

# Food Consumption and Calorie Intake in Contemporary India\*

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## Quality Assured

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## **Abstract**

This paper examines how the patterns of India's food consumption have been changing in recent times as a consequence of her faster economic growth and generally rising affluence levels. It would be conventional wisdom to expect that increased affluence would improve the general level of nutrition of most households in a developing economy. Several recent studies on the subject of India's economic growth and changing food consumption however have found evidence of widespread decline in food calorie intake, i.e. reduced nutrition. This paper conducts its own investigation of the nutritional implications of the changing food consumption patterns. Its findings reinforce some of the earlier ones. In seeking some explanation for these changes, the paper estimates the Quadratic Ideal Demand Model (QAI) and presents expenditure and price elasticities based on these estimates. Linking them back to the observed changes in food consumption helps understand how the nutritional effects have occurred. They also offer some policy directions to improve food and nutrient security in the fast-changing Indian economy and society.

JEL Classification Nos.: C2, D1, E2, F1, F4

## **1. Introduction**

There has been much discussion of the effects of economic reforms on living standards in India during the 1990s. However, while much of this discussion has centred around movements in the poverty and inequality magnitudes, less attention has been paid to the changes in the pattern of Food consumption during this period. Such an analysis is the principal motivation for this study. The importance of this analysis stems from the strong implications of the observed results for Food and its concomitant, nutrient, security. This paper builds on the earlier literature on Food security in India [for example, Suryanarayan (1997), Meenakshi and Vishwanathan (2003), Radhakrishna (2005), Rao (2005) and Ray and Lancaster (2005)].

Given the size of India's domestic market and her resource endowments, changes in the pattern of her food consumption have strong implications for her trade and investment links with the rest of the world. The period considered in this study, 1987/88 – 1999/2000, witnessed trade liberalisation in India on an unprecedented scale. Exploration of foreign trade and investment implications of these changes must be of considerable policy interest. This theme, while not the subject matter of this paper, has been addressed in Chatterjee, Rae and Ray (2006).

The rest of the paper is organised as follows. Section 2 describes, briefly, the data sources and analyses the changes in the composition of India's Food consumption during the 1990s. Section 3 describes the econometric modelling of Food expenditure and reports the estimated expenditure elasticities which help explain the changes. The calorie implications of the changing food consumption patterns are discussed in Section 4. The paper ends with a few concluding remarks in Section 5.

## **2. Changes in Food Consumption Pattern**

The data sets used in our analysis are from the 43<sup>rd</sup> (July, 1987 – June, 1988), 50<sup>th</sup> (July, 1993 – June, 1994) and the 55<sup>th</sup> (July, 1999 – June, 2000) rounds of the National Sample Survey (NSS) in India. These surveys are comparable because they are all based on “thick” samples. All the consumption figures are monthly figures. The 55<sup>th</sup> round data provides information, at the household level, on calorie intake. In conjunction with the (calorie) conversion factors of Indian foods provided in Gopalan, et.al. (1999), this information was used to calculate calorie intake figures in the other rounds. The present study is conducted on an 11 item disaggregation of Food consumption [see Table 1].

Table 1 reports the changes at the All-India level in the monthly per capita consumption (kgs.) of the principal Food items between 1987/88 and 1999/2000. Several features of these changes are worth noting. First, Cereals consumption is generally much higher in the rural areas than in the urban, mainly due to the higher consumption of Rice by the rural households. The reverse is the case for Meat/Fish/Eggs and Fruits/Vegetables - the consumption of these items being higher for the urban households. Second, there has been a marked decline in the consumption of the Cereal items as a whole over the period, 1987/88 – 1999/2000, with the reduction being particularly sharp in respect of the smaller Cereal items (barley, maize) and of some Cereal substitutes such as tapioca. Third, there has been a switch in food preferences towards non Cereal items such as Meat/Fish and Fruits/Vegetables in both rural and urban areas.

The all India picture, presented in Table 1, however, masks considerable regional heterogeneity in the consumption of Rice and Wheat. Table 2 provides evidence on this by reporting the corresponding estimates for the States of Andhra Pradesh (South), Maharashtra (West), Punjab (North) and West Bengal (East). The evidence of regional heterogeneity is clear from the figures reported in the table. If one treats these four States as being the

‘representative’ of the regions that they belong to, then Table 2 shows that Rice consumption is much higher in the South and the East than in the other regions. In contrast, Wheat consumption dominates Rice consumption in the North, unlike in the rest of the country. The picture of a stagnant or declining consumption of the Cereal items, especially of barley, maize and tapioca, generally holds for all the regions.

The expenditure shares of the Food items are compared between 1987/88 and 1999/2000 in Table 3 which presents the all India sample means for the rural and the urban areas in the NSS rounds 43 and 55. The shift in food preferences away from the Cereal items towards Meat, Fish and Eggs and Fruits/Vegetables is seen quite clearly from Table 3 which reports a downward movement in the budget share of Cereals and an upward movement in those of the principal non Cereal items. The decline in the expenditure shares is particularly large in case of the smaller Cereal items, barley and maize. Another feature of this table is the sharp rural/urban difference in food habits, with the rural household spending a much greater share of its Food expenditure outlay on Cereals than the urban household. The other items where significant rural/urban differences exist are Processed Food and Beverages, with the urban household spending a greater share of its Food budget on these items than the rural household. In the case of Processed Food, for example, the urban household’s budget share of this item is nearly twice that of the rural household.

These changes in the pattern of Food consumption, including the shift from Cereal to non Cereal items, took place against the background of a decline in the Food expenditure share in the household’s total expenditure outlay. This is evident from Table 4 which presents, for the selected States, the Food expenditure shares corresponding to the various percentile groups across the expenditure distribution arranged in increasing order of affluence. While the decline in the food expenditure share during the 1990s occurred right across the expenditure spectrum, the magnitude of the decline was much larger in the lower

percentile groups. Consistent with the earlier discussion, Table 4 reveals several differences between the rural and urban households. For example, the Food expenditure share is generally higher in the rural household than in the urban and, in most cases, this differential increased sharply during this period. In view of the Engel's Law, which postulates an inverse relationship between a household's budget share of Food and its aggregate expenditure outlay, the latter feature suggests a differential income growth between the rural and the urban areas during the 1990s, the latter achieving higher income growth.

### 3. The Demand System and Expenditure Elasticities

To get some insight into the changes in Food consumption pattern, discussed above, let us present the expenditure elasticity estimates. These will give us a likely explanation for the observed switch from Cereals to non Cereal items during the 1990s. To do so, we employ the Quadratic Almost Ideal (QAI) Demand System proposed by Blundell, Pashardes and Weber (1993). The QAI extends the well known Almost Ideal (AI) demand model by allowing a non monotonic relationship between marginal budget share and income. Although the AI model has been widely used in analysing consumption in developing countries [see, for example, Ma, et.al. (2004)], there is now considerable evidence to suggest that the assumed linearity of budget shares in the log of household expenditure is empirically false, and it makes the AI a very restrictive model [see, for example, Meenakshi and Ray (1999)]. The QAI model is given, in budget share terms,  $w_i$ , as:

$$w_i = \alpha_i + \sum_{j=1}^n \gamma_{ij} \log p_j + \beta_i \log(x^R) + \lambda \beta_i [\log(x^R)]^2 \quad (1)$$

$$i=1, \dots, n$$

where  $p_i$  s are the household specific unit values of the various items, obtained by dividing the expenditure values by the physical quantities, and  $(\alpha_i, \gamma_{ij}, \beta_i, \lambda)$  are the demand system

parameters,  $x^R$  is the per capita real Food expenditure of the household, and is defined as follows:

$$\log x^R = \log x - \log P \quad (2)$$

where  $x$  is per capita money expenditure, and  $\log P = \sum_k w_k \log p_k$  is the Stone Price Index.

$\lambda$  represents the generalisation of the QAI over AI and, when  $\lambda = 0$ , QAI specialises to AI.

The expenditure elasticity,  $\eta_i$ , of item  $i$  is given by:

$$\eta_i = \frac{\beta_i + 2\lambda\beta_i \log x}{w_i} \quad (3)$$

Note that the QAI demand model, used here, allows the elasticity estimates to change sign unlike the restrictive AI model.

The QAI demand system [equation (1)] was estimated separately for rounds 43, 55 and for each of the 17 major States of the Indian Union. The elasticities were calculated at sample mean using equation (3). Table 5 presents the QAI expenditure elasticities in the two rounds for the 4 representative States (rural areas only)<sup>1</sup> There is considerable agreement between these States on the principal qualitative features of the results. Rice is an expenditure inelastic item, while Meat/Fish/Eggs and Vegetables/Fruits are expenditure elastic items in all cases. There are some significant differences too. For example, Wheat turns out to be a very expenditure inelastic item in Punjab, while the reverse is the case in the primarily Rice consuming State of Andhra Pradesh. The overall message from Table 5 is that there is considerable regional heterogeneity in the expenditure responses to the income changes making a countrywide generalisation difficult and misleading. One generalised conclusion that can be drawn, however, is that the inelastic nature of Rice and the elastic nature of Meat, Fish, Eggs and Vegetables/Fruits helps explain the shift in consumer preferences from

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<sup>1</sup> For space reasons, we have been selective in our reporting. The elasticity estimates of all the States are available on request, as are those for the urban households.

Cereals to Non Cereals during the 1990s reported earlier. A comparison between the elasticity estimates of Rounds 43, 55 shows that the expenditure elasticity of Rice declined during the 1990s, thus, providing a further explanation of the observed fall in the budget share of Cereals during this period.

The shift in Food spending away from Cereals which are sources of cheap calories to more expensive calorie sources such as Meat, Fish, Eggs and Vegetables/Fruits raises the issue of the nutritional implications of such a shift. The importance of this issue stems from the fact that Food is only an intermediate resource in the production of calories which are needed for human survival. The concept of the poverty line, as applied in the developing countries including India, is firmly based on the idea of a minimum calorie requirement. Hence, the calorie implications of the shift in Food preferences, to which we now turn, are of considerable policy importance because of their link with nutrient security. While improving affluence levels may prompt a varied diet, the variety can be at the expense of calorie adequacy if the taste changes favour lower-calorie food items. It then becomes an empirical question as to whether food spending changed in line with the switching of food consumption in favour of the more expensive, but lower-calorie, sources.

#### **4. Calorie Implications of the Changing Food Preferences**

Table 6 presents the calorie shares of the various Food items, at the All India level, in the two years, 1987/88 and 1999/2000, calculated separately for the rural and urban areas. It is clear that, notwithstanding the movement away from Cereals to non Cereals, Rice and Wheat continue to supply well over 50% of the total calorie intake of the household. This table, also, shows that the expenditure share of Cereals in Food spending understates its calorie importance in the Indian diet. These numbers, also, show that the Indian diet is more diversified than, say, the Vietnamese diet where nearly 80% of the calorie intake comes from



Rice alone [see Molini (2006)]. This observation acquires importance in the light of the result by Hoddinott and Yohannes (2002) that increased diversity of calorie sources is associated with an increase in calorie intake. Table 6, also, shows that, notwithstanding their rising importance in expenditure terms, as reflected by an increase in their budget shares, Meat, Fish, Eggs and Fruits/Vegetables supply only around 10% of the total calorie intake of the household. However, in line with the discussion in Section 2, the calorie importance of these items has increased during the 1990s. There are some interesting rural/urban differences that are apparent from Table 6. At the all India level, the calorie share of Rice in the rural areas exceeds that in the urban areas and this differential remained throughout the 1990s. The minor cereal items- barley and maize, enjoy greater calorie importance in the rural areas than in the urban, while the reverse is the case with Milk and other Dairy products. These findings are useful to the authorities in devising effective nutrient enhancing strategies in a period of significant economic changes.

Table 7 shows the movement in the calorie intake figures in the period from the late 1980s (1987/88) to the end of the millennium (1999/2000) by presenting the median monthly per capita calorie consumption in the “thick samples” from the 43<sup>rd</sup>, 50<sup>th</sup> and 55<sup>th</sup> rounds of the NSS. The table presents the All India figures and those for the 4 representative States. Notwithstanding the significant shift in consumer preferences from Cereals to non Cereals, the All India figures do not reveal any systematic variation in the calorie intake figures. The decline in the calorie intake in rural areas over the whole period, 1987/88 – 1999/2000, contrasts sharply with the increase in the urban areas. The All India figures mask some significant regional differences. The rural Southern region, represented by Andhra Pradesh, records a sharply lower calorie intake than the rural North, represented by Punjab. This picture holds throughout the period of this study. Table 6, also, reveals a high level of calorie deprivation in India. If one recalls that the poverty lines in India were originally based on a

minimum per capita calorie requirement of 2400 calories per day in the rural areas, and 2100 calories in the urban, then the median figures suggest that, right through the reforms decade of the 1990s, a large number of households were unable to meet their minimal calorie requirements. The issue is studied in detail in Ray and Lancaster (2005).

## **5. Concluding Remarks**

The wide ranging economic reforms undertaken in India during the 1990s, along with a sharp rise in her growth rate, makes this decade a significant one for the country. The decade of the 1990s saw India transform herself from being a modest growth performer to the widely acclaimed status of one of the world's fastest growing economies. Given the size of her domestic market and her resource endowments and constraints, opportunities for trade with, and foreign investment in, India must be potentially large. There has been much interest around the world in the possible implications of the recent changes in India's living standards.. This study adds to this literature by analysing the changes in the nature and quantity of India's food consumption over this period, and the nutritional implications of these changes. These results are of significant interest to the policy maker because they touch on the issue of Food and nutrient security in a period of significant economic change that is meant to improve the overall wellbeing of the people. The importance of this issue is underlined by the finding of this study that, notwithstanding the changes to India's food consumption, Cereals continue to supply well over 50% of the total calorie intake of the household, highlighting the fact perhaps that, with all the excitement about India's faster growth performance, she is still a low-income developing country.

One of the issues the present study points to concerns the implications of the observed changes in India's food consumption for her trade and investment relations with the rest of the world. The large and growing size of India's middle classes, with their changing tastes

and preferences for both food and non-food items offers a potentially huge market for the rest of the world. An examination of that issue is an obvious agenda for further research.

**Table 1: All India Mean Per Capita Consumption<sup>(a)</sup> (kg./30 days)**

Food Item	Rural		Urban	
	1987/88	1999/2000	1987/88	1999/2000
	(Round 43)	(Round 55)	(Round 43)	(Round 55)
Rice	7.35	7.20	5.65	5.50
Wheat	4.80	4.40	4.57	4.40
Other Cereals <sup>(b)</sup>	2.59	1.30	0.83	0.40
Total Cereals	14.74	12.90	11.05	10.3
Pulses	0.97	0.90	1.06	1.0
Dairy	3.34	4.20	4.52	5.6
Edible Oils	0.35	0.50	0.56	0.70
Meat/Fish/Eggs	0.91	1.60	2.01	2.90
Veg/Fruit	6.99	10.20	11.46	15.20
Sugar/Spices	1.53	1.50	1.63	1.60
Processed Food	0.41	1.60	0.80	2.20
Beverages	2.34	2.30	5.84	6.40

(a) Source: Authors' calculations based on NSS Rounds 43, 55.

(b) This item consists of barley, maize, tapioca, etc.

**Table 2: Regional Heterogeneity In Mean Per Capita Consumption (kg./30 days)**

FOOD ITEM	ANDHRA PRADESH				MAHARASHTRA				PUNJAB				WEST BENGAL			
	Rural		Urban		Rural		Urban		Rural		Urban		Rural		Urban	
	1987/88	1999/00	1987/88	1999/00	1987/88	1999/00	1987/88	1999/00	1987/88	1999/00	1987/88	1999/00	1987/88	1999/00	1987/88	1999/00
Rice	11.8	11.9	10.3	9.8	3.0	3.3	2.9	3.4	0.8	0.8	1.2	1.6	13.6	12.8	8.3	8.3
Wheat	0.1	0.2	0.7	0.8	2.4	3.6	4.3	4.5	11.2	9.8	8.7	7.8	1.5	1.1	2.9	2.6
Other Cereals	2.3	0.6	0.5	0.2	7.7	4.6	2.4	0.9	0.4	0.2	0.1	0.1	0.0	0.0	0.0	0.0
Total Cereals	14.3	12.8	11.5	10.8	13.2	11.5	9.6	8.9	12.4	10.8	10.0	9.50	15.1	13.9	11.3	10.8
Pulses	0.8	0.7	0.9	0.9	1.2	1.1	1.2	1.1	1.1	1.1	1.2	1.3	0.5	0.5	0.7	0.6
Dairy	2.5	3.2	3.9	4.9	2.5	2.9	4.8	5.2	13.6	12.2	10.1	10.1	1.4	1.4	2.8	3.0
Edible Oils	0.4	0.5	0.5	0.6	0.5	0.6	0.7	0.9	0.5	0.6	0.7	0.7	0.3	0.5	0.5	0.7
Meat/Fish/Eggs	1.7	2.6	2.5	3.0	1.0	1.4	2.4	2.5	0.8	1.1	1.3	1.8	1.9	4.0	3.3	6.1
Veg./Fruit	6.2	9.1	10.0	12.8	6.2	9.4	13.4	15.6	8.4	12.0	12.5	14.5	8.5	11.3	11.9	17.5
Sugar/Spices	1.4	1.3	1.5	1.4	1.7	1.7	1.7	1.7	3.0	2.5	2.3	2.3	1.1	1.1	1.2	1.4
Processed Food	1.1	1.3	2.0	1.1	0.3	1.9	0.7	2.1	0.2	1.3	0.3	1.0	0.3	0.6	0.7	1.6
Beverages	2.3	2.2	5.9	5.6	2.4	2.0	6.6	7.5	3.9	2.1	8.6	5.1	1.7	1.7	5.5	11.5

**Table 3: All India Mean Consumption and Expenditure Shares (%)**

Food Item	Rural		Urban	
	1987/88	1999/2000	1987/88	1999/2000
	(Round 43)	(Round 55)	(Round 43)	(Round 55)
Rice	24.97	21.6	16.33	13.4
Wheat	10.99	9.6	9.07	7.7
Other Cereals	5.87	2.7	1.80	0.7
Total Cereals	41.82	33.8	27.20	21.8
Pulses	6.48	6.2	6.16	5.5
Dairy	9.87	13.8	13.23	15.9
Edible Oils	7.41	6.0	8.65	5.8
Meat/Fish/Eggs	4.27	5.4	5.37	6.0
Veg./Fruit	10.32	12.9	12.29	14.3
Sugar/Spices	8.73	8.7	8.12	7.4
Processed Food	8.28	9.4	13.59	16.7
Beverages	2.83	3.9	5.38	6.5

**Table 4: Variation of Food Share (i.e. Engel Food Ratio) Across the Expenditure Distribution**

State	Round 43 (1987/88)															
	5%		10%		25%		50%		75%		90%		95%		99%	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Andhra Pradesh	0.88	0.85	0.88	0.84	0.87	0.81	0.83	0.76	0.76	0.69	0.67	0.67	0.60	0.52	0.51	0.41
Maharashtra	0.87	0.85	0.87	0.83	0.85	0.80	0.82	0.74	0.77	0.69	0.71	0.63	0.65	0.56	0.57	0.51
Punjab	0.84	0.82	0.83	0.80	0.81	0.77	0.78	0.73	0.73	0.67	0.66	0.60	0.59	0.56	0.50	0.48
West Bengal	0.91	0.87	0.92	0.87	0.91	0.82	0.89	0.84	0.84	0.75	0.79	0.68	0.72	0.56	0.68	0.49
State	Round 55 (1999/2000)															
	5%		10%		25%		50%		75%		90%		95%		99%	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Andhra Pradesh	0.67	0.66	0.67	0.66	0.66	0.60	0.65	0.56	0.63	0.49	0.57	0.42	0.52	0.37	0.47	0.32
Maharashtra	0.63	0.61	0.64	0.60	0.62	0.57	0.60	0.53	0.57	0.50	0.53	0.45	0.47	0.40	0.41	0.33
Punjab	0.61	0.59	0.61	0.58	0.57	0.55	0.56	0.51	0.53	0.49	0.50	0.45	0.46	0.41	0.41	0.38
West Bengal	0.72	0.68	0.72	0.66	0.70	0.64	0.68	0.60	0.66	0.55	0.63	0.49	0.58	0.44	0.53	0.43

**Table 5: QAI Expenditure Elasticities (Rural Areas Only)**

Food Item	Andhra Pradesh		Maharashtra		Punjab		West Bengal	
	1987/88	1999/2000	1987/88	1999/2000	1987/88	1999/2000	1987/88	1999/2000
Rice	0.83	0.74	0.76	0.79	0.88	0.80	0.81	0.69
Wheat	1.55	1.52	1.33	1.11	0.56	0.47	0.69	1.42
Other Cereals	0.50	0.73	0.40	0.33	1.02	1.17	0.92	0.97
Pulses	1.09	0.92	0.86	0.85	0.73	0.68	1.01	1.00
Dairy	1.65	1.50	1.75	1.72	1.41	1.39	1.89	1.80
Edible Oils	1.03	0.76	1.09	0.95	0.79	0.70	1.02	0.85
Meat/Fish/Eggs	1.48	1.52	1.41	1.69	1.54	1.37	1.75	1.73
Veg./Fruit	1.02	0.77	1.03	0.99	0.97	0.98	0.96	0.97
Sugar/Spices	0.86	0.75	0.80	0.71	0.82	0.82	0.94	0.76
Processed Food	1.18	1.58	1.39	0.97	1.27	1.52	0.97	1.10
Beverages	1.06	1.19	1.35	1.17	0.81	0.66	1.21	1.29



**Table 6: Calorie Share (%) of the Food Items**

Food Item	Rural		Urban	
	1987/88	1999/2000	1987/88	1999/2000
Rice	38.00	39.53	31.4	30.12
Wheat	22.40	21.82	24.0	23.40
Other Cereals	12.90	6.99	4.6	2.35
Total Cereals	73.32	68.34	60.08	55.88
Pulses	4.60	4.41	5.4	5.15
Dairy	5.00	6.38	7.5	9.38
Edible Oils	4.40	6.52	7.6	9.35
Meat/Fish/Eggs	0.70	0.85	1.0	1.20
Veg./Fruit	4.00	5.91	5.7	7.26
Sugar/Spices	5.80	5.97	7.2	7.15
Processed Food	2.00	1.45	5.2	4.22
Beverages	0.10	0.17	0.3	0.41

**Table 7: Median Monthly Per Capita Calorie Consumption from 1987/88 to 1999/2000**

State	Rural			Urban		
	1987/88	1993/94	1999/2000	1987/88	1993/94	1999/2000
Andhra Pradesh	62,777	61,006	61,093	61,098	59,214	61,713
Maharashtra	59,326	56,237	60,631	59,888	59,739	62,208
Punjab	70,678	69,878	68,453	59,992	63,158	66,247
West Bengal	62,495	64,345	62,379	62,372	64,846	62,798
All India	64,056	63,005	62,917	62,189	62,717	65,060

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