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INTER-REGIONAL VARIATION IN CALORIE INTAKE

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I Introduction

(i) Following the publication of the results of the Seventeenth Round (1961-62) of the National Sample Survey (NSS), which included detailed information, quantity-wise, on most items of food consumed, a few studies attempted to estimate the levels of Calorie intake in different parts of India. Recently, the National Sample Survey Organisation has published estimates of Calorie intake for 1971-72 and 1973-74 based on the results of the Twenty-sixth and Twenty-eighth Rounds of the NSS. According to these estimates, the per capita intake of Calories in 1971-72 for the country as a whole was considerably lower than the level in 1961-62; though the national average registered some increase by 1973-74, it was still much below the level in 1961-62. The extent of decline in Calorie intake has however varied significantly between different regions. Why has the Calorie intake fallen despite an increase in per capita production of cereals by the early seventies? What factors account for the inter-State variations? These are some of the questions examined in this paper.

(ii) An earlier study had identified per capita output of cereals as the main explanatory variable underlying inter-State disparities in Calorie intake.[1/] While this is, by and large,

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1/ Centre for Development Studies, Poverty, Unemployment and Development Policy - A Case Study of Selected Issues with Reference to Kerala, United Nations, New York, 1975.

true for the later periods as well, the per capita output of cereals by itself does not seem to fully explain inter-State and inter-temporal variations in cereal consumption and, therefore, of Calorie intake. A major factor underlying the price and quantity of cereals consumed is the composition of the cereal basket. The proportions of different cereals - such as rice and wheat on the one hand and coarse cereals including jowar, bajra, small millets, etc. on the other - in the consumption baskets vary considerably between different regions. These cereals differ in many respects and they get reflected in the average prices, overall levels of cereal consumption, and Calorie intake in different States. Thus, the price of coarse cereals is the lowest and that of rice the highest, with the price of wheat falling in between. As a result, in the initial period, 1961-62, among those States where coarse cereals accounted for a high proportion of total cereal consumption, the per capita Calorie intake was relatively high compared to the States where rice formed an overwhelming proportion of cereal consumption. But, in the subsequent period, coarse cereals lost their comparative advantage in terms of price owing to secular decline or year-to-year fluctuations in output. Consequently, those States where coarse cereals constituted the major component of the cereal basket slipped down the scale of Calorie intake per capita. The States where rice was the staple food, which already had a low

per capita Calorie intake in 1961-62, suffered still further decline in the later period, though not as much as the States with high consumption of coarse cereals.

(iii) The present study will be confined to the levels of Calorie intake, since there seems to be no deficiency in proteins. Thus, the average intake of proteins among the rural households in the country as a whole in 1971-72 came to 76 grams per Consumer Unit (C.U.) or about 61 grams per capita per day; even for the lowest monthly expenditure class, below Rs.15 per capita, the intake of proteins came to 46 grams per C.U. or about 37 grams per capita per day, as high as the recommended dosage. Among the urban households, the average protein intake was as high as 110 grams per C.U. or 88 grams per capita.[2/] While rural-urban differences are referred to in passing, the focus will be on Calorie intake in rural areas.

(iv) The accuracy of the NSS consumer expenditure data has been a subject of debate in this country. The limitations of consumer expenditure data in general for nutritional analysis are also to be noted. However, the NSS provides the most detailed data on food intake with the widest coverage both in terms of space and time, and presumably the bias, if any, is uniform for all the rounds. The estimates of Calorie intake for 1961-62 and those

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2/ National Sample Survey, Twentysixth Round, July 1971- June 1972, Report Nos.258/10258/11.

for 1971-72 and 1973-74 are based on similar data on food intake collected by the same agency and by applying standard nutrient values of different food items. The estimates are therefore comparable.

II. The Point of Departure - The Composition of the Cereal Basket

As mentioned above, a close association between Calorie intake and per capita production of cereals in different States during 1961-62 was brought out in an earlier study. Let us now take a look at the inter-State differences in Calorie intake and percapita output of cereals in 1961-62 to see how close the relationship is.

(i) It is true that the intake of Calories is generally high in those States where per capita output of cereals is high (Table 1), as,for example, in Rajasthan, Punjab (including Haryana) and Madhya Pradesh; and in those States where Calorie intake is low, the per capita output of cereals is also low as in Maharashtra, West Bengal and Kerala. The association between the two variables is closer in respect of the rural areas, and understandably so, since inter-State movement of cereals as between rural areas is likely to be very much lessthan from rural to urban areas. On the other hand, there are States like Orissa and Andhra Pradesh whose per capita output of cereals is higher than the All-India average and the intake of Calories is still significantly below the national average. Similarly in States like Uttar Pradesh and Karnataka, the average production of

Table 1: Calorie intake and Related Variables, 1961-62

States ranked according to Calorie intake (Rural)	Calorie intake percapita per day			Cereal output: Kg. percapita per year	Proportion of different Cereals to total of all cereals consumed: Percent			Average retail price of all cereals Rs. per kg.
	Rural	Urban	Combined		Rice	Wheat	Coarse Cereals	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rajasthan	3147	2469	3037	199.90	1.88	18.16	79.85	0.36
Punjab	3076	2156	2891	232.14	11.99	64.89	23.11	0.49
Jammu & Kashmir	3033	2361	2922	167.73	58.01	14.59	27.36	0.42
Madhya Pradesh	2910	2162	2803	226.62	43.05	26.55	29.54	0.42
Uttar Pradesh	2854	2162	2765	147.72	31.68	32.09	36.22	0.48
Karnataka	2758	2046	2599	151.21	33.01	2.89	64.10	0.47
Bihar	2541	2330	2523	124.32	69.71	16.06	14.17	0.55
Gujarat	2503	2115	2403	105.16	15.49	14.66	69.85	0.47
Orissa	2375	2233	2366	211.10	94.39	0.38	5.28	0.45
Assam	2354	2140	2338	147.76	98.01	1.89	0.12	0.56
Maharashtra	2280	1916	2177	128.53	23.75	8.46	67.69	0.45
Andhrapradesh	2184	1997	2151	167.59	63.49	0.30	36.27	0.54
West Bengal	2175	2040	2112	137.98	96.61	2.69	0.63	0.62
Tamil Nadu	2147	1934	2090	155.28	71.02	0.70	28.34	0.57
Kerala	1631	1554	1620	58.55	99.19	0.71	0.10	0.66
All India	2511	2063	2445	157.43	51.46	15.47	33.00	0.51

Source: Col.1,2,&3: Centre for Development Studies, Poverty, Unemployment and Development Policy, op. cit.
Col.4: Derived from Estimates of Area and Production of Principal Crops in India, 1961-62, Directorate of Economics and Statistics, Ministry of Food and Agriculture, Government of India.
Col.5-7: National Sample Survey, Seventeenth Round, September 1961 - July 1962. Tables with Notes on Consumer Expenditure, Part II, No.200, I.S.I., Calcutta, 1969 (Mimeographed).
Col.8: The quotient of value and quantity of all cereals consumed.

cereals is comparatively low, but the intake of Calories is comparatively high; again, in Gujarat and Maharashtra the intake of Calories ishigher than in Assam and West Bengal which have a higher per capita output of cereals.

(ii) A significant feature of States like Rajasthan, Gujarat, Maharashtra and Karnataka is the high proportion of coarse cereals in the total consumption of cereals, as may be seen from Table 1. Among this group of States, the intake of Calories is also higher than the level of per capita output of cereals would suggest. The reason is that coarse cereals are cheaper, and, therefore, yield more Calories per rupee of expenditure than rice or wheat. Thus in States where the proportion of coarse cereals consumed is relatively high, like Gujarat and Maharashtra, the average price of cereals is lower than i. Andhra Pradesh, Assam, Tamil Nadu and West Bengal were per capita output of cereals is higher. Therefore, in States where coarse cereals constitute a higher proportion of total cereal consumption, the level of Calorie intake turns out to be higher than in other States with more or less the same levels of per capita output of cereals.

That is to say, there is a clear statistical association between per capita output of cereals and Calorie intake, the coefficient of correlation being 0.678. As is to be expected, the association between the price of cereals and Calorie intake is stronger; the correlation comes to -0.807. However, the proportion of coarse

Table 2: Price of Cereals and Purchasing Power of the Rupee in terms of Calories, Rural Areas 1961-62

States	Retail Price of Cereals				Yield of Calories per rupee of expenditure on:			
	Rice	Wheat	Coarse Cereals	All Cereals	Rice	Wheat	Coarse Cereals	All Cereals
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rajasthan	0.63	0.47	0.33	0.36	5520	7349	10454	9488
Gujarat	0.66	0.53	0.41	0.47	5244	6555	8418	7383
Maharashtra	0.63	0.55	0.38	0.45	5451	6279	9074	7689
Karnataka	0.64	0.60	0.38	0.47	5382	5796	9074	7314
Group average	0.64	0.54	0.38	0.44	5399	6495	9255	7961
Andhra Pradesh	0.63	0.40	0.40	0.54	5520	8625	8625	6348
Uttar Pradesh	0.51	0.47	0.37	0.48	6762	7349	9281	7142
Madhya Pradesh	0.47	0.42	0.33	0.42	7245	8142	10454	8246
Tamil Nadu	0.64	0.64	0.40	0.57	5382	5417	8625	6038
Jammu & Kashmir	0.45	0.45	0.34	0.42	7728	7590	10143	8246
Punjab	0.54	0.44	0.37	0.49	6383	7866	9315	7107
Bihar	0.59	0.49	0.42	0.55	5865	7004	8211	6279
Group average	0.55	0.47	0.38	0.50	6412	7428	9236	7058
Orissa	0.46	0.57	0.27	0.45	7452	6038	12765	7590
Assam	0.56	0.47	0.50	0.56	6141	7349	6900	6141
West Bengal	0.62	0.51	0.60	0.62	5520	6723	5762	5555
Kerala	0.66	0.71	..	0.66	5210	4830	..	5210
Group average	0.58	0.57	0.46	0.58	6081	6236	8476	6124
All India	0.58	0.47	0.37	0.51	6003	7418	9315	7004

Note: Col 1-4: Being the quotient of value and quantity of cereals consumed.

Source: The same as of Table 1.

cereals consumed has a bearing on the average price of all cereals, and the correlation between the two works out to -0.665, almost as high as that between per capita output of cereals and Calorie intake.

(iii) In States like Orissa, Assam, West Bengal and Kerala where rice constituted the staple diet of the rural population, the average intake of Calories was the lowest. As noted earlier, the price of rice is the highest among all cereals. In 1961-62, the retail prices of rice was more than one and a half times that of coarse cereals and about one and a quarter times that of wheat. In Punjab, Haryana, Uttar Pradesh and Madhya Pradesh where per capita output of cereals is comparatively high and the cereal basket consisted of wheat, coarse cereals and rice, the average intake of Calories was much higher.

The other side of the medal

That coarse cereals are cheaper than rice and wheat and, therefore, the regions where coarse cereals form a significant proportion of total cereal consumption have fared better in 1961-62 than other States where superior cereals dominate, is only one side of the medal. The other side is that the States where coarse cereals are the staple diet suffer from certain basic constraints, which render the food budgets of these regions extremely vulnerable. Being rain-fed crops, mostly grown in drought-prone areas, coarse cereals are characterised

by low yields and returns, and high instability of output. The low yields and high instability of output are largely due to the agro-climatic conditions associated with the habitations of those crops and to some extent inherent in the genetic characteristics of the crops. Being inferior cereals, the staple food of the lower income groups, they are low-value crops, mostly consumed where they are produced, with low inter-State movements. These features act as constraints on their growth.[3/] Be that as it may, such constraints have great implications for the food budgets of the regions concerned.

III. Profile of Changes in Calorie Intake

(i) The per capita Calorie intake in the country as a whole declined from 2445 in 1961-62 to 2170 in 1971-72* (See Appendix Table 1). All the States of the Indian Union, without any exception, had a share in this decline. Later there was some improvement, with the average per capita Calorie intake for the country rising from 2170 in 1971-72 to 2263 per day in 1973-74; but it was still nearly 7½ per cent below the level in 1961-62.

3/ N.S. Jodha, "Prospects for Coarse Cereals - Permanent Constraints of Jowar and Bajra", Economic and Political Weekly, Vol.VIII, No.52, December, 1973.

* The FAO/WHO Expert Committee has recommended 2223 Calorie per capita per day as the minimum required for Asia and the Far East. See: Food and Agriculture Organisation, Agricultural Commodity Projections, 1970-80, Rome 1971, Table 4, p.31.

Table 3: Levels of Calorie intake in the Early Sixties and Seventies, Rural Areas

States	Calorie intake percapita			Percentage increase(+) or decrease (-) over		Percentage of total expenditure on food in 1971-72					Percentage of total cereal consumption in the early seventies		
	1961-62	1971-72	1973-74	1961-62 1971-72	1961-62 1973-74	Cereals Cereal substitutes	Milk Milk products	Edible Oil	Meat Fish Egg	Sugar	Rice	Wheat	Coarse Cereals
	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Rajasthan	3147	2586	2719	-17.82	-13.60	48.83	25.12	4.27	1.07	6.52	1.53	25.84	72.63
2. Punjab	3076	2954	2815	- 3.97	- 8.49	28.35	31.00	4.59	1.95	13.04	6.79	68.22	24.99
3. Haryana	..	2874	2971	..	..	41.05	34.09	2.09	0.79	8.75	5.45	68.66	25.89
4. Jammu & Kashmir	3033	2793	2742	- 7.91	- 9.59	51.19	15.14	6.41	5.92	2.95	56.89	16.44	26.67
5. Madhya Pradesh	2910	2852	2422	- 1.99	-16.77	60.84	9.34	5.18	1.87	4.44	41.93	27.65	30.42
6. Uttar Pradesh	2854	2407	2450	-15.66	-14.15	57.05	13.67	5.66	2.43	7.00	25.98	45.71	28.31
Group Average	3004	2747	2687	- 9.47	-12.52	47.89	21.39	4.70	2.34	7.12	23.09	42.09	34.81
7. Karnataka	2758	2054	2211	-18.27	-19.83	59.30	7.52	3.23	2.94	4.65	27.69	2.91	69.42
8. Gujarat	2503	2295	2180	- 6.31	-12.90	43.67	17.02	8.46	1.12	9.22	11.10	22.49	66.41
9. Maharashtra	2280	2033	2044	-10.83	-10.35	54.13	7.11	6.23	4.44	6.29	18.05	14.02	67.93
Group Average	2514	2194	2145	-11.80	-14.36	52.34	10.55	5.97	2.83	6.72	18.94	13.14	67.92
10. Bihar	2591	2178	2186	-14.29	-13.97	68.23	6.02	4.01	3.35	2.09	56.99	21.58	21.43
11. Orissa	2375	2017	2125	-15.07	-10.53	70.21	2.03	3.34	4.67	2.23	90.20	3.25	6.55
12. Assam	2354	2132	2105	- 9.43	-10.58	59.07	5.82	4.83	10.57	3.09	96.77	3.41	0.18
13. Andhra Pradesh	2184	2118	2209	- 3.02	+ 1.14	60.75	6.00	4.73	5.49	2.23	62.07	0.79	37.14
14. West Bengal	2175	1860	2070	-14.48	- 4.83	67.06	4.63	5.04	6.01	2.81	81.53	16.86	16.10
15. Tamil Nadu	2147	1910	2012	-11.04	- 6.29	57.99	4.32	4.79	5.22	2.30	68.76	0.54	30.70
16. Kerala	1631	1610	1534	- 1.29	- 5.95	50.93	5.69	3.04	6.70	3.50	95.43	4.08	0.49
Group average	2201	1975	2034	- 9.87	- 7.29	62.03	4.93	4.25	5.14	2.61	78.82	7.21	16.08
All India	2511	2168	2328	-13.65	- 7.29	57.41	10.80	4.76	3.56	4.65	43.73	21.60	34.67

Source: Col.1: Poverty, Unemployment and Development Policy, op. cit. Table 3, p.15; Col.2&3: National Sample Survey Organisation, Sarvekshana, Vol.II, No.I, July 1978, Table 4, p.5; Col.6-13, National Sample Survey, 25th (1970-71), 27th (1972-73) and 28th (1973-74) Rounds, Reports Nos. 231, 234 and 240.

(ii) The average Calorie intake among the rural population in 1971-72, viz, 2188 per capita per day, was about 14 per cent below that in 1961-62. The decline is registered in all the States; the percentage decline ranged from 1.29 in Kerala to 18.27 in Karnataka. The intake rose to 2328 Calories per capita in 1973-74; but still it was 7.29 per cent below the level in 1961-62. In quite a few States, the average intake in 1973-74 was even less than that in 1971-72; Punjab, Jammu & Kashmir, Madhya Pradesh, Karnataka, Gujarat, Assam and Kerala belong to this category. (See Table 3).

(iii) While the average Calorie intake had fallen in all the States between 1961-62 and 1971-72 - and in some there was a further fall by 1973-74 - the significance of the decline differs qualitatively across the States. Obviously, the crucial question is the initial level of intake. Thus, for instance, Calorie intake in Punjab declined by about 4 per cent by 1971-72 and by about 8.5 per cent by 1973-74 compared to 3076 Calories in 1961-62. But the decline evidently does not signify a nutritional deterioration. For, after all, even in 1973-74, the average intake came to 2815 Calories, a reasonably high level by any standard. On the contrary, it could as well reflect an improvement in the nutritional standard; the fall in Calorie intake might be due to a qualitative improvement in the diet.

The expenditure on cereals and cereal substitutes in Punjab came to only 28.35 per cent of total expenditure on food in 1971-72, slightly less than one-half the All-India average. On the other hand, the proportion of expenditure on milk and milk products as well as on sugar was nearly three times the All-India average. (See Table 3). The rural population in Punjab derived about 13 per cent of their total Calorie intake from milk and milk products, meat, fish and egg (mainly from milk and milk products), compared to the national average of about 5 per cent. As against this, the proportion of Calories contributed by cereals and cereal substitutes, pulses, etc. was significantly lower in Punjab than in other States. (See Appendix Table 2). In other words, the decline in Calorie intake reflects a tendency to substitute more nutritious and palatable food items for cereals which became inferior goods thanks to a rise in the level of income. The food consumption in Haryana, which till the other day formed a part of Punjab, falls into the same pattern. Further, Punjab-Haryana region has been exporting an increasing proportion of its cereal output to other States from the late sixties. In Jammu & Kashmir, Madhya Pradesh, Uttar Pradesh and Rajasthan also, the level of Calorie intake in 1971-72 and 1973-74 was fairly high, above 2400 per capita, despite a perceptible fall since 1961-62. In this group of States, wheat forms a significant proportion of total cereal intake; wheat and coarse cereals together add up to a little over three fourths of the total. Further, per capita output of cereals in these States was higher than in the rest of the States.

(iv) Karnataka, Gujarat and Maharashtra are a class by themselves, in that a high proportion-over two-thirds - of the total cereal consumption among the rural population comprised coarse cereals. The average intake of Calories, which in the initial period, viz., 2514 for the group as a whole, was comfortably above the minimum requirement, suffered a steep and steady decline subsequently. By 1973-74 the average Calorie intake in all the three dropped below the minimum requirement. The steep rise in the price of coarse cereals since 1961-62 deprived these State of the comparative advantage enjoyed during the early sixties. In terms of the proportion of coarse cereal consumption, Rajasthan also would belong to this group. But in terms of average Calorie intake in the initial as well as subsequent periods, Rajasthan belongs to the high-Calorie group of States.

(v) The remaining States, viz., Bihar, Orissa, Assam, Andhra Pradesh, West Bengal, Tamil Nadu and Kerala, fall at the other end of the scale. Among these States, rice constituted the principal component of the cereal basket,about 83 per cent in the early sixties and 79 per cent in the early seventies; wheat and coarse cereals came to only a negligible proportion in the majority of them. The average intake even in the base year, among this group of States as a whole was below the minimum requirement viz., 2201 Calories. In the two subsequent periods, the average intake was below the recommended allowance

in all the seven States. The nutrition level in these States is precarious and their deficiency seems to be chronic.

(vi) While the average Calorie intake in the rural areas registered a substantial fall between 1961-62 and 1971-72, that in the urban areas of the country as a whole went up during this period from 2063 to 2179 per capita per day. The increase occurred in seven States, generally in those where the intake in rural areas was comparatively low. The overall average declined in 1973-74 compared to 1971-72, as well as 1961-62, though in quite a few States the intake level in 1973-74 was higher than in 1961-62.

In sum, the profile of change in Calorie intake between the early sixties and early seventies would divide the country into two broad regions. The first includes Punjab, Haryana, Rajasthan, Jammu & Kashmir, Madhya Pradesh and Uttar Pradesh. For all these States, the average Caloric intake among the rural population in both 1971-72 and 1973-74 was way above the minimum requirement inspite of a significant decline since 1961-62. The other region covers the remaining ten States and accounts for about 63 per cent of the country's rural population in 1971-72. In nine of them during 1971-72 and in all the ten during 1973-74, the average intake was below the norm, though the rate of decline since 1961-62 was not of a higher order than that for the first group of States.

IV. Factors Underlying Inter-State Variation

According to an earlier study, the main factors underlying inter-State differences in Calorie intake in rural areas are the level of production of foodgrains and the degree of inequality in the distribution of land, (via their influence on the quantum of the marketed surplus and the level of foodgrains prices). That is to say, Calorie intake will vary directly with per capita output and inversely with the degree of inequality in land distribution. It is further argued that the level of income was not a relevant factor governing Calorie intake except in respect of the non-landowning population. The results of the regression analysis confirmed the above inference. About 76 per cent of the inter-State variation in Calorie intake in the rural areas is explained by per capita foodgrains production and inequality in land distribution. When percapita income and price of cereals are also brought in, the value of R^2 rises from 0.76 to 0.86.4/

It is true that, in the early seventies also, a major component of the inter-State differences in Calorie intake in the rural areas is the level of per capita output of cereals. The coefficient of correlation between Calorie intake and per capita output of cereals worked out to 0.674 in 1961-62, and 0.703 in 1971-72 and 1973-74. However, there is more to it than per capita output per se. We shall here argue that cereal consumption and,

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4/ Poverty, Unemployment and Development Policy, op. cit.

therefore, Calorie intake is a function of (a) the level of purchasing power or income, and (b) the price of cereals. As for the level of price, it would depend not only upon per capita production, but also on the composition of the cereal consumption basket, thanks to the difference between the prices of different cereals. The supply of cereals is determined by production, since inter-State movement of cereals is negligible as far as rural areas are concerned.

In the earlier study, the level of per capita income proved to be not significant as an explanatory variable: the coefficient of regression of per capita agricultural income on (total) Calorie intake per capita came to -0.61, with a standard error of 1.53. On a priori basis, the level of income as a determinant of Calorie intake is crucial for non-producers. Admittedly, it is a relevant factor for small and marginal farmers also who have to purchase foodgrains to meet at least a part of their consumption needs. Thus, the proportion of the rural population purchasing cereals would be sizeable and for them the level of income would be a relevant factor. Further, the measure of income used in the earlier study is per capita agricultural income; but per capita agricultural income is not identical with per capita rural income.

In the following analysis, we use per capita consumer expenditure as a proxy for per capita rural income. Obviously, it is not a correct measure of rural income; perhaps it is a better approximation. Be that as it may, there is a positive

Table 4: Unemployment Rate, Consumer Expenditure and Calorie Intake in Rural Areas

State	Person-day-Unemployment Rate 1972-73: Percent	Monthly Percapita Consumer expenditure: Rs.		Calorie intake	
		1971-72	1973-74	1971-72	1973-74
	(1)	(2)	(3)	(4)	(5)
Punjab	4.21	66.51	75.51	2954	2815
Haryana	3.35	59.47	72.45	2874	2971
Madhya Pradesh	3.85	36.80	50.39	2852	2422
Jammu & Kashmir	2.81	46.51	52.24	2793	2742
Rajasthan	2.10	43.64	64.04	2586	2719
Uttar Pradesh	3.64	38.60	51.32	2407	2450
Group Average	3.33	48.55	60.79	2744	2686
Gujarat	4.79	44.17	54.49	2295	2180
Karnataka	8.13	40.21	53.32	2254	2211
Bihar	9.86	37.18	56.01	2178	2186
Assam	2.43	40.97	52.03	2132	2105
Andhra Pradesh	12.85	37.07	50.67	2118	2209
Maharashtra	10.22	38.97	52.27	2033	2044
Orissa	11.06	31.91	42.66	2017	2125
Tamil Nadu	13.48	33.89	47.74	1910	2012
West Bengal	11.79	35.89	47.50	1860	2070
Kerala	22.73	39.16	55.35	1610	1534
Group Average	10.73	37.74	51.20	2041	2068
All India	7.96	38.82	53.01	2168	2328

Source: Col.1: National Sample Survey Organisation, Some summary Information on the Survey on Employment and Unemployment, October 1972 - September 1973, Report Nos.255/6, 255/7 and 255/8, 1976 (Mimeo), average for subrounds 3 and 4;

Col.2 and 3: National Sample Survey, 25th, 27th and 28th Rounds, Report Nos.231, 240 and 284;
Col.4 & 5: as in Table 3.

Table 5: Production, Proportion of Cereals Consumed and Average Price of Cereals, Rural Areas

	1971-72					1973-74				
	Production of cereals kg. per capita	Proportion of cereals consumed: per cent			Average price of cereals Rs.per kg.	Production of cereals kg. per capita	Proportion of cereals consumed: percent			Average price of cereals Rs. per kg.
		Rice	Wheat	Coarse cereals			Rice	Wheat	Coarse	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Punjab	554.01	7.06	67.35	25.59	0.78	516.32	6.70	72.63	20.62	1.01
Haryana	378.39	6.54	76.20	22.26	0.89	314.51	4.35	66.12	29.53	1.12
Madhya Pradesh	218.71	43.69	25.10	31.20	0.93	192.47	38.54	32.19	29.79	1.38
Jammu & Kashmir	197.48	56.90	16.58	26.52	0.87	197.79	57.21	15.72	27.29	1.00
Rajasthan	191.31	1.50	25.78	72.73	0.83	198.09	1.78	26.67	71.59	1.21
Uttar Pradesh	165.18	25.00	43.48	31.52	0.90	148.52	27.69	50.25	22.04	1.34
Group average	284.18	23.45	41.58	34.97	0.86	261.30	22.77	43.93	33.48	1.18
Karnataka	188.21	29.44	3.19	67.37	1.11	192.79	30.48	2.14	68.61	1.59
Orissa	177.81	89.27	3.83	6.90	1.09	206.66	92.15	2.09	5.48	1.41
West Bengal	167.32	81.59	17.59	0.82	1.34	138.74	81.41	15.38	3.32	2.00
Andhra Pradesh	156.55	59.85	0.64	39.51	1.03	180.42	66.84	1.05	35.89	1.40
Gujarat	149.26	11.73	19.93	68.34	1.03	131.29	9.64	26.51	63.88	1.50
Bihar	143.14	54.57	21.34	24.09	1.20	119.55	58.89	21.67	19.68	2.01
Tamil Nadu	138.47	67.42	0.56	32.02	0.99	168.87	91.18	0.56	27.92	1.41
Assam	128.47	95.71	4.29	0.00	1.20	131.17	96.74	3.26	0.00	1.73
Maharashtra	84.09	18.10	16.05	65.85	1.11	114.76	18.01	9.94	72.42	1.54
Kerala	62.61	95.23	4.52	0.25	1.50	55.66	95.65	3.26	0.91	2.36
Group average	139.59	60.29	9.19	30.51	1.16	143.95	62.10	8.59	29.81	1.69
All India	181.54	43.92	21.76	34.32	1.04	179.59	43.45	21.99	34.56	1.52

association between per capita monthly consumer expenditure and Calorie intake in the rural areas; the coefficient of correlation between the two came to 0.579 in 1961-62, 0.639 in 1971-72 and 0.523 in 1973-74.

Consumer expenditure for a significant proportion of the rural population may depend on the level of employment. The rate of unemployment in the early seventies - measured as the percent of unemployed person days to the total person days available - and the per capita monthly consumer expenditure in the rural areas when plotted on a scatter diagram suggests that there is, by and large, an inverse correlation between the two. The relation between unemployment rate, consumer expenditure and Calorie intake is brought out in the two way table (Table 6).

The broad pattern which emerges is in States where unemployment rates are low, consumer expenditure and Calorie intake are high, as, for e.g., in Haryana, Punjab, Jammu & Kashmir and Rajasthan. As against this, in States like Andhra Pradesh, Bihar, Maharashtra, Orissa, Tamil Nadu and West Bengal, unemployment rates are high, while consumer expenditure and Calorie intake are low. On the other hand, there are a few States, as is the case with Madhya Pradesh and Uttar Pradesh, Calore intake is high despite low consumer expenditure; and in a few other States like Karnataka and Kerala where Calorie intake is low despite a comparatively high consumer expenditure. But then, in the former

group unemployment rates are low, in the latter group the reverse is the case. ~~The apparent inconsistency may be due to the price factor.~~

Table 6: Unemployment Rate, Consumer Expenditure and Calorie Intake in the Rural Areas in early Seventies

States where per-capita monthly consumer expenditure is:	States where unemployment Rate (PDUR) is: Below All India Average		Above All India Average	
	1971-72	1973-74	1971-72	1973-74
	(A)	(C)	(E)	(G)
Below All-India Average				
Unemployment Rate• Percent	3.74	3.18	11.81	11.88
Consumer Expenditure	37.70	51.49	35.19	48.17
Calorie intake	2629	2430	2017	2092
Above All India Average	(B)	(D)	(F)	(H)
Unemployment Rate: Percent	3.28	3.61	13.69	16.29
Consumer Expenditure:	50.18	66.62	39.45	55.68
Calorie intake	2606	2671	1966	1860

Note: Unemployment rate, person-day-unemployment-rate, stands for the ratio of days of labour force not working and seeking or available to the total person days available.

Source: National Sample Survey, 27th Round, 1972-73, Rural Areas.

The average price of cereals emerges as another crucial variable underlying inter-State variations in Calorie intake as we attempt to show in what follows. Inter-State differences in cereal prices have tended to widen since 1961-62. The coefficient of variation in the average price of all cereals which was 15.17 per cent in 1961-62 rose to 17.78 per cent in 1971-72 and 23.58 per cent in 1973-74.

Table 7: Inter-State Differences in Cereal Prices, Rural Areas

Crop	1961-62	1971-72	1973-74
RICE			
Mean: Rs.	0.579	1.296	1.846
S.D.: Rs	0.073	0.198	0.387
C.V.:Percent	12.67	15.25	20.98
WHEAT			
Mean: Rs.	0.515	0.997	1.386
S.D.: Rs.	0.083	0.130	0.817
C.V.: Percent	16.19	13.06	21.15
COARSE CEREALS			
Mean: Rs.	0.393	0.837	1.169
S.D.: Rs.	0.077	0.183	0.253
C.V.: Percent	19.56	21.81	21.67
ALL CEREALS			
Mean: Rs.	0.502	1.061	1.526
S.D.: Rs.	0.072	0.181	0.360
C.V.: Per cent	15.17	17.78	23.58

Thus over the years, despite a perceptible increase in cereal output in some States, the inter-State differences in cereal prices are widening. The implications of this for inter-State variation in cereal consumption and Calorie intake are obvious.

As to the factors governing inter-State variation in cereal prices, per capita output would appear to be the crucial one. For, the average price of cereals is low in States where per capita output is high and vice versa. However, the level of production does not seem to fully explain the inter-State differences in prices. Since the price of rice, wheat and coarse cereals vary considerably as mentioned earlier, the differences in the proportion of different cereals consumed as between the States should also influence the levels of average prices. To test this proposition we ran a regression of per capita output of all cereals, and the proportion of rice in total cereal consumption, and the average price of cereals. The results appear to show that the proportion of rice consumed is as important a factor accounting for inter-State variation in cereal prices as the level of production. A partial correlation analysis brings this out more sharply.

Table 8: Linear Regression Analysis of Price of Cereals on Production of cereals and proportion of Rice consumed

Year	Regression coefficients C	R	R^2	$r_{PR.C}$	$r_{PC.R}$
1961-62	-0.0007617 (2.5716)	0.0013593 (3.2825)	0.6815	0.6874	-0.5957
1971-72	-0.0005673 (1.7031)	0.0030624 (2.5543)	0.5841	0.5731	-0.4377
1973-74	-0.0018738 (2.5011)	0.0036162 (1.5879)	0.5567	0.4052	-0.5739

Note: P = average price
R = Percentage of rice to total cereals consumed
C = Per capita output of cereals

Figures in parenthesis stand for the T-values.

Now to pull all the variables together, we ran a regression of per capita output, and price, of cereals, per capita consumer expenditure and its coefficient of variation on Calories intake in 1961-62. For 1971-72 and 1973-74, we also introduced unemployment rates, PDUR, (1972-73) for the rural areas. The results are summarised in Table 19.

Table 19: Linear Regression Analysis of Calorie Intake on Level of Cereal Production, Price, Consumer Expenditure and other Related Variables

Year	Regression coefficients					R^2
	Per capita output of cereals	Prices of cereals	Percapita consumer expenditure	Coefficient of variation of per capita consumer expenditure	Unemployment rate (PDUR)	
1961-62	1.276 (0.788)	-3420.658** (3.809)	47.546* (2.841)	0.559 (0.080)	-	0.835
1971-72	0.741 (0.877)	-568.454 (1.335)	7.978 (0.728)	14.442 (0.972)	-33.102* (2.435)	0.870
1973-74	0.369 (0.547)	-369.311 (2.081)	8.662 (1.206)	0.030 (0.177)	-25.352* (2.620)	0.888

Note: Figures within paranthesis refer to the absolute T-values.

* Significant at 5% level

** Significant at 1% level

Levels of cereal output and their prices, per capita consumer expenditure and the degree of inequality together explain a little over 83 per cent of the inter-State variation in Calorie intake in 1961-62. Of these, the coefficient of regression of price and

consumer expenditure are significant, whereas that of per capita output is not. When we introduce unemployment rate the value of R^2 for 1971-72 rises 0.870, all other variables pale into insignificance. While R^2 improves further to 0.888 in 1973-74 the price factor reemerges as an important variable, though during this year, as in 1971-72, unemployment rate appears to be the most significant variable underlying inter-State variation in Calorie intake.

Summary and Conclusion

In the ultimate analysis, the level of Calorie intake for the vast masses of the rural people is a function of their income, as governed by the level of employment, and the price of cereals which, in turn, is determined by the level of production and the composition of the cereal basket. By and large, the prices of cereals are lower in the high-Calorie States, viz., Punjab, Haryana, Jammu & Kashmir, Madhya Pradesh and Uttar Pradesh than in the other States; the rate of increase in cereal prices since 1961-62 is also lower in this group of States compared to the rest of rural India. On the other hand, the per capita consumer expenditure in the high-Calorie region has been generally higher.

The average price of cereals being higher in the low-Calorie States - which together account for nearly two-thirds of the country's rural population - the per capita consumer expenditure required to meet the minimum Calorie intake must also be higher. The average consumer expenditure among this group of States being generally lower, other things being equal, the proportion of households falling below the critical minimum expenditure class may be greater. An implication of the differential trends in the price of cereals and per capita consumer expenditure since 1961-62 between the two groups of States is the possibility of an accentuation of the inter-regional disparity in the extent of undernutrition. This hunch needs to be carefully examined, which we shall reserve for another occasion.

If the above inferences are valid, it follows that an increase in cereal production by itself will not ensure an improvement in the Calorie intake in the low-Calorie group of States; it may be a necessary condition, but not a sufficient condition. Increase in employment opportunities and income is a precondition for raising the level of their nutrition status.

P.C.K. Panikar

Appendix Tables

Table 1: Levels of Calorie intake in the Early Sixties and Seventies

	Rural			Urban			Combined		
	1961-62 (1)	1971-72 (2)	1973-74 (3)	1961-62 (4)	1971-72 (5)	1973-74 (6)	1961-62 (7)	1971-72 (8)	1973-74 (9)
Rajasthan	3147	2586	2719	2469	2393	2243	3037	2552	2635
Punjab	3076	2954	2818	2156	2270	2355	2891	2792	2708
Haryana	..	2874	2971	..	2250	2244	..	2764	2843
Jammu & Kashmir	3033	2793	2742	2361	2267	2497	2922	2695	2696
Madhya Pradesh	2910	2852	2422	2162	2289	2108	2803	2760	2373
Uttar Pradesh	2854	2407	2450	2162	2101	2046	2765	2364	2393
Karnataka	2758	2254	2211	2046	1912	1995	2599	2171	2158
Bihar	2541	2178	2186	2330	2249	2300	2523	2185	2197
Gujarat	2503	2295	2180	2115	2122	2230	2403	2246	2194
Orissa	2375	2017	2125	2233	2213	2164	2366	2033	2128
Assam	2354	2132	2105	2140	2163	2031	2336	2135	2098
Maharashtra	2280	2033	2044	1916	2041	2163	2177	2035	2081
Andhra Pradesh	2184	2118	2209	1997	2087	2121	2151	2112	2192
West Bengal	2175	1860	2070	2040	2015	2196	2112	1898	2101
Tamil Nadu	2147	1910	2012	1934	1797	2091	2090	1876	2036
Kerala	1631	1610	1534	1554	1658	1760	1620	1618	1571
All India	2511	2168	2328	2063	2179	2003	2445	2170	2263

Source: Col.1 and 4: Poverty, Unemployment and Development Policy, op. cit., p.15;
Col.2,3,5,6,7,8 and 9: National Sample Survey Organisation, Sarvekshana, Vol.II, No.I, July 1978, Table 4, p.5.

Table 2: Percentage of Caloric Intake from Different Food Groups, All Expenditure Classes, 1971-72

State	Group I		Group II		Group III		Group IV		Group V		Sum of Groups I and II	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
1. Andhra Pradesh	82.86	7157	4.48	5.73	2.92	5.59	3.62	5.51	6.12	11.66	87.54	77.30
2. Assam	86.08	72.88	3.69	5.82	3.79	6.51	3.70	7.22	2.74	7.59	89.77	78.70
3. Bihar	86.59	77.07	6.05	6.78	2.68	4.81	2.40	5.34	2.28	5.97	92.64	83.85
4. Gujarat	78.24	65.71	5.66	6.82	7.16	9.85	6.08	12.00	2.86	5.62	83.90	72.53
5. Haryana	78.70	74.54	4.00	4.18	13.36	11.09	11.69	5.53	2.25	4.66	82.70	78.72
6. Jammu & Kashmir	82.59	76.97	3.01	2.88	6.93	7.73	3.59	6.56	3.88	5.86	85.60	79.35
7. Karnataka	83.81	73.53	7.22	7.85	3.23	6.33	2.21	5.37	3.53	6.92	91.03	81.38
8. Kerala	78.22	70.70	7.15	7.87	5.08	7.56	2.31	3.07	7.24	10.80	83.37	78.57
9. Madhya Pradesh	57.30	71.28	31.35	6.92	4.71	7.21	4.01	8.91	2.63	5.68	88.65	78.20
10. Maharashtra	81.42	64.37	7.07	8.22	3.70	7.28	4.81	9.52	3.10	10.01	88.49	72.59
11. Orissa	89.46	76.20	3.27	5.47	1.50	4.09	2.23	5.29	3.54	8.45	92.73	81.67
12. Punjab	73.64	66.20	4.18	4.47	12.63	13.07	5.30	6.58	6.25	9.68	77.82	70.67
13. Rajasthan	84.64	69.85	3.01	4.02	7.16	10.78	2.57	6.49	2.02	8.86	87.65	73.87
14. Tamil Nadu	81.31	72.15	6.93	6.75	3.22	5.97	3.70	5.42	4.80	7.71	88.23	78.90
15. Uttar Pradesh	83.92	76.15	6.33	6.19	4.47	6.50	3.49	5.94	1.79	4.82	90.25	82.34
16. West Bengal	86.18	70.18	3.30	4.75	2.83	5.71	3.89	6.81	3.80	12.55	89.48	74.93
All India	82.43	71.08	7.34	6.38	4.56	7.43	3.46	6.54	2.21	8.57	86.77	77.46

Note: Group I: Cereals, Cereal substitutes, potato, sugar and jaggery; Group II: Pulses, nuts and seeds; Group III: Milk and Milk products, meat, egg, and fish; Group IV. Edible Oils. Group V: Fruits, Vegetables, Spices and prepared food.

Source: The National Sample Survey. Twentysixth Round. Report Nos.238. Vol.I and Vol.II.

Appendix Table 3: Retail Price of Cereals and their index Numbers (1961-62=100) Rural Areas

States	RICE					WHEAT				
	Price: Rs. per kg.			Index Numbers		Price: Rs. per kg.			Index Numbers	
	1961.62	1971-72	1973-74	1971-72	1973-74	1961-62	1971-72	1973-74	1971-72	1973-74
Rajasthan	0.63	1.40	1.90	176.00	304.00	0.47	0.95	1.36	202.56	289.98
Punjab	0.54	1.10	1.51	203.33	279.11	0.44	0.83	1.01	187.93	230.07
Haryana	..	1.14	1.60	..	..	..	0.91	1.14	..	..
Jammu & Kashmir	0.45	1.05	1.20	235.43	269.06	0.45	0.63	0.82	138.77	182.22
Madhya Pradesh	0.47	1.07	1.56	227.18	336.21	0.42	0.92	1.39	217.49	328.61
Uttar Pradesh	0.51	1.17	1.62	229.41	317.65	0.47	0.91	1.32	193.62	280.85
Group Average	0.52	1.16	1.57	214.27	300.21	0.45	0.86	1.17	188.07	262.35
Karnataka	0.64	1.40	2.17	218.75	339.06	0.60	1.12	3.46	187.92	576.67
Bihar	0.59	1.39	2.22	236.39	377.55	0.49	1.11	1.87	225.15	379.31
Gujarat	0.66	1.74	2.56	264.44	389.06	0.53	1.06	1.56	201.52	296.58
Orissa	0.46	1.12	1.44	241.40	311.02	0.57	1.13	1.41	197.90	252.19
Assam	0.56	1.24	1.75	220.35	310.83	0.47	1.05	1.00	223.88	213.22
Maharashtra	0.63	1.51	2.18	239.30	345.48	0.55	1.06	1.82	193.43	332.12
Andhra Pradesh	0.63	1.19	1.55	190.10	247.60	0.40	1.10	1.38	275.00	345.00
West Bengal	0.62	1.40	2.07	224.36	331.73	0.51	1.09	1.70	212.89	332.03
Tamil Nadu	0.64	1.12	1.55	175.27	242.57	0.64	1.01	1.50	158.81	235.85
Kerala	0.66	1.54	2.41	231.93	362.95	0.71	0.98	1.24	137.25	173.67
Group average	0.61	1.37	1.99	224.23	325.79	0.55	1.07	1.60	221.51	313.66
All India	0.58	1.26	1.81	218.75	314.24	0.47	0.95	1.39	203.86	298.28

Note: Prices arethe quotients of thequantity and value of different cereals consumed.
Source: The same as in Table 1.

(contd...)

Appendix Table 3 contd..

	COARSE CEREALS				
	Price Rs. per kg.			Index Numbers	
	1961-62	1971-72	1973-74	1971-72	1973-74
Rajasthan	0.33	0.79	1.14	239.39	345.45
Punjab	0.37	0.61	0.85	164.86	229.73
Haryana	..	0.76	1.21	..	..
Jammu & Kashmir	0.34	0.55	0.71	161.76	208.82
Madhya Pradesh	0.33	0.75	0.16	227.27	351.52
Uttar Pradesh	0.37	0.66	1.06	177.42	284.95
Group average	0.35	0.69	1.02	194.14	284.09
Karnataka	0.38	0.99	1.30	260.53	342.11
Bihar	0.42	0.89	1.55	211.90	369.05
Gujarat	0.41	0.93	1.32	226.83	321.95
Orissa	0.27	0.70	0.94	259.26	348.15
Assam	0.50	..	..	..	..
Maharashtra	0.38	1.02	1.35	268.42	355.26
Andhra Pradesh	0.40	0.83	1.07	230.00	267.50
West Bengal	0.60	1.25	1.70	208.33	283.33
Tamil Nadu	0.40	0.75	1.07	187.50	267.50
Kerala	..	1.00	1.14	..	..
Group average	0.38	0.93	1.27	231.60	319.36
All India	0.37	0.83	1.21	224.32	327.03