FOOD INSECURITY IN RAJASTHAN
A SECONDARY DATA ANALYSIS

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CONTENTS

CHAPTER I - INTRODUCTION

Food is the most important need of a person along with shelter and clothing. Non-availability of food leads to hunger that exists in different forms. Hunger is one aspect of food insecurity. It can be mild or severe, open or hidden, persisting or short-term etc. according to its nature.

Food insecurity is a broad concept and it has several dimensions. All the factors that lead to hunger are a matter of concern when we deal with food insecurity. With the efforts taken so far to remove hunger from the world it is clearly understood that it is not an easily achievable goal. As far as hunger is concerned about one third of the world's hungry population is in India and the state of Rajasthan comes under severely food insecure in the Food Insecurity Atlas of Rural India, a study conducted jointly by MSSRF and WFP[1].

This report is an attempt to look at the relative positions of all the 32 districts of Rajasthan with regard to Food Insecurity.

What is Food Insecurity

Food insecurity exists when all people, at all times, do not have physical and economic access to sufficient, safe and nutritious food to meet their dietary access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life[2].

Food insecurity may be **present or potential** when we consider the time dimension. A state producing sufficient food per capita at present may not be able to produce the same per capita production in future, due to land degradation or lack of incentive price. A person consuming adequate calories has food security at present. However, if he is faced with uncertain income flows, he has potential food insecurity. In poor societies, food insecurity and livelihood insecurity go together. Further, potential food insecurity is related not only to the existing malnutrition, but also to poor sanitation and health conditions. The likelihood of a person falling ill or consuming diet, which is unbalanced, has potential food insecurity. Thus potential food insecurity can occur either due to potential lack of availability or potential lack of livelihood or potential threat of disease, and lack of absorption.

[1] Food Insecurity Atlas of Rural India
[2] FAO (1996)

Food insecurity may be **chronic or transitory**. Chronic food insecurity refers to a situation of persons, consistently consuming diets inadequate in calories and essential nutrients. This often happens due to the inability to 'access' food either by production, purchase, gift or aid. Transitory food insecurity is a temporary short fall in food availability and consumption. A fall in income, increase in food prices, shortage of production, a temporary short fall due to floods, droughts and other natural calamities etc. lead to temporary food insecurity.

Food insecurity may be at the National level or at state level. It is at National level when the Nation is not producing enough or not in a position to import enough for its citizens. State level food insecurity may take the form of inadequate production, or inadequate movement of food to all corners of the State at affordable prices.

Food insecurity exists at household level and also at individual level. Household food insecurity is caused by unemployment, employment in low paying jobs or high food prices. Disease, health, malnutrition, and problems of availability or unequal distribution of food within the households cause individual food insecurity. In the same family women are often anaemic or malnourished. Gender bias may cause hunger of women and girls in the family. Individual food insecurity may start in an unborn child as foetal under nutrition. It takes the form of low birth weight babies, under nourished children and adults. The ultimate severe form of food insecurity is starvation death.

Major categories of Food Insecurity

Food Insecurity is divided into three broad categories. Problems due to lack of "**Food Availability**", lack of "**Food Access**" and lack of "**Food Absorption**". Food availability leads to food access and food access leads to food absorption. This distinction helps to separate the causes of Food Insecurity and address them individually.

Food Availability

Food availability depends upon production and net inflow of food. Availability may be hampered by low level of production or inadequate inflow of food into the area. Low level of production may be due to limitations such as markets, technology and natural resource base. It may also be due to lack of price incentives to production. Environmental sustainability is equally important for long term assured production. Lack of sustained production leads to lack of availability of food.

The low inflow of food may be due to poor infrastructure, poor demand and lack of government-supported measures to ensure availability. This also results in unavailability of enough food. Along with these factors low availability of food may also occur due to natural disasters, such as droughts, floods, cyclones and earth quakes that disrupt normal life.

Food Access

Those who are unemployed, employed on a casual basis and under employed suffer from economic access and hence limited physical access to food. Persons pursuing un-viable enterprises and persons with low asset base have poor livelihood access and physical access to food. They all spend a large percentage of their income on food yet get very little to eat. Food prices also play an important part in the household's ability to purchase adequate balanced diet for all members of the households. Further, social and gender related factors might prevent access to livelihood as well as an individual's access to balanced diet.

Poor physical access to food leads to poor consumption and poor nutrition. Levels of food consumption mainly depend upon food availability and food access. Food consumption also depends upon habits, preferences, perceptions and the knowledge of basic nutrition. Intake of calories, protein, fats and other basic nutrients are guided by the above considerations. Malnutrition is a result of low level of calorie consumption and low level of protein consumption. This is open hunger.

Low level of nutrient consumption may occur if people do not consume balanced diets. This may happen due to lack of education or lack of knowledge of nutrition. Iron deficiency, vitamin deficiency, iodine deficiency and calcium deficiency are wide spread due to lack of knowledge and lack of access to natural foods rich in these nutrients. The lack of fortified foods to compensate for the natural foods add to the problem of wide spread of micro nutrient deficiency.

Food Absorption

Food absorption means being able to assimilate the food consumed for a healthy life. Food absorption in turn depends upon the state of health or disease, pollution, sanitation and hygiene of the surroundings. These in turn depend upon health infrastructure. The out come of poor food absorption is an unhealthy population – infants, children, mothers, women and men.

Food availability, Food access and Food absorption are not separate phenomena. One leads to the other and also overlap. Food production leads to livelihood access and food access and food consumption. Livelihood access in turn leads more demand for food, better prices and incentives for production. Better livelihood access also leads to better education, better living standards, better sanitation, better knowledge of nutrition and better absorption and better health.

Why do we need food insecurity map of Rajasthan?

The Food insecurity map of Rajasthan would serve as an advocacy tool to highlight the deprived sections, deprived locations and deprived situations of the State of Rajasthan. It shows concentration of vulnerable people so that attention can be focused in those districts and on those people.

However the present map is a simple attempt just to get some initial idea of food insecurity in Rajasthan. For this, nineteen indicators have been used, six representing Food Availability, eight representing Food Access and five indicating Food Absorption[3]. A map by itself is not enough. The problems should be analysed more closely at the block level. Elimination of hunger needs a multi pronged approach. The solutions are not simple and universal. They are complicated and location specific.

At the district level, the situation need to be studied more closely to recognise the strengths and weaknesses of the district in various aspects, to design an appropriate programme.

It is important at first, to estimate the intensity of the problem at the district level and discuss the programme requirements. At the second stage studies should be undertaken at block level to understand the requirements of the block and its people and then design programmes to make the district hunger free.

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[3] Maps are discussed briefly at the end of the analysis

CHAPTER 2 - STATE PROFILE

The State of Rajasthan was formed in the year 1949 by merging 19 princely states and 3 chiefships, which varied in size, population, administrative efficiency and socio economic development. Administratively the State is divided into 32 districts, 105 sub-divisions, 241 tehsils and 237 development blocks (Panchayat Samitis) with 37889 inhabited villages. The Sate of Rajasthan stretches over an area of 3.42 lakh sq. kms. It is the largest State in the country in terms of area and accounts for about 10.41 percent of India's area and 5.5 percent of its population.

The state of Rajasthan is located in the northwestern region of India between 23° 3' and 30° 12' North latitudes, and 69° 30' to 78° 17' East longitudes. Rajasthan occupies the western most part of India and shares International boundary with Pakistan in the west. The neighbouring States are Punjab and Haryana in the North, Uttar Pradesh in the Northeast, Madhya Pradesh in the Southeast, and Gujarat in the Southwest.

The economy of Rajasthan is characterized by slow growth rate, wide gap between the state and national per capita income, frequent visitations of drought and famine, inadequate infrastructure, hostile physical environment, and low productivity in many sectors besides its poor inheritance at the time of its formation and long international border. Rajasthan has rich mineral deposits and also possesses comparative advantage in agricultural and animal husbandry products. About half a century's planned development has made rapid strides, especially in commodity producing sectors. Yet the state continues to be in the lowest quartile in terms of major indicators like literacy and per capita income. A large portion of its population suffers from deprivation in matters of health, water supply, etc.

The topography of Rajasthan consists of Arvali hill system and Vindhyan hill system. The area to the west of the Arvali ranges, occupying about two-thirds of the total area of the State is almost arid and undulating while the eastern part is comparatively well drained and fertile. The Vindhyan hill system extends to parts of Chittorgarh, Jhalwar, Bundi, Kota, Sawai Madhopur and Dholpur districts. The intensive soil erosion and degradation of the environment in this part have created the critical problems of formation and spread of ravines.

The area to the west of Arvali is characterized by extremes of temperature, long periods of severe recurring droughts, accompanied by high velocity winds and semi arid conditions of

humidity. The area to the east and southeast of the Arvali ranges has relatively sufficient amount of rainfall. The climate of the State is the driest in the country with large variations. The summer temperature ranges between 40°C and 45°C. The rainfall of the Sate is not only meagre but also varies significantly from year to year, quite frequently leading to droughts. The average rainfall of the State is 675mm and it varies from 258 mm in the Western districts of Jaisalmer to more than 1000 mm in Alwar, Dousa, and Sawai Madhopur. The coldest month is the month of January when the average mean temperature varies from 12°C in the north to 16°C in the south.

Amongst all the constituent units of the country, Rajasthan with its scanty, low and irregular rainfall is highly susceptible and vulnerable to drought conditions. Human and cattle population, have to undergo severe hardships due to droughts since it leads to loss of work (employment) and scarcity of fodder besides drinking water, etc. People have to be employed as casual labour on famine relief works to give them at least maintenance livelihood. Barring a few exceptions, year after year, drought and famine conditions have prevailed in some or the other districts.

According to 2001 census the population of Rajasthan is more than 56 million. The density of population per sq km is 165 where as for India it is 324.

Rajasthan ranks 29th in literacy among the states/UTs of India. It has significantly improved in literacy rate in the last decade. Total literacy has grown up to 61.03 % in 2001 compared to 38.55 of in 1991. Female literacy has also reached 44.34% compared to 20.44 % in 1991. Sex ratio has also increased significantly from 910 in 1991 to 922 in 2001.

Mapping of Food Insecurity

Mapping of Food Insecurity consists of selecting the indicators which best describe the situation of food availability, food access and food absorption. The situation is analysed and relevant indicators are chosen. Nineteen indicators have been chosen to form the final food insecurity map of Rajasthan

First the food availability is discussed and there are six indicators for food availability situation. Then the factors that lead to problems in food access are studied. Problems of physical access, economic and livelihood access and discrimination are looked into and eight indicators have been chosen which best describes the situation. While looking at the

nutritional status of adult and children appropriate indicators of food absorption are selected. Five indicators chosen explains the food absorption situation of Rajasthan.

All the selected indicators have been mapped separately. Besides nineteen maps, four composite maps have been formed which represents the food availability situation, food access situation, food absorption situation and the final Food Insecurity situation of Rajasthan.

The detailed discussion of the indicators and their inter relationship across the district gives us insight into the strengths and weaknesses of the districts. A lot of other factors that explains the existing state of the district are also explained along with.

The use of maps enhances the visual impact of the findings. The three chapters on food availability, food access and food absorption present detailed picture of the districts.

To plot the individual indicators on map the data of each indicator is ranked first from 1 to 32. The state in worst position gets rank one and one in the best position gets rank 32. The data is divided into five class intervals representing five typologies. To plot the four composite maps of food availability, food access, food absorption and final Food Insecurity Map, a mapping index is prepared. To get the mapping index, the individual ranks of indicators under respective headings of availability, access and absorption are added up to get the cumulative rank. Similarly, for the final Food Insecurity map the ranks of all the 19 indicators are added up to get the cumulative rank. The cumulative rank is then divided by the number of indicators to get the mapping index. The mapping index is then divided into five class intervals and plotted in different colours. If the mapping index has 19 indicators and 32 districts, a district that has the worst situation with respect to all indicators, will have a value of 19. If a district is good in every single aspect, it will have the value of 608. With 19 indicators and 32 districts these are the limits. All the other situations fall in between these two values. Thus lower the value, the worse off the situation and higher the value, the better off the situation of the district in respect of the composite maps.

The districts are divided into five classes that represent five typologies. The class intervals are unequal. This is because if equal intervals are taken, many states would fall into the middle classes and the extreme classes will have very few states. Hence, the ideal approach is to use the natural breaks that follow the pattern of the data to decide the class intervals.

'Arc-view' Geographical Information System software has been used to detect the natural breaks in the series, so that the error in detecting natural breaks is minimized. Where necessary, the class limits have been adjusted slightly to suit the distribution of states more evenly between the two classes. Each class represents a typology, which is named as per the level of food insecurity. Class limits are rounded off to the nearest digit or two decimal points. This has been done to capture the typologies better.

The mapping index of the composite maps gives the combined intensity of various factors. The state with severe problems in one aspect may be relatively problem-free in other aspect. Hence, the mapping index gives the relative position of a district vis-à-vis others as per the combined intensity of the problem of food insecurity. The Mapping Index indicates the average position of the state with respect to others.

The inclusion or exclusion of certain indicators might change the final mapping index. All the indicators carry equal weight and the methodology do not give special weight to any indicator. The weighting is implicit in the number of parameters in each group. Out of the nineteen indicators six indicators represent food availability, eight represent food access and five represent food absorption. Thus, food availability gets an implicit weight of 32 percent, food access 42 percent and indicators representing food absorption get a weight of 26 percent. The description of the indicators, the method of computation and the sources of information are given in the relevant chapters of food availability, access and absorption.

A large number of indicators have been used to prepare this food insecurity map. This is because if more numbers of indicators are used this would capture all the dimensions of food insecurity in different parts of the state. The major emphasis is more on the analysis of the individual indicators rather than on the composite maps. This is because they are the targets of public action and policy and understanding them is more important than the relative position of each district in the composite map. At the same time, composite maps are useful in giving us a more consolidated picture.

Data Limitations and Adjustments

The data for indicators are derived from the secondary sources[4]. The main limitation of the data is the lack of comparable data for the same year. Reliability also varies. The data of different indicators belong to different years. Some of them belong to 1991 census while

[4] See appendix …….. for the sources of data and reference years for the 19 indicators used.

some data belongs to 1995-99. Projected figures for 1998 are used for some and some data belong to latest 2001, Rajasthan census. So care should be taken while interpreting the data.

The main sources of data are publications like Statistical Abstract, Rajasthan 1998, Agricultural Statistics – Rajasthan (1998-99), Basic Statistics, Rajasthan, 2000 , India Nutrition Profile – 1998, Human Development Report – 1999, WFP report on Food Security Atlas of Rajasthan and Census of India 2001, Rajasthan.

With the innumerable limitations of the data, the findings are indicative of the approximate position of the districts. If different indicators are used or if data is updated the picture may change.

Some adjustment has been done to get the data for Karauli for the indicator on Deficit in per capita production over consumption. No separate data for cereal production in Karauli was available for the year 1997-98 because if was a part of S. Madhopur then. To separate the Karauli data from S. Madhopur the percentage of area under cereal production of Karauli and S. Madhopur was calculated which came out to be 43% for S. Madhopur and the rest 57% for Karauli. These percentages were applied to the total cereal production of 484930 tonnes, which came out as 208520 tonnes for S. Madhopur, and 276410 tonnes for Karauli.

For indicators like consumption of cereals, consumption of milk and products, percentage of holdings less than 1.0 ha, percentage of marginal workers, percentage of stunted children under 5, percentage of population with CED and number of PHCs no separate data for Karauli was available. So the data of S. Madhopur has been repeated for Karauli.

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CHAPTER 3
FOOD AVAILABILITY OF RAJASTHAN

It is very important for everybody to eat enough and this depends on food being available. Availability of food depends on domestic production and imports from outside. When there is not enough domestic production, food is imported. Imports can be used to ensure that prices of wage goods such as food do not escalate, even if food production falls short of the requirements.

This chapter looks into various aspects of food availability in Rajasthan, bearing in mind both current and future food availability. Six indicators have been chosen. They are

- Deficit in per capita cereal production over requirement
- Average Yield/ha of Food Grains
- Consumption of Cereals (gm/cu/day)
- Consumption of milk and milk products (gm/cu/day)
- Deviation in Rainfall and
- Percentage of forest area to total geographical area

The indicators explain the present availability, fluctuations in production and the sustainability aspects in food production. Based on this, the food availability situation of Rajasthan has been mapped. The map shows the relative position of the districts with regard to food availability.

Area Under Major Crops

As far as Rajasthan is concerned nearly two-thirds of total cropped area is under food crops, which include cereals, pulses, vegetables, fruits, sugarcane, condiments and spices. The area under cereals decreased slightly in 1998-99 from 9358223 ha to 8831900ha compared to the area in 1997-98 but that of pulses increased slightly during the same period. Area under cultivation of Oil seed, Cotton and Sugar Cane also got reduced in 1998-99 compared to 1997-98[5].

[5] Some facts about Rajasthan – 2000, (small book)

Barmer has got the highest area under cereal production followed by Nagaur, Jodhpur and Jaipur. Though these districts have the highest area under production all these districts are deficit in cereal production over requirement.

Sirohi is the district with lowest area under cereals followed by Rajsamand and Dholopur. But still Rajsamand and Dholpur are not deficient in cereal production. This may be because these two districts have better yield per hectare.

Deficit in Per Capita Cereal Production Over Requirement

The adequacy of cereal production depends on the deficit or surplus production of the particular area, which in turn depends on the norms based on average requirements. The Indian Council of Medical Research provides us with this norm. The recommended daily allowance of cereal is 420g/day per person. Deficit or surplus in cereal production per capita per day by each district over recommended daily allowance shows whether that district is producing enough food to meet the requirements of its population or not.

Per capita cereal production index is computed for all the districts with ICMR recommended daily allowance as the base. The ICMR recommended quantity is taken as one and the per capita cereal production of the districts are computed as proportion of it. When the per capita cereal production is more than the ICMR recommended quantity, the index is above one and when the per capita cereal production is below the ICMR recommended quantity, the index is below one. Thus the districts with the value above one are surplus districts while those with value less than one are deficit in cereal production over requirement.

To calculate the cereal production average cereal production of 1997-98 and 1998-99 is used and then divided by the projected population of 1998 to get the average cereal production per year. It is then converted into cereal production per month and then per day in grams. 13% has been deducted as a loss from seed, feed and wastage.

Though the state of Rajasthan produces just enough to meet its cereal requirement, all the districts in Rajasthan are not self sufficient in cereal production. 15 districts are deficient in cereal production and the other 17 districts produce moderate surplus to surplus. The district Bundi produces thrice its requirement while the districts of Hanumangarh and Ganganagar produces above two and a half time than their actual requirement. Districts producing moderately surpluses are Dausa, Alwer, Bharatpur, Chittaurgarh, Dholpur, Sawai Madhopur, Banswara, Tonk, Bhilwara and Kota.

Western region of Rajsthan, which is the hot arid zone, is deficit in cereal production. Jaisalmer is the district with highest deficit in cereal production and is followed by Jodhpur, Barmer and Ajmer in the extreme deficit category. The deficit in cereal production in this area may be due to low rainfall and less percentage of cropped area under irrigation. High deficit districts are Pali, Jalore, Sirohi, Churu, Nagaur, Bikaner, Rajsamand, Jhalawar and Jaipur.

Districts of Jhunjunu, Baran and Sikar produce such low surpluses that any fluctuation in production can lead to a deficit situation.

The districts of Bundi, Ganganagar and Hanumangarh are the surplus producing districts. The reason may be the availability of irrigation facilities in this area.

Average Yield/ha of Food Grain

Farming sector in Rajasthan is dominated by cereal production. They are produced mainly under rain fed conditions and are mostly used for domestic consumption. The cereal production has increased from the year 1995-96 to 1997-98[6] but decreased in 1998-99[7].

The farming practices in Rajasthan are highly influenced by the availability of water. Intensive cropping is practiced in areas with irrigation facilities. Irrigation also favours high input agriculture, which affect the yield of the crop very much.

Average yield of food grains/ hectare can be one factor, which affects the availability of food. Higher the yield, higher the production and therefore the availability of food can also be higher.

The district of Tonk stands very high above other states in average yield/ha with 5155.198 kgs. This may be beacause100% of villages in Tonk district have access to irrigation, where 68% depend on hand pumps and 22% on traditional open wells.

Watershed activities are also carried out in the district of Tonk. Next comes Sawai Madhopur with 2481.765kgs / ha followed by Bundi, Kota, Bharatpur and Dholpur.

[6] Statistical Abstract – Rajasthan 1998, p- 129.
[7] Some facts about Rajasthan – 2000, (small book)

Barmer is the district with lowest yield/ha at 207.91kgs/ha followed by Jaisalmer at 223.19kgs / ha and Jodhpur at 289.74kgs / ha. Low yield in this hot arid western desert region may be because of extreme climates and low rainfall. They also have less than 10 percent of cropped area under irrigation. The districts with lowest yield have also got the highest deficit in per capita cereal production. This shows the necessity to improve the yield/ha in achieving food security. Short duration and drought resistant varieties should be developed which can sustain the yield even in adverse climatic conditions.

Consumption of Cereals

Availability of food is very well reflected by the amount of cereals consumed by the population. Consumption of food is directly related to availability though it can depend on many other factors like purchasing power, health, gender etc. Other reasons for low cereal consumption may be due to the diversification of food crops, deficit in production, etc. More the consumption better is the health of the people.

Consumption of cereals is calculated assuming that all the population consumes equally. Higher consumption in a district does not necessarily mean that the entire population are eating well. The poorest deciles may still be hungry while the other groups enjoy a reasonably comfortable level of cereal consumption.

Among the 32 districts of Rajasthan highest cereal consumption is in the district of Bhilwara, which is 564.2 gm/cu/day. The districts of S. Madhopur, Karauli, Sikar, Bharatpur, Jaipur, Bikaner and Baran follow next.

The district with the lowest consumption of cereals is Rajsamand, where it is as low as 356.3 gm/cu/day. The other districts, which are low in cereal consumption, are Hanumangarh, Jhunjunu, Sirohi, Dungarpur and Jaisalmer. In these districts consumption is less than 420gm/cu/day, which is the recommended norm by ICMR.

Consumption of Milk and Milk Products

Rajasthan has the highest animal population in the country, the population of animals exceeding human population.

In Rajasthan, people rely on animals even more than they rely on crops. During droughts when it is not possible to produce food grains, a household is dependent mainly on milk and other animal products. Sheep and goat rearing are important in livelihood strategies of small

and marginal landowners as well as the landless. They are a critical element in livelihood for the pastoral transmigrates.

To look at the part played by animals in the food availability of Rajasthan consumption of milk and milk products are taken as an indicator. This choice of this indicator is based on the availability of data. There is no data available for meat consumption or any other indicator related to animals and hence we have taken milk consumption indicator alone. From the data it is very clear that most of the districts, which are poor in cereal consumption, are good in the consumption of milk and milk products and the districts with low consumption of milk and products are better in cereal consumption. This shows that animals play a very important role in the areas of low cereal production. Lower consumption of cereals in those areas is compensated by the higher consumption of milk and milk products. This shows us the important role of animals with regard to the availability of food in areas where crop production fails, in the State.

The district of Jhalawar is the lowest in the consumption of milk, the figure being as low as 27.20gm/cu/day. The ICMR recommended intake is 150gms / day. The deficit in milk consumption seems to be compensated by high cereal consumption, which is 519gms/cu/day. The districts that follow Jhalwar in low consumption of milk are Chittaurgarh, Banswara, Bhilwara, Jaipur and Sikar in the order. All these districts have reasonably high levels of cereal consumption.

The districts with higher consumption of milk and milk products are Jhunjunu, Pali, Hanumangarh, Bharatpur, Sawai Madhopur, Karauli, Ganganagar and Sirohi in the decreasing order. Though good in milk consumption the districts of Jhunjunu, Hanumangarh, Ganganagar, Sirohi and Rajsamand are very poor in cereal consumption. The districts of Pali, Bharathpur, Sawai Madhopur and Ganganagar are better both in consumption of milk and milk products and cereal consumption.

Instability in Cereal Production

Fluctuations in cereal production from year to year are referred to as instability in cereal production. Farm incomes of the marginal farmers are influenced by the instability in cereal production and prices, especially in the drought prone areas. Local economy may also be influenced to some extent by this instability in production. The level of instability is related to factors like weather and natural calamities factors. When production falls the local prices are likely to go up, thus compensating to some extent for a reduction in farm income. But

the small and marginal farmers and agricultural farmers who are net consumers are affected very badly when the prices go up. Their food security is reduced.

Fluctuations in production can be due to many reasons like deficit in rainfall, excess rainfall, high humidity, pest and diseases. It can also occur due to lack of price incentives and shift of area to other crops. Production instability takes into account all the factors that cause yield instability as well as area instability.

To study the instability of food production in Rajasthan deviation in rainfall is taken as an indicator, which is explained in detail below.

Deviation in Rainfall

Annual rainfall in Rajasthan varies significantly. There is a very rapid and marked decrease in rainfall to the west of Aravali range making western Rajasthan the most arid part. The average annual rainfall in this region ranges from less than 10 cm in north west part of Jaisalmer (lowest in the state), to 20 to 30 cm in Ganganagar, Bikaner and Barmer regions, 30 to 40 cm in Nagaur, Jodhpur, Churu and Jalore regions and more than 40 cm in Sikar, Jhunjhunu and Pali regions and along the western fringes from 55 cm in Ajmer to 102 cm in Jhalawar. In plains, Banswara (92.0 cm) and Jhalawar (95 cm) districts receive the maximum annual rain. Mount Abu (Sirohi district) in the south-west, however, receives the highest rainfall in the state (163.8 cm). The yearly total rainfall is highly variable at different places all over the state and it is most erratic in the western half with frequent spells of drought, punctuated occasionally by heavy down showers in some years, associated with the passing low pressure systems over the region.

Agriculture in Rajasthan is predominately rain fed agriculture. The crop production mainly depends on the availability of rainfall in these areas. Deviations in rainfall within the years show the fluctuations in the season and instability in crop production. Hence deviation in rainfall is taken as an indicator, which affects the availability of food. This indicator only reveals the fluctuation of rainfall for the period considered, but does not reveal whether it is excess or deficit in rainfall. However, higher the deviation it can be inferred that either there was excess rainfall or deficit in rainfall that affected the crop production and hence it is taken as an indicator that affects the availability of food.

To calculate the deviation in rainfall, rainfall data for the five years from 1995-1999 are used. Rainfall fluctuation is highest in the districts of Jhalawar, Pali, Jalore, Sirohi, Bhilwara,

Karauli and Bundi respectively. Banswara is the district with the least fluctuation in rainfall followed by Udaipur, Alwar, Barmer, Dholpur, Dungarpur, and Rajsamand.

Deficit in Rainfall

Data given by the department of irrigation of Rajasthan shows that Rajasthan was deficit in rainfall for the year 2000. The state as a whole received only 382.4 mm of rainfall that is 28% less than the average rainfall of 531.0 mm. Districts of Barmer, Ajmer, Baran, Nagaur and Kota received normal rainfall. All the other districts were deficit in rainfall.

Environmental Sustainability

Sustainability is not limited to food production but includes environmental sustainability, which is essential for long-term viable crop and animal production. While instability in crop production cause short-term food insecurity, other factors like environmental degradation and climate change pose threats to long-term sustained productivity. Potential food security may arise out of unsustainable livelihood and production practices. These lead to deforestation and degradation, soil erosion, desertification etc. Practices which make a district food secure at present may lead to food insecurity in future if there is over exploitation of non-renewable natural resources.

Sustainability can be defined as the use of natural resources or the application of a practice or technology in a manner in which the long-term net impact on natural resources is not negative. In other words we must use only as much of natural resource as can be replenished. More ecologically friendly practices of production, preservation of forestlands, less exploitation of the static component of ground water etc., would sustain production for longer terms.

We have taken percentage of forest area to total area as an indicator of environmental sustainability.

Percentage of Forest Area to Total Geographical Area

It is important to protect forests and vegetation to guard against the depletion of topsoil, allow percolation of water into the soil and stop desertification. Forest areas and vegetation not only attract rain clouds, but also stop run-off water and help in the percolation of water into the soil. Destroying forests in order to increase croplands often increases the chances of desertification.

The state of Rajasthan has only less than 4 percent of its geographical area under forests. This limited area of forest is not distributed evenly between the districts. The district of Jodhpur has the least area under forests, at 0.31 percent of total geographical area. Jodhpur is followed by Churu, Jaisalmer, Nagaur, Barmer and Hanumangarah. All these districts have less than one percent under forests.

None of the districts in Rajasthan has 40 percent of area under forests, which is the recommended area, needed to be under forests as far as sustainability is concerned. Karauli has the highest area of 32.82 percent under forests, which is followed by Baran at 30.12. percent. Sirohi, Udaipur, Bundi, Kota, and Banswara follow next.

Food Availability Map of Rajasthan

To obtain the final Food Availability map all the districts have been ranked for the chosen parameters and the rank for each district has been summed up to get a cumulative ranking index. The mapping index is obtained by dividing the cumulative ranking index with the number of indicators. This mapping index of availability is divided into five class intervals, using the natural break in the series. The five classes represent five typologies. The districts, which show the worst situation of availability, are shown in the lightest shade of green and the districts that have good availability are in the darkest shade of green. The districts, which fall in between, are represented in yellow colour.

The districts of Jalore, Nagaur, Ajmer, Jodhpur and Jaisalmer fall in the most food insecure category in terms of food availability. Other than Ganganagar which emerges as moderately food secure and is located in the northwest, all the food secure and moderately food secure districts lie towards the east, viz. Food Secure: Bundi, Sawai Madhopur, Karauli, Bharatpur, Dholpur, and Moderately Food Secure: Udaipur, Banswara, Baran, Dausa and Tonk.

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CHAPTER 4
FOOD ACCESS

The food security situation of a state is affected by food affordability and food access of its population. Food access is bound up in the bundle of 'entitlements'[8]. Entitlements include initial endowments such as land, assets, skills, knowledge, physical ability etc. and what can be acquired through exchange. People have to go hungry when their entitlements do not include enough food[9]. This may happen due to a change in the conditions of exchange, such as a fall in the price of their produce or a fall in wages. Endowments may also change due to the loss of one's physical ability to work due to illness etc.

All the abilities of a person to acquire food may be included except those that involve illegal means. It may include organizational and collective bargaining strengths such as labour unions, farmers organizations and women's self help groups and so on.

The inability to avoid starvation and under-nourishment and to escape premature mortality among children and women, scheduled castes and scheduled tribes and disadvantaged communities, is due to the lack of affordability and the lack of means. Enhancement of individual affordability through livelihood access helps such disadvantaged groups escape starvation, under-nourishment, disease and premature mortality.

Eight indicators are chosen for food access and are discussed in this chapter. There are four indicators related to livelihood access, two indicators that show discrimination against caste and gender, two indicators related to rural infrastructure. Rural infrastructure is an important indicator that enhances livelihood opportunities.

The indicators related to livelihood access are

- Percentage of House Hold below poverty line
- Percentage of holdings less than 1.0 ha and
- Percentage of marginal workers to total workers
- Percentage of Total literacy

The indicators related to discrimination against caste and gender is

- Juvenile Sex ratio (0-16 yrs age group)

[8] Sen, A.K. (1977)
[9] Dreze, Jean and Sen Amartya (1995)

- Percentage of SC and ST population

The indicators related to rural infrastructure are

- Percentage of villages not connected by road to total villages and
- Road length / 1000 persons

Percentage of House Holds Below Poverty Line

Poverty denotes the level of spending below a cut off point that is linked to per household consumer expenditure derived from a basket of goods and services and also related to calorie intake. The poverty level worked out by Planning Commission of India is at the level of income assumed to be necessary to provide individuals living in rural and urban areas a daily calorie intake of 2,400 and 2,100 respectively.

Poverty in Rajasthan is mostly transient in nature. Regular droughts, regular migration by large sections in the state looking for employment, pasturelands for animal and water rich areas during droughts has severe impact on the poor.

Over the five year period 1992-97, the number of families identified below the poverty line increased by about 8 percent or at the rate of 1.6 percent per year in Rajasthan.

The districts of Banswara, Dungarpur, Udaipur and Chittorgarh that have the highest number of Scheduled tribes also have the highest level of poverty. The fast depleting forest areas, uneven terrain, and the rainfed agriculture in the region adds to its poverty.

The desert districts of Jhunjunu, Sikar, Jodhpur, Jaipur and Nagaur have low incidence of poverty. The Indira Gandhi Canal influences the agriculture of this desert area positively. Less poverty in Ganganagar and Hanumangarh may be due to their livelihood earned from animal husbandry and milch animals in the northern area, non-farm employment opportunities from household enterprises, especially handicrafts and the services sector, in trade and transport and services catering to tourism.

In the case of Rajasthan no relationship could be established between per capita income and proportion of rural poor in many districts. This may be because poverty is a function of distribution of income whereas per capita income denotes total value of goods and services produced and divided by total population.

Percentage of Holding Less than 1.0 Ha

Livelihood access of the population can be assessed in terms of the area of holdings a person possesses especially in a state like Rajasthan, which has adverse climatic conditions. More the land holding more the income he is likely to earn and therefore greater the possibility of food access. People with very less holdings and landless labourers are the most vulnerable people as far as poverty is concerned. During adverse climatic conditions or natural calamities their jobs are lost easily and if they have no land of their own to depend on, their condition is worsened.

Average size of operational holding is going down year after year in Rajasthan. As published by Revenue department, Rajasthan[10], average holding which was 5.46ha in 1970-71 got reduced to 3.96ha. by 1995-96. The pattern of distribution of total holdings by size classes for the year 1995-96 is given below.

The Pattern of Distribution of Total Holdings (1995-96)			
Size Class	No. of operational holdings (percent)	Area ha (percent)	Average size of holding (ha)
Up to 1.0 ha	30.03	3.67	0.48
1.0 to 2.0 ha	20.23	7.37	1.44
2.0 to 4.0 ha	20.82	14.99	2.85
4.0to10.0 ha	19.84	31.14	6.22
10.0 ha $^{+}$	9.08	42.83	18.69
Total	100	100	

Source: Revenue (Agriculture Census) Department, Rajasthan,Jaipur.

From the table it can be seen that nearly one-third operational holdings are less than 1 hectare. About one-fifth holdings which are above 10 ha account for 43 percent of total area. This imbalance or inequality can be observed in the districts also.

[10] Revenue (Agriculture Census) Department, Rajasthan, Jaipur in Human Development Report, Rajasthan

The tribal district of Dungarpur has got the highest percentage of holdings (57 of) that are less than 1.0 ha. It is followed by Dholpur, Rajsamand, Banswara, Bharathpur and Udaipur. The tribal population are frequently affected by famines due to less possession of assets especially land. These people are dependent on natural resources especially forests for their existence. Once these non-renewable resources get depleted they are poverty. Hence possession of assets especially land is very important for a poverty free life in this area.

Desert districts of Rajasthan have got less percentage of small holdings or in other words area of land holdings are high. Among the desert districts Bikaner is the best with only 1.3 percent of holdings less than 1.0 ha. Districts of Barmer, Churu, Ganganagar, Barmer, Jaisalmer, Hanumangarh and Jodhpur has also got less percentage of holdings below 1.0 ha. But though the average size of land holdings is quite large in this region their productivity is constrained by inadequate water availability due to low and erratic rainfall. The districts in the desert and tribal areas are more prone to famines.

Percentage of Marginal Workers to Total Workers

Marginal workers are those who work for 183 days in a year. More the number of marginal workers the situation of a district is considered bad since marginal workers don't have secure jobs throughout the year.

The districts with higher percent of marginal workers are Dungarpur, Banswara, Udaipur, Barmer and Alwar. The data clearly shows that most of the tribal districts fall in worse condition, which explains that most of the tribal people are marginal workers. They get only less days of work, which gives less access to purchasing power that adds to their poverty.
The better states as far as the indicator is concerned are Dholpur, Jaipur, Kota and Ajmer. Except Dholpur the other three are urban districts where people are assured of more jobs compared to rural and tribal areas.

Percentage of Total Literacy

Education was not given much importance in Rajasthan. The poor literacy rates would be evident from the fact that in 1941, literates were only 5.46 percent of total population. Greater attention was paid to educate the masses in the post-independence era and thereby the literacy percentage registered a steady rise. As a result of this steady rise, literacy level has increased tremendously which can be seen from the table below. In the last one decade literacy rate have increased double the rate of the previous decade.

Year	% of literates
1951	8.02
1961	15.21
1971	19.70
1981	24.38
1991	38.55
2001	61.03

The National Sample Survey of 1993-94 gives us information about school attendance and percentage of dropouts in the age group of five to fourteen. The data show that the school attendance is the lowest for Rajasthan at 31 percent and also stands worst in percentage of dropouts. The differentials in school dropouts between boys and girls are the highest in Rajasthan.

Literacy rate varies widely among the districts of Rajasthan. Kota is the district with highest literacy rate with a percentage of 74.45% followed by Jhunjunu, Sikar, Jaipur, Churu and Hanumangarh.

The lowest literacy rate is for Banswara with only 44.22 percent of the population literate. The other districts that follow are Jalore, Dungarpur, Bhilwara, Jaisalmer and Tonk.

Though the literacy rates have improved a lot, the reason for the slow rate of improvement is due to its historical past. Further the vast desert and hilly tracts, coupled with sparse population renders the task of development of educational infrastructure very costly. High growth rate of population, neglect of girl child, inadequate educational infrastructure, specially shortage of women teachers and financial constraints are other major hurdles in universalisation of elementary education.

Discrimination by Caste and Gender

Food access and Livelihood access opportunities are not available equally to everybody. The most disadvantaged are women and children and Scheduled caste and Scheduled tribe population. In many societies, cutting across social class, caste and community and ethnicity, gender discrimination of some sort or the other is prevalent. They usually consume less than

others due to various reasons. They also earn less. Many of them are illiterate. They face entry barriers to livelihoods, either because of prejudice or because of their social status.

Although the status of women in almost all the States is more or less similar where males dominate and females are accorded low status, the Gender Development Index (GDI) developed by UNDP presents a highly disappointing and disconcerting picture for Rajasthan. Among the 15 major states studied AP, Assam, Bihar, Gujarat, Haryana, Karnataka, Kerala, MP, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, UP and West Bengal, Rajastan comes in the 13th position. The ranking of Rajasthan as per Human Development Index (HDI) is also low at 12th position. It can be inferred that low GDI for Rajasthan is mainly due to overall backwardness in literacy, enrolment, neglect of social services despite certain pockets of philanthropic activities by few enlightened people.
To have a closer look at gender discrimination, indicator of juvenile sex ratio is examined in more detail.

Juvenile Sex Ratio (0-6 years)

Juvenile sex ratio is an outcome indicator of gender discrimination. Many authors argue that the juvenile sex ratio is a better indicator than the adult sex ratio for analysing gender discrimination. This is because juvenile sex ratio is not affected by migration[11]. To look at the juvenile sex ratio individuals aged 0-6 years are considered. Children normally live with parents and sex distribution are not affected by any other factor, except death, whereas adult men and women in some states migrate unevenly leaving more men or more women behind.

As per the report in Food Insecurity Atlas of Rural India[12], in Rajasthan where the sex ratio reported in 1991 were only 919, there were more deaths of female children compared to male children in the year 1997. This only points to the indicated bias against females in the state where the sex ratio was very low in 1991. Rajasthan showed the maximum imbalance of 30 to 32 percent more female deaths than male deaths in 1997 for both infants and children below four years of age. The juvenile sex ratio and the sex ratio of Rajasthan in 1991 were about 920 per 1000.

The Juvenile sex ratio in Rajasthan varies considerably within the districts. It is worst in the district of Ganganagar with 852 juvenile females against 1000 males. It is followed by Dholpur, Jaisalmer, Jhunjunu, Hanumangarh and Bharatpur.

[11] Agnihotri, Satish (2000)
[12] FIARI

The districts that are better in sex ratio are Banswara, Dungarpur, Bhilwara, Udaipur, Rajsamand, and Jhalawar. The sex ratios in these districts are better because they are the tribal districts and the discrimination between girls and boys in tribal community are very low.

Low sex ratio in Rajasthan is an indicator that reflects the low status of women. Some other reasons for low sex ratios may be female foeticides, female infanticides, neglect of girl child, and high mortality among females at all stages of life.

Percentage of Scheduled Caste and Scheduled Tribe population

Scheduled Castes and Scheduled Tribes are the most economically backward section of the population. Scheduled castes are the most disadvantaged in terms of assets, education, incomes, land ownership and operation, when compared to other castes. Though they are brought under special benefit programme and their condition have improved from the past, areas with higher concentration of them are to be given special attention.

The Scheduled Tribe population lives mainly in forest areas. Historically they have been poor and backward and lived on poor nutrition. Extreme poverty is common among them whether they belong to cultivator or labour household. Hence areas with higher concentration of SC and ST population are considered to be area with backwardness and hence it is taken as an indicator that affects the food access situation.

From the Food Insecurity Atlas of Rural India it can be observed that Scheduled Tribe population in Rajasthan is better off than Scheduled Tribe populations of some other states like Orissa, Bihar and Madhya Pradesh. However even when their percentage in lower expenditure class is less, the deprivation and vulnerability of Scheduled Castes in the extremely lower expenditure class of less than Rs.140 per capita per month are likely to be severe.

The distribution of SC/ST population among the districts of Rajasthan is not even. More than 50% of the population in the districts of Banswara, Dungapur and Udaipur are SCs and STs. They are the tribal districts of Rajasthan and these districts fall under extreme low category in food access, which very well explains that they are the most vulnerable people among the population.

Districts with lowest population of SC/STs are Sikar with 16.66%, Jhunjunu with 16.68 %, Jodhpur with 18.09%, Bikaner with 18.9% and Ajmer with 20.8% respectively.

Rural Infrastructure

Rural infrastructure is a basic requirement for food access. The adequacy of infrastructure helps determine one state's success in diversifying production, expanding trade, coping with population growth, reducing poverty or improving environmental conditions.

Even with the strenuous efforts made during the plan era Rajasthan remain in the bottom quartile in the matter of infrastructural development. In the year 1993-94 it occupied the third last position with only Bihar and M.P. behind it as reported in the Human Development Report, Rajasthan.

Within the State, there are wide variations amongst the districts in relation to infrastructural development.

Percentage of Villages not Connected by Road to Total Villages

Roads play a very important role in food access. Without roads it is not possible to have movement of goods. Local produce has to first reach the markets and then the processing centres. Movement of inputs for crops and sale of crop and animal outputs will be better when a road network is established. Availability of work and non-agricultural employment also improve with better road links.

There is wide variation within the districts with regard to percentage of villages connected by roads to total villages. From the ranking carried out it can be seen that percentage of villages not connected by road to total villages ranges from 71.55 % in Jalawar to 9.19 % in Jodhpur. From the figures it can be observed that the desert districts of Jodhpur, Jalore, Pali, Ajmer, Sirohi, Nagaur, Bikaner, Jhunjunu, Rajsamand, and Sikar appear to be in relatively better position as far as linking of villages to roads is concerned. Districts in very bad position appear to be Jalawar, Udaipur, Dausa, Tonk, Baran, Chittaurgarh, Bundi, Kota, Ganganagar and Alwer. In all these districts more than 50% of the villages are not connected by road to total villages.

Road Length/1000 Persons

By the end of the year 1997-98, the total length of roads in Rajasthan was 145961 km that worked out to 42.6 km per 100 sq km of area and 332.5 km per lakh of population. Road length/1000 population also tells us about the development of a particular area. It tells

about the need for further improvement in the infrastructure facilities needed for the enhancement of the living condition of the population.

Jaisamler stands very high above all the other districts with 8.38 kms per 1000 population. This is because of the lower population and higher area in this desert district. Other western districts like Barmer, Pali, Bikaner, Jodhpur and Bhilwara also have high road length/1000 population.

Sawai Madhopur, Jaipur, Bharatpur and Jhalawar fall in the lower category with less than 1km per 1000 persons. The infrastructure facilities in these districts are very poor which is reflected in their low position in the food access map of Rajasthan.

Food Access Map of Rajasthan

The cumulative index of food access of Rajasthan is based on eight variables as discussed in the previous sections of the chapter. The selected indicators of livelihood access and food access are as follows:

- Percentage of House Hold below poverty line
- Percentage of holdings less than 1.0 ha
- Percentage of marginal workers to total workers
- Juvenile Sex ratio (0-6 yrs age group)
- Percentage of female literacy and
- Percentage of SC and ST population
- Percentage of villages not connected by road to total villages and
- Road length / 1000 persons

The cumulative mapping index of food access ranks all the indicators as per the level of food insecurity. Cumulative rank is obtained by adding up the ranks, and is divided by the number of indicators to make the index uniform for all the composite maps. The ranks of the various indicators vary from 1 to 32. Rank 1 stands for the worst possible position or the maximum food insecurity. Rank 32 indicates the best possible position.

The food access map of Rajasthan shows that the districts with extremely poor food access are the darkest coloured ones, viz. Sawai Madhopur, Karauli, Udaipur, Dungarpur and Banswara. The districts in the middle - Jodhpur, Bikaner, Ajmer, Nagaur, Pali and Sikar emerge comfortable on the food access front on the basis of the indicators considered.

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CHAPTER 5
FOOD ABSORPTION

Food absorption means being able to assimilate the food consumed for a healthy life. Availability of food is the first step followed by livelihood access and physical access to food. Food absorption or assimilation of the food into the body is the final step in achieving food security for a healthy and long life.

Food absorption is possible only when the food consumed contains all the essential nutrients and micronutrients and is consumed in a manner in which it is absorbed well into the body. Therefore a balanced diet and knowledge of nutrition with good dietary practices are important. Food absorption also depends on the state of health of the individual, safe water supply, environmental sanitation and hygiene.

Problems of food absorption lead to an unhealthy population of malnourished adults with low body mass index. The children would be stunted, under weight and wasted. The population would suffer from diseases of various sorts. Prolonged malnutrition would impair the mental and physical faculties of a person and prolonged conditions of disease and morbidity may lead to other problems. The ultimate outcome can be premature death and shorter life span.

Rajasthan's health status is still far from satisfactory. From the Human Development Report of Rajasthan it can be seen that out of the 90 problem districts in the country nearly one-fourth of the districts are in Rajasthan. There are imbalances in the spread of health institutions, physical facilities, equipment and availability of manpower. The location of hospitals and inpatient beds is skewed in favour of urban areas.

Food availability and access alone cannot guarantee a productive and healthy life to individuals in society. A balanced diet, availability of health care, sanitary and hygienic environment all determines the healthiness of an individual. Rajasthan is highly insecure in terms of food absorption. The State has high infant mortality rate, is poor in health infrastructure facilities, has a high percentage of severely wasted children and a very low life expectancy. All these factors make Rajasthan the fourth most food insecure State (with a cumulative rank of 40), after Bihar, Madhya Pradesh, Uttar Pradesh and Gujarat, from the food absorption angle.

Five indicators are used to represent the food absorption situation of Rajasthan.

I) Indicators to examine adult health:
   - Life expectancy at birth
   - Percentage of population with CED

II) Indicators to examine child health:
   - Percentage of stunted children under the age 5
   - Infant mortality rate and

III) Indicator of Rural health Infrastructure
   - Number of persons per PHC.

Life Expectancy at Birth

The status of adult health can be examined in terms of several indicators such as life expectancy, chronic energy deficiency, mortality rates etc. Life expectancy is one of the most important among these indicators. The long term outcome of food security is ultimately reflected in an improvement in the life expectancy of the population. Increasing life expectancy is a pointer to the improving food security of the state.

Life expectancy for the state of Rajasthan is 61.36 years. Life expectancy varies considerably within the districts of Rajasthan. About half of the districts fall below the state average while the other districts are above it. The district of Bikaner has got the highest life expectancy at 75.39 years followed by Churu at 70.56 years. Ganaganagar and Hanumangarh follow with 69.79. The other districts, which follow in order, are Jaisalmer, Barmer, Nagur, Sikar, Jodhpur and Jhunjhunu.

The district, which is worst in life expectancy, is Tonk. The life expectancy of its population is only 52.62 years. Dholpur, Bharathpur, and Sawai Madhopur follow it. From the data it can be observed that the districts in North and West are better off compared to the South and East of the State.

Chronic Energy Deficiency

Chronic Energy Deficiency (CED) in adults is a result of long-term under-nutrition and malnutrition. Recent studies have documented significant relationships between antnropometric measures and health status. Body Mass Index can be used to assess both leanness and obesity. Body Mass Index is defined as the weight in Kilograms divided by the

height in meters squared (kg/m^2). CED is usually indicated by a BMI of less than 18.5. BMI of <16 indicates severe chronic energy deficiency, BMI which comes between 16-17 is moderate CED and those between 17-18.5 BMI is Mild CED.

We have taken the percentage of population with severe chronic energy deficiency (< 16 BMI) as an indicator of food insecurity. Banswara occupy the worst position with 20.6 percentage of population with severe chronic energy deficiency. Sirohi, Dungarpur, Bundi, Kota, Tonk and Nagur follow next. All these districts have more than 15 percent of population with CED.

Bhilwara is in the best position with only 4.1 percent of population with CED followed by Sikar at 4.4 percent. Other districts, which are in better position, are Chittorgarh, Alwer, Jaipur, Ganganagar, and Jodhpur.

Percentage of Stunted Children Under the Age 5

Child nutrition is extremely important, as better health of infants and children below five will influence their future growth, health, immunity to diseases and mental faculties. The nutrition and health status of a child can be assessed in terms of height-for-age. The height-for-age index measures linear growth retardation (being shorter for any given age than expected against an international reference- the National Centre for Health Statistics (NCHS) standard. The severity of stunting is expressed as the number of standard deviations from the international reference median of height-for-age. The height-for-age estimates, expressed as percentages, falling below three standard deviations, are considered to suffer from severe stunting. Those between two standard deviations and three standard deviations are considered as moderately stunted.

In the case of percentage of severely stunted children less than five Tonk is in worst position with 80% followed by Barmer with 67%, Hanumangarh with 66% and Ganganagar with 65%.

Bhilwara is in best position followed by Sikar, Alwar, Jaipur, Ganganagar and Jodhpur.

Infant Mortality Rate

Infant mortality indicates the number of infants dying before the age of one per thousand live births. The problem of nutrition starts with the malnutrition of pregnant women, is

manifested in Low-Birth-Weight babies and infant deaths. Infant mortality also results from a lack of immunization, medical help, safe drinking water etc.

Though Rajasthan has showed some progress in life expectancy, birth rates and death rates over the successive plans, its health status is still far from satisfactory. Out of the 90 problem districts identified in the country where the birth and infant mortality rates are significantly high nearly one-fourth of the districts are in Rajasthan.

Infant mortality is consistently higher in Rajasthan compared to all India average as shown in the figure below[13].

Year	Infant Mortality Rate	
	Rajasthan	India
1985	108	97
1986	107	96
1987	102	95
1988	103	94
1989	96	91
1990	84	80
1991	79	80
1992	90	79
1993	82	74
1994	84	74
1995	86	74
1996	86	72
1997	85	71

From the above table it can be seen that the IMR in the state of Rajasthan declined from a level of 108 infant deaths per 1000 births in 1985 to 79 in 199. But it increased from 79 in 1991 to 85 in 1997. The IMR in Rajasthan has been much higher always when compared to IMR of the country as a whole. Only the states of Orissa and Madhya Pradesh have higher IMR than Rajasthan. Malnutrition is one of the major causes of infant deaths in Rajasthan. Also the deep-rooted feudal culture, which gives women very low status in the society, has had profound impact on their health.

[13] Human Development Report, Rajasthan – 1999.

IMR varies considerably within the districts of Rajasthan. About half of the districts fall below the state IMR status of 85 deaths per thousand births. The district of Tonk is the worst with 116 deaths followed by Bharatpur and Dholpur at 113, Sawai Madhopur and Karauli at 108, Bhilwara at 105 and Chittaurgarh at 101.

The state, which is best as far as IMR is concerned, is Bikaner with 46 deaths per 1000 births. Churu, Ganganagar, Hanumangarh, Jodhpur, Jaisalmer and Jhunjunu follow it.

Number of Persons per PHC

Consumption, lack of disease and better absorption depend not only on nutrition knowledge, education and resources but also on the type of health care facilities available in the district. Good rural health infrastructure is important to keep the population free from disease. To have a look at this we have taken only one indicator of number of persons per PHC based on availability of district level data.

Then number of people per PHC explains the availability of health services for the people. More the number of people per PHC points out the need to establish more health care centres for the population.

The best districts with less number of people per PHC are Karauli, Rajsamand, Banswara, Dungapur, Jalore, Jaisalmer and Jhunjunu. The worst district is Jaipur with as high as 516 ('000's) persons per PHC. This may be because of higher population in this capital district. The other districts that follow are Kota, Ajmer, S.Madhopur, Ganganagar, Dausa and Bikaner.

Food Absorption Map of Rajasthan

The parameters used to estimate the food absorption situation in Rajasthan are Life expectancy at birth, Percentage of population with CED, Percentage of stunted children under the age 5, Infant mortality rate and number of persons per PHC.

The absorption map reveals that the desert districts of Jaisalmer and Bikaner, and Churu, Jhunjunu and Sikar are in relatively better position compared to districts of Bundi, Tonk, Sawai Madhopur, Bharatpur and Dholpur, which occupy the lowest range.

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CHAPTER 6
FOOD INSECURITY IN RAJASTHAN

Food Insecurity Map of Rajasthan

The preceding chapters, focus on the three individual aspects of food security namely, food availability, food access and food absorption. But a more holistic picture of food insecurity of the State as a whole will emerge only if these three aspects can be combined together. The composite map of food insecurity is a step towards this. The various indicators discussed under each aspect of food insecurity have been consolidated to get the composite map.

Measuring Food Insecurity

Nineteen indicators were combined to calculate the mapping index of food insecurity as explained earlier. All these indicators carry the same weight. However, there is an implicit weight to each dimension, such as availability, access and absorption.

The 32 districts have been put into five typologies, based on the composite mapping index calculated. Class intervals of each typology have been chosen by the GIS software Arc-view, following natural breaks in the series. Minor adjustments have been made in the class limits to round them off to the nearest decimal point.

Interpreting the Food Insecurity Map

The food insecurity map of Rajasthan gives an overall picture of the food insecurity situation at the district level. The map is an advocacy tool; it heightens peoples awareness. The food insecurity map does not reveal everything about the food insecurity of a district at a glance. It is necessary to go through a series of maps and interrelationships of each aspect to understand the complex food insecurity situation. A map is a good beginning to do this.

The map thus captures and summarizes the distribution in a large number of indicators. It shows the typology of the district with each typology having certain problems in common. We shall illustrate these not only with the parameters included in the mapping index but also with the help of the insights gained from the preceding analysis. An attempt to go deeper into the causes of food insecurity within the state and districts would require a typology specific to that graphical entity. Each state will have its own specific set of problems.

It is important to note that several of the indicators pertain to the most vulnerable sections of the population within the districts. The map lays greater emphasis on deprivation and vulnerability. Hence, the indicators chosen are not always average figures for a particular district. This is an important factor to keep in mind while interpreting the map. As has already been stressed in the previous chapters, the average may be very different from the plight of the lowest ten per cent. In the food insecurity map, we have attempted to represent deprivation rather than the average status of a district. The map particularly emphasizes vulnerable persons and vulnerable situations and is ideally suited for programme intervention for the poor and vulnerable sections of the population. The food insecurity map of Rajasthan thus highlights the situations that need public action and specific interventions.

The Pattern of Food Insecurity

The Food Insecurity map of Rajasthan clearly shows that on the whole, Dungarpur, Udaipur, Jhalwar are the most insecure districts, followed by Tonk, Sirohi, Jalore, Banswara, and Sawai Madhopur. They are *'poor'* in terms of most of the indicators. The most food secure districts are Sikar, Bikaner and Churu. These districts are good in terms of many indicators, which carry weight in the index. There are moderately food secure districts such as Jodhpur, Hanumangarh, Ganganager, Bhilwara, Jaipur, Nagaur. Sawai Madhopur had emerged as food insecure in terms of both Food Access and Food Absorption and emerges overall Food Insecure in spite of being relatively food secure in terms of food Availability. Karauli which was carved out of Sawai Madhopur is in a slightly better position than its parent district.

What we see from the map are the major typologies of food insecurity. Each group of districts has a set of specific problems common to it. None of the districts is in an ideal position of being totally food secure, including Sikar and Churu. The typologies are not meant to certify districts as *'good'* or to tag certain districts as *'bad'*. The typologies show the common problems of food availability, food access and food absorption in these districts.

The analysis of the problems is based on many more indicators, which tell us a more complete story. If one were to start with the map and then go beyond the indicators of the map, searching for answers to questions, the story of food insecurity would unfold[14].

[14] The correlation matrix of sixteen indicators is given in Annexure 6.1.

INDICATOR SOURCES

1) **Deficit in per capita cereal production over requirement (Total) (1997-99)**

Average cereal production, for the year 1997-98-Statistical Abstract, 1998. P 129 (Karauli data calculation given in the end)
Average cereal production, for the year 1998-99-Agricultural Statistics – p-55 (Separate data for Karauli and S.Madhopur available)

Projected Polpulation for the year 1998 **('000 Population*)***
Statistical Abstract, Rajasthan, 1998. Page 41.
(Separate data for Karauli and S.Madhopur)

2) **Average yield/ha of Food Grains in Kgs (1997-99) (Total)**

Total Food Grain Production in Tonnes (1997-99)
For 1997-98 food grain production data - *Statistical Abstract, Page 138. (Separate data for Karauli and S.Madhopur available)*
***For* 1998-99 *food grain production data* data** – Agricultural Statistics- Rajasthan (1998-99) P.57 (Separate data for Karauli and S.Madhopur available)

Total Area of Food Grain Production (1997-99)
For 1997-98 Food Grain Area Production data - Statistical Abstract, 1998. Page 138. (Separate data for Karauli and S.Madhopur available)
1998-99 data – Agricultural Statistics – Rajasthan (1998-99)p.39 (Separate data for Karauli and S.Madhopur available)

3) **Standard Deviation in rainfall (1997-1999)**
1997-1998 Rainfall data - Statistical Abstract, Rajasthan, 1998. Page 51.
(Separate data for Karauli and S.Madhopur available)
1999 Rainfall data - Basic Statistics, Rajasthan, 2000. Page 72.
(Separate data for Karauli and S.Madhopur available)

4) **Consumption of Cereals (gm/cu/day) (1995-96) (Total)**
India Nutrition Profile" –1998. Page,169.
(S.Madhopur data repeated for Karauli))

5) **Consumption of milk and products (gm/cu/day) (1995-96) (Total)**
India Nutrition Profile" –1998. Page,169.
(S.Madhopur data repeated for Karauli))

6) **Percentage of Forest Area to Total Geographical Area (1997-98) (Total)**
Agricultural Statistics, Rajasthan 1998-99 p.1 & p.4.
(Separate data for Karauli and S.Madhopur available)

7) **Percentage of Households below poverty line (1997) (Rural)**
WFP Report, Table 9.
(Separate data for Karauli and S.Madhopur available)

8) **Percentage of SC & ST Population to Total Population (1991) (Total)**
Human Development Report -1999. Page, 166.
(Separate data for Karauli and S.Madhopur available)

9) **Percentage of Total Literacy (2001) (Total)**
Census of India 2001, Rajasthan, page 171
(Separate data for Karauli and S.Madhopur available)

10) Juvenile Sex Ratio (0-6 age) (2001) (Total) Census of India 2001, Rajasthan, page 82 (Separate data for Karauli and S.Madhopur available)

11) **Percentage of villages not connected by road to total villages (1998) (Total)**
Human Development Report -1999. Page, 195.
(Separate data for Karauli and S.Madhopur available)

12) Road length per 1000 population (1998) (Total)
Components
Road length in km (1998)
Human Development Report –1999. Page, 194
(Separate data for Karauli and S.Madhopur available)

Projected Polpulation for the year 1998 **('000No.s)**
Statistical Abstract, Rajasthan, 1998. Page 41.
(Separate data for Karauli and S.Madhopur available)

13) Percentage of holdings less than 1.0 ha (1995-96) (Total)
Human Development Report - 1999. Page, 175.
(S.Madhopur data repeated for Karauli)

14) Percentage of marginal workers to total workers (1991) (Total)
Human Development Report –1999. Page, 180.
(S.Madhopur data repeated for Karauli))

15) Infant Mortality Rate (1997) (District-wise vital rates) (Total)
Human Development Report –1999. Page, 199.
(Separate data for Karauli and S.Madhopur available)

16) Life expectancy at Birth (1997) (Total)
Human Development Report –1999. Page, 199.
(Separate data for Karauli and S.Madhopur available)

17) Percentage of Stunted Children Under 5 (1995-96) (Total)
"India Nutrition Profile" –1998. Page, 170.
(S.Madhopur data repeated for Karauli)

18) Percentage of Population With CED III, (adults) (<16 BMI) (1995-96) (Total)
"India Nutrition Profile" –1998. Page, 170.
(S.Madhopur data repeated for Karauli)

19) Number of persons ('000s) per PHC (1997-98) (Total)
Components
***Projected Polpulation for the year 1998* ('00 No.s)**
Statistical Abstract, Rajasthan, 1998. Page 41.
(Separate data for Karauli and S.Madhopur available)

Number of PHCs (Total) (1997-98)
Statistical Abstract, Rajasthan, 1998. Page, 78.
(S.Madhopur data repeated for Karauli)

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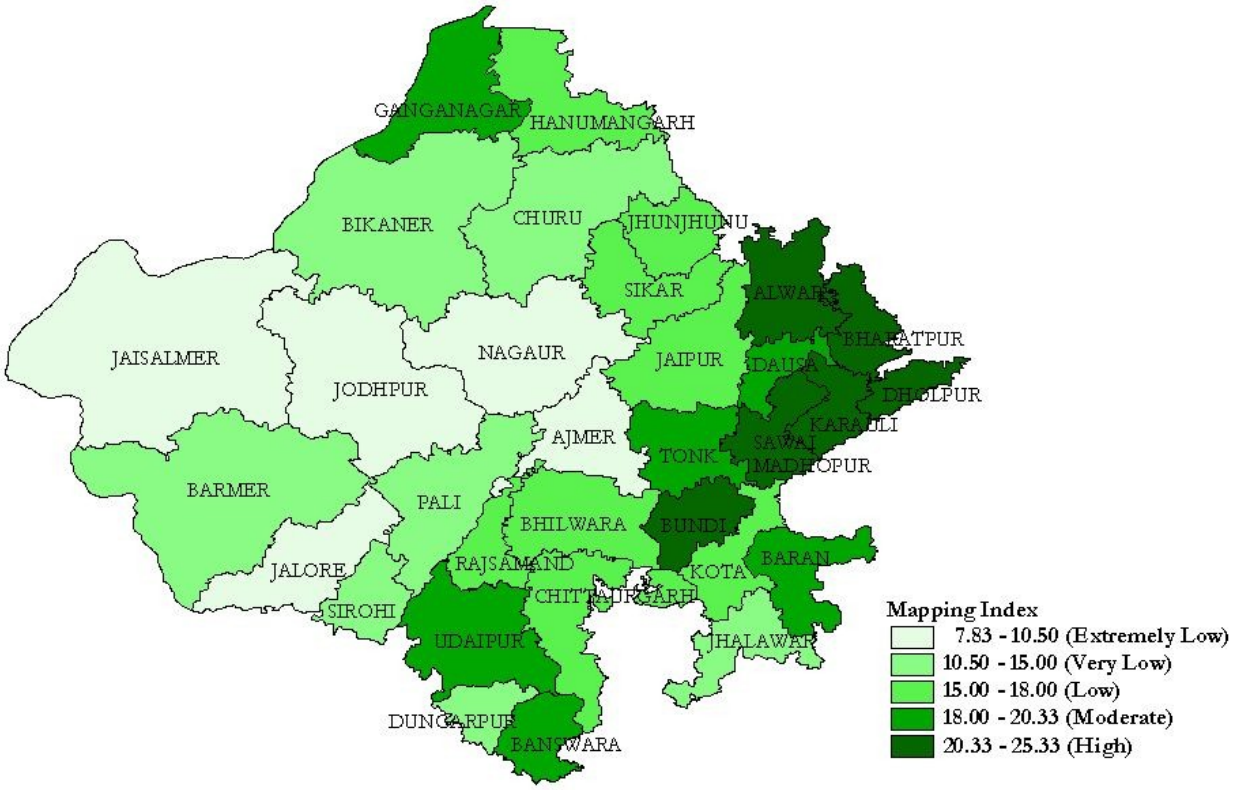
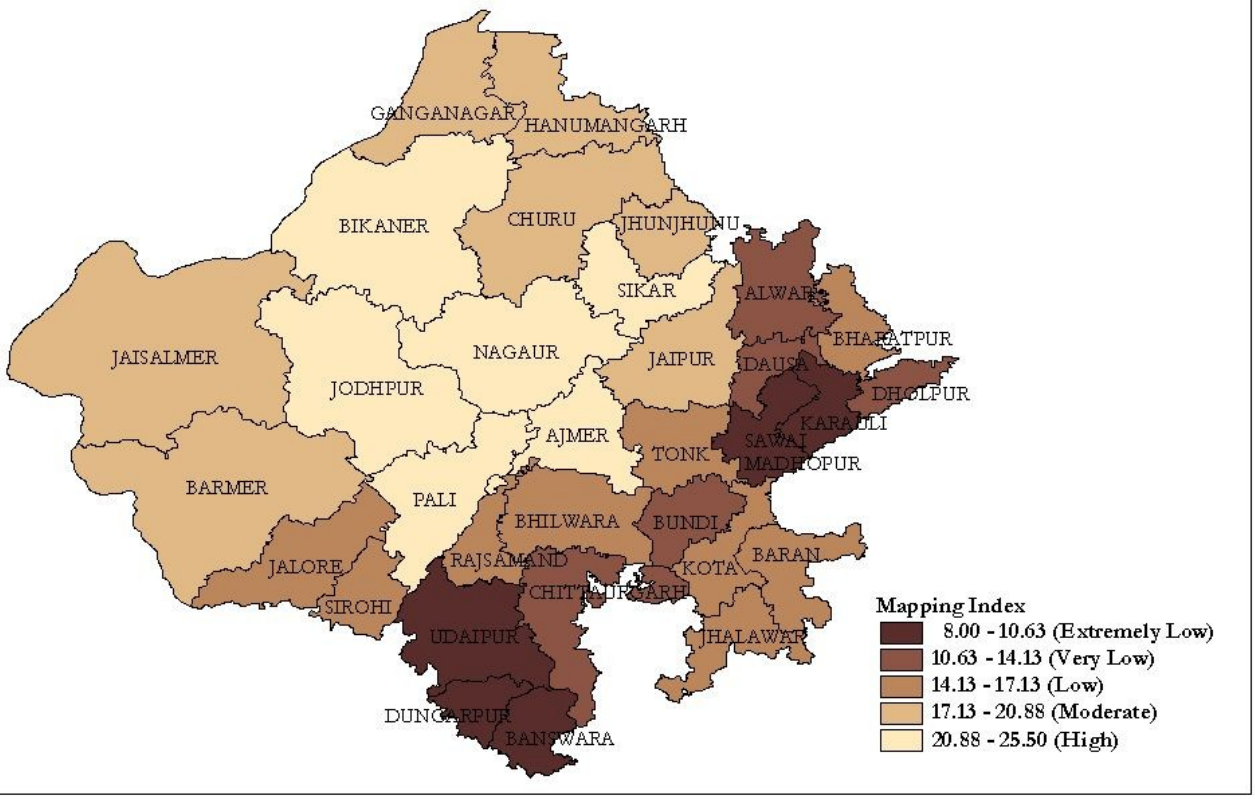
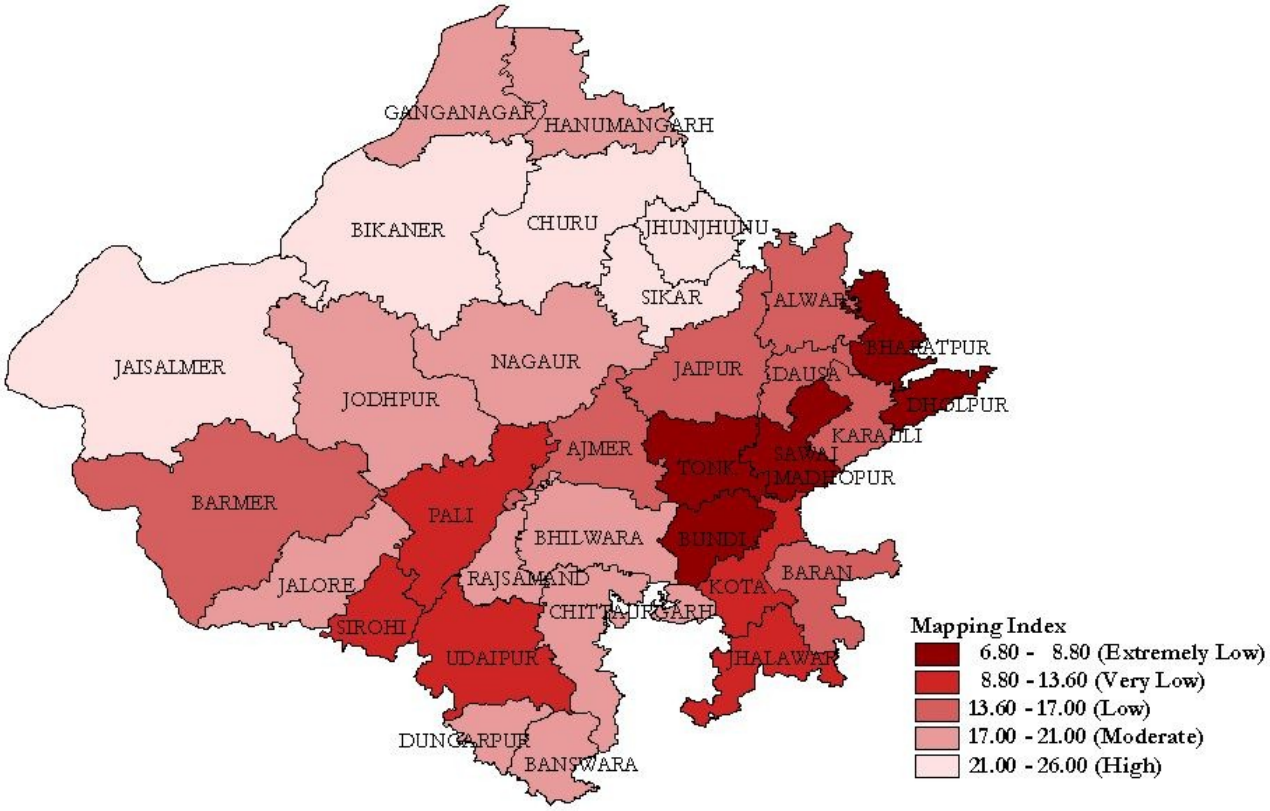
FOOD AVAILABILITY MAP



FOOD ACCESS MAP



FOOD ABSORPTION MAP



FOOD INSECURITY SITUATION IN RAJASTHAN