICIENCY DISEASES

PERCENTAGE REFERS TO TOTAL NUMBER OF PATIENTS

FIG. 4.12
SONBARSA

Village Sonbarsa lies about 10 km to the south of Sultampur on Sultampur-Pratapgarh road at 26°11'22" north latitude and 82°08'05" east longitude in an area of sandy loam soil. It is a medium size village of 286 acres with the population of 810 persons (389 males and 421 females). Out of 286 acres, 131 acres are put to double cropping, 49 acres are cultivable wasteland and 26 acres are not available for agricultural use. Water for irrigation is available from two private and a government owned tube-well and a pond. Rice is the most important kharif crop (transplanted and broadcast) followed by jowar (big and small millets), maize, urä (black gram) sugarcane and sweet potatoes. In rabi as usual wheat is the leading crop, followed by barley, peas, gram mustard and potatoes.

About three fourth of the total population is Muslim, followed by 20 per cent Kurmi and Yadav and 5 per cent Harijans. About 5 per cent of the total population belongs to category A, 14 per cent of category B, rest 81 per cent falls under category C in this village. About 80 per cent of the population is non-vegetarian. Availability of calories is by and large satisfactory and fairly well in comparison to other villages. During the field work the writer observed that the village community has a fair supply of cereals so as to enable them to get two square meals. But their diets lack in essential nutrients. One tenth of the population thus is
exposed to deficiency diseases and 1.23 per cent died owing to prolonged deficiency of essential nutrients. Table XVII serves as an index for measuring the health conditions of the village population. The figures with (-) signs indicate a tendency towards ill-health and deficiency diseases, while figures with (+) signs indicate better position in respect of essential nutrients needed for keeping good health.

Unlike other villages here too caloric intake varies from category to category. It is evident from Table XVII that the intake of calories per head per day in category (A) is about 2545.4 whereas it is 2349.4 and 2163.3 in categories (B) and (C) respectively. Supply of other nutrients are also not uniformly distributed among the villagers belonging to different income groups, e.g. the position of protein and fat is good in category A but it is in short supply in categories B and C (-3.2, -7.2 and -9.3, -35.1 per cent). Supply of iron is fairly high in all the categories whereas the availability of carbohydrates, calcium, vitamin-A and vitamin-C has registered its shortage among the rural community. These nutrients are short to the tune of -4.5, -38.7, -31.8 and -44.4 per cent, in the case of category A, whereas in the other two categories (B) and (C), it falls short to the tune of -12.0, -44.2, -46.1, -27.6 and -7.3, -53.0, -59.6, -40.6 per cent respectively. Other nutrients, e.g. thiamine, riboflavin and niacin have registered a good supply in the
Table XVII
Sonbarsa

Supply of Different Nutrients per head per day in Categories A.B.C. and Percentage of Departure from Standard Requirement

<table>
<thead>
<tr>
<th>Elements of Food</th>
<th>Standard Requirement</th>
<th>Actual Intake A</th>
<th>Actual Intake B</th>
<th>Actual Intake C</th>
<th>PDSR A</th>
<th>PDSR B</th>
<th>PDSR C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein g</td>
<td>68</td>
<td>75.9</td>
<td>65.85</td>
<td>61.7</td>
<td>+11.6</td>
<td>-3.2</td>
<td>-9.3</td>
</tr>
<tr>
<td>Fat g</td>
<td>50</td>
<td>61.7</td>
<td>46.4</td>
<td>32.5</td>
<td>+23.4</td>
<td>-7.2</td>
<td>-35.1</td>
</tr>
<tr>
<td>Carbohydrate g</td>
<td>440</td>
<td>420.3</td>
<td>385.6</td>
<td>407.7</td>
<td>-4.5</td>
<td>-12.0</td>
<td>-7.3</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>700</td>
<td>428.8</td>
<td>390.5</td>
<td>328.8</td>
<td>-38.7</td>
<td>-44.2</td>
<td>-53.0</td>
</tr>
<tr>
<td>Iron mg</td>
<td>22.5</td>
<td>49.48</td>
<td>4.31</td>
<td>36.5</td>
<td>+119.9</td>
<td>+91.5</td>
<td>+62.2</td>
</tr>
<tr>
<td>Vitamin-A. I.U.</td>
<td>3500</td>
<td>2386.4</td>
<td>1886.8</td>
<td>1412.3</td>
<td>-31.8</td>
<td>-46.1</td>
<td>-59.6</td>
</tr>
<tr>
<td>Thiamin mg</td>
<td>1.12</td>
<td>2.36</td>
<td>2.0</td>
<td>1.94</td>
<td>+110.7</td>
<td>+78.6</td>
<td>+73.2</td>
</tr>
<tr>
<td>Riboflavin mg</td>
<td>1.46</td>
<td>1.65</td>
<td>2.01</td>
<td>1.14</td>
<td>+13.0</td>
<td>+37.6</td>
<td>-21.9</td>
</tr>
<tr>
<td>Niacin mg</td>
<td>19</td>
<td>20.1</td>
<td>28.19</td>
<td>20.7</td>
<td>+5.8</td>
<td>+48.4</td>
<td>+9.1</td>
</tr>
<tr>
<td>Vitamin-C mg</td>
<td>43</td>
<td>23.9</td>
<td>31.11</td>
<td>25.5</td>
<td>-44.4</td>
<td>-27.6</td>
<td>-40.6</td>
</tr>
<tr>
<td>CALORIES</td>
<td>2400</td>
<td>2545.4</td>
<td>2349.4</td>
<td>2163.3</td>
<td>+6.1</td>
<td>-2.1</td>
<td>-9.9</td>
</tr>
</tbody>
</table>
first two categories. Riboflavin however is short by -21.9 per cent in category C, while the other two vitamins are fairly well in this category too.

Deficiency of essential nutrients weakens the resistance against the diseases. Consequently a number of deficiency diseases are prevalent in this village but the mortality rate is comparatively low being only 1.23 per cent. The obvious reason for low rate of mortality lies in the fact that it is a small village and its clearliness poses no problem for the rural population. Further the houses are kept free from dampness and bad smell. Other factors that contribute to the higher rate of mortality are also to a large extent non-existant.

Deficiency of protein, calories, fat, calcium and vitamin-A has caused 9.7, 13.2, 8.4, 18.1 per cent of the deficiency patients to suffer from kwashiorkor/marasmus, rickets, osteomalacia, and eye diseases (night and colour blindness, xerophthalmia, keratomalacia) etc. and several other inflammations (Fig.4.13).

Deficiency of vitamin-C, caused scurvy, tooth and gum diseases and accounted for 6.6 per cent, the lowest in all the twelve villages under study. Apart from these diseases, anaemia, beri-beri, diabetes, pellagra and urinary calculi is also found in the village and accountef for 12.2, 11.8, 8.1, 5.6 and 4.3 per cent respectively. Anaemia does exist
SONBARSA
NUTRITIONAL DEFICIENCY DISEASES

PERCENTAGE REFERS TO TOTAL
NUMBER OF PATIENTS

KERATOMALACIA
XEROPHTHALMIA
URINARY CALCULI
SCURVY TOOTH & GUM
DISEASES
RICKETS
PELLAGRA
OSTEOMALACIA
KWASHOERKER/MARASMUS
EYE DISEASES &
RETARDED GROWTH
DIABETES
BERI-BERI & GASTRO
INTESTINAL
ANAEMIA

FIG. 4.13
specially in females and children although iron intake is in surplus but the deficiency of vitamin-C and other reasons discussed earlier give way to such problems. Same may be said to be the reason for cases of beri-beri, pellagra as the elements of thiamine, niacin and by and large riboflavin is fairly supplied.

It would be therefore, correct to say that the villagers are exposed to multi-nutrients deficiency, worse among them are the low income category people, who represent a majority of population. They suffer from the deficiency of eight nutrients at a time.
CHAPTER V

CONCLUSION AND SUGGESTIONS
The Central Ganga-Ghaghra Doab comprising the district, of Faizabad and Sultanpur, consists of altogether 5335 villages. Hence it is not possible for an individual to survey all these villages, because this will involve heavy expenditure and require a number of years to complete the project. In view of the fact that the area under study, on the whole, presents homogeneous conditions with regard to environmental conditions, pattern of agricultural products, economic level of the rural community and their dietary habits. In view of these facts, the present study spread over 12 villages may be considered valid to a large extent to arrive at a reasonable conclusion in respect of the prevalence of deficiency diseases in the rural communities of the area.

The area under study is primarily an agricultural one, where about 80 per cent a more of the inhabitants are engaged in agricultural pursuits. Their activities are to a large extent controlled by physical environment e.g., climate, relief, drainage and soil. These factors together result in the production of different crops, cereals and non-cereals which provide the source of livelihood for the rural population. Besides the supply of grains, vegetables are also easily available for consumption. Milk and milk products, meat, fish and fruits are consumed by the villagers on a restricted scale due to many reasons. Therefore the village community is by
and large has to depend mostly on cereals, pulses and vegetables for their daily diets.

The study of the selected villages shows that the pressure of population on the land is considerably high. Although the percentage of the cultivated land is also high, nevertheless in each case some amount of cultivated land remains unproductive owing to various factors, i.e. injurious salts or high percentage of sand. The percentage of unproductive land is greater in the agriculturally non-prosperous villages, situated in the ill-drained plain. Here, the main cause of its occurrence is due to water-logging and relatively high water table which in villages like Mumtaznagar, a good portion of land is useless due to depression infested with weeds (Maujha) and soil erosion renders the land unproductive. In order to check the extension of waste-land, it is essential to bring improvement in the drainage system with a view to provide water to the rice fields or the water so stored may be utilized in the rabi season. Besides this, the improvement will also be helpful in protecting the enormous quantity of combined nitrogen which lies in the pore spaces of soil. The soil texture would improve and would thus lead to better utilization of the existing cultivated land. In both the agricultural seasons the cultivated land is dominated by the grain crops. The major kharif crops are rice, jowar, maize and sugarcane. Potatoes and sweet potatoes are sown as cash crops. Wheat mixed with barley and peas
dominate the land in the rabi season. The net-cropped land, in both the seasons are almost equal as in the kharif, some crops continue till the rabi season and at the same time some of the land is left fallow in the kharif season to regain fertility for the rabi season.

The occupational structure of the village population shows that agriculture is the main occupation of the majority of the rural communities. In every village more than 80 per cent of the population is exclusively dependent on the cultivation of land. The remaining population mostly serves the primary rural population through ancillary services and thus indirectly depends on land. However, a small percentage finds some means of livelihood in the close by cities and towns.

In the area under study as well as in other parts of rural India, percentage of literacy is very low and a high percentage of the population is poor. In such circumstances, the rural population finds itself in a helpless position. Because of illiteracy, most of the villagers do not understand the implications of under and mal-nutrition and on account of unstable economic conditions they cannot afford to take nutritive diets. Besides these factors, some of them are tied down to their traditional food habits. Religious and cultural factors too contribute to the mal-adjusted dietary habits. Finally, as revealed by the survey, most of the people do not bother or do not try to understand these terms.
nutrition and balanced diet. They eat food to satisfy their hunger. They know that certain food tastes good but they could not afford to have it. Their desire to have certain food items is not because of its nutritive value but became of its taste. Food habits are generally related to types of food products available to the villagers under the existing geographical environments. Most of them are ignorant about the nutritive value of the daily diets. Some of the nutritional diseases e.g., endemic goitre, dental caries and fluorosis having their connection with environmental factors. A survey relating to morbidity and mortality conducted in the villages has disclosed the environmental factors involved in order to control or restrict their harmful effects on human health.

Changes in the environmental factors, if made within certain limits, do not produce abnormalities in the body functions. But when exposed to stress, adaptability may be impaired, body become vulnerable, more liable to develop disease in extreme cases. The lack of exposure of the patient to the Sun is not due to bad weather conditions but because of religious and social customs prevailing in these areas. Which force some of the women folk to stay indoor or cover their entire bodies while going out from their houses. The main incidence of osteomalacia is among the child bearing women who are sometimes immobilised by their pauses and who may need a care for support in walking.

The occurrence of the deficiency diseases is the result of long term under and mal-nutrition. This may be
ascribed to either low production of nutritive food stuff or short supply of essential elements of food available from the individual farms. Even with normal harvest, nearly half of the population lives on less than 1600 calories per head per day and consequently a partial failure of crops, reduces the diets of many poor persons to disastrously low level. In either case, the result is that people start developing various nutritional deficiency diseases. As this situation remains almost static, deficiency disease becomes a permanent feature in the rural areas of the country. However deficiency of a single nutrient may not lead to any particular disease but in combination with other essential nutrients may prove an effective instrument in the causation of deficiency diseases. Varying degree of deficiency of nutrients, the extent to which human body can resist in variable climatic conditions is an important factor which determines the nature and degree of deficiency diseases. No one nutrient functions alone and its usefulness to the body may be curtailed by the absence of other nutrients and as only a few nutrients are stored in the body, some nutrients may be discarded by the body without being used because other essential nutrients are lacking in the diet. Fat is the carrier of vitamin-A, B₆ (pyridoxin) D, E and K and helps in calcium absorption, when

1 Stevenson, G.T. and Miller, C., Introduction to Food and Nutrition, New York, 1960, p.38.
no fat or less fat is given, calcium is lost by the large intestines. Proteins also seek cooperation of certain vitamins and their lack results in abnormal intermediary reactions of amino-acids and formation of unusual and often deleterious products, while a number of vitamins appeared to have specific roles in protein metabolism. It is also said that the diets that are markedly deficient in one vitamins are often low in others too or in other words supply of energy for the muscle and other tissue-function which goes all the time and ensure a supply of all the nutrients and vitamins and minerals needed to regulate and control the complicated metabolic process of the body, the effects of all vitamins overlap and interlace to such a degree that no disease is caused by any single vitamin deficiency.

The rate of occurrence of deficiency diseases among the villagers is higher where the nutritional intake is lower. The villages placed in a better position with regard to caloric intake, protein etc., though not free from such problems yet are not so severely affected. The author has noticed that the villages which are agriculturally prosperous

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or with better agricultural efficiency has better distribution in comparison to the non-prosperous villages, which recorded low caloric intake. With a single exception of village Gaura-Baremau (agriculturally prosperous) which has lower caloric intake in comparison to the village Jhakha-Sheopur which is agriculturally nonprosperous.

There is no village understudy where the mortality rate is nil; it does vary from village to village, as the rate of morbidity is different from each other.

Approximately 60 per cent of the farming community of the twelve villages is vegetarian and most of them cannot afford to consume milk or milk products as part of their daily diets. Further, it is also clear from the available data that there is close relationship between per capita income of the villager and the caloric intake per head per day. In the village Sonbarsa, where the per capita income is highest among the villages studied, the daily caloric intake comes to about 2352.7 only -2 per cent short of standard requirement of 2400 per head per day, while in Muntaznagar, where the soil is poor and production of crops depends upon the mercy of flood-causing river, the average caloric intake per head per day is only 2043.7, short by -14.7 per cent. The reason for lower caloric intake may be ascribed to the lower production and thereby lower per capita consumption.
It is obvious from the Table XVIII that the average caloric intake varies from 2043.7 to 2352.3* per head per day in the twelve villages understudy whereas the average intake of these twelve villages comes to 2211.2* which is short by 7.9 per cent in comparison with the standard requirement of 2400 per head per day, given by I.C.M.R. after taking into consideration all groups of people, nature of their work and age etc. L.D. Stamp has recommended 2460 calories per head per day for north-western Europe but that area is different in climate and agricultural practice. But M. Shafi has suggested for Eastern Uttar Pradesh that an actual intake of 2000 calories per head per day is adequate. Comparing these norms prescribed by different writers with the available number of calories in the villages surveyed by the author, it has been found that the average daily intake is satisfactory throughout the villages if tested on 2000 level but if tested on 2400 level which is recommended level, all the villages registered shortages; none has more than -14.7 per cent. Taking into consideration the actual intake as mentioned for villages especially in lower strata (category C), it is far below any standard recommendation. However daily caloric

* Refers to average of categories A, B, C of the people in each village.
* Refers to average of all the twelve villages under study.
<table>
<thead>
<tr>
<th>Elements of Food</th>
<th>Protein</th>
<th>Fat</th>
<th>Carbohydrates</th>
<th>Calcium</th>
<th>Iron</th>
<th>Vitamin-A</th>
<th>Thiamine</th>
<th>Riboflavin</th>
<th>Niacin</th>
<th>Vitamin-C</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>gms</td>
<td>gms</td>
<td>gms</td>
<td>mg</td>
<td>mg</td>
<td>I.U.</td>
<td>mg</td>
<td>mg</td>
<td>mg</td>
<td>mg</td>
<td>Calories</td>
</tr>
<tr>
<td>Standard Requirements</td>
<td>68</td>
<td>50</td>
<td>440</td>
<td>700</td>
<td>22.5</td>
<td>3500</td>
<td>1.12</td>
<td>1.46</td>
<td>19</td>
<td>43</td>
<td>2400</td>
</tr>
<tr>
<td>AAI</td>
<td>PDSR</td>
<td>AAI</td>
<td>PDSR</td>
<td>AAI</td>
<td>PDSR</td>
<td>AAI</td>
<td>PDSR</td>
<td>AAI</td>
<td>PDSR</td>
<td>AAI</td>
<td>PDSR</td>
</tr>
<tr>
<td>1. Kumta Kasar (A)</td>
<td>48.5</td>
<td>23.6</td>
<td>-32.7</td>
<td>401.4</td>
<td>4.9</td>
<td>327.8</td>
<td>1627.5</td>
<td>-53.5</td>
<td>2.1</td>
<td>47.5</td>
<td>1.48</td>
</tr>
<tr>
<td>2. Jhanka-Sheopur (A)</td>
<td>45.9</td>
<td>30.5</td>
<td>-39.0</td>
<td>449.4</td>
<td>2.1</td>
<td>582.8</td>
<td>2295.6</td>
<td>-34.4</td>
<td>1.61</td>
<td>43.6</td>
<td>1.40</td>
</tr>
<tr>
<td>3. Richaucha (A)</td>
<td>69.4</td>
<td>48.6</td>
<td>-2.4</td>
<td>397.4</td>
<td>9.7</td>
<td>1002.1</td>
<td>2860.2</td>
<td>-18.3</td>
<td>1.73</td>
<td>54.5</td>
<td>1.29</td>
</tr>
<tr>
<td>4. Khirabad (A)</td>
<td>62.8</td>
<td>28.6</td>
<td>-42.4</td>
<td>397.4</td>
<td>9.7</td>
<td>785.4</td>
<td>2526.8</td>
<td>-27.8</td>
<td>1.73</td>
<td>54.5</td>
<td>1.29</td>
</tr>
<tr>
<td>5. Dhanipur (A)</td>
<td>60.1</td>
<td>44.2</td>
<td>-11.6</td>
<td>370.2</td>
<td>15.9</td>
<td>376.8</td>
<td>1693.2</td>
<td>-51.6</td>
<td>2.07</td>
<td>84.8</td>
<td>1.32</td>
</tr>
<tr>
<td>6. Mullahi Barasin (A)</td>
<td>49.9</td>
<td>10.7</td>
<td>-62.5</td>
<td>648.7</td>
<td>6.5</td>
<td>453.6</td>
<td>2570.7</td>
<td>-26.6</td>
<td>1.68</td>
<td>50.0</td>
<td>1.61</td>
</tr>
<tr>
<td>7. Ariya (B)</td>
<td>71.8</td>
<td>41.7</td>
<td>-16.7</td>
<td>427.7</td>
<td>2.8</td>
<td>696.2</td>
<td>2117.2</td>
<td>-39.5</td>
<td>1.68</td>
<td>50.0</td>
<td>1.55</td>
</tr>
<tr>
<td>8. Dartrapur (B)</td>
<td>67.4</td>
<td>41.8</td>
<td>-16.4</td>
<td>425.3</td>
<td>3.3</td>
<td>400.3</td>
<td>2785.9</td>
<td>-20.5</td>
<td>1.94</td>
<td>73.2</td>
<td>1.49</td>
</tr>
<tr>
<td>9. Gaura Ramam (B)</td>
<td>71.3</td>
<td>35.7</td>
<td>-28.5</td>
<td>405.8</td>
<td>7.8</td>
<td>397.2</td>
<td>4369.4</td>
<td>-0.96</td>
<td>2.26</td>
<td>96.0</td>
<td>1.99</td>
</tr>
<tr>
<td>10. Rammathpur (B)</td>
<td>62.5</td>
<td>37.4</td>
<td>-25.3</td>
<td>415.8</td>
<td>5.5</td>
<td>437.0</td>
<td>3487.4</td>
<td>-0.36</td>
<td>1.96</td>
<td>75.0</td>
<td>1.5</td>
</tr>
<tr>
<td>11. Sonbarwa (B)</td>
<td>67.8</td>
<td>46.8</td>
<td>-6.4</td>
<td>404.5</td>
<td>8.1</td>
<td>382.7</td>
<td>1895.2</td>
<td>-45.9</td>
<td>2.1</td>
<td>87.5</td>
<td>1.6</td>
</tr>
<tr>
<td>12. Unchagoan (B)</td>
<td>64.3</td>
<td>37.3</td>
<td>-25.4</td>
<td>403.6</td>
<td>8.3</td>
<td>987.5</td>
<td>3089.3</td>
<td>-11.7</td>
<td>1.76</td>
<td>64.0</td>
<td>1.95</td>
</tr>
</tbody>
</table>

A represents Agriculturally non-prosperous villages
B Agriculturally prosperous villages
AAI Actual Average Intake
PDSR Percentage departure from the Standard Requirement
+ Indicates the surplus supply of particular element of diet among the village community
- Indicates the deficient supply of particular element of diet among the village community
intake is not always an index for a normal health. The other factors like mal and under-nutrition are much more important, because a person taking required number of calories may suffer from deficiency diseases if daily diets lack essential nutrients. Summary Table XVIII indicates the average surplus and deficient supply of various nutrients like protein, fat, carbohydrates, calcium, vitamin-A, riboflavin and vitamin-C (ascorbic acid) are usually in deficient supply and lead to severe health problem in the rural areas. Further, the average supply of iron, thiamine and to some extend niacin are distributed well above the recommended requirement in all the twelve villages but certainly not in all the economic categories except iron. The rural communities mostly being vegetarian as their diets generally based on cereals, pulses, vegetables and gur (raw sugar), are more deficient in comparison to their counterparts who can take more nourishing diets.

It is obvious from the Table XVIII that the supply of essential nutrients is not satisfactory in any of the twelve villages under study. The average supply of three nutrients e.g. fat, vitamin-A and calories are deficient in all the villages, whereas protein, carbohydrates and calcium are short supplied in nine villages and vitamin-C in ten villages at varying degrees. Riboflavin and niacin are also deficient in some of the villages. All the villages except Dhanipur, Jhakha-Sheopur, Kichaucha and Khizrabad, experience
deficient supply of riboflavin, while niacin is short only in Jhakha-Sheopur and Unchegoan. Average intake of iron and thiamine is surplus in all the villages.

There is a close relationship between the mal-nutrition and the deficiency diseases prevalent among the villagers. It can be argued that the village having better supply of nutrients has lesser morbidity and mortality rates in comparison to villages experiencing worst position in respect of nutritive diets (Table XIX). Unchegoan is the village having better position in terms of intake of nutrients with the result that only 0.8 per cent of the patients died of deficiency diseases, while in the villages of Jhakha-Sheopur and Mumbaznagar with 14.6 and 14.2 per cent morbidity rates registered 1.7 per cent and 2.7 per cent deaths on account of deficiency diseases respectively.

Main deficiency diseases from which the area suffers are anaemia, beri-beri and gastrointestinal disturbances, diabetes, eye diseases (night and colour blindness, xerophthalmia, keratomalacia retarded and stunted growth, goitre, kwashiorkor/marasmus, osteomalacia, pellagra, rickets, scurvy/tooth and gum diseases and urinary calculi. It has been seen during the survey done by the writer, that the maximum cases of such diseases are from lower income group (category C); these people are more prone to such diseases than the people of the other two groups (A and B).
<table>
<thead>
<tr>
<th>Name of the Village</th>
<th>Morbidity Rate</th>
<th>Mortality Rate</th>
<th>Anaemia</th>
<th>Beri-Beri and Gastro-intestinal Disturbances</th>
<th>Colitis</th>
<th>Diabetes</th>
<th>Eye Diseases Stunted Growth</th>
<th>Goitre</th>
<th>Kwashiorkor/ Marasmus</th>
<th>Osteomalacia</th>
<th>Pellagra</th>
<th>Rickets</th>
<th>Scurvy</th>
<th>Urinary Calculi</th>
<th>Aerophthalmia</th>
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Continuous short supply of five essential nutrients i.e. protein, fat, calcium, vitamin-A and C, among the rural communities has caused heavy damage to their health. They have become easy victim of kwashiorkor/marasmus (protein caloric shortage) eye diseases and related problems, osteomalacia, urinary calculi, rickets, scurvy/tooth and gum diseases (Table XIX). It is clear from the Table XIX that the number of patients who suffered from beri-beri, eye diseases, rickets and scurvy along with tooth and gum diseases is greater than those who suffered from anaemia, kwashiorkor/marasmus, pellagra etc. It is also evident from the same table that the highest morbidity rate has been found in Jhakha-Sheopur i.e., 14.6 per cent and the lowest in the village Unchegoan, with 8.2 per cent, whereas the mortality rate of 2.7 per cent in the village Muntaznagar is the highest among the twelve villages and the lowest is reported from the village Unchegoan with 0.8 per cent.

Goitre is not a killing disease. It is commonly found in this area and particularly in the village Muntaznagar, about 13.5 per cent of the deficiency patients suffered from this disease, which resulted in physical disability. This is an endemic disease in the areas of the tarai where drinking water lacks iodin and the crops grown with such water also lacks iodine contents. Such cases are reported from other four villages too but their percentage is very low. Apart
from goitre, there are a few more diseases which are not reported from every village i.e. osteomalacia, xerophthalmia and keratomalacia (Table XIX).

Unhygienic living conditions with faulty dietary habits lead to higher morbidity. The rate is also affected by seasonal and climatic changes e.g. hot moist weather conditions suits intestinal infections, whereas eye diseases are more common during hot weather conditions. Apart from the water pollution, air pollution and food contamination are indeed other problems. Water supply in the villages are from the open wells or from the near-by ponds, which may be easily polluted. If the villagers are provided with deeply sunk hand pumps, they will not only be free from polluted water but instead they may get some iodin. This will help in protecting the against thyroid enlargement (goitre).

The century old system of disposal of wastes is unscientific. Latrines are constructed on the basis of old traditions, which are located within the enclosures of main residential areas and are usually without roofs, with the result that they become the breeding places for flies which may serve as the means for the spread of various infections diseases. The habits of going to open fields for answering this call of nature lead to soil pollution as well as underground water, resulting in contamination of drinking water
and also cause diseases to the people moving bare-footed. Every such infections reduces the utility of vitamin-C and also causes wastage of iron etc.

The food, that human beings take is closely related to the economic conditions of the rural communities. The survey conducted by the author reveals a grain situation. It is the problem of undernutrition rather than mal-nutrition. A good percentage of rural population may often could not get two square meals a day. Some of them take only boiled gram and gur (raw sugar) during the day and full meal at dinner time which usually contained some cereal and pulses. This is the crux of the problem which the writer has observed in all the villages surveyed by him. The immediate problem is that everyone should get at least two meals a day and if possible, it should contain basic elements of nutrition so that the rural population could be saved from some of the deficiency diseases.

On the whole, nutritional problems are more subtle, out of sight, remote and insidious. Even when there is enough food, there will be plenty of problems of mal-distribution (from reasons of both mal-administration and social inequality).  

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With a better planning of lands and its products, it can be possible to improve the productivity and the standard of nutrition and health of the villagers. In India, the average yield per acre is only \( \frac{2}{3} \) as high as in Japan, although on the whole, it is well favoured with agricultural resources. She can solve her food problems, if the people feel their responsibilities and work like Japanese, Americans, and more over it is free from natural calamities, which very often retard the overall development in the sphere of agriculture. As it has been observed that agriculturally prosperous villages show better nutritional standard, than the non-prosperous villages, it can be concluded that if agricultural productivity is increased by increasing the fertility of the soil and making adequate arrangements for irrigation of the crops, the nutritional standard will surely improve. A detailed plan has to be chalked out for the entire area to ensure water for irrigation purposes by making reservoirs in the lowlying areas, because the erratic nature of Indian monsoons with long dry spells accompanied by high temperature is responsible for creating occasional droughts. The government should help the population in fighting the adverse effects of scarcity conditions by constructing canals, wells, tube-wells, ponds, soil conservation, afforestation.

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While conducting the survey the author has observed that the soil in the area under study is deficient in nitrogen and organic matter. It is said that if nitrogen is increased protein will increase, but due to excessive use of $\text{H}_2$, soil becomes poor in potash and sulphate, which are essential for leguminous crops which are also rich sources of protein. The farmers tried one or two times to grow such crops but since they could not get good harvest, they dropped the idea. Therefore no rich protein crops are generally grown. This is the setback of hybrid variety of seeds says the farmer. However this is not true; yield may be increased by putting suitable amount of nitrogen, and organic manures coupled with proper irrigation water. $\text{H}_2$ in combination with $\text{P}_2\text{O}_5$ in recommend proportion with sufficient water may result in three times high yield of sugarcane. However there are other sources of nitrogenous manures i.e. farm-yard manures, compost, oilseeds and oil cakes green manuring and though rotation of crops.

The farmers should have enough knowledge to administer the fertilizers properly, as it is very difficult to give proper dose of fertilizers in the absence of detailed soil testing report relating to the area. In such cases, fertilizers may affect plant cells adversely. Keeping in view the economic conditions of the farming community, green manuring may be a cheap source of building soil fertility. Some suitable plants for green manuring should be tried which is grown
before the sowing of kharif crops so that the same land may
be used in kharif season. Secondly, cultivating leguminous
crops in rotation may also increase fertility. The rotation
of crops helps in crop planning and in increasing the soil
fertility. Planning may also help in controlling weeds and
certain crop pests and diseases. Sun-hemp (Dhaincha) is the
most important green manuring crop; if grown in those fields
which are left fallow, the fertility and productivity of the
soil may considerably be increased. Weeds, pests and diseases
also cause much damage to the crops. Problem of motha (weed)
troubles much in the kharif season. It is deeply rooted and
difficult to remove during ploughing. It can be minimized
though deep ploughing or by leaving the land fallow or by
weeding out the undesirable plants. Menace is less in clay
than in sandy and sandy-loam. Because of excessive water
and fertilizers favourable conditions for pests and diseases
arise and to combat these problems proper treatment is
required. The medicines which are generally used either
supplied late or in storage gets expired and the use of such
medicines after the expiry dates, resulted in poor performance
with less effectiveness. Proper medicines should be given
with the demonstration to use them effectively within the
valid dates.

Residual effects of grain is another problem.
Pesticides and chemicals used to same the grain from the
rodents and other insects, affect the health of villagers by
contaminating grains also. The grains when left open are contaminated by birds. So special case is to be taken in storage and to avoid contaminated grain's use so that people could be saved from the ill-effects on their health.

The alarming population growth, has created problems for social and economic development of the country. Continuous increase over takes the increase in agricultural productivity, with the result that supply of different food items cannot match the recommended requirements. The better way of keeping down the demands of food is through limitation of family size. Because of increasing prices and limited income, the availability of food to each children becomes low; not only this, housing, hygiene and other factors also may crop up. Lesser will be the children greater will be the availability of food and healthier and happier will be the family. But one thing should be kept in mind that the need for more children in down trodden societies is to ensure that at least, couple of them will come up to the age of maturity and will be helpful in financial uplift of the family. However this, inturn, is linked with the economic situation, food and public health problems. Further high pressure of population on agricultural land has resulted in the sub-division and fragmentation of holdings. The fragmented and uneconomic holdings have brought about a steady deterioration in agriculture and enhanced the poverty of the rural community.
Since the introduction of consolidation schemes, at least for the time being, the evils are reduced considerably.

The use of traditional and nature of agricultural tools are still in operation. The wooden plough is used which merely stirs the soil. Harvesting is done with hand sickles and grains are threshed under the bullock feet and winnowing is done when wind is strong or by using cotton sheets to produce air enough to carry on winnowing. These methods though serve the purpose yet result in poor yield. There is scope for raising more yields from the land at reduced cost by using efficient farm implements. Due attention is being given in this direction and more and more new equipments are being introduced and but not at a desired level. Because these implements cost much which the poor farmer cannot afford and also it may not be much economical seeing the size of the holdings.

The problem of rural finance should be latter care of by the government. The cultivators should be given financial assistance in time on credit to buy high yielding variety of seeds, manures and other accessories. Although the government has already taken steps in this direction yet the funds allocated are not enough; secondly due to red tapism, funds are not given in time or may not get the full amount requested for in certain cases. It is desirable to
establish a sort of pool system in every village and operate jointly where the right of every owner of land is safeguarded and recognised. This will not only enhance the yield per hectare but also pave the way for easy management of farm loans, procurement of modern agricultural equipments and will increase the village production. The production can also be increased by introducing the new varieties of seeds which have been discovered by the Agricultural Research Institute (New Delhi). The 'Green Revolution' has made tremendous achievements in the sphere of agriculture and various late and early varieties of cereal and non-cereal crops are now grown with high yields.

In the opinion of the author the solution of the present problem lies not only in the increase of productivity of agricultural crops, but also in the proper distribution of the product among the rural population so as to ensure qualitatively and quantitatively adequate diet for an individual. Care should also be taken to see that the daily diets of the rural population contain essential nutrients which might be provided by cheaper food items. To reduce the conditions of under and mal-nutrition created by faulty dietary habits, it is essential to make relevant modification in the food habits of the farming community by suggesting more nutritive foods which the middle and low income group of people could afford. Further as said, a change in cropping pattern will enable the farmers to cultivate such crops which
could give them some essential food nutrients e.g. protein from pulses and vitamin-A and C and calcium through leafy vegetables.

It would not be out of place to mention here that the present problem needs a more detailed study, which can be conducted by a team workers and in which geographer has to play an important role. As the present study has been made solely by a geographer, it is very much true that some important medical aspects of the various deficiency diseases could not be studied or discussed in depth.
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### APPENDIX

**Dietary Survey Analysis Form**  
Consumption of Food Factors by the Family/ The Individual

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<th>Name of Village</th>
<th>Block</th>
<th>Distt</th>
<th>Date</th>
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<table>
<thead>
<tr>
<th>Name of Food</th>
<th>Quantity</th>
<th>Calories</th>
<th>Protein</th>
<th>Fat</th>
<th>Carbohydrate</th>
<th>Calcium</th>
<th>Iron</th>
<th>Vitamin-A</th>
<th>Vitamin-B</th>
<th>Riboflavin</th>
<th>Nicotinic acid</th>
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**Family Members**

| K | F | C |

**Total income:**

**Agriculture:**

**Miscellaneous:**

**Diseases**