

Full Length Research Paper

Dimension of food security in a selected state- Uttar Pradesh

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Development agencies regard the concept of household food security-often defined as "access for all people at all times to enough food for an active, healthy life"-as a guiding principle for designing interventions in rural areas because poverty is the major determinant of food insecurity and achievement of food security is the goal of development. It is a known fact that the poor do not have adequate access to food in quantities needed for a healthy life, hence food security is an absolute necessity for development. In this paper, database related to food security for the Western Uttar Pradesh region of India were analysed for food security indices such as food availability, food stability, and food accessibility to classify the region. The result classify the southern portion of the western Uttar Pradesh as highest food security region; and the northern portion as low food security region due to lack of fair price shops, low level of purchasing power, lack of storage capacity and lack of food grains production.

Key words: Food availability, food stability, food accessibility, food security.

INTRODUCTION

The present study examines the dynamism of availability of food to the people. Need of food security arises primarily due to the fluctuation in food production and insufficient availability of food from domestic sources. Food is essential for life. It is one of the most basic needs. According to an ancient Hindu script 'all actions stem from food - food depends on food'. Unless there is enough food today for all – men, women, young and old, the prospects for food security tomorrow are greatly diminished (Singh, 2003). One of the most commonly accepted definitions of food security is adequate access to food at all times, throughout the year and from year to year. Access is ensured when all households and all individuals within those households have sufficient resources to obtain appropriate foods for a nutritious diet.

A minimum level of income below which a person is officially considered to lack adequate subsistence and to be living in poverty. The World Bank definition of poverty line for under-developed countries like India is US\$ 1 per person per day. As per the Government of India, poverty for urban areas is Rs. 296 per month and for rural areas Rs. 276 per month that is, people who earn less than Rs. 10 per day. People are said to be poor if their incomes

fall below a certain level called a threshold, also known as poverty line. In this definition, they do not have enough income to purchase and also do not have easy access to basic goods and services, such as food, clothing, housing, transportation and education (Encarta, 2005).

Today, availability of food is associated with purchasing power and food insecurity is caused by poverty. If people do not have purchasing power, they have substitute of food reserves. Food security and poverty are directly related to each other. So the needs of the poor should be protected by improving their purchasing power, through employment and income generation programmes (Srinivasan, 2002). A large proportion of the world's underfed population starves not because of general food shortage but because of insufficient access to food supplies or insufficient consuming power of people. During 2001-2002, India faced drought conditions but with the huge buffer stocks of foodgrains, the situation was under control. There are number of steps which have been taken to promote food security in India. India's population in 1951 was 361 million with a growth rate of 1.3% per annum, but in 1961 the population drastically rose to 439 million with a growth rate of 2.16% per

annum. In 1971, it jumped to 548 million with a growth rate of 2.48%. In 1981, it rose to 683 million with a growth rate of 2.13%. The production of food grains in the country in 1999-2000 was 209 million tones and it worked out to about 60 g per person per day. Theoretically $\frac{1}{2}$ kg food, if made available to each individual, is inadequate.

Moreover, the availability of food to an individual depends on the purchasing power of the person concerned, otherwise it will lead to under-nutrition, malnutrition and hunger (Shafi, 2006). Swaminathan (1995) argued that for too long, food has been considered primarily as a means to abolish hunger and minimum needs for most people, overlooking its greater role in the process of economic development. He examined the agricultural production roles in a number of developing countries and focused on the present number of malnourished people. Swaminathan (1996) has studied the role of science and technology for sustainable food security.

The agricultural productivity associated with the 'Green Revolution' in India has become possible with the introduction of high yield variety of seeds (HYVs), irrigation facilities, fertilizers and manures etc. He found that major goals of developing countries should be productivity improvement, natural resource conservations and poverty eradication. Qamar (1996) has emphasized the public distribution system in India covering about 560 million people through 135 million ration card holders. Despite the financial constraints faced by the government, provision has been made to safeguard the public distribution system (PDS) food security against inflations and maintain a buffer stock to ensure food security for the lower sections of the population. Radhakrishna (1996) examined food grain production and food consumption trends in India. India has achieved moderate success in combating transitory food insecurity caused by crop failures due to droughts or floods. Ayres and McCall (1996) examined the progress in rural, agricultural development and food security over the past 25 years. They identified those groups that are going hungry still and illustrated policies to improve food security, supplies, utilization and access.

Suryanarayana (1997) has argued that the assessments by conventional macro measures show considerable improvement in food security in India, the level of cereal consumption and calorie intake of even the general populations are still below the normal three-fold limits. Empirical evidence is used to raise a number of issues and recommendations are presented for an emphasis on investment in human capital by way of improvement in food and calorie intake for efficiency and economic growth. Data covered a variety of sources and aspects of food security during the period 1954 - 1992. Chaturvedi (1997) measured food security with the help of three components; availability, stability and access. Availability of enough food for all can be attained through efficient domestic production. Stability can be ensured by taking appropriate pre-emptive steps. The vast majority of malnourished either cannot reduce or afford natural

resources, jobs, or social support. Thus, sustainability, efficiency and equitable distribution of food requires a comprehensive approach at the country level within the available infrastructure and traditional practices so that food is produced on a sustainable basis and is made available to the poor.

THE STUDY REGION

Keeping in view the importance of food security, the author has selected 'Western U.P.' as an area for detailed study because the area under investigation is rapidly changing from agriculture to industrial activities and commercialization of crops and as a result, food security is declining due to commercialization which has reduced food grain production. Western U.P. is the most prosperous, developed and rich in agriculture region due to the great impact of the Green Revolution, though there is regional variation in food security.

The technology used by farmers is labour intensive and production is mainly dependent upon the amount of labour that the cultivator is able to put. Farmer's lack of knowledge about water management, soil fertility and land practices is prevalent in those areas of Western U.P. which is facing the problems of food insecurity. Western U.P. lies in the upper Ganga plain, which is endowed with fertile soil, level topography and suitable climatic conditions. Western U.P. lies between $26^{\circ} 20'$ to $30^{\circ} 20'$ north latitudes and $77^{\circ} 45'$ to $80^{\circ} 22'$ east longitudes. It covers an area of about 80.076 sqkm and has a population of about 61.06 million (Census of India, 2001). The region includes the districts of Saharanpur, Muzaffarnagar, Meerut, Baghpat, Bulandshahr, Gautam Bddha Nagar, Ghaziabad, Aligarh, Hatras, Mathura, Agra, Firozabad, Mainpuri, Etah, Bareilly, Budaun, Shahjahanpur, Pilibhit, Bijnor, Moradabad, Jyotiba Phule Nagar, Rampur, Farrukhabad, Kannauj, Auraiya and Etawah (Figure 1).

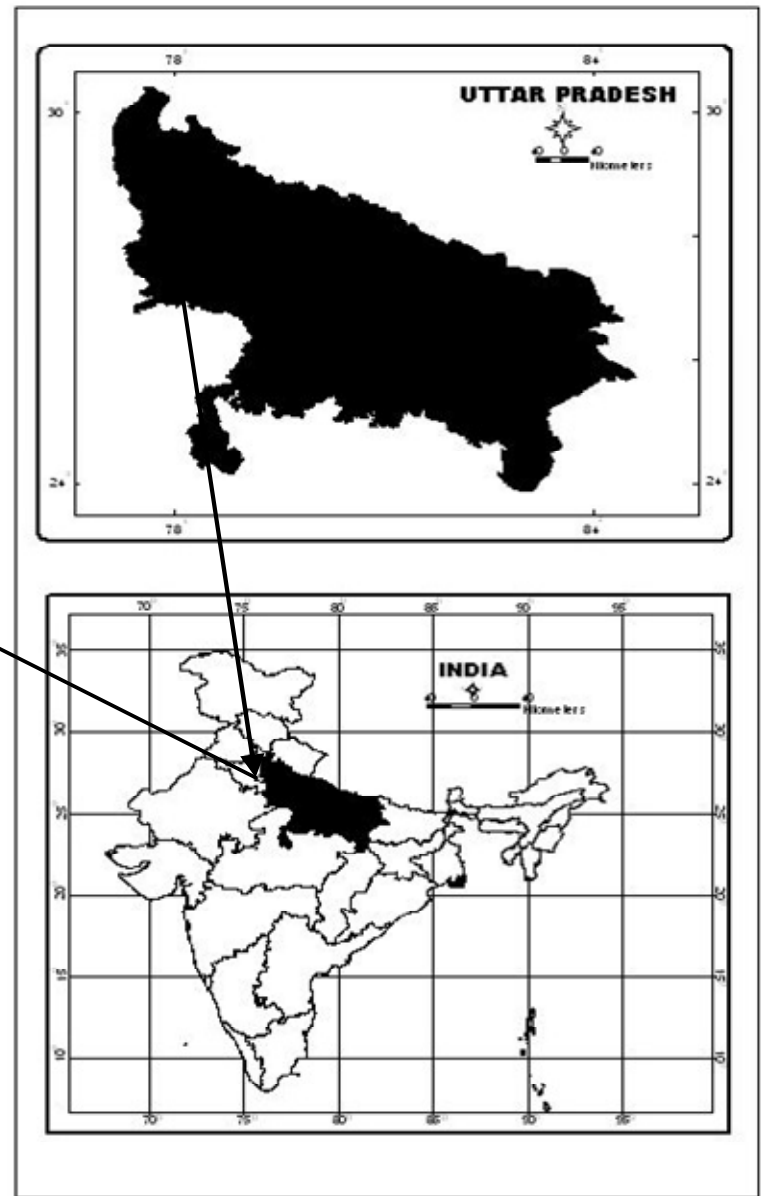
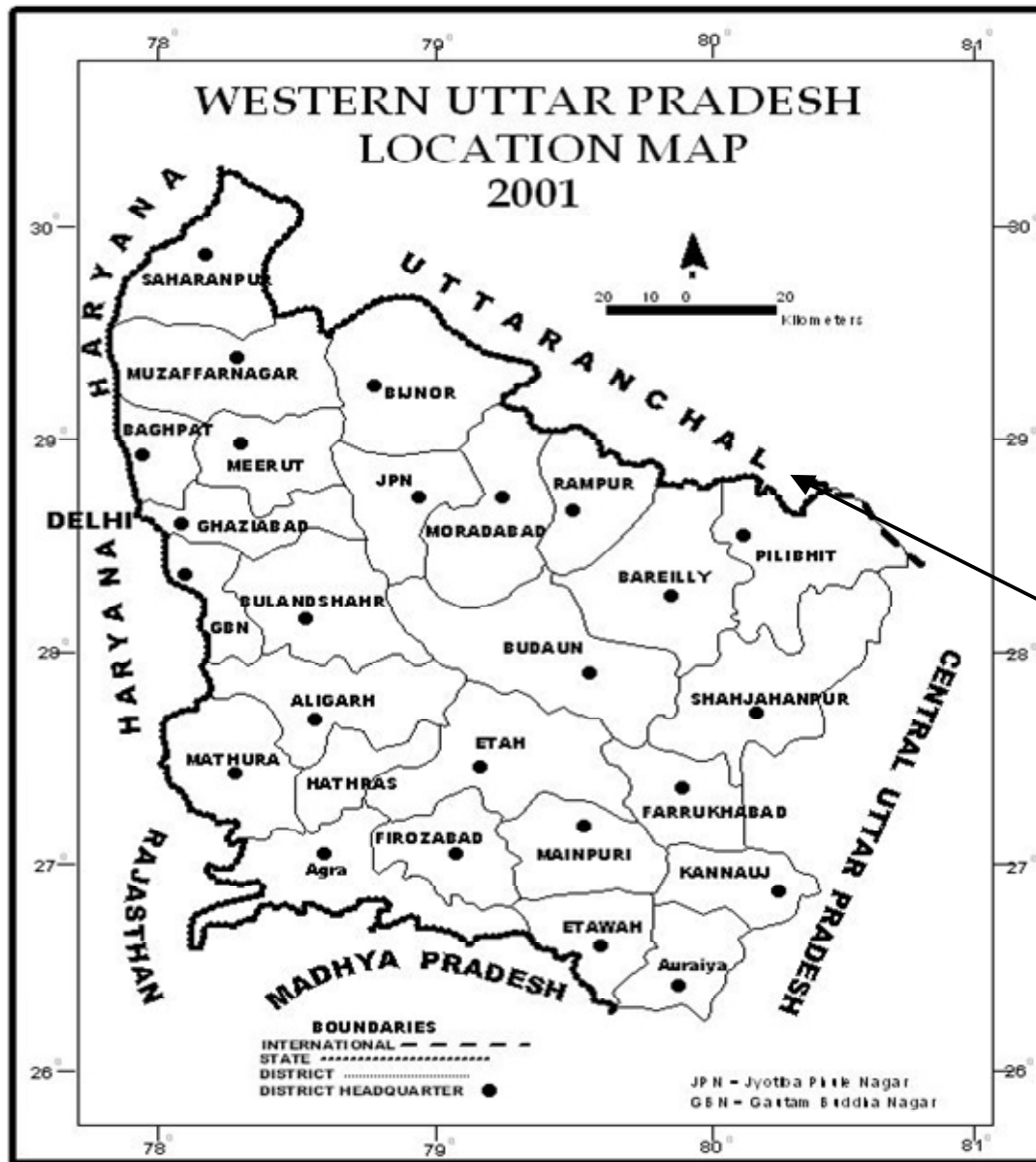
OBJECTIVES OF THE STUDY

In view of the complexity of the problem, the aims and objectives of the present work are as follows:

1. To determine the spatial variation of food availability, stability and accessibility in order to ascertain food security.
2. To assess the spatial variation in food security
3. To examine the interrelationship between the variables of food security.

MATERIALS AND METHODS

The raw data relating to food security (Table 1) were collected from various published and unpublished records of government and non-governmental organizations.



SOURCE: CENSUS OF INDIA, 2001

Figure 1. Map of the study area.

Table 1. Data relating to food security.

Selected Indicators for the study	Sources
Livestock population	Economics and Statistics Institute
Food grains availability	Ministry of Agriculture Department
Caloric availability of food grains	Ministry of Agriculture Department
Yield of food grain	Ministry of Agriculture Department
Number of fair price shop	Economics and Statistics Institute
Percentage of storage capacity	Food Supply Department
Percentage of main worker	Census of India
Percentage of literacy rate	Census of India
Percentage of families below poverty line	Food Supply Department

Agriculture data (unpublished) have been collected from the Ministry of Agriculture, Department of Statistics and Economics, Lucknow and; the Government of Uttar Pradesh, Lucknow, U. P., India. Poverty and storage capacity data have been taken from the Directorate of Food Supply Department, Lucknow, U. P., India while population data has been collected from Census of India (2001). Socio-economic data have been taken from the Economics and Statistics, State Planning Institute, Lucknow, U. P., India.

Food grains availability has been calculated in grams per head per day to examine the regional aspects of surplus and deficit areas of foodgrains availability at district level, taking 482 g/head/day as standard requirement (food intake) of the Indian Council of Medical Research (ICMR, Hyderabad). Caloric availability of foodgrains has been calculated in calorie per head per day. The Indian Council of Medical Research (ICMR) has worked out that on an average, the standard caloric requirement (calorie intake) is 2400 calories per person per day. The average daily caloric requirement in the world is 2800 calories per person. More than 70% of caloric intake in India is derived from food grains. Considering the distribution of persons in different age and sex groups and in different activities in India, the average per capita requirement of calories would be about 2400 calorie (Kravdal, 2001).

Yield is the main factor to increase foodgrains production. Yield level in kg/ha has been selected as a unit to measure the productivity and stability of production. Yield is a measure of productivity. In other words, it is a measure of output from a given amount of input. Thus, the productivity of foodgrains can be examined with the help of the yield method, which is expressed as follows:

$$Y = \frac{P}{A} \times 1000$$

Where Y= Yield, P= Production of food grains, A= Area under food grains

The production of food grains has been divided by area under food grains district wise and then obtained value multiplied by 1000.

For the purpose of standardization, the raw data for each indicator were computed into standard scores commonly known as z-score or standard score. In the first step, district-wise z-score for each indicator were calculated (Smith, 1973). The values so obtained were added district-wise and standardized scores taken out of this composite z-score (Cs) for each district and each set of indicator like food security region. Again these results were transformed back into z-score, so that 'zero' indicates average performance and unity (+ or -) represent one standard deviation, + or - indicates high or low values respectively. Thus, the levels of food security can be examined with the help of composite z-score technique, which is

expressed as follows:

$$Z = \frac{X - \bar{X}}{SD}$$

Z= Standard score, X=Original values of the score, \bar{X} = Mean of variables, SD= Standard deviation of variables

The obtained Z-score of each indicator is added district-wise to be known as composite Z-score(s) for each spatial unit of the study area.

$$C_s = \sum Z_{ij}$$

Cs denotes composite Z-scores

Zij indicates the sum of Z-scores of indicators j in district i.

This paper is divided into four sections. The first section deals with food availability which includes distributional pattern, indicators of food availability and food availability regions. The second section focuses on food stability containing distributional pattern of indicators of food stability and food stability regions. The third section highlights food accessibility and food accessibility regions. The fourth section briefly analyses food security regions in the study area.

The districts with reference to composite z-scores have been arranged into five categories of very high (more than 1.5), high (0.5 to 1.5), medium (-0.5 to 0.5), low (-1.5 to -0.5) and very low (less than -1.5). A careful selection of class intervals to decide the categories drawn on the maps are based on the mean and standard deviation. Corropleths maps have been drawn with the help of GIS technique.

SPATIAL DISTRIBUTIONAL PATTERN OF FOOD AVAILABILITY

Food security has three dimensions; available food, having enough food for the entire population, at all times and to sustain human life (Bush and Lacy, 1984). In this section, therefore, an attempt has been made to find out the trends and distributional pattern of food availability which encompasses food grains availability, caloric availability of food grains and livestock availability. Foodgrains availability (in calories/head/day), caloric

Table 2. District-wise distribution of availability, stability and accessibility with indicators in Western U. P. (2002).

Districts	Food availability				Food stability		Food accessibility		
	Livestock per 1000 population	Food grains availability in gram/head/day	Caloric availability of food grains in calories per head/day	Yield of food grains in kg/ha	Total number of fair price shop / 1000 population	Storage capacity in MT / 1000 population	Percentage of main workers to the total population	Percentage of literacy rate to the total population	Percentage of families below poverty line
Saharanpur	345	488.61	181.84	9571	0.34	38.01	23.9	62.61	6.12
Muzaffarnagar	325	462.78	153.15	1998	0.28	58.71	25.39	61.68	3.85
Meerut	300	281.43	99.95	3266	0.22	19.92	24.59	65.95	1.04
Baghpat	266	522.09	175.71	3325	0.27	2.15	24.9	65.65	0.86
Bulandshahr	283	953.73	323.5	3933	0.39	85.82	27.01	60.19	2.78
Ghaziabad	381	264.91	88.95	3071	0.18	37.49	24.31	70.89	1.42
Goutam Buddha Nagar	266	869.08	282.81	2920	0.29	0	25.7	69.78	1.08
Aligarh	417	971.01	364.03	2753	0.38	63.02	23.31	59.7	2.76
Hathras	201	809.11	357.71	1917	0.38	29.44	22.11	63.38	1.89
Mathura	365	1050.8	393.14	2912	0.32	67.74	25.94	62.21	4.64
Agra	435	442.71	164.18	2726	0.33	25.7	22.49	64.97	1.06
Firozabad	335	667	252.53	2503	0.38	44	22.16	66.33	3.6
Mainpuri	340	1190.08	237.71	2592	0.44	44.09	22.87	66.51	5.14
Etah	362	977.23	404.07	2452	0.45	38.24	23.6	56.15	6.18
Bareilly	275	676.51	338.81	1957	0.45	75.27	23.84	47.99	11.17
Badaun	377	1092.37	232.97	2406	0.48	32.86	25.05	38.83	5.84
Shahjahanpur	365	149.65	414.31	2756	0.47	125.56	24.16	48.79	4.39
Pilibhit	356	1437.14	489.32	2940	0.39	63.15	21.9	50.87	3.96
Bijnor	420	453.49	502.05	2816	0.33	11.43	22.62	59.37	2.3
Moradabad	267	723.77	153.14	2627	0.39	64.5	26.07	45.74	5.18
Jyotiba Phule Nagar	331	700.85	232.11	2729	0.49	4.34	25.53	50.21	2.32
Rampur	444	1161.66	396.95	2800	0.4	100.56	23.76	38.95	3.88
Farrukhabad	472	685.88	398.28	2873	0.42	31.31	24.25	62.27	4.29
Kannauj	456	804.87	240.52	2607	0.34	6.5	24.99	62.57	3.3
Etawah	492	943.22	307.86	2497	0.37	103.85	22.3	70.75	5.16
Auraiya	423	1170.42	365.21	3542	0.47	12.84	24.17	71.5	5.77
Total	325	768.37	2710.1	2647	0.37	48.36	28.38	58.44	100.00

Source: Calculation is based on unpublished data obtained from Directorate Ministry of Agriculture, Department of Statistics and Economics, Economics and Statistics, State Planning Institute and Directorate of Food Supply Department, Lucknow, U.P., Directorate of census operation 2001, District census handbook of U.P. Lucknow.

availability of foodgrains (in g/head/day), livestock availability (per thousand population) are variables

of food availability from which food availability regions have been developed (Tables 2 and 3).

The technique of z-score has been used, wherein all the variables are added in order to get the

Table 3. District-wise distribution of food availability, stability and accessibility (in Z-Scores) in Western U. P. (2002).

Districts	Food availability			Food stability		Food accessibility			
	Livestock per 1000 population	Food grains availability in gram/head/day	Caloric availability of food grains in calories per head/day	Yield of Food grains in kg/ha	No. of fair price shop per 1000 population	Percentage of storage capacity per 1000 population	Percentage of main workers to the total population	Percentage of literacy rate to the total population	Percentage of families below poverty line
Saharanpur	-0.18	-0.88	-0.93	-1.19	-0.43	-0.23	-0.19	0.43	1.37
Muzaffarnagar	-0.45	-0.96	-1.19	0.70	-1.29	0.40	1.15	0.31	0.01
Meerut	-0.80	-1.53	-1.65	0.50	-2.14	-0.78	0.43	0.88	-1.68
Baghpat	-1.27	-0.77	-0.99	0.53	-1.43	-1.32	0.71	0.84	-1.78
Bulandshahr	-1.04	0.59	0.31	0.08	0.29	1.22	2.61	0.11	-0.63
Ghaziabad	0.32	-1.58	-1.75	0.03	-2.71	-0.25	0.18	1.54	-1.45
Goutam Buddha Nagar	-1.27	0.32	-0.05	0.04	-1.14	-1.38	1.43	1.39	-1.65
Aligarh	0.82	0.64	0.66	0.10	0.14	0.53	-0.72	0.04	-0.65
Hathras	-2.17	0.13	0.61	-0.60	0.14	-0.49	-1.80	0.53	-1.17
Mathura	0.10	0.89	0.92	0.08	-0.71	0.67	1.65	0.38	0.48
Agra	1.07	-1.02	-1.09	2.05	-0.57	-0.60	-1.46	0.75	-1.66
Firozabad	-0.31	-0.32	-0.31	0.28	0.14	-0.05	-1.76	0.93	-0.14
Mainpuri	-0.24	1.33	0.43	-0.61	1.00	-0.05	-1.12	0.95	0.78
Etah	0.06	0.66	1.01	-0.58	1.14	-0.22	-0.46	-0.43	1.40
Bareilly	-1.15	-0.29	-0.44	-1.49	1.14	0.90	-0.24	-1.52	4.39
Badaun	0.27	1.02	1.27	-0.17	1.57	-0.39	0.85	-2.74	1.20
Shahjahanpur	0.10	-1.94	1.10	-3.10	1.43	2.43	0.05	-1.41	0.33
Pilibhit	-0.02	2.11	1.76	-0.01	0.29	0.53	-1.99	-1.13	0.07
Bijnor	0.87	-0.99	-1.20	0.26	-0.57	-1.04	-1.34	0.00	-0.92
Moradabad	-1.26	-0.14	-1.19	-0.42	0.29	0.57	1.77	-1.82	0.80
Jyotiba Phule Nagar	-0.37	-0.21	-0.49	-0.18	1.71	-1.25	1.28	-1.22	-0.91
Rampur	1.20	1.24	0.95	-0.23	0.43	1.67	-0.32	-2.72	0.02
Farrukhabad	1.59	-0.26	0.96	1.86	0.71	-0.43	0.13	0.39	0.27
Kannauj	1.36	0.12	0.46	1.54	-0.43	-1.19	0.79	0.43	-0.32
Etawah	1.86	0.55	0.17	0.06	0.00	1.77	-1.63	1.52	0.79
Auraiya	0.91	1.27	0.67	0.47	1.43	-1.00	0.05	1.62	1.16

Calculation is based on Table 2.

weight of food availability and to delineate homogenous regions (Table 4). These scores are grouped and mapped into five grades of very high, high medium, low and very low (Figure 2). Very

high concentration in food availability is found in two districts, namely, Rampur and Pilibhit which lies in the eastern portion of the study area.

High concentration of food availability region

comprises of seven districts, namely, Aligarh, Farrukhabad, Auraiya, Etawah, Etah, Bijnor and Mathura which are found to be scattered throughout the study area. These districts are observed to

Table 4. Districtwise Distribution of Food Availability, Food Stability and Food Accessibility (in composite standardized Z-Scores) in Western U.P.

Districts	Food availability	Food stability	Food accessibility	Food security
Saharanpur	-0.92	-1.33	0.98	-0.79
Muzaffarnagar	-1.20	-0.15	0.87	-0.49
Meerut	-1.83	-1.75	-0.14	-1.98
Baghpat	-1.40	-1.60	-0.06	-1.60
Bulandshahr	-0.07	1.12	1.27	0.94
Ghaziabad	-1.38	-2.11	0.22	-1.69
GBN	-0.46	-1.79	0.76	-0.73
Aligarh	0.98	0.54	-0.76	0.54
Hathras	-0.66	-0.69	-1.40	-1.29
Mathura	0.88	0.01	1.47	1.18
Agra	-0.48	0.61	-1.34	-0.61
Firozabad	-0.44	0.25	-0.58	-0.42
Mainpuri	0.70	0.23	0.32	0.41
Etah	0.80	0.23	0.24	0.71
Bareilly	-0.86	0.38	1.37	0.42
Badaun	1.18	0.71	-0.45	0.34
Shahjahanpur	-0.34	0.53	-0.62	-0.26
Pilibhit	1.77	0.57	-1.81	0.63
Bijnor	-0.61	-0.98	-1.30	-0.42
Moradabad	-1.19	0.30	0.42	-0.48
JPN	-0.49	0.18	-0.45	-0.43
Rampur	1.56	1.32	-1.78	0.83
Farrukhabad	1.06	1.51	0.45	1.49
Kannauj	0.89	-0.07	0.55	0.51
Etawah	1.19	1.29	0.35	1.45
Auraiya	1.31	0.63	1.62	1.77

Calculation is based on Table 3.

be high in food grains availability due to high productivity, high infrastructural facilities and low population density and high food grains availability. Ten districts come under the medium grade which spreads in the south-west and -east portion of the study area. Six districts including Saharanpur, Muzaffarnagar, Baghpat, Ghaziabad, Moradabad and Hathras form the low food availability regions. Only one district that is, Meerut falls in the very low concentration of food availability and lies in the western portion of the study area. Food availability has been recorded in these districts due to high population density, high rate of urbanization and high concentration of cash crop production. Pilibhit district has been reported to have the highest food availability because of its low population density and low rate of urbanization.

SPATIAL DISTRIBUTIONAL PATTERN OF FOOD STABILITY

Food stability calls for undertaking appropriate pre-emptive steps through which harmful, suspended and inter-annual instability of supplies of food can be reduced.

Built-in stability needs to be installed in the production, pricing, marketing and distribution systems. Natural and man-made disasters can often be anticipated and even prevented (Ghosh, 2000). In this section therefore, an attempt has been made to find out the distributional pattern of food stability. The analysis of food stability in spatial dimension has been worked out with three indicators such as food grains productivity, storage capacity and public distribution system (Table 2).

Food grains productivity (yield kg/ha), public distribution system (total number of fair price shop per thousand population) and storage capacity (storage capacity in metric tonnes per thousand population) are the chief determinants to food stability (Table 3). The regions of food stability have been marked out on the basis of the value of standardized z-score (Table 4). Figure 3 shows that the region of very high food stability is recorded only in one district that is, Farrukhabad which lies in the eastern portion of the study area. High grade of food stability districts constitutes Pilibhit, Shahjahanpur, Budaun, Aligarh, Agra, Rampur, Etawah, Bulandshahr and Auraiya with major concentration in the eastern and

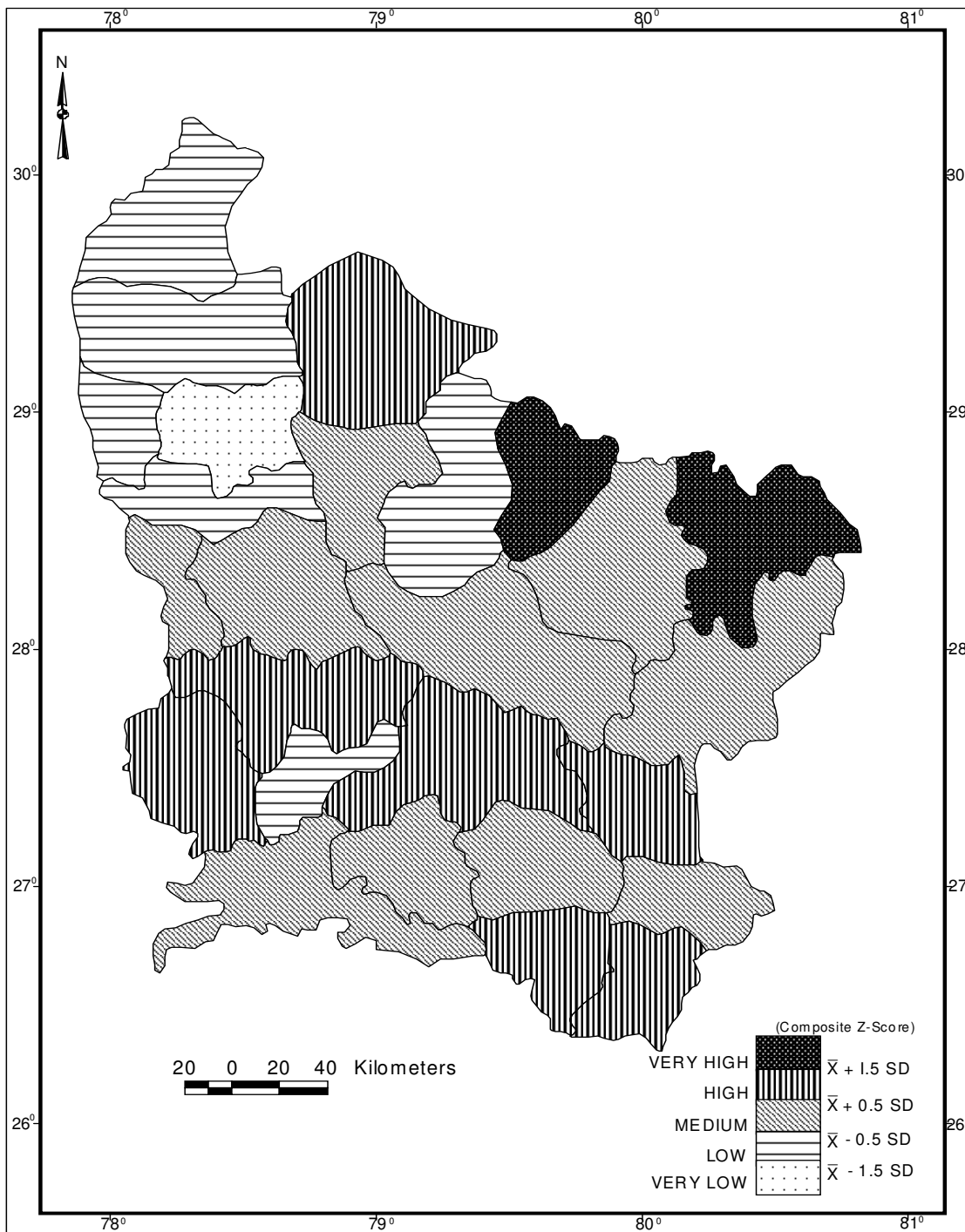


Figure 2. Food availability regions in Western Uttar Pradesh.

and southern portion of the study area.

All indicators of stability are high in these areas except productivity. Public distribution system is the most important indicator to identifying a food stable region. Medium food stability region makes a fairly extensive area on the north eastern portion and southern portion of the study area, both regions contain nine districts.

Three districts, namely, Saharanpur, Bijnor and Hathras fall under the low concentration of food stability region. Very low concentration of food stability region forms four districts of Meerut, Baghpat, Ghaziabad and Goutam Buddha Nagar which lie in the western pocket of the study area. These districts are low due to low productivity and high density of population.

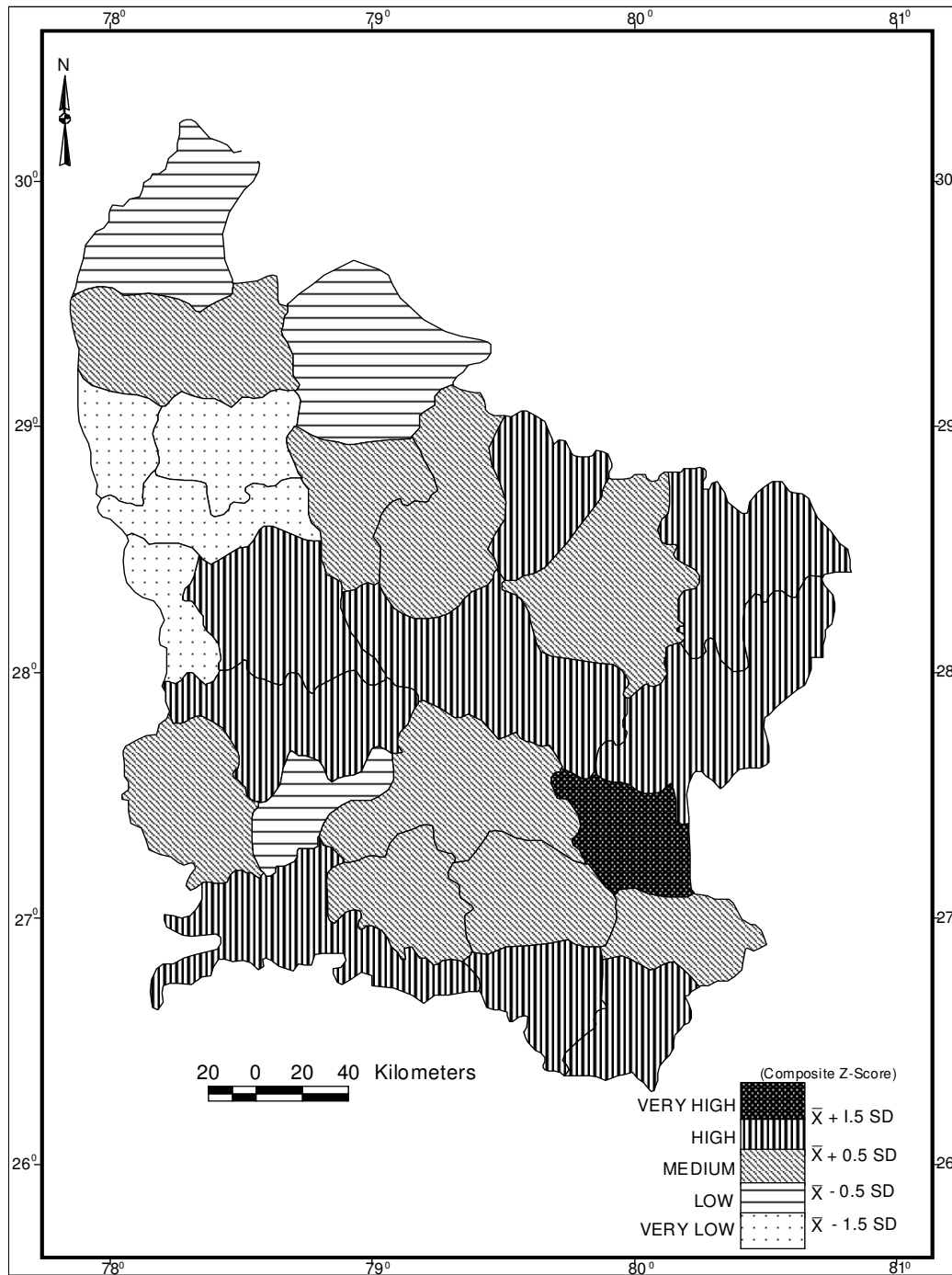


Figure 3. Food stability regions in Western Uttar Pradesh.

ASPATIAL DISTRIBUTIONAL PATTERN OF FOOD ACCESSIBILITY

'Access to adequate food for all people at all times is defined as 'food security' (World Bank, 1986). Food security is not only dependent upon food availability and stability but also upon accessibility. The majority of

malnourished people cannot produce or afford to buy enough food. They have inadequate access to natural resources, jobs, income or social scores (Chatarvedi, 1997). Food accessibility is the composite result of indicators like purchasing power, employment and literacy rate (Tables 2 and 3). Purchasing power, employment and literacy rate are the variables of analysis of food

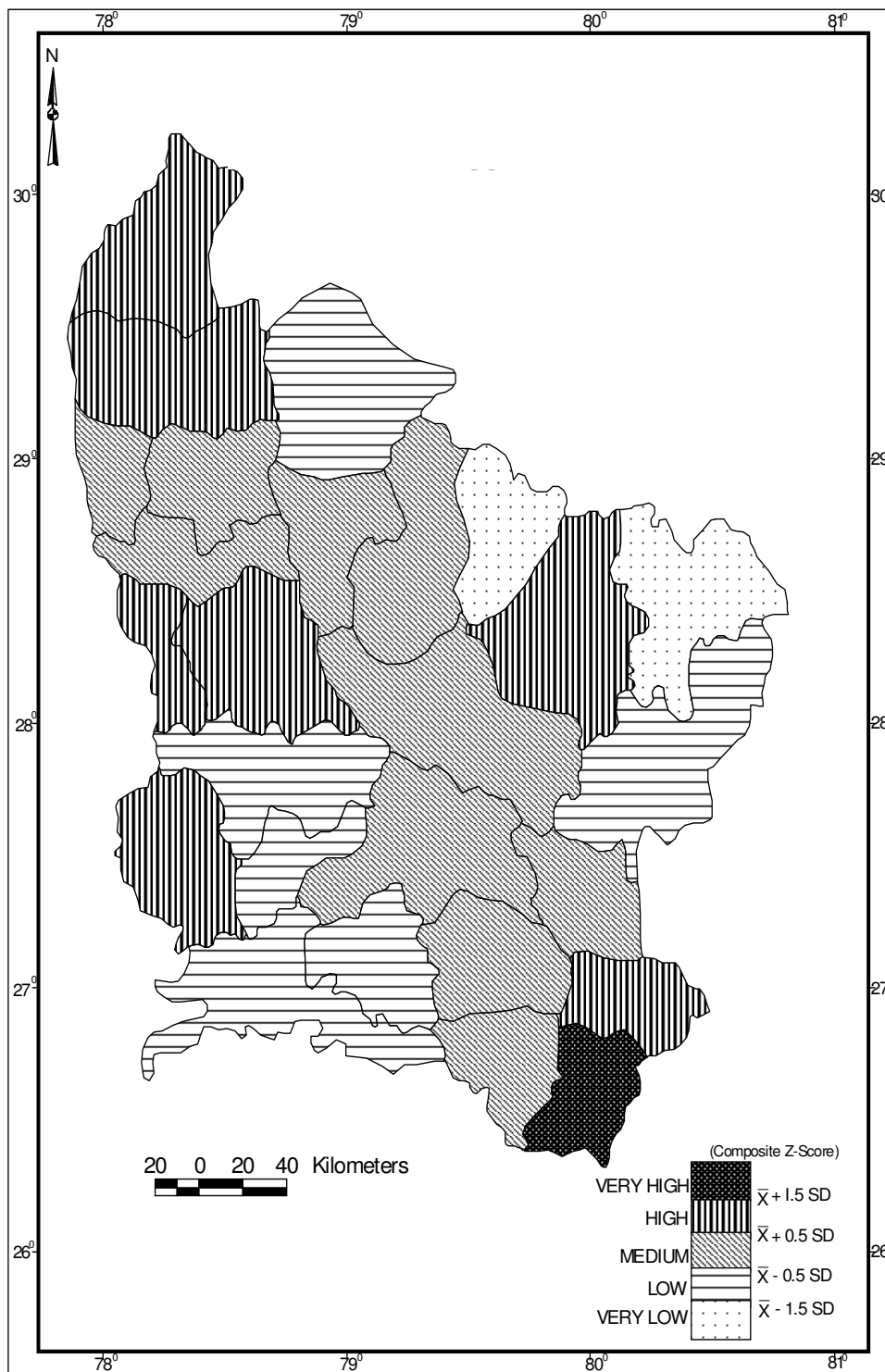


Figure 4. Food accessibility regions in Western Uttar Pradesh.

accessibility. The standardized z-scores of these variables are added in order to get the weight of food accessibility regions (Table 4).

Figure 4 reveals that Auraiya district is the only district

with a very high grade of food accessibility. High grade of food accessibility region includes seven districts namely; Saharanpur, Muzaffarnagar, Bareilly, Goutam Buddha Nagar, Bulandshahr, Mathura and Etawah. These

Table 5. Matrix correlation between the indicators of Food Security

	Food security	Food availability	Food stability	Food accessibility
Food security	1			
Food availability	0.86*	1	1	
Food stability	0.81*	0.70*	-0.07	1
Food accessibility	0.27	-0.11		

*Correlation is significant at the 1 per cent. ** Correlation is significant at the 5%.

districts witnessed high accessibility of food due to high purchasing power and employment which leads to increase in food security. But the region of high accessibility of food is dotted over some areas with lack of crop production and high population density. Food accessibility is most positively correlated to purchasing power. Literacy rate is the most important factor in eliminating poverty and to increase the knowledge of farmers to use new technology in a proper way. Medium grade of food accessibility regions are demarcated in ten districts of the study area. Six districts, namely, Shahjahanpur, Aligarh, Hathras, Bijnor, Agra and Firozabad lie in the low grade of food accessibility region. Very low grade food accessibility region form two districts, namely; Pilibhit and Rampur which lie in eastern portion of the study area. These areas are low in food accessibility due to unemployment and high poverty.

A REGIONAL ANALYSIS OF FOOD SECURITY

The foregoing analysis clearly reveals that there is a lot of variation in the level of food availability, food stability and food accessibility across the districts in Western U.P. In order to assess overall food security, composite z-scores of nine variables, including three each of food availability, three stability and three of accessibility have been added (Table 4). To divide the western Uttar Pradesh into food security regions, the composite standardized z-scores values are categorized into five grades of very high, high, medium, low and very low.

Figure 5 reveals that the district of Mathura, Etawah and Auraiya in the southern part of the study area are regions of very high food security. High food security regions are in the concentrated part of the study area and are characterized by high concentration of food stability consequent upon high storage capacity, public distribution system, high food grains production, low population density and high large size land holdings which results in higher rural development. So, purchasing power and employment are the main factors of high level food security in these regions. Three districts, namely, Bijnor, Jyotiba Phule Nagar and Bareilly come under the medium grade of food security regions. Goutam Buddha Nagar, Muzaffarnagar, Saharanpur, Moradabad, Firozabad and Agra come under the low concentration food security region scattered throughout the study area.

Very low grade of food security region are concentrated in four districts including Ghaziabad, Hathras, Meerut and Baghpat which lie in the western part of the study area. These districts are low in food security due to lack of fair price shops, low purchasing power, lack of storage capacity and lack of food grains production. Low level of food security decreases rural development.

DIMENSIONS OF CORRELATION AND LEVELS OF SIGNIFICANCE BETWEEN THE VARIABLES OF FOOD SECURITY

Finally to find out the relationship between the variables of food security, an effort has been made to work out on the basis of correlation matrix. These have been symbolized and presented in Table 5 Karl Pearson's Correlation Coefficient technique has been used to find out the relationship among them and the level of significance has been tested by employing students't test technique.

Thus it have been concluded through Table 4 which reveals that the food security is positively correlated with food availability ($r=0.86$) and food stability ($r=0.81$) at 1 per cent level of significance. However, it is positively correlated to food accessibility ($r=0.27$) but none is significant up to the accepted level. It may be asserted from the analysis that food security of the region depends on food availability and food stability. But food availability does not significantly affect 'the food stability. It is mainly due to the fact that, with the industrialization, urbanization, commercialization and technological innovation in agriculture, farmers tend to cultivate cash crops for quick earning. The large scale cultivation of cash crops, hampers the production of foodgrain crops, subsequently the foodgrain availability decreases. Food availability is strongly correlated to food stability ($r=0.70$) at 1 per cent level of significance. It is negatively correlated to food accessibility. It is clear from the analysis that food availability and stability are interdependent and interrelated. It may be said that, food stability may increase as much as the food availability increases.

Conclusion

Food security is positively correlated to food availability stability and accessibility. Food availability and stability

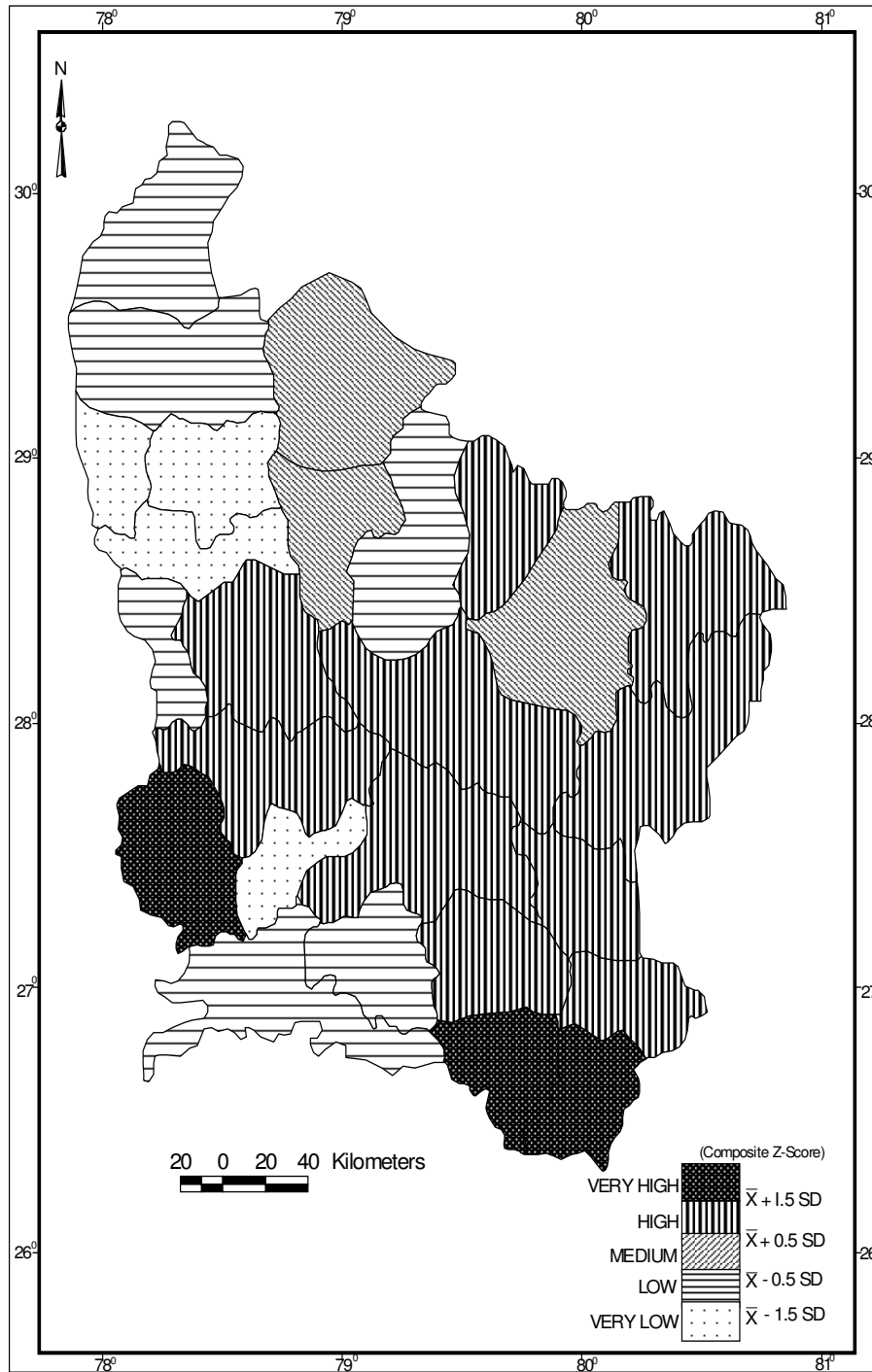


Figure 5. Food security regions in Western Uttar Pradesh.

are interdependent. But food availability is reducing mainly due to the transformation of cereal crop cultivation into commercial cropping. Food stability may be reduced due to changing land use pattern associated with Industrialization, commercialization and globalization. Food accessibility merely depends on the purchasing power of inhabitants and is different from food availability and

stability. It is mainly due to the fact that, with industrialization, urbanization, commercialization and technological innovation in agriculture, farmers tend to cultivate cash crops for quick earning. The large scale cultivation of cash crops severely hampers the production of food grains and subsequently, food grains availability is gradually reduced.

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