

# Food and Nutrition : Challenges for Policy\*

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It is a matter of great honour to me to be invited to deliver this year's lecture in memory of Dr. Rajendra Prasad and I am extremely grateful to the Indian Society of Agricultural Statistics for giving me this opportunity. It is with a deep sense of obligation and responsibility that I meet you today.

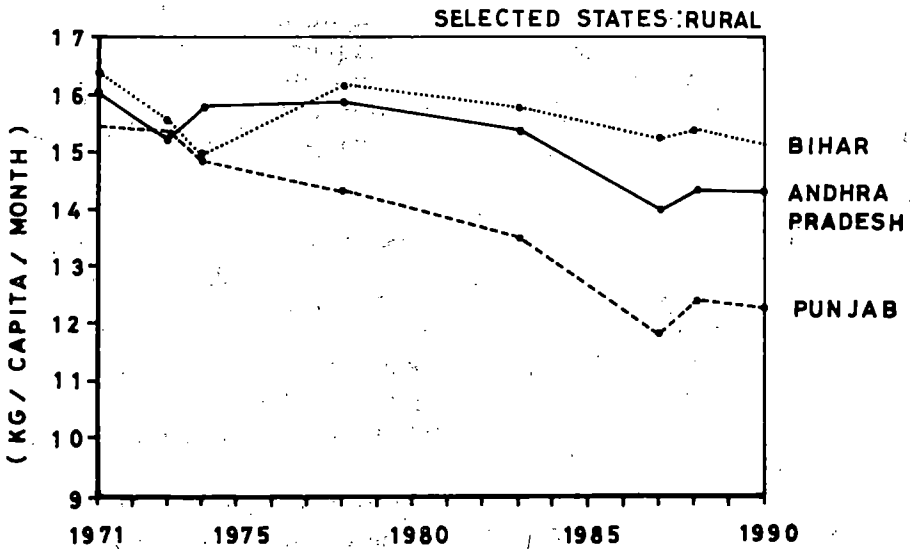
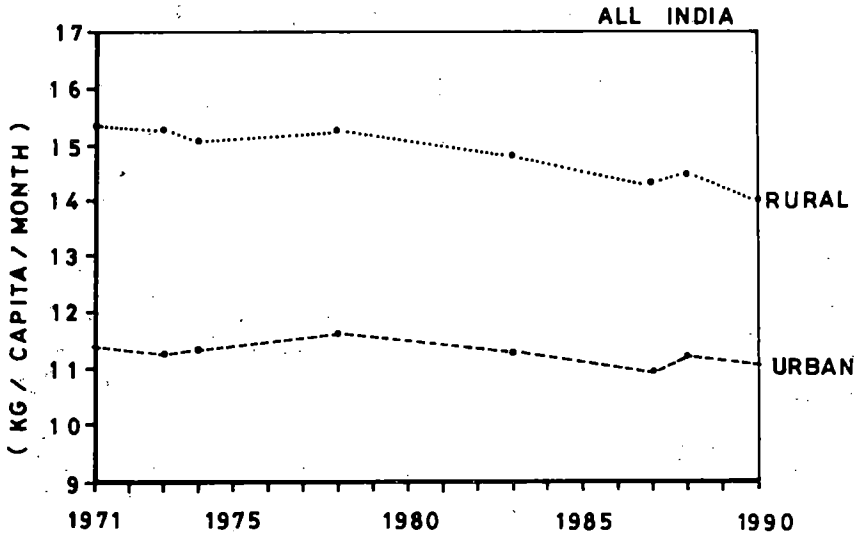
The well-being of the common man occupied the most important place in the vision of Dr. Rajendra Prasad. He dreamt of an Indian Society free from poverty, ignorance and ill-health and in which every individual is free and ensured of entitlements so as to develop and rise to the fullest stature. Some of his feelings were amply reflected in his efforts to solve the food crisis that gripped India immediately after the second world war and in the shaping of food policy. While his desire that India, being an agricultural country, should be free from its dependency on imports was met with some degree of success, his other cherished goal that India should feed its teeming millions still eludes us. My lecture is devoted to the new issues of the food problem that have cropped up in the last two decades.

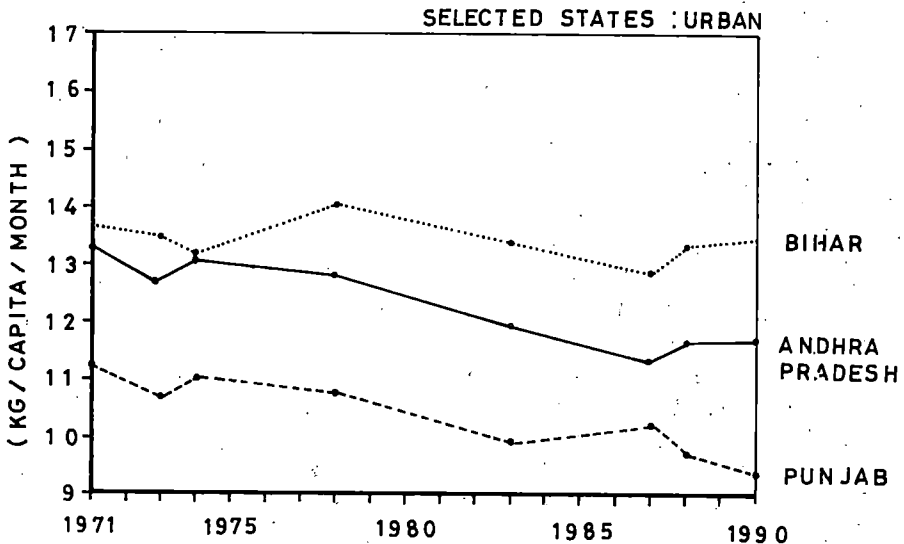
The solution to the problem of widespread malnutrition among the poor in India is generally seen in terms of overall growth or even in terms of raising the incomes of the poor through public intervention. The studies on nutrient determinants for the poor show, on the one hand, high income elasticity for food, thus providing empirical support for the mechanism for improving nutrition through increases in the income of the poor, and, on the other hand, a strong

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**TRENDS IN THE AVERAGE CONSUMPTION OF CEREALS ACROSS  
SELECTED ROUNDS OF NATIONAL SAMPLE SURVEYS (NSS) IN  
ALL INDIA AND SELECTED STATES**





inverse association of calorie intake with cereal price suggesting the protection of the poor from cereal inflation (Radhakrishna, [3]). However, a cursory look at the trends in food consumption, prices and poverty suggest that in the 1980s, despite some improvement in the incomes of the poor and decline in the relative price of cereals, cereal consumption per head has not risen. More recent analytical studies, including our own, on the relationships between food, nutrition and prices, however, indicate that growth will not solve the problem of malnourishment (Beherman and Deolalikar, [1]; Radhakrishna and Ravi, [5]). The information from the latest rounds of the National Sample Survey Organisation (NSS) and the result of the assessment of food demand by Radhakrishna and Ravi [4] provide a firmer basis for understanding the current food problem in systematic way.

### Trends in Per Capita Cereal Consumption

The National Sample Survey data show that between 1970-71 and 1988-89, the consumption of cereals per head has declined in rural and narrowly fluctuated with no significant trend in urban areas (see figure 1). And, in the recent past, cereal consumption per

head has been at about 14.5 kg/month in rural areas and 11 kg/month in urban areas. It is striking that cereal intake is not responsive to either income growth or decline in relative cereal price. The tendency does not fit into conventional wisdom which says that cereal consumption increases with income as well as with a decline in relative cereal price.

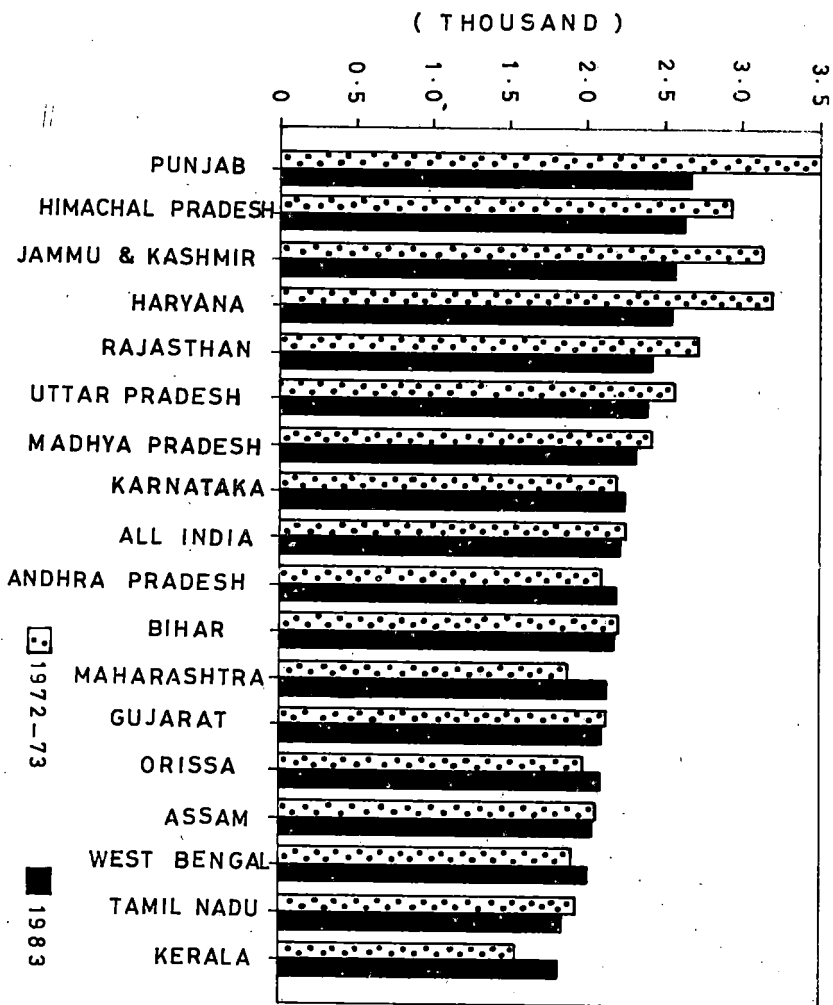
The national trend of declining rural per capita consumption of cereals is more prominent in the 1970s in Punjab, Haryana, Himachal Pradesh, Jammu & Kashmir and Rajasthan, mostly wheat consuming states. The absolute decline of about 3 kg/month between 1970-71 and 1987-88 occurred mainly due to lowered consumption of coarse cereals. NSS data show that the per capita consumption of cereals in most of the other states remained more or less stable in the 1980s. What is striking in the inter-state variations is the low per capita cereal intake in the most prosperous state of Punjab (in the 1980s fluctuating between 11.86 - 13.52 kg/month in rural areas and 9.40 - 10.25 kg/month in urban areas) as compared to the most backward state of Bihar (15.25 - 15.77 kg/month in rural area and 12.90 - 13.44 kg/month in urban areas) or even of Orissa. Part of the explanation for this counter-intuitive fact lies in the regional taste differences.

That the ICMR norm of 386 gms per day (11.67 kg/month) would be misleading for judging cereal adequacy can be illustrated by the fact that the use of such a norm would lead to the dubious conclusion that a major segment of the population of Punjab suffers from cereal deficiency. The ICMR norms for food items were based on a least cost diet exercise carried out for fixed prices which are dated by now. Since the composition of the optimum food basket varies with prices, one has to be cautious in using the commodity specific norms when prices differ from those used in the least cost exercise. Moreover, the calorie intake norm used in the optimum diet exercise differs from the more recent ICMR norm. It is quite likely the norm may also vary between regions due to agro-climatic differences.

### **Calorie Intake**

Calorie intake in 1972-73 and 1983 remained at around 2200 k cal/per caput/day in the rural areas and 2100 k cal/per caput/day in urban areas with substantial inter-state variations. For instance, per day calorie intake in 1983 varied between 1850 k cal (Kerala, Tamilnadu) and 2620 k cal (Punjab, Himachal

PERCAPITA DAILY CALORIE INTAKE IN RURAL INDIA



PERCAPITA DAILY CALORIE INTAKE IN URBAN INDIA

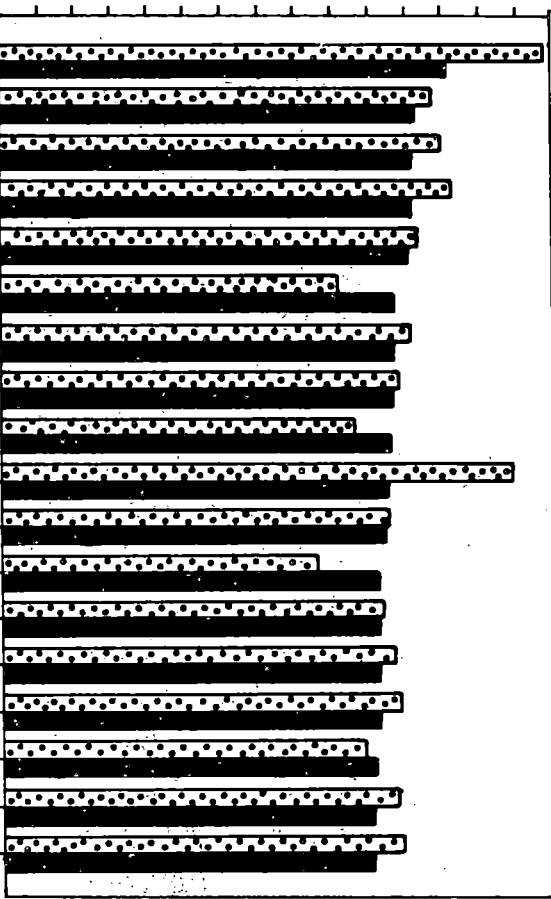
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- TAMIL NADU
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- BIHAR
- KARNATAKA
- PUNJAB
- ALL INDIA
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- UTTAR PRADESH
- MAHARASHTRA
- ANDHRA PRADESH
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1972-73

1963



Pradesh) in rural areas and between 2000 k cal (Gujarat) and 2429 k cal (Himachal Pradesh) in urban areas (see figure 2). In contrast to the All India situation, some states experienced a decline in the calorie consumption between 1972-73 and 1983. Indeed, the drop in calorie intake was steep in a majority of states in northern region viz., Haryana, Himachal Pradesh, Punjab and Jammu & Kashmir which displayed higher levels in the early 1970s. A possible explanation for the drop in calorie intake in the northern region is not hard to find. The 1970s was a period of rising income for this region. With a substantial income improvement, people might be concerned more with commodity characteristics other than nutrition (taste, appearance, attractiveness, odour, status value etc.) as they shift from traditional staple cereals to other types of food (Beherman and Deolalikar, [2]). The nutrient level in a majority of states however remained stable between 1972-73 and 1983, or marginally improved, particularly in states with a low level in 1972-73.

### **Explanation for Levelling off of Nutrient Intake**

Are these counter-intuitive results due to low food elasticity? The evidence is to the contrary. Radhakrishna and Ravi [5] report high expenditure elasticities for food (Table 1). The cereal, food and calorie elasticities are : 0.45, 0.68, 0.55 in rural areas and 0.26, 0.63 and 0.44 in urban areas and still higher value close to one are obtained for lower income groups. Their results also suggest high responsiveness of nutrient intake to prices, particularly cereal price (Table 2). For instance, a 10 percent increase in cereal price would result in 3.7 percent fall in per capita calorie intake in rural areas and 1.7 percent fall in urban areas.

A part of the explanation for the stagnant food intake levels lies in the changes in taste. A trend analysis of consumption pattern suggests a distinct shift in consumption pattern away from cereal since the mid 1970s uniformly across all expenditure groups. Even in the case of rural very poor (rural population with per capita expenditure less than 75% of the official poverty line), the share of cereals in total expenditure fluctuated without any trend between 56 and 60 percent till 1973-74, and thereafter steadily declined to 47 percent by 1986-87 (Radhakrishna and Ravi, [5]). The proportion of expenditure on non-food items increased from 18 to 25 percent, while the share of milk and milk food rose from 3 to 5 percent. More importantly, there was a shift from coarse cereals to wheat. The share of coarse cereals in cereal expenditure for this very poor group

**Table 1.** Expenditure Elasticities for Food at 1986-87 Prices

Commodity Group	Rural Expenditure Groups				Rural Aggregate	Urban Expenditure Groups				Urban Aggregate
	Very Poor	Moderately Poor	Lower Non-Poor	Higher Non-Poor		Very Poor	Moderately Poor	Lower Non-Poor	Higher Non-Poor	
Cereals	0.886	0.608	0.318	0.151	0.447	0.839	0.363	0.194	0.059	0.255
Milk & milk products	1.644	1.797	1.544	0.580	1.094	1.517	1.671	1.403	0.619	0.892
Edible oils	1.076	0.774	0.755	0.545	0.724	1.102	1.029	0.825	0.325	0.560
Meat, egg & fish	1.218	1.205	1.089	0.509	0.866	1.168	0.983	1.182	0.555	0.759
Sugar & gur	1.254	1.172	1.084	0.779	0.992	1.142	0.980	0.726	0.364	0.570
Other food	1.003	0.934	0.928	0.470	0.757	0.974	0.925	1.019	0.682	0.797
Food	0.994	0.863	0.745	0.401	0.681	0.983	0.816	0.796	0.475	0.628
Non-food	1.018	1.374	1.543	1.793	1.606	1.044	1.411	1.375	1.549	1.496
Calories	0.926	0.703	0.496	0.282	0.547	0.897	0.566	0.471	0.288	0.442

**Note :** These elasticities are evaluated from linear Expenditure System LES at the mean total expenditure levels of the expenditure groups.

Persons whose per capita expenditure falls below 75% of Poverty line are considered as very poor, whose per capita expenditure falls between 75% of poverty line and poverty line as moderately poor, between poverty line and 150% of poverty line as lower non poor and above 150% of poverty line are higher non-poor. The poverty lines used are those of

**Source :** the Planning Commission given at 1983 prices. The poverty lines have been indexed for prices. Radhakrishna and Ravi (1991).



Table 2. Calorie Price Elasticities

Price of Commodity Group		Rural Expenditure Groups				Rural Aggregate	Urban Expenditure Groups				Urban Aggregate
		Very Poor	Moderately Poor	Lower Non-Poor	Higher Non-Poor		Very Poor	Moderately Poor	Lower Non-Poor	Higher Non-Poor	
1.	Cereals	-0.716	-0.506	-0.272	-0.162	-0.366	-0.527	-0.268	-0.173	-0.056	-0.166
2.	Milk & milk products	-0.005	-0.018	-0.040	-0.052	-0.033	-0.025	-0.035	-0.052	-0.051	-0.047
3.	Edible oils	-0.031	-0.035	-0.031	-0.032	-0.032	-0.053	-0.054	-0.058	-0.032	-0.043
4.	Meat, egg & fish	-0.003	-0.005	-0.008	-0.008	-0.006	-0.014	-0.012	-0.008	-0.010	-0.011
5.	Sugar & gur	-0.030	-0.036	-0.038	-0.051	-0.041	-0.038	-0.037	-0.037	-0.021	-0.029
6.	Other food	-0.104	-0.110	-0.105	-0.100	-0.103	-0.148	-0.130	-0.138	-0.138	-0.142
	All Food Prices	-0.889	-0.710	-0.494	-0.405	-0.581	-0.804	-0.537	-0.466	-0.308	-0.490
7.	Non-food	-0.037	0.007	-0.002	0.122	0.033	-0.093	-0.29	-0.006	0.020	-0.048
	All Prices	-0.926	-0.703	-0.496	-0.283	-0.548	-0.897	-0.566	-0.472	-0.288	-0.442

Note : (i, j)th element shows the percentage change in jth class calorie intake due to 1 per cent change in price of ith commodity group.

Source : Radhakrishna and Ravi (1991).

decreased from 33 to 17 percent, and in contrast, the share of wheat increased from 16 to 25 percent in the same period. The decline in the weight of cereals in food expenditure and coarse cereal weight in total cereal expenditure would imply an increase in the cost of calories since cereal, among the food items, and coarse cereals, within cereals, are the cheapest source of calories (Radhakrishna and Ravi, [5]). It should be recognised that the above changes in the shares of various commodity groups can be attributed to two factors vis., relative price and taste. Hence, it may be argued that it would be inappropriate to attribute the above changes only to the taste factor.

### **Relative Price and Taste Effect**

For isolating the effect of taste and relative price on the consumption patterns, we have carried out a few simulations using an integrated demand model and compared the per capita intake of food items in 1986-87 (base year) with (i) simulated food intake values in the absence of taste change for analysing the effect of taste change and (ii) simulated food intake values obtained by replacing the relative price of 1986-87 with that of 1969-70 (Radhakrishna and Ravi, [5]). The simulation results are reproduced in Table 3.

The effect of relative price change tended to be positive for cereal and negative for non-cereal food items. This is understandable since the relative price of non-cereal food rose faster in the reference period. The positive effect of the relative price effect on cereal consumption outweighed the negative effect on non-cereal food consumption and hence resulted in increases in per capita food and calorie intake. The gains due to a relative price change are found to be more favourable to the poor. For instance, an increase of 13 k cals in the per capita daily consumption of the bottom 30 percent of the population in rural areas and 54 k cals in urban areas can be attributed to favourable price change. In contrast, a low 50 and 33 k cals increase in calories intake of the top 30 percent of the population in rural and urban areas can be attributed to price change. The reason for a more favourable price effect experienced by the poor is the high calorie price elasticities observed for the poor. Clearly, if one were to assess the effect of the relative price movements in the last two decades on the basis of calories consumption, one would judge it to be favourable since the poor tended to gain more.

The simulation results suggest that in the more recent period

Table 3. Base Year Predictions and Simulation Results

Commodity Group	RURAL			URBAN		
	Base Year Predictions (1986-87)	Simulation results based on		Base Year Predictions (1986-87)		
		1964-65	1969-70 relative prices		1964-65	1969-70 relative prices
		1973-74 Preferences (Taste)			1973-74 Preferences (Taste)	
<b>BOTTOM 30% OF THE POPULATION</b>						
1. Cereals (Rs./Month)	30.08	38.48	27.00	29.82	34.62	28.25
2. Other food (Rs./Month)	22.39	18.62	27.95	42.04	41.12	45.27
3. Total food (Rs./Month)	52.47	57.11	54.95	71.86	75.74	73.52
4. Calorie Intake (k cal/per caput/day)	1606	1954	1473	1537	1726	1483
<b>MIDDLE 40% OF THE POPULATION</b>						
1. Cereals (Rs./Month)	41.47	52.05	39.49	36.52	40.77	35.64
2. Other food (Rs./Month)	45.97	42.03	52.62	87.17	89.71	92.70
3. Total food (Rs./Month)	87.45	94.08	92.11	123.68	130.48	128.34
4. Calorie Intake (k cal/per caput/day)	2285	2749	2241	2162	2356	2148
<b>TOP 30% OF THE POPULATION</b>						
1. Cereals (Rs./Month)	49.57	63.04	47.72	39.36	39.60	39.02
2. Other food (Rs./Month)	85.79	86.83	98.17	147.64	168.42	156.64
3. Total food (Rs./Month)	35.36	149.87	145.89	187.00	208.01	195.65
4. Calorie Intake (k cal/per caput/day)	2967	3613	3017	2752	2934	2785
<b>ALL GROUPS</b>						
1. Cereals (Rs./Month)	40.49	51.28	38.21	35.36	38.57	34.44
2. Other food (Rs./Month)	50.84	48.45	58.88	91.77	98.75	97.65
3. Total food (Rs./Month)	91.33	99.73	97.04	127.13	137.32	132.09
4. Calorie Intake (k cal/per caput/day)	2286	2770	2243	2152	2341	2139

Note : Expenditures are expressed at 1986-87 prices.

Source : Radhakrishna and Ravi (1991)

Table 4. Marginal and Average Propensity to Consume Calories

(k.cals)

Expenditure Groups		Period I		Period II	
		Marginal Propensity	Average Propensity	Marginal Propensity	Average Propensity
<b>RURAL</b>					
1.	Very Poor	805	851	624	696
2.	Moderately Poor	571	733	408	599
3.	Lower Non-Poor	416	618	254	509
4.	Higher Non-Poor	171	438	106	363
<b>URBAN</b>					
1.	Very Poor	575	569	456	520
2.	Moderately Poor	335	476	240	426
3.	Lower Non-Poor	225	395	171	350
4.	Higher Non-Poor	84	244	66	230

Note : Per Capita Expenditure is expressed at 1986-87 prices.

Source : Radhakrishna and Ravi (1991).

Table 5. Assumptions in the Radhakrishna and Ravi food demand projections

Assumption	Years			
	1986-87	1995	2000	2010
Expenditure growth rate	----- 4% -----			
Population (millions)				
Rural	590	653	689	746
Urban	206	277	327	439
All-India	797	930	1016	1185
Ratio of rural per capita expenditure to urban	0.625	0.602	0.588	0.559
Inequality in expenditure				
Rural	----- 0.289 -----			
Urban	----- 0.318 -----			

Source : Radhakrishna and Ravi (1990).

there has been a sharp fall due to taste change in per capita daily calorie intake ranging between 348 k cals (for bottom class) - 646 k cals (for top class) in rural areas and 54 k cals (for bottom class) - 182 k cals (for top class) in urban areas. The above figures imply approximately 20 percent drop due to taste change in the calorie intake levels in all expenditure groups in rural areas and 8.8 percent drop in urban areas. The negative taste effect is stronger than the positive price effect. However, positive growth and price effects together could just balance the negative taste effect.

More instructive is the effect of taste on average and marginal propensity to consume calories (Table 4). The estimates of average and marginal propensities are found to be lower in the second period (1977-78 to 1986-87) than in the first period (1964-65 to 1972-73). The average propensity to consume calories is estimated to be lower by about 18 percent in the second period than in the first period in all the rural expenditure groups and by 9-11 percent in all the urban expenditure groups. These results are more or less in conformity with the simulation results.

A comment on the effect of taste on the poverty line defined as the per capita total expenditure to a given calorie norm is warranted. The negative taste effect on calorie intake would require periodic upward revision of the poverty line. For instance, if one were to obtain the poverty line for the second period by updating the poverty line of the first period, approximately 18 to 10 percent increase should be allowed for taste change in rural and urban areas besides carrying out price adjustments. Incidentally, if such adjustments are carried out, poverty estimate will not reveal the declining trend in the 1980s as revealed by poverty estimates based on updated 1973-74 poverty line without adjusting the taste change. Whether the poverty line should be based on calorie norm, particularly when there is no unanimity on the norm is a different question altogether.

### **Food Demand in 2000**

We have also made food demand projections for India in 2000 A.D. (Radhakrishna and Ravi, [4]), based on an integrated demand model, and it would be interesting to recapitulate the main findings here. The assumptions about the exogenous variables are : (i) total expenditure grows at 4 percent per annum; (ii) the pace of urbanisation will be consistent with the recent historical trend; (iii) the ratio of rural to urban per capita expenditure will be consistent with the trend estimated from NSS data; and (iv) inequality in

expenditure will remain the same as in 1986-87. Moreover, the population estimates are those of the World Bank (Table 5). It should be noted that the demand projection assume that consumer scale of preferences observed between 1977-78 and 1986-87 will remain the same. Projection have been made for three periods: 1995, 2000 and 2010.

The projections show that the rate of growth of demand varies for different food items. Between 1987 and 2000, the total demand would increase fastest, at more than 4% per annum for milk and milk products, and "other food" (comprising beverages, processed food, etc.); at 3.5 to 4% for meat, fish & egg; edible oils and fruits and vegetables; and at 3 to 3.5 percent for sugar & gur, and pulses. The growth of demand for cereals is sluggish at less than 2.5%. In the case of rice and wheat, the growth of total demand exceeds the population growth rate, so that there is a modest (less than 1% per annum) growth in per capita demand also, while for coarse cereals, the per capita demand will actually decline. Clearly, the growth of total demand for cereals is really only due to the growth of population.

### **Policy Concerns**

The levelling off of cereal and calorie intake remains the most challenging problem at the moment on the food front, as there is evidence that the income of the poor which is a key factor in food entitlement has shown a moderate improvement and the relative price of cereal which is another factor determining the food entitlement has also moved favourably. The levelling off would not by itself be a major concern if the intake levels of bottom segment were nutritionally adequate. There is considerable evidence that the section of the Indian population that fails to enjoy an adequate diet is sizeable. Two plausible explanations for the above apparent paradox can be offered. First, there has been a taste shift away from cereal and some non-food items have entered the basket of the poor and, within cereals, there has been substitution of commodities with higher calorie cost. Though cereal is the cheapest source of calories, there has been a drop in its share in the calorie consumption. Even with cereals, consumption of coarse cereals which are the cheapest source of calories has declined. It appears that with income improvement the entitlement set has expanded but the consumer choice has been for a less nutritive bundle due to a change in his scale of preferences. Secondly, the weakening link between food production and food entitlement may also provide an explanation

for the stationary level of calorie intake for some segment of the rural population. For some people, particularly for poor peasants, the output grown by themselves is also their entitlement to food and the selective nature of cereal output growth in the post green revolution period might not have resulted in substantial improvement in consumption for the poor peasants particularly in dry land agriculture. The recent decline in the employment elasticity in agriculture might have also weakened the income- food entitlement link. Even if the sluggish employment growth in agriculture was compensated for by the rural non-farm employment expansion, it would still reduce the share of kind payment, and thereby increase the market dependency of the poor for food which makes the food more expensive.

Even if further changes in taste are assumed away, cereal consumption per head is likely to increase at a slow rate of 0.5 percent per annum in the 1990s. In fact, the per capita consumption of coarse cereals is likely to decrease at 0.5 percent per annum. In contrast to the slow growth of cereal demand, there will be considerable expansion in the consumption of commodities with less calorie content, such as milk and milk products; meat, egg and fish, edible oil etc. In the next two decades the per capita consumption of milk and milk products is projected to increase at a high rate of 2.3 per cent per annum and total demand at 4.3 percent. It is quite likely that the induced demand for fodder may result in the competition of fodder with food crops for scarce land and thereby impose supply constraints on cereal production. However, a positive effect of milk output growth would have its induced direct and indirect employment. It has been recently argued that delicensing of dairy industry would weaken such employment expansion.

The recent evidence shows that domestic price is generally lower than international price for cereal while for other commodities domestic prices are higher. If the ghost of priciness currently haunting India has its way and the cereal price is allowed to rise and other prices are allowed to fall in order to integrate the domestic market with the international market, the problem of hunger would be aggravated since cereals are by far the major and cheap source of calories.

If the two recent tendencies of slow employment expansion and the uptrend in cereal price since mid-1990 persist in the 1990s, they are likely to affect the food entitlement of the poor. Taste change may further aggravate nutritional deficiency. Raising the real

**Table 6.** Projected Demand Growth by Commodity Groups

(Annual Growth Rate in Per Cent)

Commodity group	Per Capita			Total		
	1987-1995	1995-2000	2000-2010	1987-1995	1995-2000	2000-2010
Rice	0.54	0.49	0.44	2.51	2.28	2.20
Wheat	0.82	0.82	0.81	2.80	2.60	2.30
Other Cereals	-0.45	-0.51	-0.57	1.50	1.26	0.97
Total Cereals	0.47	0.45	0.42	2.44	2.24	1.98
Milk	2.30	2.30	2.32	4.31	4.24	3.90
Fruits and Vegetables	1.73	1.82	1.96	3.73	3.64	3.54
Edible Oils	1.59	1.62	1.65	3.58	3.42	3.22
Meat, egg and fish	1.96	1.99	2.05	3.96	3.81	3.64
Pulses	1.21	1.21	1.18	3.19	3.00	2.76
Sugar	1.57	1.57	1.65	3.56	3.40	3.22
Other food	2.27	2.39	2.56	4.20	4.00	3.70
Non-Food						