Trans. Inst. Indian Geographers
Vol. 3, No. 2, July 1981

SPATIAL PERSPECTIVE ON THE AVAILABILITY OF FOODGRAINS IN NORTH BIHAR PLAIN-WEST OF THE KOSI

K. K. DAS, Bhagalpur

ABSTRACT : The study region has a massive population base and an extremely high man-land ratio. Agriculture is the sole support of an overwhelming majority (over 90% of the rural masses in which raising of cereals has a place of pride in the area. But the condition that obtains. in respect of foodgrains supply is dismal. Spatial perspective on the availability of foodgrains, 1971 has been obtained by computing statistically surplus/deficit of foodgrains in percentage for all the 180 anchals and has been depicted on maps with Choropleth method. Categorization for spatial pattern was done keeping in view the regional average. The various parts of the study region were classified. (i) Surplus, areas, (ii) Marginal deficit areas, (iii) Low deficit areas, (iv) High deficit areas, and (v) Severe deficit areas. The regional variations depend essentially upon ecological as well as demographic factors. Over half of the region faced acute foodgrains shortages. Productive efficiency and sufficiency in foodgrains do not reveal positive correlation. Further, the actual consusumption of the rural mass heavily depends on its purchasing power. However, in a purely agricultural economy the purchasing power aspect of foodgrains supply does not bear much relevance. So, in order to enhance food supply and reduce food deficit, we shall have to put premium on agricultural growth rates in the region.

Regional Setting : North Bihar Plain-West of the Kosi is a compact area constituting the major part of the Bihar Plain lying wholly to the north of the Ganga river. It is hemmed in between the parallels of 25°12'15" and 27°37'0" N. and meridians of 83°50'0" and 87° 15' 0" E, and covers an area of 35,823 Km^2. It had a total popuation of 20.01 millions in 1971. The region is separated from Nepal in the north by the Bihar-Nepal international border while it is broadly delimited by the Ganga river in the south. In the west, the regional boundary is co-terminous with the eastern extension of Uttar Pradesh while the Kosi river sets its eastern limit. It comprises, wholly or in part, some 14 newly re-organised districts, viz., West Champaran, East Champaran, Gopalganj, Siwan, Saran, Vaishali, Muzaffarpur, Sitamarhi, Madhubani, Darbhanga, Samastipur, Begusarai together with Khagria (Monghyr) and Naugachhia (Bhagalpur) subdivisions. In all there are 180 *anchals* for which agricultural and population data pertaining to 1971 have been compiled and computed.

General Background of the Study

With only 20.6 per cent. of the total area of the State of Bihar the study region contains over 35 per cent. of its total population, indicating a high location quotient of 1 : 8.The area forms a solid block of entremely dense population, average being 535 persons per Km^2 and is easily one of the most congested rural tracts in India (Dayal, 1968). Barring a few exceptions the central

south, south west and central north are generally areas of high to very high (635 person per Km^2) population agglomeration and in all, occur over one-third (in 66 *anchals* out of 180) of the region. By contrast, density of population is low to very low (under 435 persons per Km^2) in only 25 *anchals* out of a total of 180. The eastern portions, particularly the south east as well as large chunks of land lying mostly in the floodplains of the Kosi and Kamla-Balan rivers together with the north west lying in the hilly and forested Siwalik Zones are characterised by low concentration of population. Moderate to moderately high density of population (435-635 persons per Km^2) occur over half (in 89 anchals out of 180) of the region and are most extensive forming compact blocks in mid west, central east and east of the region. The area, on the whole, is representative of one of the early settled portions of the Middle Ganga Plain and in which the pressure of population on land resources is intense.

In North Bihar Plain in general and the area lying to the west of the Kosi river in particular, a massive population base and an extremely high man-land ratio coupled with traditional subsistence agriculture are symptomatic of stagnant economy. The area is par excellence agricnltural as an over-whelming majority (over 90%) of the rural masses is dependent on it and a preponderantly high proportion of 79 of the total land is cultivated. *Aghani* and *rabi* harvests with 35.27 and 34.62 per cent respectively of sown area (T.S.A.) are most important in the region. They are followed by *bhadai* (23.53%) and *garma* harvests (6.56%) which taken together account for about one-third of T.S.A. Among seasonal crops that are grown in the area raising of food crops is overwhelmingly important (over 88% of T. S. A.) in which cereals have a place of pride. Proportion of area under food crops varies from a maximum of 96.48 in Sikta *anchal* to a minimum of 70.84 in Chanpatia *anchal* - both in West Champaran district. Broadly speaking, areas lying in the easten half as also in west and south have over 90 per cent of T.S.A. under food crops and are the most extensive tracts in the entire region. Areas with medium to relatively high proportion of T. S. A. (70-80%) under food crops are found in compact block in the south together with five small patches scattered over west and south of the region. In rest of the area proportion of T. S. A. under food crops is high (80 to 90%) which are mainly found in the north-west, south-west, east, north and south-east of the region. But paradoxically enough agriculture is beset with lack of assured irrigation facilities together with frequent occurrences of floods and droughts apart from inadequacy of other infrastructural components, etc. The net result is that despite flat alluvial plain, favourable subtropical monsoon and pristive richness of the soils conducive for prosperous farming, proportion of multiple cropping is yet low (46%) as also poor yields from the farm are obtained and the condition that obtains in the study area in respect of food supply therefore is dismal.

The area under study thus possesses distinct geographical personality of its own in which a great majority of the rural people appears to be underfed and malnourished. However, the author's adherence of study here is strictly with the quantity of food supply and not to the quality of the diet. How far do the agricultural produce conform to the food requirements of the regional population ? And what is the extent of available and needed food quantum in the area ? In the present paper therefore an attempt has been (i) to measure the available quantum of foodgrains in the region, (ii) to reveal distributionl pattern of foodgrain surplus / deficit quantum, and (iii) finally,to make its interpretative analysis. Since the study area is overwhelmingly rural (about 95% of its population living in over 20,000 villages) the paper deals exclusively

with rural data.

Previous Investigations and Methodology

Commendable treatise of micro-level studies is available from the works of Shafi (1960), Krishan (1970) and Das (1972) besides Singh (1947), Sen Gupta (1975) and Mitra (1980) at the national level. These ex-quisite works shed valuable light on quantitative and qualitative traits of food balance sheet.

A table showing total production of cereals pulses and sweet potatoes and their daily availability per capita per day together with per head per annum surplus or deficit foodgrains in producing areas has been made. Average per hectare yields of crops were not available for small administrative unit below the district level and as such **ancbal** level data on yield rates have been estimated on the basis of average yields .for districts. While estimating yields of different crops district average and land capability scores of all the 180 anchals of this micro-region have been taken into account. The cereals considered here include rice (both *bhadai* and *aghnai*) wheat, maize, *marua* and millets and pulsse need no elucidation. These two viz., cereals and pulses are collectively designated as food grains (Adige, 1974). It is important to note that in the Indian situation of a legume culture the adequacy of calories rather than of proteins is significant in the diet (Mitra and Mukherji, 1980). The present study therefore attempts to find answers only in terms of cereals and pulses intakes and their requirements for the population. Sweet potato is an important supplementary food in rhe area and has been termed as famine food. (Aykroyd, 1966). The per hectare yield of most grains have been practically at the same level for the last several years as there has been little development of facilities for irrigation and improvement in croppiag conditions. The increase in population, on the other hand, has brought out reduction in the per capita availability of cereals and pulses per annum per day.

According to the recommendations of the Nutritional Advisory Committee, the foodgrain requirement in a balanced diet of an adult male in India is 397 gms. of cereals and 85 gms. of pulses per day. The balanced diet includes several items of what are known as protective foods such as milk, meat, egg, etc. Since these protective foods are not being produced at presant in quantities adequate for balanced diet, a large majority of the people have to make up for these deficiency by additional consumption of cereals (Chopra, 1975). According to Sukhatme 403 gms· of cereals is needed to meet minimum nutritive target. It is to be noted here that consumption of cereals and pulses is relatively high in rural areas than in urban centres. It is thus difficult to prescribe one particular yardstick as to the caloric need of a population as dietary standards widely vary in different parts of the country and among different ethnic groups. The present exercise therefore begins by assuming national average requirements of cereals and pulses for the entire population irrespective of age-sex biological groups. The estimated calories by Singh for the whole day for an adult work out to 2580 which are in tune with Aykroyd intake of 2600. Sukhatme argues for the average requirement per capita per day at the physiological level (calories from food actually consumed) should be at least 2100 (Sukhatme, 1961). More recently, SenGupta, on the other hand has recommended the average caloric requirement of 2300 apart from ICMR (1968) recommended requirement of 2400 and FAO/WHO (1971) 2170 calories per capita per day are significant at the national level. At the micro-level Shafi on the basis of his findings placed it at 2,000 calories for eastern Uttar Pradesh and considers the figure to be adequate and a reasonable minimum requirement under Indian condition. Das, on the other hand, has found out the average at 2052 calories on the basis of his micro level studies of 7

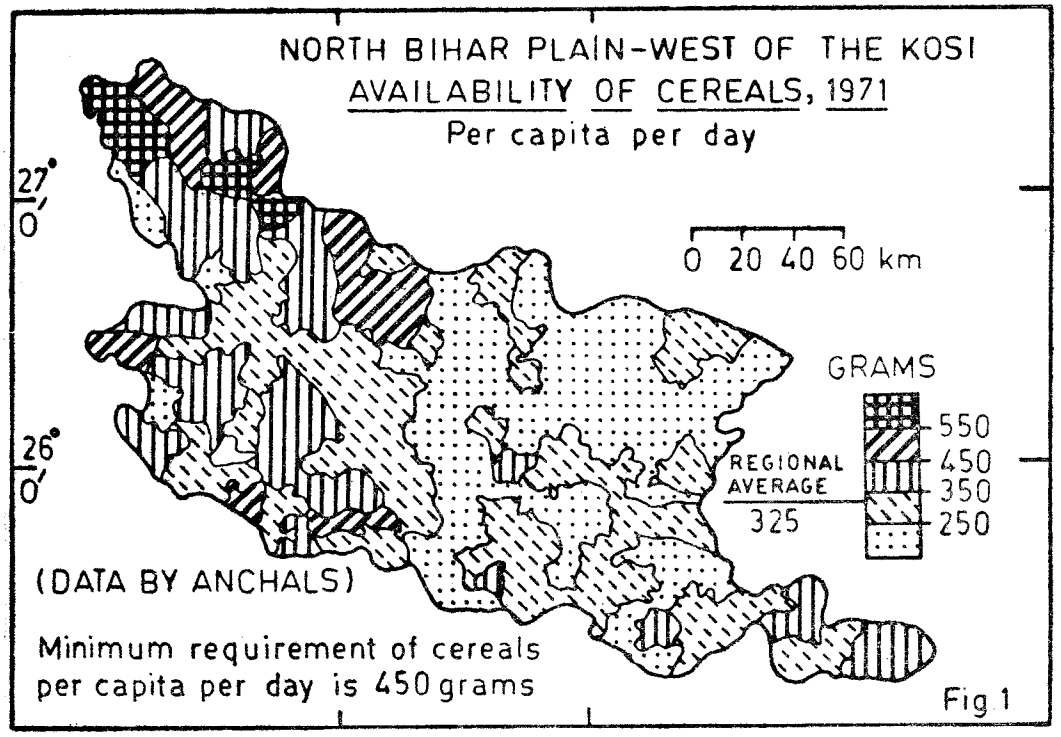

NORTH BIHAR PLAIN-WEST OF THE KOSI
AVAILABILITY OF CEREALS, 1971
Per capita per day
27° 0′
26° 0′
0 20 40 60 km
GRAMS
550
450
350
250
REGIONAL AVERAGE
325
(DATA BY ANCHALS)
Minimum requirement of cereals per capita per day is 450 grams

Fig 1

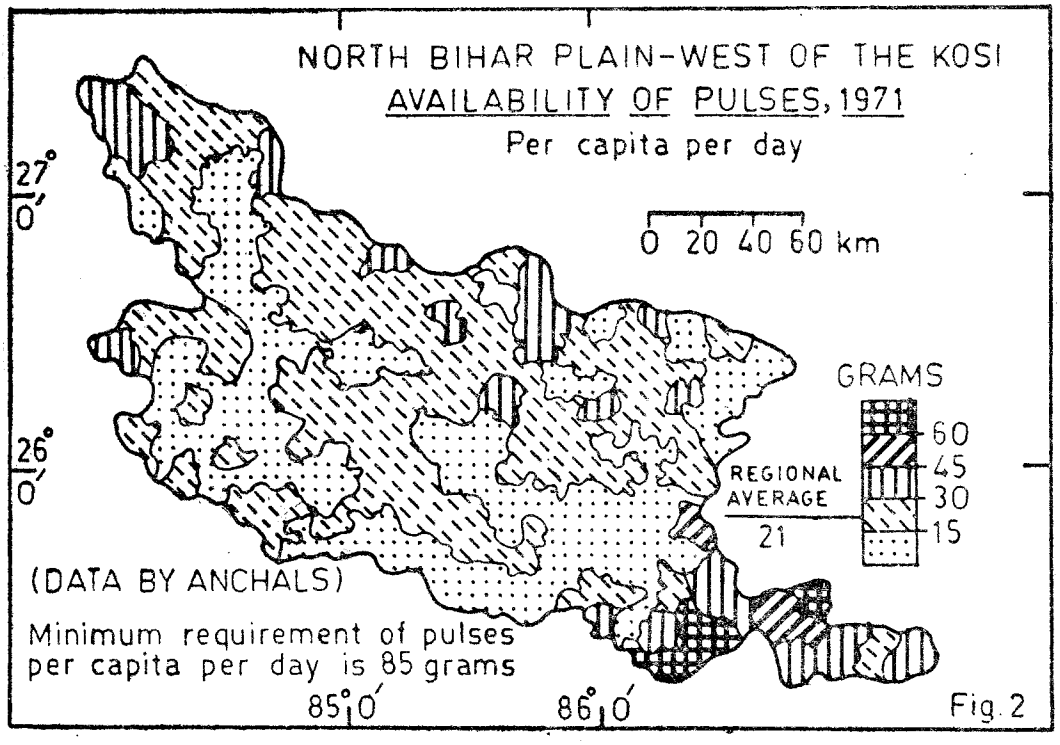

NORTH BIHAR PLAIN-WEST OF THE KOSI
AVAILABILITY OF PULSES, 1971
Per capita per day
27° 0′
26° 0′
0 20 40 60 km
GRAMS
60
45
30
15
REGIONAL AVERAGE
21
(DATA BY ANCHALS)
Minimum requirement of pulses per capita per day is 85 grams
85° 0′
86° 0′

Fig. 2

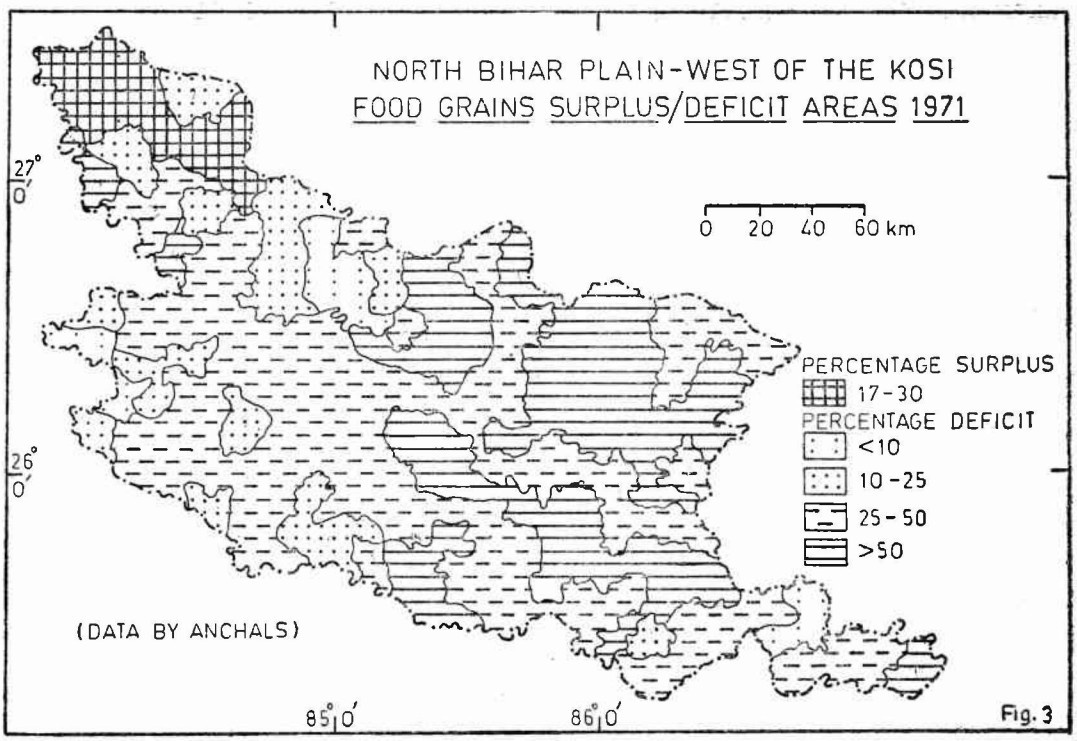
selected villages in the Kosi Region, Bihar. The present study area lies in between Shafi's eastern Uttar Pradesh on theWest and Das's Kosi region in the east and has almost similar geo-economic-demographic structure. It has, therefore, been found advisable to base arguments following them. A difference of 52 calories per head per day does not make any material change and the daily calorific requirement of 2,000 or 2,052 is estimated to be available from 580 gms. of food out of which approximately 450 gms. or 0.45 Kg. are estimated to be obtained from cereals and the balance of 130 gms. in the shape of pulses, edible oil, carbohydrates, animal products, etc. (Shafi, 1960). About 0.45 Kg. of cereals per head per day is therefore a critical point for the sustenance of the mankind as a whole (Stamp, 1964). *Anchal* of the region with less than and greater than 0.45 Kg or 450 gms. per capita of available cere als per day are therefore deficit and sur plus areas respectively. Surplus / deficit of foodgrains per head in percentage has been calculated as under : Surplus or deficit of foodgrains in gms. per head per day X 100/535 gms.

(i. e. per head daily requirement of foodgrains including 450 gms. cereals and 85 gms. pulses).

Spatial Patterns : Availability of Cereals

The regional average in respect of the availability of cereals stands at 325 gms per head per day, national average being 420 gms. as against a minimum quantum of 450 gms. This clearly implies an overall deficit in supply of cereals to the extent of 125 gms. per capita per day in the region. An examination of Fig: 1 reveals marked disparities in the availability of cereals in different *anchals* for which data have been computed. It is heartening to note that in only 25 out of 180 *auchals* the per capita availability per day is more than 400 gms. while in remaining 155 *anchals* the figures are less than the required value and range from severe through small to marginal shortages. The surplus cereals availability co-exists with moderate densities of population and such areas are found in north western portion of the region. The surplus is however insignificant in most of these *anchals* where it hardly exceeds 30 gms. except in few *anchals*, eg. in Sikta, Sidhaw, Narkatiaganj, Ramnagar, Mainatanr, Motihari, Patahi and Dariapur where the value exceeds 500 gms. In about 11 *anchals* this availability is just adequate. The fact remains that more than four-fifths of the region is deficit and even after consuming supplementary food (sweet potato and minor crops) people survive partly on the supply of imported grains distributed through Government fair price shops. Among the reasons for continued and widespread deficit in cereals (despite their increased production) may be attributed to rapidly growing demands. In spite of a very favourable ecological environment and a high proportion of cultivated land, total yields are at present low and inadequate primarily for two reasons : (i) primitive methods of farming, and (ii) insufficient inputs in agriculture. Prevailing poverty and ignorance of the farmers due to high illiteracy are the root causes of this sorry state of affairs. The bulk of them respond slowly to institutional measures adopted by the Government and fostered through *anchals*-cum-development blocks.

Areas with small to severe shortages of cereals co-exist with high densities of population. Shortages of cereals are partly met by consumption of sweet potatoes grown locally and seasonal consumption of mango, jack fruit, banana, *lithi*, etc., in large quantities, for which the area has a place of pride in the entire state. Further it is interesting to note that areas of small to severe shortage of cereals grow sweet potatoes as much as possible though its cropland does not have a wide coverage. It constitutes the main diet of the poor strata of the society owing to its cheap selling price. It is important to note here that areas of efficiently grown cereals also



form small to severe deficit areas in the availability of cereals. In other words, there does not exist any correlation between productive efficiency and sufficiency in food. Rather, less praductive areas are sufficiency areas since the population pressure in them is less acute.

Availability of Pulses

Fig. 2 showing per capita availability of pulses and empirical findings about protective food items like fruits and vegetables, milk, meat and eggs indicate marked deficiencies in regard to each of the above items. The deficiencies are particularly large respect of pulses. Among other factors it may be attributed to too much attention given to the raising of high-yielding cereals and therefore the production of pulse has decresed considerably and our per caput per day supply is significantly low. The fact is corroborated well in the study region in which large areas previously under pulse culture as second crop in the crop association have now been largely replaced by wheat. The regional average in respect of the availability of pulses is only 21 gms per head per day against a minimum requirement of 85 gms. The national average is 47 gms. No part of the region has even near sufficiency in pulses. However, the relative position in south east is a bit improved while it is the worst in the north west, south west and in the south. *ancnals* lying in the north comprising the districts of Sitamarhi and parts of Muzaffarpur and Madhubani enjoy middle position. In the composition of the common diet therefore creals constitute the stample food and pulses are comparatively less common and dairy products find little place. A vast majority of the people subsist on poor diets which contain too much of carbohydrates (starch) and too little of protein which are derived chiefly from pulses and and leafy vegetables. It has resulted in

undernutrition and ill-balanced diet has given rise to signs of malnutrition. Nutrition diseses are a common feature.

Foodgrains Surplus/Deficit Areas

Considering the above two maps and the data calculated on the methodology already explained, the whole region has been divided into five food surplus / deficit areas, viz., (i) Surplus areas. (ii) Marginal deficit areas (deficit below 10%), (iii) Low deficit areas (10–25%), (iv) High deficit areas (25–50%) and (v) Severe deficit areas (over 50%), assuming that 0.53 Kg. per day or 195.3 Kg. of foodgrains per annum is the minimum needed requirement Fig. 3 It is worthwhile to note that percentage deficit of foodgrains is invariably high in almost all the *anchals* of this micro-region. The regional variation, however, depends essentially upon ecological as well as demographic factors. The average deficit of foodgrains in the region is 35.4% which varies from a minimum of 3.18% in Bijaipur *anchals* (Gopalganj) to a maximum of 68.3 per cent in Bisfi *anchals* (Madhubani). A small area in the extreme north west is surplus so far as the availability of foodgrains, particularly of cereals, is concerned. It is noteworthy that as many as 175 *anchal* sout of a total of 180 were deficit in foodgrains and only 5 *anchals* namely Sikta, Sidhaw, Narkatiaganj, Ramnagar and Mainatanr (All in West Champaran) showed food surplus. No *anchals* of the surplus areas showed food surpluses of substantial amount. Further, none of the *anchals* of high density of population showed any food surplus.

The accompanying map reveals that as 51 *anchals* were subject to severe foodgrains deficit and in parts of north east, south east and central north, they form compact blocks separately. A few others were scattered over south and north western portions of the region. All these *anchals* have generally high to very high density of population (600 – 750 persons per Km^2) coupled with relatively poor cropping conditions as agriculture in these areas is beset with complete lack of irrigation facilities together with frequent occurrence of floods and droughts whereby agriculture fails in most of the years. These *anchals*, therefore, need urgent attention of agriculturalplanners and more investment in agricultural inputs like fertilizer and irrigation.

High deficits of foodgrains occurred over half (in 89 *anchals* out of 180) of the region, and were most extensive forming a compact block over the whole Gandak-Ghaghra interfluve in the south west, the Ganga riparian tract in the south together with parts of central north and Kosi flood plain in the east of this micro-region. However, this compact belt of high deficitt was interspersed with areas of severe deficit in the eastern half on the one hand, and low deficit in the western half on the other. Secondly, in the eastern half it is characterised by moderate to relatively high density of population (535–635 persons per Km^2 with more backward agricultural conditions which are subjected to both floods and droughts. In its western half there is though a bit improved cropping pattern but is offset by high through very high to extremely high density of population (635-893 persons per Km^2). Proportion of multiple cropping was everywhere high (over 60%). Security from floods in the Gandak-Ghagra interfluve and at least one secured good harvest, particularly in the Ganga riparian tract have provided some relief despite rural congestion in this vast tract of the region.

Areas having low (10-25%) to marginal deficits (below 10%) are widely scattered in the south west, north west and extreme south east. The former occurred in 26 *anchals*, 11 of which were in parant Champaran district alone in the north west. Champaran was followed by 5 *anchal* each of Siwan and saran and in Gopalganj in thesouth west and 1 *anchals* each in Begusarai and Naugachhia (Bhagalpur) in the extreme south east. Marginal deficit (near optimum conditions)

occurred in 9 *anchals* and were marked by patchy distribution. Of these, 4 *anchals* were again noticed in East Champaran alone in the north west, 2 each in Gopalganj (SW) and Khagaria (Monghyr in SE) and 1 in Siwan (SW). In all these sections they were patchy and on the whole covered a small proportion (1/5th) of the region's total area, In the north west and extreme south eastern portions a moderation in the foodgrains deficit may be attributed to relatively low density of population ranging between 335-535 persons per Km^2 and availability of irrigation facilities from Gandak Project in the case of former. Proportion of multiple cropping though at present ranged between 24-36 only the cropping conditions are fast improving after construction of the Tirhut Canal net. In the case of areas lying in the south west it may be explained due to the development of productive intensification of agriculture under Package Agricultural Development Programme in addition to other factors. Low to marginal deficit *anchals* generally have large urban populatien.

Summary and Conclusion

The preceding analysis of spatial distribution of *anchals* rated surplus or deficit in foodgrains shows that none of the *anchals* having high through very high to extremely high density of population had any food surplus. Over half of the region faced acute foodgrains shortages. According to Sukhatme one person ' out of every four of India's people appears to be underfed and two out of every four are matnourished. (Sukhatme, 1975). It may be safely concluded to be equally applicable in the study area. However, it does not mean that there is mass starvation in areas of high to severe deficiency of foodgrains, particularly in the extremely congested rural parts of the region. These *anchals* are in chronic need of foodgrains supplies from outside. The actual consumption of an individual or a family or a section of the population depends not so much on average availability but its purchasing power. Due to high pressure of population in the region, particularly in the parent districts of Saran, Muzaffarpur and Darbhanga, there is mass exodus of male working population in search of employment whereby they provide purchasing power for their respective families. Low purchasing power of the people gives a fluctuating trend. The food-for-work programme (now renamed the National Rural Employment Programme) recently launched by the government has wholesome impact on the food position, particularly among the agricultuaral labourers and the down-tro dden in the society. There are malpractices in the implementation of the programme which include mis-appropriation of foodgra ins by for bogus entries, delay in there supply and use of foodgrains for furtherence of political objectives etc. The rich and privileged eat all they need but the poor take only what they can afford which not always fully meet their needs. However, the crux of the problem is also to examine the relationship between family size and consumption of different sections of the population along with their economic aspects. In a purely agricultural economy the purchasing power aspect of food supply does not bear much relevance. So, in order to enhance food surplus and reduce food deficit,we shall have to put premium on agricultural growth rates, more efforts should go to productive intensive cultivation and multiple cropping through the provision of assured irrigation facilities and higher fertilizers use. Emphasis should also be laid on the raising of high-protein, high-yielding cereals in order to provide minimum requirement of the balanced diet.

Acknowledgement

The author is deeply indebted to his teacher, Dr. K. N. Das, Head of the Deptt. of Geography Bhaglpur University, Bhagalpur for looking through the manuscripts of the paper and for making useful suggstions.

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Address of the author

Dr. Kewal Krishna Lal Das, Lecturer, P. G. Deptt. of Geography, Bhagalpur University, Bhagalpur 812007.