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Surplus and Deficit Regions in Purvanchal: A Study based on Food Energy and Nutrition

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ABSTRACT:

The paper deals with the status of availability of food energy and nutrition in one of the most backward region of Uttar Pradesh during 1991 and 2008. The food grain was converted into Kcal and important nutrients as per the guidelines of Indian Council of Medical Research. The derived figures were divided by the total population and subtracted from the standard requirements to identify surplus and deficit areas in Purvanchal. It was found that Purvanchal is by and large in deficit of not only energy in Kcal, but in major nutrients also. There is found little change in the status over the period of time. Carbohydrates are the only nutrients in which the study area reported satisfactory result.

Keywords: Surplus, Deficit, Energy, Nutrients, Purvanchal

INTRODUCTION:

Humans need a wide range of nutrients to lead a healthy and active life, which can be derived only from a well balanced diet. As per the Food and Agriculture Organization (FAO, 2002 and 2006) about 852 million people worldwide are victims of malnutrition and acute hunger. There are thirty three countries where about 35 per cent population is undernourished. Majority of such people live in Asia and Africa.

Malnutrition is the one major causes of morbidity, mortality, loss of national productivity and medical expenses. Under nutrition contributes to 60 per cent of deaths due to infectious diseases like malaria, measles, diarrhoea, pneumonia and prenatal disorders in pre-school children. In India, 36 per cent deaths are due to communicable diseases, prenatal and maternal conditions and nutritional deficiencies (NSI-INSA-2009).

The body needs energy for maintaining body temperature and metabolic activities, and for supporting physical work and growth. The factors which influence energy needs are age, body size, physical activity and, to some extent, climate and altered physiological status such as pregnancy and lactation. The basic concept of estimating energy, calcium, protein and other nutrients is that unlike energy, protein is not stored in the body as a reserve and the daily protein intake should match the daily protein metabolism to satisfy a man's daily protein requirements.

At the time of independence India faced two major nutritional problems; one was the threat of famine and acute starvation due to lack of national and regional food security systems; the other was chronic-under nutrition due to low dietary intake because of lack of purchasing power among the poorer segments of the population.

One of the first efforts of India was to build up a food security system to ensure that the threat of famine no longer stalks the country. Investment in agriculture and the green revolution have ensured that the food production has kept pace with the population growth and by and large India remained self sufficient in food. Establishment of adequate buffer stocks has ensured availability of food stuffs within affordable cost even during the times of drought. The fact that India has not witnessed famine and acute starvation on a massive scale in the last five decades is the most eloquent testimony for the success of these efforts. According to recent National Family Health Survey (NFHS-3, 2005-2006) and UNICEF Reports (UNICEF: December 2007), 46 per cent of pre-school children and 30 per cent of adults in India suffer from moderate and severe grades of protein-calorie malnutrition as judged by anthropometric indicators. Currently, India is in nutrition transition with 10 per cent rural adults and 20 per cent urban adults suffering from over nutrition leading to an emerging double burden of malnutrition (Gopalan C., NFI Bulletin, November, 2008).

As per the findings of the latest National Family Health Survey (NFHS) conducted in 2005-06, 46 per cent children below the age of 3 years are underweight; 79 per cent children aged 6-35 months have anemia, as do 56 per cent of married women aged 15-49 years and 24 per cent of similar men; 33 per cent women and 28 per cent of men have a Body Mass Index (BMI) below normal and 58 per cent of pregnant women have anemia. Indicators are much worse in rural India. The disheartening fact is that these indicators have only marginally changed since the previous NFHS in 1998-99. In terms of calorie consumption, the picture is even worse. According to 2004-05 study by the National Sample Survey (NSSO), average daily intake of calories by the rural population has dropped from 2153 Kcal in 1993-94 to 2047 Kcal in 2004-05 indicating 4.9 per cent fall, as against a fall of 2.5 per cent (from 2071 Kcal to 2020 Kcal) in urban areas.

The purpose of the research in nutrition and availability of these nutrients is that whether the study area is sufficient enough to provide the real nutritional diets to the people or they suffer owing to nutritional deficiency.

STUDY AREA:

The Study area Purvanchal extends between 28^{o} 44” N to 24^{o} 26” N latitude and 80^{o} 03” E to 83^{o} 00” E longitude and consists of 27 districts of Uttar Pradesh. It lies in the fertile Indo Gangetic Plain. Physiographically the region lies in Gangetic Plain; the northern strip of the plain is called bhabar and Tarai and possesses some distinctive features of its own. The region experiences tropical to sub tropical monsoon type of climate (Figure 1).

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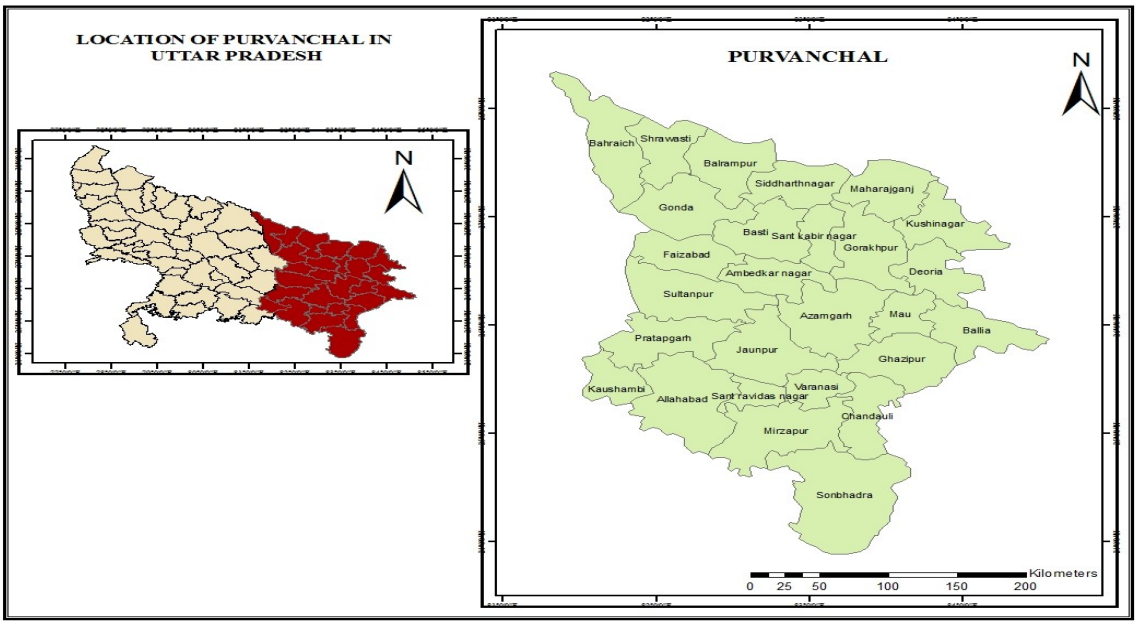

Figure 1: Study Area

OBJECTIVES:

The single objective of the paper is to assess the level of surplus and deficit in terms of Calories and major nutrients in Purvanchal

Material and Method:

The study is entirely based on secondary data obtained from Sankhyaki Patrika (Statistical Bulletins) of all the districts of Purvanchal from 1991-2008 and Agricultural Bulletins of Uttar Pradesh and Census of India for different periods. For assessing the level of surplus and deficit in term of energy and important nutrient, the standards developed by Indian Council of Medical Research (ICMR) were applied.

Spatial Pattern of Energy:

Calorie intake is not the only measure to determine the state of good health, but this is directly responsible for the occurrence of specific deficiency diseases. As per the ICMR the standard caloric requirement for average adult Indian is about 2400 Kcal. It varies for different social and age groups. In the present analysis average of 2400 calories is taken as standard for Purvanchal. While calculating per head/day availability of energy and major nutrients six cereal crops (wheat, rice, maize, barley, jowar, bajra) three dominant pulses (pigeon pea, red gram and peas) and three oilseeds (mustard, linseed, sesamum) were taken in to account.

The analysis reveals that in only five districts viz. Bahraich (3700 Kcal), Sharawasti (4208 Kcal), Balrampur (3783 Kcal), Maharajganj (3411 Kcal) and Chandauli (3177 Kcal) had energy availability of more than the standard. It is amazing to note that only seven districts reported deficit in food grains in absolute terms in 1991 depicting a sharp difference between

availability of food in energy terms. It may be because of the fact that all the districts were in short supply of oilseeds and major pulses in 1991. Besides, all the other districts have poor availability of energy. There are found eleven districts where the availability is less than 2000 calories per head/day ranging between 893 Kcal in Varanasi and 1939 Kcal in Mirzapur.

The average availability of calories in 2001 is 2149. The sorry state of availability of energy in Purvanchal is that the number of surplus districts has not only come down from five to four but the level also declined sharply. Highest availability of 2976 Kcal is recorded in Maharajganj in 2001. There are found sixteen districts where the energy availability is less than 2000 per head/day. In 2008, the average availability declined further to 1972 kcal. Varanasi with 746 calories remained on the last ladder. Sonbhadra district has emerged as surprise district because the availability dipped from 2808 to 806 kcal. The surplus districts though surplus marginally but the deficit districts are deficit significantly (Table 1 and Figures 2 a, b and c).

Table 1: Availability of Energy and Per cent Change, 1992, 2002 and 2006

	Availability of Kcal per head/day			Per cent Change	
Districts	**1991**	**2001**	**2008**	**1991-2001**	**2001-2008**
Bahraich	3799	2190	2708	-42.34	23.64
Shrawasti	4208	2703	1914	-35.76	-29.20
Balrampur	3783	1546	2111	-59.14	36.54
Gonda	2103	2372	1942	12.78	-18.09
Siddharthnagar	1445	2218	2746	53.43	23.82
Basti	2542	2002	1853	-21.23	-7.47
Sant Kabir Nagar	1838	1972	2122	7.29	7.61
Maharajganj	3411	2976	3035	-12.75	1.98
Gorakhpur	1736	1633	1613	-5.92	-1.23
Deoria	2275	1955	1954	-14.05	-0.07
Kushinagar	2011	1842	1723	-8.42	-6.43
Ballia	1566	1969	1752	25.74	-11.04
Mau	2227	1979	1498	-11.12	-24.29
Azamgarh	2102	2207	1961	5.02	-11.16
Faizabad	2249	1989	1472	-11.54	-26.01
Ambedkar Nagar	2330	2775	2367	19.11	-14.72
Sultanpur	2156	2283	2071	5.90	-9.28
Pratapgarh	1872	1816	1768	-3.02	-2.63
Jaunpur	2096	1887	1949	-9.98	3.25
Allahabad	1513	1672	1570	10.56	-6.10
Kaushambi	1891	1805	1652	-4.55	-8.47
Mirzapur	1939	2400	1797	23.76	-25.10
Ghazipur	2085	2026	2104	-2.84	3.84
Varanasi	893	912	746	2.19	-18.25
Chandauli	3177	2867	2920	-9.73	1.83
Sant Ravidas Nagar	1464	1238	1094	-15.47	-11.64
Sonbhadra	1678	2808	806	67.32	-71.30
Average	**2237**	**2075**	**1972**	**-1.28**	**-7.41**

Source: Economic and Statistics Department, Lucknow, 2010.

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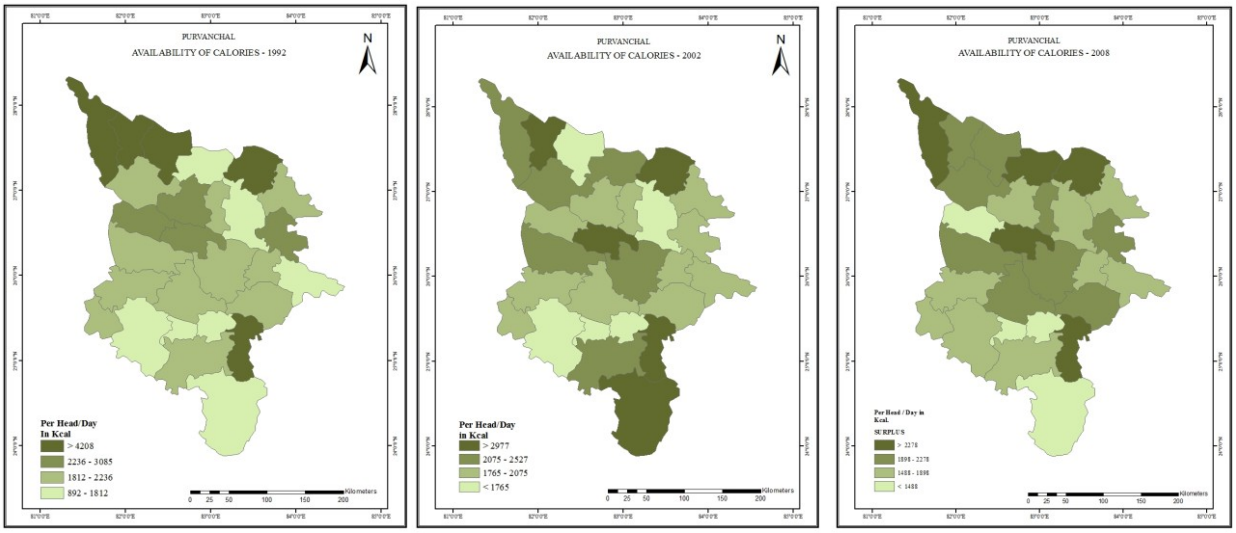

Figure 2: a, b, c: Availability of Calories, 1992, 2002 and 2006

Change analysis of energy availability reveals some abnormal situation. For, the districts with very high availability in 1991 recorded very high negative growth. All the Tarai districts experienced negative growth ranging between -35.76 and -59.14 per cent. The important growth features are that only eleven districts recorded positive growth with highest of 67 per cent in Sonbhadra and lowest of 2.19 per cent in Varanasi. The growth during 2001and 2008 repeats almost the same trend and pattern except that a good number of districts with positive growth during 1991-2001 have recorded a negative growth in the second phase. The growth pattern during both the phases does not follow any specific pattern (Table 1 and Figures 3 a, b).

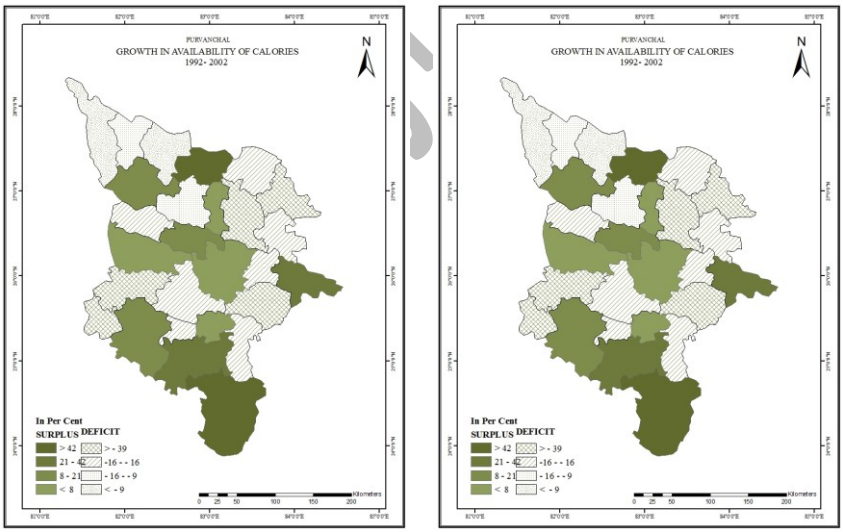

Figure 3: a, b: Per Cent Change in Availability of Calories, 1992-2002, 2002-2008

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AVAILABILITY OF NUTRIENTS:

Proteins:

The average daily protein requirement of an Indian adult, in terms of a high quality protein like milk, egg at the physiological level has been estimated to be 60 grams. One gram per kilogram of body weight is the RDA for men as well as women is suggested considering protein of mixed vegetable origin with NPU 65 relative to egg (ICMR-2010).

Table 2: Availability of Different Nutrients and Per cent change in 1992-2002, 2002-2008

	Carbohydrates / gm			Growth		Proteins /gm			Growth	
Districts	**1992**	**2002**	**2006**	**1992-2002**	**2002-2006**	**1992**	**2002**	**2006**	**1992-2002**	**2002-2006**
Bahraich	3799	441	560	-43	27	117	68	76	-42	13
Shrawasti	4208	546	396	-36	-27	130	83	54	-36	-35
Balrampur	3783	300	437	-60	46	116	50	59	-57	19
Gonda	2103	484	402	13	-17	64	71	55	11	-23
Siddharthnagar	1445	450	568	56	26	44	66	77	48	18
Basti	2542	409	383	-21	-6	76	59	52	-23	-12
Sant Kabir Nagar	1838	402	439	8	9	55	58	60	6	3
Maharajganj	3411	608	628	-12	3	101	86	85	-14	-1
Gorakhpur	1736	334	334	-6	0	51	47	45	-7	-4
Deoria	2275	400	404	-14	1	66	57	55	-14	-3
Kushinagar	2011	375	357	-8	-5	58	53	49	-9	-8
Ballia	1566	403	362	27	-10	50	59	49	18	-17
Mau	2227	407	310	-11	-24	66	58	42	-12	-27
Azamgarh	2102	454	406	5	-11	63	65	55	3	-15
Faizabad	2249	407	305	-12	-25	67	58	41	-13	-29
Ambedkar Nagar	2330	571	490	19	-14	70	80	67	15	-17
Sultanpur	2156	466	428	6	-8	67	69	58	3	-15
Pratapgarh	1872	370	366	-3	-1	58	56	50	-4	-11
Jaunpur	2096	387	403	-10	4	62	56	55	-11	-1
Allahabad	1513	339	325	11	-4	48	53	44	10	-16
Kaushambi	1891	361	342	-4	-5	68	62	47	-9	-25
Mirzapur	1939	484	372	25	-23	63	75	51	19	-32
Ghazipur	2085	415	435	-2	5	64	61	59	-5	-2
Varanasi	893	187	154	3	-18	28	27	21	-3	-22
Chandauli	3177	590	604	-10	2	94	84	82	-11	-2
Sant Ravidas Nagar	1464	254	226	-15	-11	45	37	31	-18	-16
Sonbhadra	1678	564	167	71	-70	54	87	23	60	-74
Average	**2237**	**423**	**393**	**-1**	**-6**	**68**	**62**	**53**	**-4**	**-13**

Table: 2 Continued….

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	Calcium / mg			Growth		Iron / mg			Growth	
Districts	**1992**	**2002**	**2006**	**1992-2002**	**2002-2006**	**1992**	**2002**	**2006**	**1992-2002**	**2002-2006**
Bahraich	371	218	206	-41	-5	46	27	31	-42	17
Shrawasti	409	262	146	-36	-44	51	33	22	-36	-32
Balrampur	386	187	161	-52	-14	47	20	24	-57	21
Gonda	194	211	148	8	-30	25	28	22	12	-20
Siddharthnagar	147	202	209	37	4	18	27	32	49	19
Basti	226	174	141	-23	-19	30	24	21	-21	-10
Sant Kabir Nagar	168	173	162	3	-7	22	23	24	6	4
Maharajganj	304	253	231	-17	-9	41	35	35	-14	0
Gorakhpur	151	138	123	-9	-11	21	19	19	-6	-3
Deoria	188	164	149	-13	-9	26	23	22	-13	-2
Kushinagar	174	158	131	-9	-17	24	22	20	-8	-10
Ballia	156	174	133	12	-23	19	23	20	24	-13
Mau	187	164	114	-12	-30	26	23	17	-11	-25
Azamgarh	181	185	149	2	-19	24	26	23	5	-12
Faizabad	198	171	112	-13	-35	26	23	17	-11	-28
Ambedkar Nagar	202	226	180	12	-20	27	32	27	19	-16
Sultanpur	202	205	158	2	-23	25	27	24	6	-11
Pratapgarh	176	169	135	-4	-21	22	21	20	-3	-5
Jaunpur	182	160	148	-12	-7	24	22	22	-10	2
Allahabad	152	164	120	8	-27	18	20	18	10	-10
Kaushambi	238	209	126	-12	-40	23	22	19	-5	-14
Mirzapur	213	240	137	12	-43	24	29	21	21	-29
Ghazipur	192	177	160	-8	-9	24	24	24	-3	2
Varanasi	84	77	57	-7	-27	11	11	9	1	-19
Chandauli	275	238	222	-13	-7	37	33	34	-10	1
Sant Ravidas Nagar	135	107	83	-21	-22	17	14	13	-16	-13
Sonbhadra	196	283	61	44	-78	21	34	9	60	-73
Average	**211**	**188**	**145**	**-2**	**-22**	**27**	**25**	**22**	**-2**	**-10**

Pulses are an important source of proteins. Being traditional society by and large Indians are vegetarian and rely heavily on proteins available from pulses alone. It is surprising to find that in spite being deficit in pulses in absolute terms the region is quite sufficient in proteins as seventeen districts are sufficient enough in providing protein to their existing population in 1991.

In 2001, the average per head/day availability of proteins is 62 grams, slightly more than the requirement. The number as well as the level of protein surplus districts declined Significantly. It follows almost the same pattern as that of availability of calories. For, every district recorded a decline but highest decline is reported in the districts which was highest surplus in 1991. Not a single district touched the figure of 100 grams rather majority hovered around 50 grams in 2001 (Table 2 and Figures 4 a, b and c). The situation in 2008 though based on projected values, yet reflects the hidden trend in the availability. The average

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availability declined further to 53 grams in 2008. Only a few districts were which were put under surplus category otherwise majority is in deficit. It is found that those districts were in deficit in 1991 having moved to surplus category in 2008.

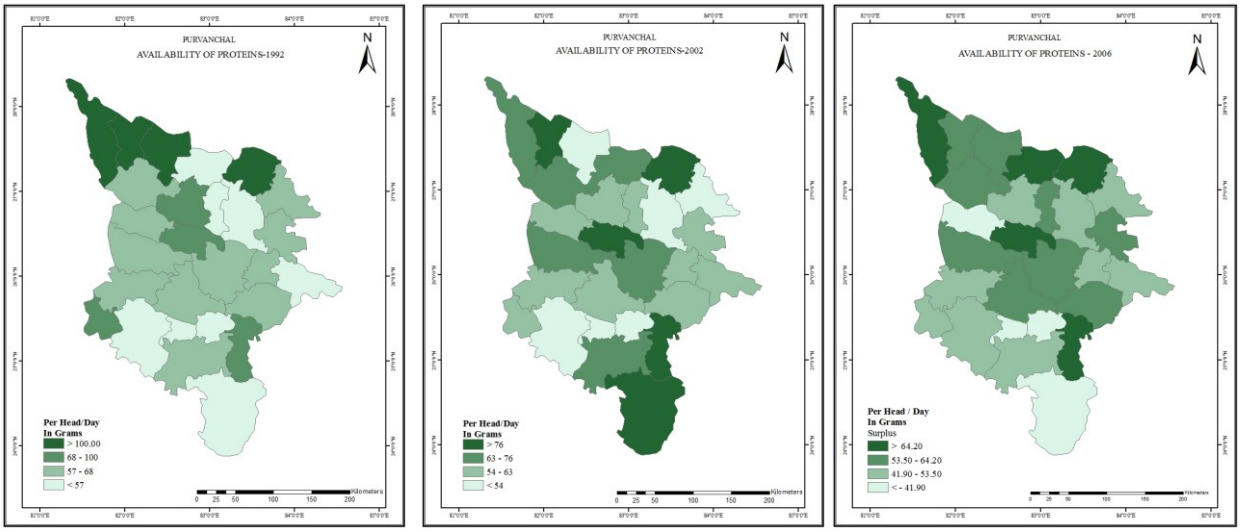

Figure 4: a, b, c: Availability of Proteins, 1992, 2002 and 2006

Change analysis of proteins reveals that though about 50 per cent districts recorded a positive growth in the availability of proteins but it does not have any specific pattern. It ranges between a high of 60 per cent in Sant Ravidas Nagar and a low of 3 per cent in Azamgarh. The other worth mentioning districts are Siddharthnagar (48 %), Ballia (18 %), Mirzapur (19 %) and Ambedkarnagar (15 %). The situation of protein availability declined further during 2001-2008. With the exception of Sant Kabir Nagar (3 %) and Balrampur (19 %) and Bahraich (13 %), all the other districts recorded a negative growth ranging between -74 per cent in Sant Ravidas Nagar and -1 per cent in Jaunpur. The general pattern is such that high negative growth is found in Tarai districts. In the southern districts the growth is low. In between these two the negative growth rate is highest in the central part (Figures 5 a, b)

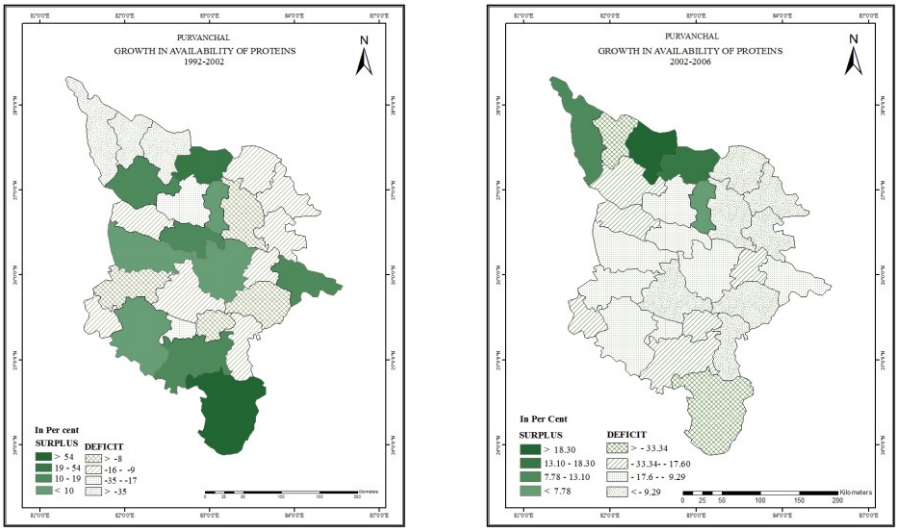

Figure 5: a, b: Per Cent Growth in Availability of Proteins, 1992-2002, 2002-2006

Calcium:

Calcium is a vital mineral that our body uses to stabilize blood pressure and build strong bones and teeth. Milk is a rich source of calcium. Calcium intake is fairly high (1 gram or more a day) in communities that consume plenty of milk as in the West. However, in developing countries where milk intake is low, most dietary calcium comes from cereals. Since these are only a moderate source, the daily intake of Calcium in such communities is in a low range of 300-600 mg a day (ICMR-2010). The daily requirement of calcium is 400 mg. It is observed in Table 2 and Figures 6 a, b and c that out of 27 districts, only Shrawasti district is sufficient in terms of availability of Calcium in 1991 while in 2001, not even a single district is sufficient in availability in calcium. Furthermore, all 27 districts showing a great sign of failure in terms of availability of Calcium. The average availability of calcium in 2008 was 145 gms per head/day. It means that there is a deficit of about 255 grams per head/day.

Change Analysis shows a mix pattern. The average growth during 1991-2001 is -2 per cent. Except Siddhartha Nagar (37 %), Gonda (8 %), Sant Kabir Nagar (3 %), Allahabad (8 %), Sultanpur (2 %) and SonbChange Analysis shows a mix pattern. The average growth during 1991-2001 is -2 per cent. Except Siddhartha Nagar (37 %), Gonda (8 %), Sant Kabir Nagar (3 %), Allahabad (8 %), Sultanpur (2 %) and Sonbhadra (44 %) all other districts recorded negative growth ranging between -52 per cent in Balrampur and -7 per cent in Varanasi. The situation during 2001-2008 has deteriorated sharply as all the districts recorded negative growth of more than -5 per cent (Figures 7 a and b).

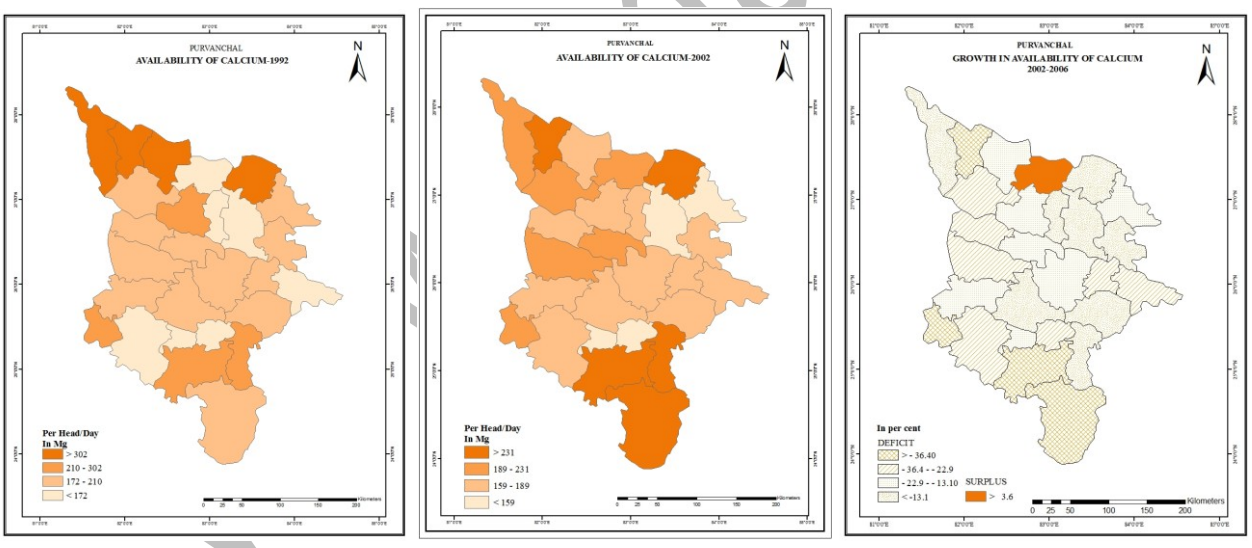

Figure 6: a, b, c: Availability of Calcium, 1992, 2002 and 2006

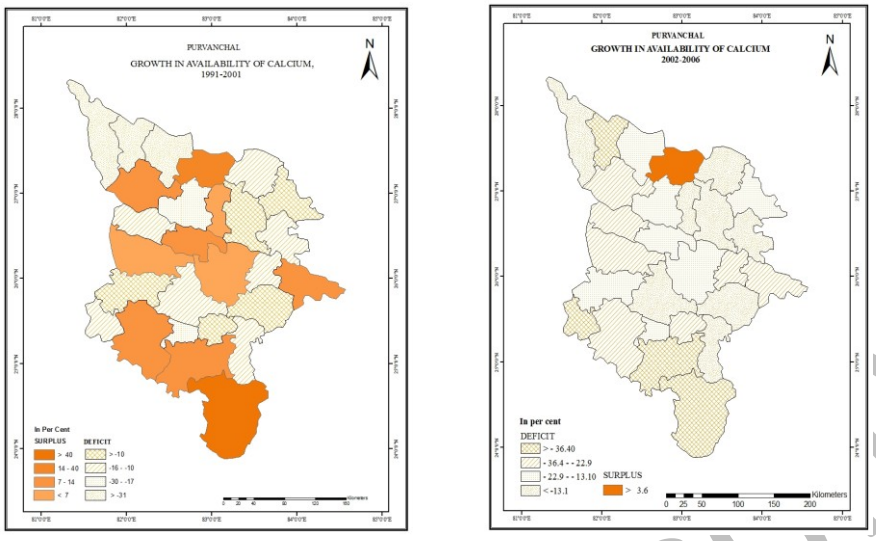

Figure 7: a, b: Per Cent Growth in Availability of Calcium, 1992-2002, 2002-2006

Iron:

Anemia is a serious public health problem in India, affecting all segments of the population, especially infants and young children, adolescent boys and girls, women of child-bearing age and pregnant women. Recent surveys conducted by the NNMB and NFHS-3 show high prevalence of anemia (24.3 %) even in men aged more than 20 years (ICMR-2010). Despite supplementation programs being in operation for decades in India, there has been no perceptible decrease in the prevalence of anemia. The prevalence is similar in both urban as well as in rural areas; however, gender differences exist from the age of 15 years, as females become more vulnerable to this malady. In an urban slum, 75 per cent of the children suffering from anemia were seen to respond to iron administration and 22 per cent of anemic children also had biochemical vitamin B12 deficiency (NFHS-3), IIPS (2005-2006). The standard requirement of iron is 28 mg per head/day.

Table 2 and Figures 8 a, b and c, show that the average availability of iron in 1991 was 27 mg per head/day. It declined to 25 mg and 22 mg in 2001 and 2008 respectively. Year wise analysis reveals that there are six districts in 1991 which are sufficient enough in the availability of Iron. Rest of the 21 districts is in deficit in availability of Iron. In 2001, the number of the surplus districts remains the same but there is sharp decline in the quantity of calcium. For, the availability ranges between 11 in Varanasi and 35 in Maharajganj. It may be noted the surplus districts are marginally surplus but the deficit districts are significantly deficit. The availability of iron deteriorates further in 2008. The number of surplus districts has come down to three only. In the deficit districts about half of them are deficit by 35 per cent but the remaining are short of more than 50 per cent.

Change analysis of availability of iron reveals that Purvanchal recorded a negative growth of -2 per cent during 1991-2001 and -10 per cent during 2001-2008. With few exceptions, all the districts recorded negative growth in both the phases. However, there are found some significant patterns. The districts which recorded positive growth in the first phase recorded negative growth in the second phase and vice- versa (Table 2 and Figures 9 a and b)

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Figure 8: a, b, c: Availability of Iron, 1992, 2002, 2006

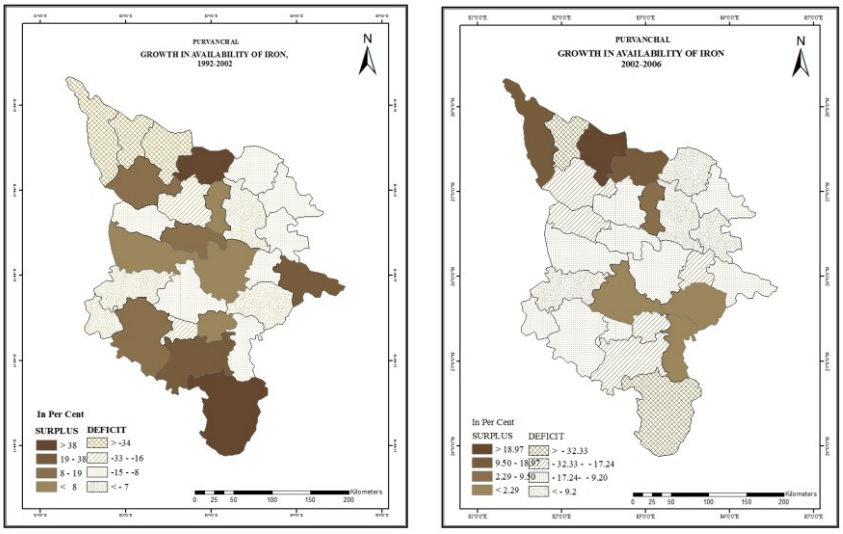

Figure 9: a, b: Per Cent Growth in Availability of Iron, 1992-2002, 2002-2008

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Carbohydrates:

Carbohydrates make up one of three necessary components for nutritional health, along with fats and proteins. The recommended dose of carbohydrates for, for men is 130 grams. It is evident from table 2 that on an average almost all the districts are sufficient enough in providing daily requirement of Carbohydrates to the existing population of the Purvanchal. Shrawasti district is leading in 1991 followed by Bahraich and Balrampur, while in 2001, Maharajganj district is leading followed by Chandauli and Ambedkar Nagar. Though Varanasi district has the least availability in 1991 but it is still providing sufficient carbohydrates followed by Siddharthnagar and Allahabad (Table 2 and Figures 10 a, b and c). Though the availability declined significantly yet the region is in surplus of carbohydrates in 2008. Except Varanasi (18 %) and Sonbhadra (28 %) all the other districts are in surplus of more than 75 per cent.

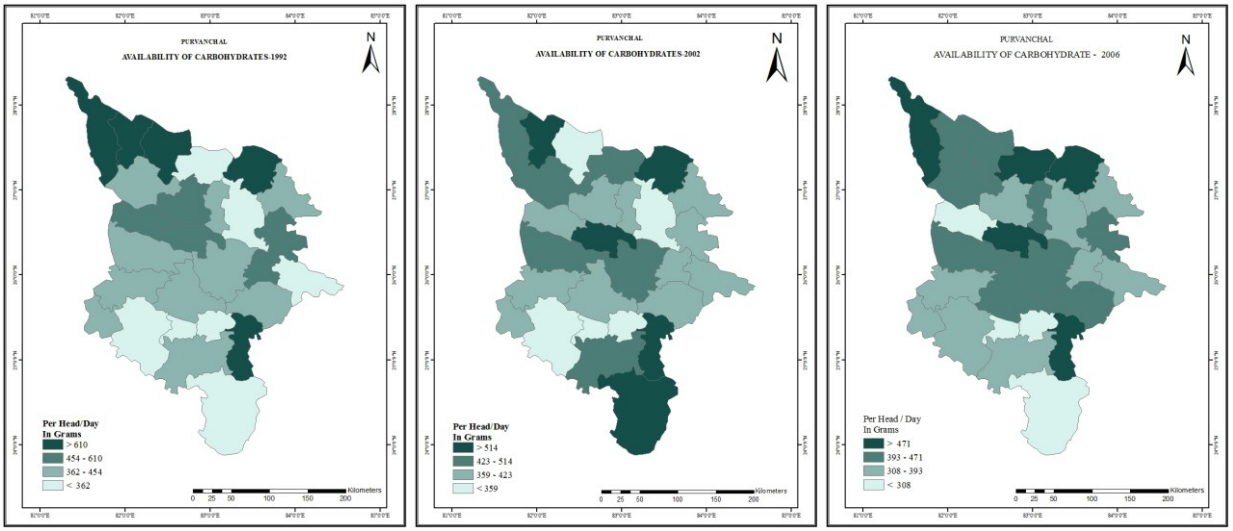

Figure 10: a, b, c: Availability of Carbohydrates, 1992, 2002, 2006

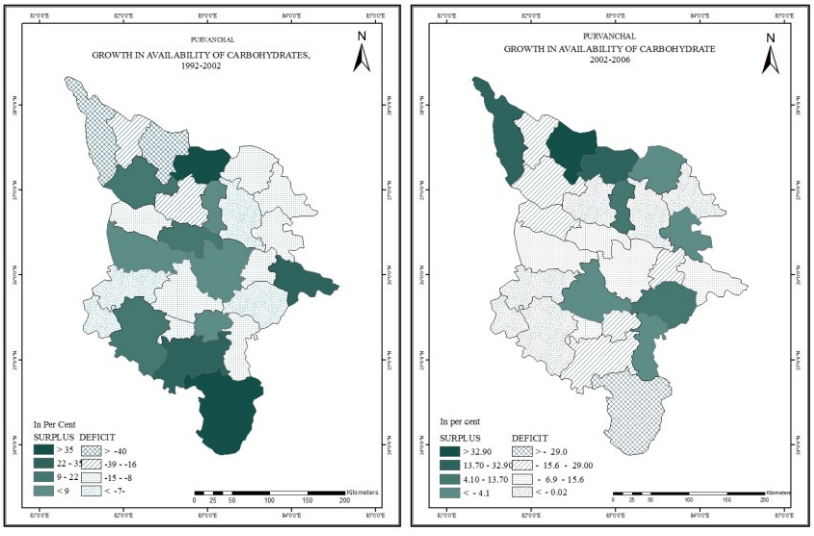

Figure: 11: a, b: Per Cent Growth in Availability of Carbohydrates, 1992-2002, and 2002-2006

The average availability of per head/day carbohydrates was 2237 grams in 1991. It declined to 423 grams in 2001 and 393 in 2008. That is, the availability declined by -1 per cent during 1991-2001 and -6 per cent during 2001-2008. Though nine districts have recorded positive growth during the first phase and ten in the second phase but at a declining rate of growth (Figures 11 a and b).

CONCLUSIONS:

The study highlights that Purvanchal is by and large in deficit of not only energy in Kcal, but in major nutrients also. There is found little change in the status over the period of time. Carbohydrates are the only nutrients in which the study area reported satisfactory result. The districts of Varanasi, Siddharthnagar and Shrawasti have emerged as most important in terms of availability of nutrients.

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