



ISSN (E): 2277-7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2023; 12(6): 1798-1805  
© 2023 TPI

[www.thepharmajournal.com](http://www.thepharmajournal.com)

Received: 10-04-2023

Accepted: 13-05-2023

## Alvira Rajwadi

Senior Research Fellow,  
International Agribusiness  
Management Institute, Anand  
Agricultural University, Anand,  
Gujarat, India

## RS Pundir

(I/C) Principal & Dean,  
International Agribusiness  
Management Institute, Anand  
Agricultural University, Anand,  
India

## The impact of changing consumption patterns on food and nutritional security in Gujarat state

Alvira Rajwadi and RS Pundir

### Abstract

This paper attempted the consumption pattern and nutrient intake through different food items. Pulses are nutritive commodity and main source of dietary protein for majority of vegetarian population. For this study, National Sample Survey Organization's (NSSO) 55<sup>th</sup>, 61<sup>st</sup> and 68<sup>th</sup> rounds data were taken for consumption pattern calculations and for measuring nutrient intake. ICMR's prescribed dietary allowance used for calculations. It was found that consumption of pulses has increased over the years. While the consumption of cereals has decreased, indicating that people are diverting to high value and nutritive commodity as compared to staple food items. The per capita per day nutrient intake through pulses and milk have increased from last two rounds while the nutrition intake through cereals have declined over the years, indicating that changing consumption pattern have great impact on nutrition intake. The analysis has shown that per capita per day intake of nutrients from food items have declined except calcium and zinc. This indicates that nutrition intake has declined which could be a major issue of nutritional and food security. The protein intake gap was noticed to be positive indicating that its intake was sufficient but the gap was found to be decreased over the years. It can be concluded that some nutrients intake were in sufficient quantity as recommended and some were lacking. So, it is advised that households should focus on nutritional security and maintain their dietary basket as per nutritional requirements of their family and include pulses in their food basket as their major source of protein.

**Keywords:** Elasticity, NSSO, consumption pattern, consumption expenditure

### Introduction

Majority of the Indian population is vegetarian and mostly depends upon foodgrains and vegetables for their dietary requirement. India has experienced urbanization in recent years with outcome of change in dietary pattern of Indian households. Indian households diverted towards the high-value commodities like milk, meat, fruits, fish, vegetables, and other processed food products. While the availability of a larger variety of food commodities in the market and growing food processing sector in the country are responsible factors behind this shift in dietary pattern (Mittal, 2006) [6]. Due to this dietary diversification consumption of staple food has been decreased over the years. This decline indicates improvement in the welfare, as laid down by Engel's hypothesis. Decreased staple food consumption may leads towards nutritional security. As mentioned above Indian population is vegetarian and their main source of vegetable protein is pulses.

Nutrients are needed to perform various functions in the body and for healthy life. These include proteins, fat, carbohydrates, vitamins and minerals. These nutrients are in most foods consumed daily in various proportions. However, some foods provide only a few nutrients like sugar, edible oils, etc. Vitamins and minerals do not supply energy but they both play an important role in metabolic activity of the body. Thus, our diet must be well balanced as to provide all the nutrients in proper proportions.

Deaton and Dreze (2009) [1] have reported a sustained decline in per capita calorie consumption during the last two decades by examining the NSSO data of several rounds on food consumption. They also reported of decreasing intake levels of proteins and many other nutrients except, fat. They have attributed this decline in calorie/nutrient intake to general reduction in calorie nutrient requirements of people due to better health, as well as lower activity levels. Because, a wide range of nutrients such as proteins, fat, carbohydrates, vitamins and minerals are needed to maintain normal activities of human body. These nutrients are present in most foods consumed daily in various proportions. Kumar *et al.* (2004) [5] have noted that the decline in per capita consumption of cereals, particularly coarse cereals, has worsened the nutrient status of poor.

### Corresponding Author:

#### Alvira Rajwadi

Senior Research Fellow,  
International Agribusiness  
Management Institute, Anand  
Agricultural University, Anand,  
Gujarat, India

Pulses are the important source of proteins, vitamins and minerals and are known as 'Poor man's meat' and 'Rich man's vegetable', contributing significantly to the nutritional security of the country (Singh *et al.* 2014) [12]. Pulses constitute more than 20 percent of protein, around 55-60 percent carbohydrates, around 3.2 percent fiber, more than 1 percent fat and rich source of all other vitamins and minerals (Singh *et al.*, 2014) [12].

According to Joshi *et al.* (2016), the intake of protein through pulses has been decreased from 12.06 percent to 10.9 percent from 1983 to 2011, while calories intake was decreased from 5.20 percent to 4.48 percent, calcium from 10.3 percent to 7.31 percent and zinc from 10.07 percent to 7.26 percent from 1983 to 2011 in India, while the nutrient intake through cereals have drastically declined over the years and though vegetables it remains steady from 1983 to 2011. Nutrient intake through fruits, milk and MFE has increased over the years which shows the dietary diversification among households that households were moving from staple food items to high value commodities. Mittal (2006) [6] pointed out that consumption pulses has changed over the years and 15.2 percent people in the country are undernourished. This signifies the importance of pulses in food nutrition security for Indian population.

### Methodology

This study was mostly based on data of published sources. Gujarat perspective was taken into consideration. The per capita consumption was calculated using NSS round 68<sup>th</sup>, 61<sup>st</sup> and 55<sup>th</sup>. For which round 68 (2011-12), round 61 (2004-05) and round 55 (1999-00), NSS survey reports 558, 509 and 461

were used, respectively.

The sample households were categorized into different groups. The per capita consumption was calculated using NSS round 68<sup>th</sup>, 61<sup>st</sup> and 55<sup>th</sup>. The quantity of pulses that individual consumed was calculated. Different conversion factors for pulses were taken from the book 'Nutrition Value of Indian Foods by C. Gopalan *et al.* (1971) [2] and standard nutrient chart provided by NSSO in its report on 'Report on Nutrition Intake in India' (NSSO, 2012) [10]. The conversion factor used is presented in Annexure table. The standard nutrient recommendation table was taken from Indian Council of Medical Research's (ICMR) prescribed Recommended Dietary Allowances (RDA) (ICMR, 2009) and from the book 'Nutrition Value of Indian Foods by C. Gopalan *et al.* (1971) [2]. And the gap between intake and standard requirement was further calculated.

### Results and Discussion

The per capita annual consumption of pulses has decreased from 11.19 kg to 9.45 kg in rural Gujarat and 12.53 kg to 11.38 kg in urban Gujarat during 1999-00 to 2004-05, respectively. While the per capita annual consumption of pulses has increased from 9.45 kg to 10.26 kg in rural Gujarat and 11.38 kg to 11.59 kg in urban Gujarat from 2004-05 to 2011-2012, respectively. This shows that in the last decade the consumption of pulses was increased as compared to earlier period. The consumption of pulses decreased at -8.37 percent and -7.48 percent in rural and urban households, respectively, from 1999-00 to 2011-12. Total cereal consumption also shows declining trend over the years.

**Table 1:** Structural shift in food consumption patterns in rural and urban households of Gujarat

Food items	Rural			Urban		
	1999-00	2004-05	2011-12	1999-00	2004-05	2011-12
<b>Annual per capita consumption (kg)</b>						
Total cereals	123.98	122.48	106.14 (-14.39)	103.30	100.85	95.96 (-7.10)
Pulses	11.19	9.45	10.26 (-8.37)	12.53	11.38	11.59 (-7.48)
Foodgrains	135.17	131.94	116.40 (-13.89)	115.83	112.23	107.55 (-7.14)
Milk (litres)	65.94	60.53	66.56 (0.94)	80.06	81.54	81.63 (1.96)
Edible oil	9.98	9.94	12.71 (27.44)	12.78	12.86	14.94 (16.95)

**Source:** Calculated from different rounds of NSS survey data and author's own calculations for aggregated groups

**Note:** Figures in parentheses indicate percentage change from 1999-00 to 2011-12

Table 2 presents that the expenditure on pulses has decreased from ₹ 288.35 per capita in 1999-00 to ₹ 250.15 per capita in 2004-05 and further increased to ₹ 591.54 per capita in 2011-12 in rural Gujarat. In urban Gujarat it decreased from ₹ 331.06 per capita in 1999-00 to ₹ 318.52 per capita in 2004-05 and further increased to ₹ 683.65 per capita in 2011-12. The percent share of expenditure on pulse from total food

expenditure has decreased from 7.18 percent to 5.77 percent in rural and 6.16 percent to 4.81 percent in urban households over the years. The consumption expenditure on total cereals has increased from ₹ 983.55 per capita to ₹ 1530.32 per capita in rural Gujarat and ₹ 1007.06 per capita to ₹ 1862.92 per capita in urban Gujarat from 1999-00 to 2011-12, respectively.

**Table 2:** Structural shift in food consumption expenditure in rural and urban households of Gujarat

Food items	Rural			Urban		
	1999-00	2004-05	2011-12	1999-00	2004-05	2011-12
<b>Annual per capita consumption expenditure (₹)</b>						
Total cereals	983.55 (24.50)	967.86 (23.03)	1530.32 (14.93)	1006.06 (18.71)	1091.23 (17.92)	1862.96 (13.12)
Pulses	288.35 (7.18)	250.15 (5.95)	591.54 (5.77)	331.06 (6.16)	318.52 (5.23)	683.65 (4.81)
Foodgrains	1271.90 (31.68)	1218.01 (28.98)	2121.87 (20.69)	1337.12 (24.86)	1409.75 (23.16)	2546.61 (17.93)
Milk	814.56 (20.29)	871.86 (20.74)	2152.28 (20.99)	1073.47 (19.96)	1298.79 (21.33)	2682.75 (18.89)
Edible oil	424.74 (10.58)	530.10 (12.61)	1081.62 (10.55)	545.92 (10.15)	703.48 (11.55)	1298.67 (9.15)
Others	1503.8 (37.45)	1583.13 (37.67)	4897.57 (47.77)	2421.16 (45.03)	2676.06 (43.96)	7672.54 (54.03)
Total food expenditure	4015.00 (100.00)	4203.10 (100.00)	10253.34 (100.00)	5377.67 (100.00)	6088.08 (100.00)	14200.57 (100.00)

**Source:** Calculated from different rounds of NSS survey data and author's own calculations for aggregated groups

**Note:** Figures in parentheses indicate percentage to total food expenditure

The consumption of high-value commodities has increased over the years indicating that the people are fond of consuming more diversified and more nutritive food item as compared to staple food items. This clearly indicates that income of households and food prices strongly affect the dietary pattern. The consumption of cereals observed to have declined but consumption expenditure on cereals found to have increased this shows that due to increase in price of cereals people shifted to other commodities.

Table 3 exhibits the per day per capita intake of different nutrients through pulses in rural and urban households of Gujarat. The table reveals that per day per capita all the nutrient intake has decreased from year 1999-00 to 2004-05 and then increased in 2011-12 for rural and urban Gujarat. The per day per capita intake of protein increased from 6.598 g to 7.210 g and 7.403 g to 7.710 g from the year 2004-05 to 2011-12, respectively, in rural and urban households. The per capita per day calcium intake was increased from 45.109 mg

to 49.809 mg in rural households and 51.125 mg to 53.471 mg in urban households from 2004-05 to 2011-12, respectively. While the fat intake was in minute quantity, but increased from the year 2004-05 to 2011-12. The phosphorus intake increased from 98.591 mg to 109.259 mg in rural households and 111.741 mg to 117.291 mg in urban households from 2004-05 to 2011-12, respectively. The per capita per day iron intake was almost similar in all the three rounds and for rural and urban households. The per capita per day carotene intake through pulses increased from 33.541 µg in 2004-05 to 36.955 µg in 2011-12 and 38.014 µg in 2004-05 to 39.672 µg in 2011-12 in rural and urban households, respectively. The results revealed that, the per capita per day nutrient intake through pulses has increased from last two rounds. As discussed earlier also the per capita annual consumption of pulses increased over the years. This might be the reason that the intake of nutrient through pulses has increased.

**Table 3:** Per person change in nutrition intake from pulses in Gujarat from 1999-00 to 2011-12

Nutrients	Rural			Urban		
	<b>Per day per capita intake</b>					
	1999-00	2004-05	2011-12	1999-00	2004-05	2011-12
Calcium (mg)	53.569	45.109	49.809	59.047	51.125	53.471
Phosphorus (mg)	117.082	98.591	109.259	129.057	111.741	117.291
Iron (mg)	2.534	2.134	2.346	2.794	2.419	2.518
Carotene (µg)	39.831	33.541	36.955	43.905	38.014	39.672
Thiamine (mg)	0.161	0.136	0.148	0.177	0.154	0.159
Riboflavin (mg)	0.073	0.062	0.068	0.081	0.070	0.073
Niacin (mg)	0.809	0.681	0.755	0.891	0.772	0.811
Vitamin C (mg)	0.172	0.145	0.161	0.190	0.164	0.172
Zinc (mg)	0.903	0.760	0.843	0.995	0.862	0.905
Calories (kcal)	118.478	99.438	110.774	130.584	112.680	118.759
Protein (g)	7.877	6.598	7.210	8.644	7.403	7.710
Fat (g)	0.650	0.521	0.640	0.741	0.616	0.684

**Source:** Calculated from different rounds of NSS survey data

Table 4 presents the per day per capita intake of nutrient through cereals in rural and urban households of Gujarat state. The table presented that per day per capita nutrition intake through cereals has decreased over the years. The per day per capita calcium intake decreased from 119.189 mg to 99.259 mg and 111.487 mg to 102.157 mg in rural and urban Gujarat, respectively, from 1999-00 to 2011-12, respectively. The per

day per capita calories intake decreased from 1188.570 kcal to 1002.969 kcal in rural households and 1008.842 kcal to 927.953 kcal in urban households from 1999-00 to 2011-12, respectively. The per day per capita protein intake decreased from 36.167 g to 30.773 g in rural households and 31.009 g to 29.190 g in urban households from 1999-00 to 2011-12, respectively. The fat intake was also decreased from 8.081 g

in 1999-00 to 5.976 g 2011-12 and 4.409 g 1999-00 to 4.367 g in 2011-12 in rural and urban households, respectively. The per day per capita carotene, phosphorus, iron and niacin intake decreased from 206.710 µg to 137.167 µg, 1034.206 mg to 865.607 mg, 23.874 mg to 21.417 mg and 10.516 mg to 9.168 mg, respectively, in rural households from 1999-00 to

2011-12, respectively. The per day per capita carotene, phosphorus, iron and niacin intake decreased from 92.296 µg to 83.041 µg, 891.311 mg to 824.881 mg, 25.876 mg to 23.850 mg and 10.402 mg to 9.609 mg, respectively, in urban households during 1999-00 to 2011-12, respectively.

**Table 4:** Per person change in nutrition intake from cereals in Gujarat from 1999-00 to 2011-12

Nutrients	Rural			Urban		
	Per day per capita intake					
	1999-00	2004-05	2011-12	1999-00	2004-05	2011-12
Calcium (mg)	119.189	114.031	99.259	111.487	107.940	102.157
Phosphorus (mg)	1034.206	1013.511	865.607	891.311	872.801	824.881
Iron (mg)	23.874	23.264	21.417	25.876	25.136	23.850
Carotene (µg)	206.710	185.978	137.167	92.296	90.081	83.041
Thiamine (mg)	1.218	1.203	1.021	1.091	1.066	1.006
Riboflavin (mg)	0.726	0.690	0.604	0.671	0.650	0.616
Niacin (mg)	10.516	10.329	9.168	10.402	10.144	9.609
Vitamin C (mg)	0.050	0.118	0.001	0.187	0.237	0.002
Zinc (mg)	4.238	4.107	3.565	3.521	3.459	3.263
Calories (kcal)	1188.570	1159.552	1002.969	1008.842	990.543	927.953
Protein (g)	36.167	35.386	30.773	31.009	30.377	29.190
Fat (g)	8.081	7.520	5.976	4.409	4.321	4.367

**Source:** Calculated from different rounds of NSS survey data

As discussed above, the nutrition intake through cereals have declined over the years, it might be because the consumption of cereals also decreased over the years. The protein intake through cereals was higher as compared to pulses, it might be because the consumption of cereals was higher as compared to pulses as discussed earlier so the nutrition quantity intake through cereals might be more as compared to pulses.

Table 5 indicates the per day per capita nutrient intake through milk in rural and urban households of Gujarat. It can be seen from the table that the nutrient intake decreased from 1999-00 to 2004-05 and then increased in 2011-12 in both rural and urban households. The per capita per day consumption of calcium decreased from 411.361 mg in 1999-00 to 356.669 mg in 2004-05 then increased to 386.882 mg in

2011-12 in rural households. In urban households also calcium intake decreased from 502.712 mg in 1999-00 to 445.826 mg in 2004-05 and further increased to 488.931 mg in 2011-12. The per day per capita calories intake was increased from 215.450 kcal to 228.424 kcal in rural households and 266.710 kcal to 285.162 kcal in urban households from 2004-05 to 2011-12, respectively. The per day per capita protein intake increased from 8.041 g to 8.443 g in rural households and 9.539 g to 10.010 g in urban households from the year 2004-05 to 2011-12, respectively. The per day per capita fat intake through milk increased from 15.663 g in 2004-05 to 16.659 g in 2011-12 and 19.874 g in 2004-05 to 21.305 g in 2011-12 in rural and urban households, respectively.

**Table 5:** Per person change in nutrition intake from milk in Gujarat from 1999-00 to 2011-12

Nutrients	Rural			Urban		
	Per day per capita intake					
	1999-00	2004-05	2011-12	1999-00	2004-05	2011-12
Calcium (mg)	411.361	356.669	383.882	502.712	445.826	488.931
Phosphorus(mg)	274.240	237.780	255.921	335.141	297.217	325.954
Iron (mg)	4.986	4.323	0.465	6.093	5.404	0.593
Carotene (µg)	640.725	555.540	597.925	783.012	694.407	761.546
Thiamine (mg)	0.112	0.097	0.105	0.137	0.122	0.133
Riboflavin (mg)	0.361	0.313	0.337	0.442	0.392	0.430
Niacin (mg)	0.249	0.216	0.233	0.305	0.270	0.296
Vitamin C (mg)	3.740	3.242	3.490	4.570	4.053	4.445
Zinc (mg)	0.224	0.195	0.209	0.274	0.243	0.267
Calories (kcal)	246.932	215.450	228.424	298.329	266.710	285.162
Protein (g)	8.418	8.041	8.443	9.878	9.539	10.010
Fat (g)	18.772	15.663	16.659	22.998	19.874	21.305

**Source:** Calculated from different rounds of NSS survey data

As discussed earlier that the annual per capita milk consumption decreased between 1999-00 to 2004-05 and then increased in 2011-12. The reason might be that the nutrient intake through milk decreased from 1999-00 to 2004-05 and further increased in 2011-12 in both rural and urban households. So as the per capita annual consumption of milk

increased the nutrient intake through milk also increased. Table 6 shows the per day per capita nutrient intake from vegetables for rural and urban households of Gujarat state. The per day per capita calcium intake was found to be decreased from 68.373 mg to 52.923 mg in rural households and 74.993 mg to 63.576 mg in urban households from 1999-

00 to 2011-12, respectively. The per day per capita phosphorus intake decreased from 131.861 mg in 1999-00 to 102.066 mg in 2011-12 and 144.630 mg in 1999-00 to 122.612 mg in 2011-12 in rural and urban households,

respectively. Iron intake also decreased over the years from 3.381 mg to 2.617 mg in rural households from 1999-00 to 2011-12, respectively. Further, the iron intake was found to be almost similar in all the rounds in case of urban households.

**Table 6:** Per person change in nutrition intake from vegetables in Gujarat from 1999-00 to 2011-12

Nutrients	Rural			Urban		
	Per day per capita intake					
	1999-00	2004-05	2011-12	1999-00	2004-05	2011-12
Calcium (mg)	68.373	59.552	52.923	74.993	72.468	63.576
Phosphorus (mg)	131.861	114.849	102.066	144.630	139.760	122.612
Iron (mg)	3.381	2.945	2.617	3.708	3.584	3.144
Carotene (µg)	1066.724	929.102	825.691	1170.017	1130.625	991.897
Thiamine (mg)	0.171	0.149	0.132	0.187	0.181	0.159
Riboflavin (mg)	0.106	0.092	0.082	0.116	0.112	0.099
Niacin (mg)	0.977	0.851	0.756	1.071	1.035	0.908
Vitamin C (mg)	59.920	52.189	46.381	65.722	63.509	55.717
Zinc (mg)	1.905	1.659	1.475	2.090	2.019	1.772
Calories (kcal)	83.024	292.382	71.714	87.007	318.920	86.531
Protein (g)	2.800	4.242	2.524	3.067	5.368	3.019
Fat (g)	0.399	0.537	0.272	0.435	0.718	0.326

**Source:** Calculated from different rounds of NSS survey data

The per capita per day carotene intake from vegetables was found to be decreased over the years, it decreased from 1066.724 µg to 825.691 µg in rural households and 1170.017 µg to 991.897 µg in urban households from 1999-00 to 2011-12, respectively. The per capita per day vitamin C intake decreased from 59.920 mg to 46.381 mg in rural households and 65.722 mg to 55.717 mg in urban households from 1999-00 to 2011-12, respectively. The calories intake drastically decreased from 292.382 kcal in 2004-05 to 71.714 kcal in 2011-12 in rural households and 318.920 kcal in 1999-00 to 86.531 kcal in 2011-12 in urban households. The per day per

capita protein intake decreased from 4.242 g to 2.524 g in rural households and 5.368 g to 3.009 g in urban households from 2004-05 to 2011-12, respectively. Fat, thiamine, riboflavin and niacin intake was found to be in very less quantity and it also decreased over the time. The perusal of the table also indicates that the zinc intake from vegetables was almost similar in all the rounds in rural and urban households. The intake of nutrients from vegetables decreased over the time indicating that this could be attributed to the decreased consumption of vegetable leading, in turn, to decreased nutrient intake.

**Table 7:** Per person change in nutrition intake from fruits in Gujarat from 1999-00 to 2011-12

Nutrients	Rural			Urban		
	Per day per capita intake					
	1999-00	2004-05	2011-12	1999-00	2004-05	2011-12
Calcium (mg)	4.332	5.899	5.250	8.129	7.572	8.666
Phosphorus (mg)	5.874	7.999	7.119	11.024	10.267	11.751
Iron (mg)	0.261	0.355	0.316	0.489	0.455	0.521
Carotene (µg)	61.452	83.684	74.474	115.328	107.414	122.938
Thiamine (mg)	0.009	0.013	0.011	0.018	0.016	0.019
Riboflavin (mg)	0.013	0.017	0.015	0.024	0.022	0.025
Niacin (mg)	0.049	0.067	0.060	0.092	0.086	0.098
Vitamin C (mg)	5.190	7.068	6.290	9.741	9.073	10.384
Zinc (mg)	0.139	0.190	0.169	0.262	0.244	0.279
Calories (kcal)	17.947	21.272	20.351	31.647	29.757	31.715
Protein (g)	0.180	0.237	0.204	0.319	0.320	0.312
Fat (g)	0.165	0.158	0.311	0.274	0.193	0.432

**Source:** Calculated from different rounds of NSS survey data

Table 7 presents the per day per capita intake of nutrients from fruits in rural and urban households of Gujarat. A perusal of table reveals that the per day per capita intake of carotene increased from 61.452 µg to 83.684 µg from 1999-00 to 2004-05, respectively, and further decreased to 74.474 µg in 2011-12 in rural households. The table also revealed that, in urban household carotene intake has decreased from 115.328 µg in 1999-00 to 107.414 µg in 2004-05 and then increased to 122.938 µg in 2011-12. The per day per capita phosphorus intake from fruits decreased from 7.999 mg to 7.119 mg in rural households and increased from 10.267 mg

to 11.751 mg in urban households from the year 2004-05 to 2011-12, respectively. The calories intake decreased from 21.272 kcal to 20.351 kcal in rural households and increased from 29.757 kcal to 31.715 kcal in urban households from 2004-05 to 2011-12, respectively. All other nutrition intake was in very less quantity from fruits. The calcium intake also declined in rural households and increased in urban households from 2004-05 to 2011-12. The vitamin C intake fell from 7.068 mg in 2004-05 to 6.290 mg in 2011-12 in rural households and increased from 9.073 mg in 2004-05 to 10.384 mg in 2011-12 in urban households.

The focus on last two rounds data the per day per capita carotene, vitamin C, calories, phosphorus and calcium intake declined in rural households and increased in urban households, this might be because the consumption of fruits increased in urban households in last two rounds and decreased in rural households as the urban people are more diverted to high value commodities.

Table 8 exhibits the per day per capita nutrient intake through MFE in rural and urban households of Gujarat. The per day per capita calories intake increased from 3.656 kcal to 6.605

kcal in rural households and 5.792 kcal to 7.250 kcal in urban households from 2004-05 to 2011-12, respectively. The phosphorus intake was increased from 7.790 mg in 2004-05 to 13.964 mg in 2011-12 and 12.002 mg in 2004-05 to 14.900 mg in 2011-12 in rural and urban, respectively. The per day per capita protein and fat intake was in very low quantity but increased over the years in rural and urban households. The calcium intake increased from 1.821 mg to 3.264 mg in rural households and 2.806 mg to 3.483 mg in urban households from 2004-05 to 2011-12, respectively.

**Table 8:** Per person change in nutrition intake from MFE in Gujarat from 1999-00 to 2011-12

Nutrients	Rural			Urban		
	Per day per capita intake					
	1999-00	2004-05	2011-12	1999-00	2004-05	2011-12
Calcium (mg)	2.357	1.821	3.264	4.131	2.806	3.483
Phosphorus(mg)	10.082	7.790	13.964	17.673	12.002	14.900
Iron (mg)	0.294	0.227	0.407	0.516	0.350	0.435
Carotene (µg)	3.361	2.597	4.655	5.891	4.001	4.967
Thiamine (mg)	0.011	0.009	0.016	0.020	0.014	0.017
Riboflavin (mg)	0.007	0.006	0.010	0.013	0.009	0.011
Niacin (mg)	0.148	0.114	0.205	0.259	0.176	0.218
Vitamin C (mg)	0.033	0.026	0.046	0.058	0.040	0.049
Zinc (mg)	0.058	0.045	0.080	0.101	0.069	0.085
Calories (kcal)	4.865	3.656	6.605	8.895	5.792	7.250
Protein (g)	0.709	0.585	1.041	1.287	0.876	1.089
Fat (g)	0.193	0.124	0.219	0.401	0.225	0.276

**Source:** Calculated from different rounds of NSS survey data

The per day per capita carotene intake has increased over the years in both rural and urban households of Gujarat. It can be seen from the table that nutrient intake was decreased from 1999-00 to 2004-05 and increased in 2011-12. This might be because the consumption of MFE increased over the years leading, in turn, increased nutrient intake over the time in both rural and urban households.

Table 9 reveals per capita per day nutrients intake from different food items in the year 2011-12. The per day per capita intake of calcium, phosphorus, iron, carotene, calories, protein and fat from pulses was 51.615 mg, 113.221 mg, 2.431 mg, 38.295 µg, 114.713 kcal, 7.456 g and 0.662 g, respectively in 2011-12. The per day per capita intake of calcium, phosphorus, iron, carotene, calories, protein and fat from cereals was 100.688 mg, 845.518 mg, 22.617 mg,

110.467 µg, 965.964 kcal, 29.992 g and 5.182 g, respectively in 2011-12. The table also revealed that nutrient intake from cereals was higher than that of pulses, while the pulses are the rich source of nutrients then cereals, but it might be due to much higher consumption of cereals was than that of pulses. Thus, the nutrient intake from cereals was higher than the pulses. As discussed earlier that consumption of milk was increased over the years and thus the nutrient intake from milk also increased. The per day per capita intake of calcium, phosphorus, carotene, calories, protein and fat from milk was 435.701 mg, 290.468 mg, 678.638 µg, 256.412 kcal, 9.216 g and 18.951 g, respectively in 2011-12. The per capita per day vitamin C intake was higher from vegetables (50.986 mg) then all other food items. And calories and protein intake has been higher from cereals in 2011-12.

**Table 9:** Per person nutrition intake from different food items in Gujarat in 2011-12

Nutrients	Per capita availability from different sources (2011)					
	Pulses	Cereals	Fruits	Vegetables	Milk	MFE
Calcium (mg)	51.615	100.688	6.935	58.178	435.701	3.372
Phosphorus(mg)	113.221	845.518	9.404	112.201	290.468	14.426
Iron (mg)	2.431	22.617	0.417	2.877	0.528	0.421
Carotene (µg)	38.295	110.467	98.381	907.679	678.638	4.809
Thiamine (mg)	0.153	1.014	0.015	0.145	0.119	0.016
Riboflavin (mg)	0.071	0.610	0.020	0.090	0.383	0.011
Niacin (mg)	0.783	9.385	0.079	0.831	0.264	0.212
Vitamin C (mg)	0.167	0.002	8.310	50.986	3.961	0.048
Zinc (mg)	0.873	3.416	0.223	1.621	0.238	0.083
Calories (kcal)	114.713	965.964	25.956	79.023	256.412	6.923
Protein (g)	7.456	29.992	0.257	2.768	9.216	1.065
Fat (g)	0.662	5.182	0.371	0.299	18.951	0.247

**Source:** Calculated from different rounds of NSS survey data

Table 10 indicates the per capita per day intake of nutrient from all food items in rural and urban households of Gujarat

from the year 1999-00 to 2011-12. A perusal of the table shows that calories and protein intake declined during 2004-

05 to 2011-12 in both rural and urban households. To be specific the per day per capita calories intake decreased from 2274.725 kcal to 2018.644 kcal in rural households and 2303.029 kcal to 2100.521 kcal in urban households from 2004-05 to 2011-12, respectively. The protein intake was found to be decreased from 57.588 g in 1999-00 to 53.438 g in 2011-12 and 56.236 g in 1999-00 to 54.768 g in 2011-12 in rural and urban households, respectively. It was interesting to note that phosphorus intake was observed to be decreased in

rural households and increased in urban households. The calcium intake increased from 641.726 mg to 681.715 mg in rural households and 761.430 mg to 819.607 mg in urban households from 2004-05 to 2011-12, respectively. The per day per capita iron intake decreased from 41.379 mg in 1999-00 to 34.779 mg in 2011-12 and 46.057 mg in 1999-00 to 39.196 mg in 2011-12 in rural and urban households, respectively.

**Table 10:** Per person change in intake of nutrients from all food items in Gujarat from 1999-00 to 2011-12

Nutrients	Rural			Urban		
	Per day per capita intake					
	1999-00	2004-05	2011-12	1999-00	2004-05	2011-12
Calcium (mg)	722.380	641.726	681.715	832.887	761.430	819.607
Phosphorus(mg)	1625.908	1531.973	1453.793	1601.363	1529.112	1543.757
Iron (mg)	41.379	38.905	34.779	46.057	44.160	39.196
Carotene (µg)	2125.707	1898.325	1851.756	2344.206	2222.137	2224.200
Thiamine (mg)	1.725	1.650	1.532	1.706	1.637	1.628
Riboflavin (mg)	1.328	1.221	1.193	1.401	1.319	1.346
Niacin (mg)	13.199	12.671	11.820	13.646	13.155	12.870
Vitamin C (mg)	70.024	63.815	61.865	81.783	78.857	79.067
Zinc (mg)	8.038	7.498	8.863	7.939	7.542	9.211
Calories (kcal)	2145.239	2274.725	2018.644	2140.532	2303.029	2100.521
Protein (g)	57.588	56.631	53.438	56.236	56.233	54.768
Fat (g)	59.971	57.425	61.569	69.234	65.825	71.805

**Source:** Calculated from different rounds of NSS survey data

The per capita per day vitamin C intake decreased while zinc intake increased over the years. It can be seen from the table that the per capita per day intake of nutrients declined except

calcium and zinc. This indicates that nutrition intake has declined which could be a major issue of nutritional and food security.

**Table 11:** Gap in nutrition recommended and nutrition intake in Gujarat from 1999-00 to 2011-12

Nutrients	Rural			Urban		
	Per day per capita intake gap					
	1999-00	2004-05	2011-12	1999-00	2004-05	2011-12
Calcium (mg)	68.856	-11.798	26.822	177.718	106.260	163.929
Phosphorus(mg)	972.225	878.290	800.435	947.911	875.660	891.447
Iron (mg)	22.621	20.147	15.749	26.931	25.034	19.822
Carotene (µg)	-2441.854	-2669.236	-2799.050	-2326.992	-2449.061	-2529.071
Thiamine (mg)	0.494	0.419	0.271	0.594	0.526	0.494
Riboflavin (mg)	-0.155	-0.263	-0.326	0.095	0.013	0.015
Niacin (mg)	-2.531	-3.060	-4.180	-0.910	-1.400	-1.891
Vitamin C (mg)	28.959	22.750	20.256	40.156	37.230	36.944
Zinc (mg)	-1.924	-2.465	-1.265	-2.282	-2.680	-1.198
Calories (kcal)	-267.960	-138.474	-448.385	1.874	164.371	-75.950
Protein (g)	10.066	9.109	4.589	6.756	6.752	3.854
Fat (g)	29.049	26.503	30.527	42.156	38.747	44.802

Table 11 shows the per capita per day intake gap for rural and urban households of Gujarat from 1999-00 to 2011-12. Here negative sign shows the deficiency while positive sign shows the quantity is consumed as per recommended does. The calcium, phosphorus, iron, thiamine, vitamin C, protein and fat intake was found sufficient as per recommended dose. The per day per capita carotene intake gap increased from -2441.854 µg to -2799.050 µg in rural households and -2326.992 µg to -2529.071 µg in urban households from 1999-00 to 2011-12, respectively. The riboflavin intake gap increased from -0.155 mg to -0.326 mg in rural households and it was sufficiently consumed in urban households. The per day per capita niacin intake gap increased in both rural and urban households from 1999-00 to 2011-12. The table also revealed that the per capita per day zinc intake gap

decreased from -2.465 mg to -1.265 mg in rural households and from -2.680 mg to -1.198 mg in urban households from 2004-05 to 2011-12, respectively. This implied that intake of zinc increased over the years in rural and urban households of Gujarat. The calories intake gap was found to be increased in rural and urban households from -267.960 kcal in 1999-00 to -448.385 kcal in 2011-12 and 1.874 kcal in 1999-00 to -75.950 kcal in 2011-12, respectively. The protein intake gap was noticed to be positive indicating that its intake was sufficient but the gap was found to be decreased over the years. As mentioned earlier majority of the population is vegetarian and their main source of protein is pulses so there is need to increase consumption of pulses. It can be concluded that some nutrient intake were in sufficient quantity as recommended and some were lacking. The reason behind this

might be the changing dietary pattern of households. Further, more carotene intake gap might be due to improper consumption of vegetables. This might be reason that the consumption patterns were the most affecting factor to nutritional security.

### Conclusions

The consumption of pulses was found to be increased over the year, but the increase was in small quantity and thus it can be said that pulses consumption in Gujarat remains steady over the years. The consumption of total cereals was found to be decreased over the years. While the per capita annual consumption expenditure on total cereals and pulses was increased over the years indicating that the prices of cereals and pulses has increased over the years. As rural people spent more on total food consumption as compared to urban while rural households were observed consuming more staple food while urban were found consuming diversified food items. Protein intake gap was not found in any households in the study area but the intake of protein through all the food items was decreased over the time. Major protein source for Indian population is pulses. So, there is need to encourage pulses consumption to overcome this issue. Due to dietary diversification, some nutrient intake was found to be decreased over the years. This is the alarming situation where policy makers and all these institutions and individuals concerned should focus on nutritional security to avoid this imbalance.

### Policy Implications

The consumption pattern has changed due to rise in income level of households, changing taste and preference, urbanization, increasing awareness, nutritional requirement *etc.* hence there is need to focus on the production of pulses to meet the demand of growing population. The nutrient intake was increased for some nutrient and for others it was decreased, so there is need to focus on balance diet to overcome the nutritional deficiency and spread awareness among the people about nutritional diet. The protein intake gap was not found in all households but its intake showed, declining trend and that is the major concern so there is needs to improve the consumption of pulses to improve the intake of protein as the pulses are the major source of protein. Now a days nutritional security is of major concern thus, awareness about nutritional security and easily and timely availability of major nutrients is the vital area of focus. The nutrition intake gap was found for some nutrients like, calcium, calories, carotene, zinc *etc.* To overcome this problem there is strong need to increase intake of these nutrients for balance diet. While the pulses are the major source of protein for majority of vegetarian population. So there is need to supply pulses through PDS.

### Acknowledgement

The paper is based on Ph.D. thesis of the first author. The authors thankfully acknowledge the technical assistance received from Centre for Agricultural Market Intelligence, NAHEP-CAAST, Anand Agricultural University, Anand-388110 and National Agricultural Higher Education New-Delhi-110012. Authors would also like to thank Dr. Surabhi Mittal, Senior Consultant, for guidance during the research work. Project, Indian Council of Agricultural Research, Pusa, Krishi Anusandhan Bhawan-II,

### References

1. Deaton A, Dreze J. Food and nutrition in India: Facts and Interpretations. *Economic & Political Weekly*. 2009;44(7):42-65.
2. Gopalan C, Sastri BVR, Balasubramanian SC. Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India; c1971.
3. ICMR. Nutrient Requirement and Recommended Dietary Allowances for Indians. A Report of the Expert Group of the Indian Council of Medical Research, Hyderabad. National Institute of Nutrition, Indian Council of Medical Research; c2009.
4. Joshi PK, Gulati A, Cummings R JR. Agricultural diversification in south Asia: Beyond food security; c2006. p. 47-81.
5. Kumar P. Fish demand and supply projections in India. ICAR-ICLARM project, Division of Agricultural Economics, New Delhi: Indian Agricultural Research Institute; c2004.
6. Mittal S. Structural shift in demand for food- India's prospects in 2020. Indian Council for Research on International Economic Relations (ICRIER), working paper, 2006, 184, 1-35.
7. NSS Survey report. National Sample Survey Organization, Consumer Expenditure Survey. Government of India. New Delhi, 2001, Report No. 461.
8. NSS Survey report. National Sample Survey Organization, Consumer Expenditure Survey. Government of India. New Delhi, 2006, Report No. 509.
9. NSS Survey report. National Sample Survey Organization, Consumer Expenditure Survey. Government of India. New Delhi, 2011, Report No. 558.
10. NSS Survey report. National Sample Survey Organization, Nutrition Intake in India, report no. 540 (66/1.0/2, NSS 66<sup>th</sup> round (July, 2009-June, 2010). Ministry of Statistics and Programmer Implementation, GOI, 2012.
11. NSS Survey report. NSS 68<sup>th</sup> Round Report. National Sample Survey organization, Ministry of Statistics and Programmer Implementation, GOI; c2014.
12. Singh AK, Singh SS, Prakash V, Kumar S, Dwivedi SK. Pulses production in India: Present status, bottleneck and way forward. *Journal of Agrisearch*. 2014;2(2):75-83.
13. Commodities <https://commodities.cmie.com>
14. Commodities <https://statesofindia.cmie.com>
15. India state agri. [www.indiagristat.com](http://www.indiagristat.com)