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Long Term Change in Dietary Patterns and Food Demand in Asia: India 1970-1990

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Editorial introduction

The Centre has for some time made efforts to identify and estimate long term trends in food consumption and demand in Asia. The initial efforts used the balance sheet approach which is the quickest and most cost efficient way to estimate trends. For identification and estimation of the dynamics in consumption, one needs to identify consumer behaviour of income (or otherwise defined) groups; this way one can establish relations between income and expendable income for food.

Engels' Law is in full operation in Asia, where economic growth of national economies is becoming a wide stream. In the past decennia economists have eagerly followed the trend in rice and wheat consumption with the purpose of establishing the point where per capita consumption and demand would level off. This point has largely been reached. The observation of trends in consumption and demand yield, of course, far more information. It confirms, first, that there are still significant regional differences in cereal consumption and magnitude of economic and income growth, and second, that consumption and demand differ among agriculture commodities.

It is widely recognized that increased expendable income induces more consumption of meat, which has the effect of increased investment in and production of animal feed, sourcing carbohydrate from maize, sorghum and cassava, and protein/fat from soybean, fish meal and animal byproducts. But there are many more changes, such as the strongly increased demand for horticultural products. All these changes lead to regional shifts in agricultural product mixes; the pattern is highly variable because of the many commodities involved. It is important to identify the regional specificities in order to map the effects of agricultural development on the rural economy. In many isolated areas, consumption tends to follow local seasonality in production.

A first step of a systematic study of consumption and demand is to identify the broad course of events in Asia, using expenditure data. The results presented below for India are part of a larger study covering consumption, demand and business development of the main agricultural commodities in seven major economies in Asia.

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Introduction

This contribution analyses food consumption patterns on the basis of the latest available National Sample Survey (NSS) data. The analysis focuses on differences in the food intake levels across expenditure groups and also between rural and urban areas. An analysis of the nature and causes of shifts in consumption patterns over time is also presented. The forces of urbanization, high economic growth and changes in taste will influence the food consumption pattern.

The data

In India, the National Sample Survey Organization (NSSO) collects data on household consumption at the national level at various time intervals by adopting sample survey techniques. The present study used data of six rounds (27, 28, 32, 38, 42 and 43) of the National Sample Survey (NSS) pertaining to the years 1972/73, 1973/74, 1977/78, 1983, 1986/87 and 1987/88. These rounds provide disaggregated data on consumption in terms of quantity and value for major commodities by 12/13 expenditure groups, by urban-rural location and also by state. In addition to the commodity-wise disaggregated data on food grains, viz., rice, wheat, coarse grains (sorghum, pearl millet, maize, finger millet, other small millets), bengal gram, and other pulses, these rounds of NSS also contain data on other food and non-food items, total consumer expenditure (income) and the number of persons per family, separately for different expenditure classes. The data refer to the average per capita consumption over the past 30 days in each of the expenditure classes. Prices of rice, wheat, coarse cereals and gram for rural and urban areas were computed implicitly as expenditure divided by the quantity for each of the expenditure classes for each round. Retail prices of other commodities, for which the quantities were not available, were compiled from Agricultural Prices in India published by the Directorate of Economics and Statistics, government of India. Monthly retail prices of commodities in different markets were averaged for each state for the corresponding months of the NSS rounds.

For convenience of the analysis, the 12/13 expenditure groups were merged into four groups on the basis of the deviation between expenditure and poverty lines as followed by the Planning Commission. Based on the expenditure classes of

NSS, persons below 75% of the poverty line are defined as very poor, between 75% and the poverty line as moderately poor, between the poverty line and 150% of the poverty line as non-poor and expenditure classes above 150% of poverty line as rich. Per capita expenditure is taken as a proxy for income and these terms are used interchangeably in the study.

Table 1 Consumption pattern of cereals by period in rural and urban India (kg/year/capita).

NSS Round	Year	Rice	Wheat	Coarse Cereals	Total Cereals
Rural					
17	1961/62	106.7 (50.0)	32.2 (15.0)	74.8 (35.0)	213.7
27	1972/73	104.1 (49.7)	46.6 (22.2)	58.9 (28.1)	209.6
28	1973/74	83.9 (45.7)	42.8 (23.3)	56.8 (31.0)	183.5
32	1977/78	86.5 (44.9)	49.4 (25.6)	56.7 (29.4)	192.6
38	1983	80.7 (44.8)	54.3 (30.1)	45.1 (25.1)	180.1
42	1986/87	86.5 (49.5)	58.0 (33.2)	30.3 (17.3)	174.8
43	1987/88	88.1 (49.1)	61.6 (34.3)	29.8 (16.6)	179.5
44	1988/89	86.0 (48.6)	57.5 (32.5)	33.6 (19.0)	177.1
Urban					
17	1961/62	74.9 (49.9)	49.9 (33.2)	25.4 (16.9)	150.2
27	1972/73	60.1 (43.4)	58.6 (42.4)	19.6 (14.2)	138.3
28	1973/74	65.5 (47.5)	52.6 (38.2)	19.7 (14.3)	137.8
32	1977/78	67.6 (46.0)	64.6 (43.9)	14.8 (10.1)	147.0
38	1983	64.7 (47.1)	58.6 (42.7)	14.1 (10.3)	137.4
42	1986/87	64.8 (48.5)	58.6 (43.9)	10.1 (7.6)	133.6
43	1987/88	68.1 (47.8)	60.4 (44.5)	10.6 (7.7)	139.1
44	1988/89	65.1 (48.4)	58.5 (43.5)	10.9 (8.1)	134.5

Figures in parentheses are percentages of total cereal consumption.

Source of data: NSSO, Survey on Consumer Expenditure, various rounds.

Trend in consumption of cereals

This section covers consumption in the years 1960 - 1990. Table 1 shows that the share of rice in total cereal consumption was around 50% in 1961/62. It fell marginally until 1983 and thereafter shows an increasing trend. Currently it is stable at 48.5%. In the years 1960 - late 1980s, the share of coarse cereals

Message from the Director

The CGPRT Centre has established its capacity during the 14 years since its foundation in 1982 to meet the needs for further development in agriculture in developing member countries in Asia and the Pacific region.

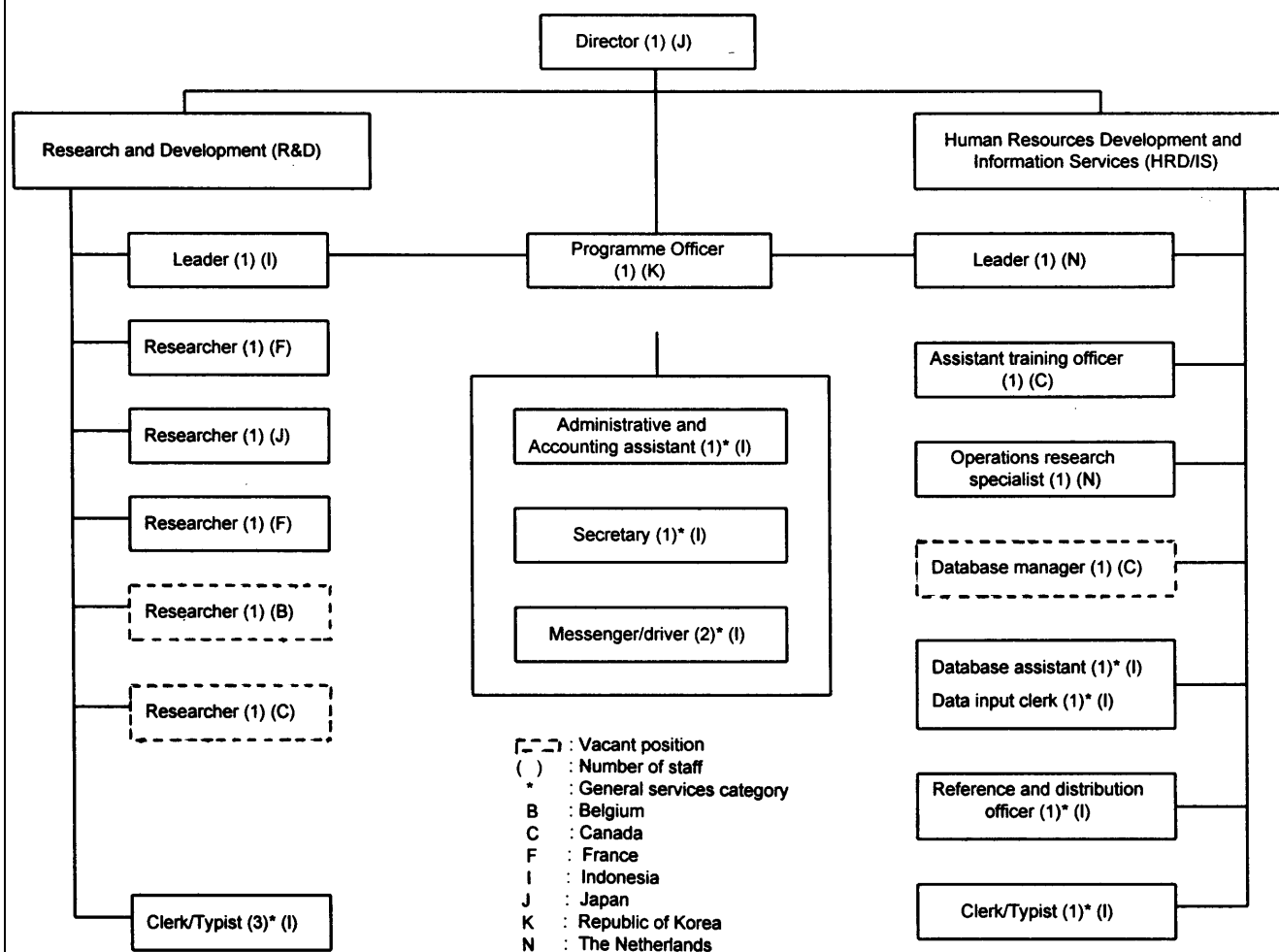
The chart below shows the functional structure and the staff arrangement of the Centre as of 1 November 1996. There are 23 staff, including 3 vacant positions, from 7 countries under two programmes, Research and Development (R&D) and Human Resources Development and Information Services (HRD/IS).

Under the R&D programme, the Centre implements research projects in collaboration with national experts of participating countries in the region, and under the HRD/IS programme, it holds various types of seminars, workshops and training courses. It also publishes the findings of research projects, proceedings and syllabi of seminars and workshops, and statistical profiles of partner countries, as well as this *Palawija News*. It has a small but useful library and a database which are open for all our partners.

You are always welcome to access the Centre in any way.

HARUO INAGAKI

Organization of the CGPRT Centre



in total cereals declined from 35% to 19% in the rural areas and from 17% to 8% in the urban areas. The share of wheat in total cereal consumption rose steadily from 15% to 34% in rural areas and from 33% to 45% in urban areas in the years 1961/62 and 1987/88. Wheat seems to be replacing coarse cereals. The consumption trend parallels the trend in per capita availability of cereals.

The consumption of cereals per head has declined in rural as well as in urban areas during the period 1961/62 to 1988/89, despite the rise in income and decline in relative cereal price. The declining trend in cereal consumption in rural areas is attributable to a structural shift in tastes and preferences on account of the increasing availability of a wide variety of food items other than food grains as well as a wide range of non-food goods and services. Nevertheless, per capita cereal consumption is much higher in rural areas. The importance of coarse cereals in direct human consumption is declining for both rural and urban populations. However, due to increasing consumption of livestock products, the demand for coarse cereals as feed can be expected to increase at a faster rate.

Structural change in consumption

Over the past three decades the per capita consumption of cereals as food has declined while that of fruits, vegetables, meat, fish, eggs and dairy products has increased. There is no doubt that household income and food prices strongly influence food consumption patterns. There are a number of arguments which support the effects of structural shifts as distinguished from income and price effects. As people move from rural to urban areas, the structural shift in consumption pattern can take place as a result of changes in options and behavioural characteristics:

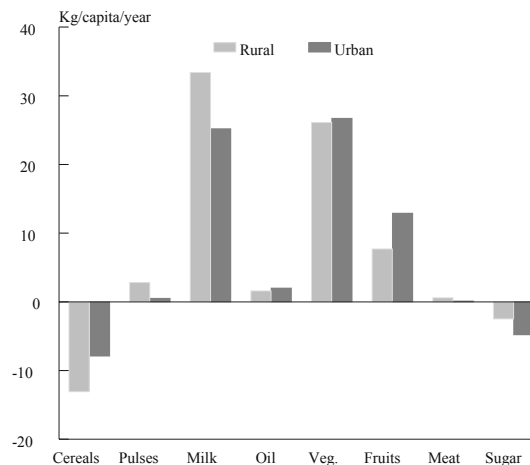
- (i) in urban markets a wider choice of food is available, as compared to rural markets, (Huang and Bouis 1995),
- (ii) urban residents are exposed to the rich variety of dietary patterns of foreign cultures,
- (iii) urban lifestyles requires foods which take less time to prepare, and
- (iv) urban occupations tend to be more sedentary and require a lower energy expenditure and so a lower calorie intake as compared to rural occupations.

While changes in food demand patterns which are not attributable to increases in household

incomes and changes in food prices may first be noticed in urban areas, as structural transformation proceeds to a more advanced level these same changes in food demand patterns eventually may occur in rural areas as well. At some point, market availability and lifestyles in urban and rural areas become virtually indistinguishable.

An ideal data set for measuring structural shifts in food demand patterns would record foods consumed, prices, income by source, and standard demographic information for a large number of families before and after these families migrated from rural to urban areas. Such a longitudinal data set would record this information across two or more generations. However, such data sets are not available. A next best alternative (not involving observations for the same households over time) would be two national cross-sectional household surveys taken several years apart. The consumption pattern based on NSS data at two points of time, 1977 and 1988, disaggregated by income and rural and urban areas is given in Tables 2 and 3, while Figure 1 illustrates the structural changes in food consumption in India.

Figure 1 Changes in food consumption (1987 minus 1977).



As shown in Table 3, the consumption of food items increased with the increase in income. The consumption of staple food is higher in rural areas, whereas the consumption of non-staple food is higher in the urban population. A greater variety of meat, fish, dairy products, fruits and vegetables is available in urban markets than in rural areas, encouraging greater habitual consumption of these foods. The comparison of the consumption pattern at two points

of time illustrates the shift in consumption pattern in favor of non-staple foods for each income group for both rural and urban populations.

Table 2 Annual per capita food consumption (kg) in India.

Income Group	Cereals	Pulses	Milk	Oil	Veg.	Fruits	Meat	Sugar
1977								
Rural	192.6	8.7	24.6	2.7	24.7	2.6	2.7	13.5
I	157.4	5.1	6.0	1.5	15.8	1.0	1.4	5.7
II	192.6	7.9	15.3	2.4	23.3	1.4	2.3	9.9
III	214.5	10.4	30.5	3.2	29.5	3.0	3.4	15.9
IV	250.5	17.0	77.9	5.3	42.6	8.2	5.7	35.7
Urban	147.0	11.7	39.7	4.8	39.7	5.9	4.8	17.1
I	122.9	5.8	8.3	2.0	18.7	1.4	1.8	7.7
II	143.9	8.1	17.4	3.1	26.6	2.1	2.9	11.1
III	152.7	11.0	31.6	4.4	35.7	3.9	4.4	15.4
IV	156.5	17.0	73.5	7.3	60.2	11.7	7.6	26.3
1987								
Rural	179.5	11.5	58.0	4.3	50.8	10.3	3.3	11.0
I	144.5	6.8	10.2	2.0	33.3	3.0	1.4	4.6
II	169.2	9.3	22.3	3.1	41.4	5.2	2.3	7.2
III	183.5	11.0	44.0	4.1	50.4	8.7	3.1	10.5
IV	206.5	16.7	130.0	6.8	70.0	20.5	5.4	18.6
Urban	139.1	12.2	64.9	6.8	66.4	18.8	4.9	12.3
I	120.5	6.7	15.6	2.9	35.4	5.0	2.8	6.0
II	135.7	9.1	32.0	4.5	48.2	9.0	3.6	8.9
III	141.2	12.1	58.4	6.5	65.3	14.9	4.3	12.1
IV	147.2	17.0	116.7	10.4	94.3	35.8	7.3	17.6

The structural shift is quite significant even in the rural areas. Between 1977 and 1987, the per capita annual consumption of cereals declined from 193 kg to 180 kg in rural areas and from 147 kg to 139 kg in urban areas (Table 3). The declining trend in sugar consumption can be observed both in rural and urban populations. During the decade, the per capita annual consumption of fruits and vegetables increased from 27 kg to 61 kg in rural areas and from 46 kg to 84 kg in urban areas. The annual consumption of milk increased from 25 kg to 58 kg in rural and from 40 kg to 65 kg in urban areas. The consumption of meat, fish and eggs has also shown an increasing trend, but the per capita annual consumption still remained low (3.3 kg in rural and 4.9 kg in urban populations), because the majority of the Indian population is vegetarian and derives the major share of protein from pulses and milk. The share of non-food items in total expenditure increased by 2.5% in rural and 5% in urban areas between 1977/78 and 1987/88, while per capita calorie intake increased marginally (less than 3%). Consumers are not meeting additional energy requirements from additional consumption of cereals but from non-cereal and non-crop commodities. This is true for all income groups in rural as well as in urban areas. During the period

1977-87, the cereal budget share declined by 11% in rural and 8% in urban areas. This budget has been diverted to high value commodities. Thus, a diversified food basket is exhibited both in rural and urban areas with significantly higher levels of per capita consumption of milk and milk products, fruits and vegetables, and meat. The increasing demand for livestock products (milk, meat and eggs) will push the demand for feed. Empirical estimates presented in this section support the hypothesis that, in addition to income and urbanization, structural changes in food demand can be quite significant factors driving the rapid changes in dietary patterns.

Table 3 Structural change in consumption of food in India.

Item	Rural			Urban		
	1977	1987	Change	1977	1987	Change
Annual Per Capita Food Consumption (kg)						
Rice	86.5	88.1	+1.6	67.6	68.1	+0.5
Wheat	49.4	61.6	+12.2	64.6	60.4	-4.2
Coarse cereals	56.7	29.8	-26.9	14.8	10.6	-4.2
Cereals	192.6	179.5	-13.1	147.0	139.1	-7.9
Pulses	8.7	11.5	+2.8	11.7	12.2	+0.5
Milk	24.6	58.0	+33.4	39.7	64.9	+25.2
Edible oil	2.7	4.3	+1.6	4.8	6.8	+2.0
Vegetables	24.7	50.8	+26.1	39.7	66.4	+26.7
Fruits	2.6	10.3	+7.7	5.9	18.8	+12.9
Meat, fish & eggs	2.7	3.3	+0.6	4.8	4.9	+0.1
Sugar	13.5	11.0	-2.5	17.1	12.3	-4.8
Percent of Total Calorie Intake by Source						
Cereals	81.0	73.6	-7.4	68.6	63.2	-5.4
Pulses	3.7	4.8	+1.1	5.5	5.6	+0.1
Milk	2.5	5.7	+3.2	4.5	7.1	+2.6
Edible oil	2.9	4.6	+1.7	5.8	8.1	+2.3
Vegetables	2.2	4.4	+2.2	3.9	6.4	+2.5
Fruits	0.3	1.0	+0.7	0.6	1.9	+1.3
Meat, fish & eggs	0.4	0.5	+0.1	0.9	0.9	+0.0
Sugar	6.4	5.1	-1.3	9.1	6.3	-2.8
Other food	0.5	0.3	-0.2	1.1	0.5	-0.6
Percent of Total Food Expenditure						
Cereals	50.8	39.8	-11.0	34.6	26.6	-8.0
Pulses	6.3	6.4	+0.1	6.6	6.1	-0.5
Milk	13.0	14.3	+1.3	16.3	17.1	+0.8
Edible oil	5.5	8.0	+2.5	7.8	9.5	+1.7
Vegetables	5.8	8.0	+2.2	7.3	9.0	+1.7
Fruits	1.7	2.6	+1.5	3.0	4.4	+1.4
Meat, fish & eggs	4.1	5.2	+1.1	5.6	6.6	+1.0
Sugar	4.2	4.5	+0.3	4.4	4.2	-0.2
Other food	8.7	11.2	+2.5	14.4	16.5	+2.1
Percent of Total Expenditure						
Food	65.4	62.8	-2.6	60.7	55.4	-5.3
Non-food	34.6	37.2	+2.6	39.3	44.6	+5.3
Annual expenditure (Rs per capita)	850	2,070	+1,220	1,166	3,126	+1,960
Total Calorie Intake per day						
Per capita	2,238	2,298	+60	2,022	2,078	+56
Per adult unit	2,820	2,849	+29	2,487	2,514	+27

Demand analysis

A number of demand models are available for estimating income and price elasticities of demand for a commodity. Recent demand studies are centered around complete demand systems which take into account mutual interdependence of a large number of commodities in the budget decisions of the consumer. Important models which have received considerable attention are the linear expenditure system of Stone (1954), and almost ideal demand system (AIDS) of Deaton and Muellbauer (1980). Bouis (1992) suggested a model based on demand characteristics, known as the food characteristic demand system (FCDS). In this study, results of demand models based on FCDS (given in Table 4) are taken from the recent work of Kumar et al. (1994). The demand parameters based on the linear expenditure system (given in Table 5) are taken from the recent work of Radhakrishna and Ravi (1990). Both estimates show that expenditure elasticities are low for urban consumers as compared to rural consumers. The cheapest source of calories (cereals) has inelastic demand and the income elasticities are lowest. The magnitude of expenditure elasticities for cereals is much higher in the case of LEDS than those obtained from FCDS. This is puzzling; once the expenditure elasticities for rice and wheat are positive and significantly high in magnitude, why did the per capita cereal consumption not increase with total expenditure. The calorie-income elasticity based on FCDS was 0.12 for both rural and urban consumers. In the case of LEDS, it was 0.42 for rural and 0.46 for the urban consumers. Empirical evidence from India and the Philippines shows that calorie-income elasticities should be near zero. This is because, after attaining the minimum caloric requirement, the consumer will allocate his additional income to high value products and buy the calories from costly sources. Calorie elasticity derived from the demand parameters of FCDS was the lowest. The demand elasticities obtained from FCDS may give the most reliable demand projections for food commodities.

Growth in demand for food

The consumer demand elasticities given in Table 6 for India have been derived as the weighted average of elasticities for the rural and urban groups. They can be used in projecting the growth in demand for food under the assumptions that expenditure

grows at 5% per annum and population grows at 1.91%. As shown in Table 6, the rate of expansion of demand varies for different food items. The growth of demand for cereals is mainly due to the growth of population. The demand for meat, fish and eggs will increase about 5.8% per annum, the demand for pulses, edible oils, vegetables, fruits and milk is projected to increase at 3.3 to 4.1% per annum.

Table 4 Expenditure and own price elasticities based on FCDS by rural and urban population, India.

	Expenditure Elasticity		Own Price Elasticity			
	Rural	Urban	Uncompensated Rural	Uncompensated Urban	Compensated Rural	Compensated Urban
Rice	0.059	0.008	-0.248	-0.255	-0.230	-0.266
Wheat	-0.070	-0.091	-0.183	-0.190	-0.192	-0.194
Coarse cereals	-0.132	-0.176	-0.236	-0.301	-0.241	-0.304
Pulses	0.307	0.215	-0.519	-0.517	-0.505	-0.499
Milk	0.458	0.372	-0.624	-0.667	-0.583	-0.626
Oil	0.390	0.234	-0.566	-0.522	-0.545	-0.503
Vegetables	0.385	0.253	-0.569	-0.550	-0.547	-0.563
Fruits	0.442	0.360	-0.648	-0.685	-0.641	-0.672
Meat	0.848	0.633	-0.888	-0.889	-0.855	-0.854
Sugar	0.135	0.062	-0.398	-0.396	-0.393	-0.388
Others	0.936	0.695	-0.968	-0.967	-0.898	-0.896
Non-food	2.247	1.866	-1.241	-1.235	-0.419	-0.377

Source: Kumar et al. 1994.

Table 5 Expenditure and own price elasticities based on LEDS by rural and urban population, India.

	Expenditure Elasticity		Own Price Elasticity			
	Rural	Urban	Uncompensated Rural	Uncompensated Urban	Compensated Rural	Compensated Urban
Rice	0.455	0.220	-0.553	-0.276	-0.481	-0.257
Wheat	0.436	0.258	-0.658	-0.463	-0.632	-0.449
Coarse cereals	0.029	-0.260	-0.821	0.104	-0.820	0.102
Pulses	0.713	0.493	-1.303	-0.537	-1.273	-0.520
Milk	1.150	0.990	-0.785	-0.660	-0.686	-0.566
Oil	0.755	0.608	-0.538	-0.388	-0.496	-0.356
Fruits & vegetables	0.806	0.811	-0.785	-0.612	-0.730	-0.550
Meat	0.926	0.823	-0.640	-0.544	-0.610	-0.514
Sugar	0.873	0.573	-0.598	-0.345	-0.573	-0.332
Others	0.874	1.044	-0.934	-0.808	-0.879	-0.713
Non-food	1.595	1.403	-1.017	-0.984	-0.440	-0.365

Source: Radhakrishna and Ravi 1990.

Table 6 Projected growth in demand for food.

Commodity	Expenditure Elasticity	Growth in Demand (%)
Rice	0.049	2.15
Wheat	-0.075	1.54
Coarse cereals	-0.137	1.23
Pulses	0.283	3.33
Milk	0.435	4.09
Edible oils	0.337	3.60
Vegetables	0.345	3.64
Fruits	0.412	3.97
Meat, fish & eggs	0.777	5.80
Sugar	0.115	2.49

Demand for livestock products

The livestock and poultry industries are the major consumers of food grains and oil cake as feed. For projecting the requirement for feed, one needs reliable demand projections for livestock products (milk, meat and eggs). In this section, the demand for milk, meat and eggs in the year 2000 is estimated. Examination of data on livestock products, given in Table 7, reveals that meat production (including poultry meat) in India increased by an average annual growth rate of 14% between 1980 and 1992 and reached about 3.4 million tons in the year 1992. Egg production increased by two-fold from about 10 billion eggs in the 1980s to about 23 billion in the year 1992, an average rate of growth about 7% per year. Milk production also grew faster at an annual growth of 5%, reaching 55 million tons in the 1990s from 32 million tons in the 1980s. The production of livestock grew much faster than the population which has resulted in higher per capita availability of meat, eggs and milk. However, the per capita consumption of livestock products is still lower than recommended levels.

Table 7 Production of milk, meat and eggs in India.

Year	Meat (thousand tons)	Eggs (millions)	Milk (million tons)
1980	894	10,060	31.6
1981	910	10,876	34.3
1982	960	11,454	35.8
1983	975	12,792	38.8
1984	1,125	14,252	41.5
1985	1,167	16,128	44.0
1986	1,227	17,310	46.1
1987	1,383	17,795	46.7
1988	1,753	18,980	48.4
1989	3,098	20,204	51.4
1990	3,198	21,115	54.9
1991	3,282	21,984	55.7
1992	3,351	23,070	55.9
Growth (%)	13.89	7.40	4.94

Source: Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India.

Note: Production of meat includes beef, buffalo, sheep, goat, pig and poultry products (excluding eggs).

The demand for milk, meat and eggs was projected using trend projection as well as demand system approaches. Livestock production for the triennium average ending (TE) 1992 is taken as the base year demand pertaining to the year 1991. The trend projection approach is based on the assumption that the recent past trend will continue in future. The demand projections of consumer demand is based

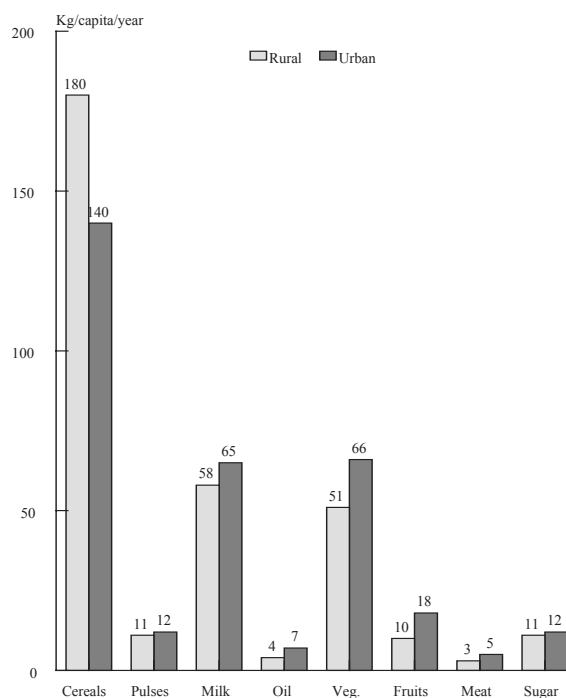
on the assumption that the total expenditure will grow at 5% per annum and population will grow at 1.91% per annum during 1991-2000. Table 8 presents the projected demand for milk, meat and eggs in the years 1995 and 2000.

The demand projections based on trend lines appear to be high, especially for meat, and it is unlikely that these levels will be achieved by the year 2000. The demand projections based on the consumer demand system look more realistic. In the year 2000, demand for milk will be about 79 million tons, meat (including poultry meat) 5.4 million tons, and eggs 36.6 billion.

Table 8 Demand for milk, meat and egg in India.

Item	1991	1995	2000	Annual Growth (%)
	Base year 1991-2000			
Trend Projection Approach				
Milk (million tons)	55.60	67.43	85.81	4.94
Meat (million tons)	3.28	5.51	10.60	13.89
Eggs (million)	22,056	29,346	41,934	7.40
Consumer Demand System Approach				
Milk	55.60	65.24	79.69	4.08
Meat	3.28	4.11	5.45	5.80
Eggs	22,056	27,635	36,635	5.80

Figure 2 Food consumption pattern in 1987/1988, India.



Consumption pattern

As shown in Figure 2, annual per capita consumption of cereals is much higher in rural areas (180 kg) compared to urban areas (140 kg). The low cereal consumption in urban areas is compensated by higher consumption of milk, vegetables, fruits, meat and edible oils. With the information explosion as a result of breakthroughs in communication technology during the nineties, the rural population is being exposed to the availability of new consumable food items as well as durable goods. This has brought changes in their living and consumption patterns and, therefore, rural consumers are coming much closer to the urban food consumption pattern over time.

Table 9 Budget shares of different expenditure groups in 1987/88.

Commodity Group	Expenditure Group				
	I	II	III	IV	All Groups
Rural					
<u>Percent of food expenditure</u>					
Cereals	55.3	49.6	42.7	30.8	39.8
Pulses	6.6	6.7	6.4	6.3	6.4
Milk & milk products	5.1	8.3	12.9	19.4	14.3
Edible oils	7.0	7.6	7.9	8.4	8.0
Vegetables	8.8	8.5	8.2	7.6	8.0
Fruits	1.1	1.5	2.1	3.6	2.6
Meat, eggs & fish	3.4	4.4	5.0	5.9	5.2
Sugar	3.3	3.8	4.4	5.2	4.5
Others	9.3	9.6	10.3	12.9	11.2
Total food	100	100.0	100	100	100
<u>Percent of total expenditure</u>					
Food	74.2	72.4	68.8	55.3	62.8
Non-food	25.8	27.6	31.2	44.7	37.2
Total per capita expenditure (Rs/year)	927	1341	1819	3616	2070
Population (million)	158.3	120.3	168.3	138.6	585.6
Urban					
<u>Percent of food expenditure</u>					
Cereals	44.5	37.9	29.6	19.3	26.6
Pulses	7.0	6.8	6.4	5.5	6.1
Milk & milk products	8.1	12.0	16.2	20.2	17.1
Edible oils	8.6	9.2	9.8	9.5	9.5
Vegetables	9.2	9.2	9.5	8.7	9.0
Fruits	1.8	2.5	3.5	5.9	4.4
Meat, eggs & fish	4.8	5.7	6.2	7.3	6.6
Sugar	4.2	4.5	4.5	3.9	4.2
Others	11.8	12.1	14.3	19.6	16.5
Total food	100.0	100	100	100	100
<u>Percent of total expenditure</u>					
Food	71.9	68.6	63.8	47.6	55.4
Non-food	28.1	31.4	36.2	52.4	44.6
Total per capita expenditure (Rs/year)	1,087	1,647	2,476	5,739	3,126
Population (million)	28.7	27.4	50.9	83.0	190.0

I: Very poor; II: Poor; III: Non-poor; IV: Rich.

Total expenditure

With the total household expenditure at Rs 1.806 billion and population at 775.57 million, the per capita annual expenditure comes to Rs 2,329 in the year 1987/88 (Table 9). It was estimated at Rs 2,070 for rural areas and Rs 3,126 for urban areas, indicating a fairly large rural-urban difference in per capita annual expenditure (33.8% lower in rural population). The rural-urban difference increased from lower to higher expenditure groups. Furthermore, inter-group disparity in expenditure was much higher in the urban area than in the rural area.

Budget share by commodity group

Table 10 shows that rural consumers spent 63% of their income on food items compared to 55% spent by urban consumers. Further, expenditure on food items decreased with increase in income level. Among the food items, the share of cereals dominated the food expenditure, except for the urban rich where the share of milk and milk products ranked first among food items. The urban population also spent a higher proportion of per capita expenditure on milk and milk products, fruits, vegetables and other foods and a lower level of per capita expenditure on cereals compared to rural areas. Thus, urban areas exhibited a more diversified food basket. Considerable variation in consumption level and pattern existed among the expenditure groups. Food grains (cereals + pulses) accounted for a major part of the expenditure on food for the very poor groups: 62% in the rural areas and 52% in the urban areas. On the other hand, milk, fruits, vegetables, meat and other food items figured prominently in the consumption baskets of the upper expenditure groups. Thus, the study of consumption patterns suggests that growth in demand for milk, fruits and vegetables will increase with growth in the economy.

The variation in consumption pattern, as observed in the foregoing analysis, can be basically attributed to changing consumer tastes and preferences on account of the increasing availability of a wide variety of food items in the urban areas. The share of urban areas in population is expected to increase from 26% in 1991 to 28% by 2000 A.D. This increasing urbanization and widening rural-urban income disparity will reduce per capita consumption of food grains and increase the consumption of other food items.

Table 10 Distribution of calorie intake by source in 1987/88.

Commodity Group	Expenditure Group				All Groups
	I	II	III	IV	
Rural					
Percent of total calorie intake					
Cereals	83.6	80.0	75.7	65.3	73.6
Pulses	4.0	4.4	4.6	5.4	4.8
Milk & milk products	1.4	2.5	4.4	9.9	5.7
Edible oils	3.0	3.8	4.4	5.6	4.6
Vegetables	4.1	4.2	4.4	4.7	4.4
Fruits	1.0	0.4	0.6	0.8	1.5
Meat, eggs & fish	0.3	0.4	0.5	0.7	0.5
Sugar	3.0	3.9	4.9	6.7	5.1
Others	0.2	0.2	0.2	0.3	0.3
Calorie intake/capita/day	1,629	1,994	2,286	2,984	2,298
Family size	5.79	5.51	5.12	4.41	5.07
Adult unit	4.43	4.35	4.13	3.71	4.08
Calorie intake/adult/day	2,129	2,526	2,834	3,547	2,856
Urban					
Percent of total calorie intake					
Cereals	77.5	71.9	64.8	54.0	63.2
Pulses	4.4	4.9	5.6	6.3	5.6
Milk & milk products	2.4	4.1	6.5	10.3	7.1
Edible oils	4.9	6.2	7.8	10.0	8.1
Vegetables	4.8	5.4	6.3	7.3	6.4
Fruits	0.7	1.1	1.5	3.0	1.9
Meat, eggs & fish	0.7	0.7	0.8	1.0	0.9
Sugar	4.4	5.3	6.3	7.3	6.3
Others	0.3	0.3	0.4	0.8	0.5
Calorie intake/capita/day	1,468	1,781	2,058	2,576	2,078
Family size	6.34	5.80	5.03	3.54	4.69
Adult unit	4.84	4.61	4.15	3.08	3.86
Calorie intake/adult/day	1,923	2,241	2,494	2,961	2,525

Note: I: Very poor; II: Poor; III: Non-poor; IV: Rich.

In 1987 nearly half of the rural population fell in the bottom two expenditure groups. On the other hand, more than two-thirds of urban population was concentrated in the upper two expenditure groups and the poverty groups accounted for less than one-third of the urban population. In 1987/88, India had 43% of her population as poor and 57% non-poor. Out of this, 82% of poor and 68% of non-poor were concentrated in the rural areas, indicating the potential market for cereals in the rural areas.

Calorie consumption

Table 11 presents the calorie intake from different food commodities by expenditure group in rural and urban areas in 1987/88. Cereals accounted for 74% of the total calorie intake in the rural and 63% in the urban areas. More significantly, the very poor

group derived more than three-fourths of its total calorie intake from cereals. The average per adult daily calorie intake has varied from 1,923 calories by urban very poor to 3,547 calories by rural rich. The Planning Commission has recommended 2,400 calories per day for rural and 2,100 calories per day for urban people. If we accept these norms, calorie requirements were met at the aggregate level. Nevertheless, nutritional deficiency was observed among the very poor group; calorie intake level was deficient by 27% for the rural very poor and 15% for the urban very poor.

A comparison of cereal consumption with the norms of the Indian Council of Medical Research (ICMR) reveals that all the groups, except the urban very poor, consumed adequate cereals, even though all the poor groups suffer from calorie deficiency Table 11. The calorie deficiency was, therefore, due to a shortfall in the consumption of milk, vegetables, fruits, meat, etc. Cereals, particularly coarse cereals, are the least expensive source of calories and, therefore, rural poor take more calories from cereals. The possibility of substituting food items such as milk, meat, vegetables, fruits, etc. for cereals is unaffordable for very poor people. Thus, with increase in income, cereal consumption will increase in the future to overcome the calorie deficiency among the very poor consumers. The calorie share of cereals decline with increase in per capita expenditure. This pattern is more noticeable in urban areas. The decline in calorie share of cereals is compensated for by a marked increase in calorie intake from milk, vegetables, fruits, meat, sugar, etc. As income rises, households generally diversify their food consumption patterns by shifting towards more expensive and higher quality food items.

Table 11 Annual per capita food consumption (kg) by income group in 1987/88.

Cereal	Expenditure Group				All Groups
	I	II	III	IV	
Rural					
Rice	66.4	87.2	93.4	98.3	88.1
Wheat	41.3	52.3	61.4	82.1	61.6
Coarse cereals	36.8	29.7	28.7	26.1	29.8
Total cereals	144.5	169.2	183.5	206.5	179.5
Urban					
Rice	55.0	66.8	71.0	71.6	68.1
Wheat	47.9	54.4	60.5	70.1	60.4
Coarse cereals	17.6	14.5	9.7	5.5	10.6
Total cereals	120.5	135.7	141.2	147.2	139.1

Note: ICMR norm for cereals is 386 gms per day (141 kg/year).

Conclusion

It is clear from the foregoing discussion that, in spite of a decline in real prices and an increase in income, the per capita consumption of cereals has declined over time. Within the cereals group, wheat

has replaced coarse grains. Further, there is a structural shift in the consumption pattern in favour of fruits, vegetables and livestock products. This shift is mainly because of changes in taste, urbanization and growth in the economy.

CGPRT Centre News and Activities

Market Prospects of Upland Crop Products and Policy Analysis in Selected Asian Countries (MPUPA) Project

The MPUPA project has almost completed the seven country studies. The reports submitted by the first group of countries: India, Indonesia, the Philippines and Thailand, will be published in the Working Paper Series. The lead article of this issue of Palawija News is from the India country study which has just been published. The experts from China, Pakistan and Vietnam presented draft country reports at the Centre on 31 July to 2 August 1996. These reports will also be published.

The following is a short summary of the findings from the second group of country studies.

Change in dietary patterns

China

Based on analysis of recent trends in dietary patterns, food consumption in China is expected to change in favor of livestock products, vegetables, fruit and edible oil, along with income growth and shift in tastes. The domestic demand for feed in 2000 is projected to increase significantly.

Pakistan

A trend in consumption patterns towards fruits, vegetables and livestock products was observed. Cereal consumption is declining, while expenditure on fruits, vegetables and livestock products is increasing. This change is mainly associated with a moderate increase in income.

Vietnam

Economic growth under the Doimoi policy has had great impact on the Vietnamese diet. During the

period 1965 to 1989, daily per capita calorie intake of the Vietnamese increased from 1,872 kcal to 1,966 kcal, while the proportion of carbohydrate in total energy intake decreased from 83% to 77.9%. A large variation in dietary patterns was observed among regions. Protein intake from animal food products was at almost adequate in the South, but still insufficient in the North. In the North more vegetables, roots and tubers and soybean were consumed than in the South. Moreover, in the rural area people consume little livestock products, processed food, fruit and fishery products.

Survey of major upland crop markets

China

Maize is mainly used as feed and is still largely controlled by the government in terms of production, marketing and trade. The demand for maize in 2000 is projected to be 110.25 million tons, of which 68% will be used as feed. Soybean is chiefly used as food or oil extraction and most of the soybean meal is utilized domestically. Due to an increasing domestic demand, future expansion of soybean export will be limited. Rice is the staple food of about 60% of the population; 80% of the rice is used for direct human consumption, while a small proportion is used as feed or processing material. Rice exports have stagnated since the 1980s, but increased in the recent years. It is anticipated that rice export will not expand in the near future due to the low quality of the product and strong domestic demand from the growing population. Potato and sweet potato account for 7% of the total grain production. These commodities are mostly consumed domestically. Forty percent of the production is used as food for rural inhabitants, while 50% is used as feed and 10% in the processing industry.

Pakistan

Soybean is planted on a very limited scale. Soybean oil is mainly imported from USA and soybean meal from India. The projected demand of soybean meal in 2000 will be 11.55 thousand tons, of which 7.22 thousand tons will be imported and 5.67 thousand tons supplied by domestic production. Potato production is mostly consumed in the domestic market, and industrial demand for potato is stagnating. The maize processing industry is not well developed; industrial demand for maize is expected to increase at a rate of 6.8% per year. However, per capita consumption of maize in Pakistan is decreasing. Rice is the second largest staple food of the country; moreover, Pakistani Basmati rice has a high international demand and fetches a premium price. The increased export of rice is projected.

Vietnam

Maize and soybean have a good market prospect because of increasing demand in the livestock sector in the country. Cassava also has good potential in both domestic and export markets. In the 1990s Vietnam has become an important exporter of rice. Domestic rice consumption also has an increasing trend.

Case studies of successful and failed production/market promotion attempts and newly emerging products

China

Since the early 1980s, the production of vegetables and fruit has rapidly developed. New emerging commodities, such as citrus, apple, canned fruits, fresh vegetables, edible fungus and canned vegetables, were investigated. The case of cotton production promotion was also introduced as an unsuccessful market promotion case.

Pakistan

The production of almost all fruits and vegetables has considerably increased during the last two decades. The major export fruits and vegetables include mango, citrus, guava, onion, and potato. Among the new emerging commodities, strawberry, mushroom and canola are worth mentioning. Mango, citrus and molasses are studied as successful attempts to improve market potential. The poor market performance of apple, onion and tomato were also scrutinized.

Vietnam

Cashew, orange, and by cassava chips were studied as new emerging products. Coffee, groundnut and sugar-cane were selected for successful cases, and potato, sweet potato and tomato for unsuccessful cases.

Policy recommendations

The following suggestions and recommendations for improving market prospects of upland crop products (UCPs) were emphasized by the second group of countries:

- Commercialization of the grain trade should be accelerated (China).
- Investment in construction of grain, vegetable and fruit markets should be increased.
- The use of advanced communication technologies should be enhanced for establishing efficient information systems for UCP markets.
- Monitoring and controlling of the quality of export products need to be strengthened.
- Export promotion activities, including exhibitions and fairs in prospective export markets, need to be expanded.
- Integration of production, harvesting, grading, packaging and procurement for export purposes is recommended.
- Export procedures should be simplified.
- Proper post-harvest management should be introduced and disseminated by further strengthening of extension services.
- Grading, packaging and procurement systems for export purposes need to be improved.
- The provision of cold storage and refrigerated trucks and ships needs to be enhanced.
- Airport and seaport facilities need to be improved.
- Fruit and vegetable exports should be included among the industries that receive government support (Pakistan).
- Wholesale market facilities should be improved, especially in terms of hygiene drainage systems, strict phyto-sanitary inspection measures, etc.
- Diversification of products and quality improvement should be enhanced through increased investment in the processing industry.
- Appropriate technology to lower production costs should be introduced.

Regional Workshop

A regional workshop "Market Prospects of Upland Crops in Asia" is scheduled to be held in Bogor, 25 to 28 February 1997 to further disseminate the findings of the MPUPA project. The workshop will assemble researchers in the related fields and agricultural policy planners from MPUPA participating and non-participating countries in the

region. Moreover, the workshop is expected to contribute to smooth continuation of the follow-up project "Effects of Trade Liberalization on Agriculture in Selected Asian Countries with Special Focus on CGPRT Crops". The Centre is inviting researchers who will be assigned as the national experts of this follow-up project to the workshop.

International Courses and Meetings

27th International Course on Vegetable Production: Selected Topics in Vegetable Production

**International Agricultural Centre
Wageningen, the Netherlands August 10 -
November 15, 1997**

The course intends to extend and deepen participants' knowledge of vegetable growing and to acquaint them with various production and post harvest aspects. The course aims at providing participants with information, tools and insights on how to make farmers achieve their vegetable production potential and to acquaint them with post harvest aspects such as handling and marketing.

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MBA Food Industry and Agribusiness

Wageningen Agricultural University

The MBA Food Industry and Agribusiness in Wageningen differs from general management

programmes by its focus on agri-industrial chains in which farms, suppliers, processors, distributors, retailers and customers are important players. Furthermore the MBA Food Industry and Agribusiness programme is distinctive in paying specific attention to the distinguishing features of technologies and technology developments in agri-industrial chains. It does so because technology, in the broadest sense of the word, is crucial in the increasingly competitive business environment.

The MBA programme offers knowledge directed to strengthen agri-industrial chains in an international perspective. The programme aims to develop managers who are well-grounded in general business management, are aware of the position of their firms in agri-industrial chains and able to involve other links in the value-added chains in order to achieve their objectives.

The MBA programme is open to university graduates from a variety of disciplines who have evident affinity for the food industry and agribusiness, either by educational or by professional experience. Candidates must be proficient in English. The Graduate Management Admission Test (GMAT) is a prerequisite. Work experiences is valued highly in the admission process.

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Training Program on Optimizing Management for Precision Farming: A Systems Approach

March 10 - March 15, 1997 Gainesville, Florida

The overall goal of this training program is to increase the capabilities of participants to apply quantitative tools to optimize management of spatially-variable fields, taking advantage of new sources of information, methods for their use, and equipment for precision farming. Specifically, the program will focus on:

1. Information tools for managing spatial data, including GIS, remote sensing, and yield monitoring data.
2. Analysis software to gain insight into the magnitude of spatial variability and possible reasons for this variability, including kriging, correlation, and crop and soil model approaches.
3. Description of CERES and CROPGRO crop simulation models, focusing on maize, wheat, and soybean crops, and information required for their applications to spatially-variable fields.
4. Operation of the Decision Support System for Agrotechnology Transfer (DSSAT) v3.1 software system, including components linking DSSAT crop models with GIS and spatial analysis programs.
5. Example applications of DSSAT v3.1 to optimize management in specific field situations.

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New Title in the PROSEA Series Plant Resources of South-East Asia No. 10, Cereals

G.J.H. Galben and Soetjipto Partohardjono (editors)

Cereals are the mainstay of human nutrition. Their direct consumption provides about 60% of the world food energy on average. Moreover, a large part of the feed needed for livestock also stems from cereals.

Cereals breeding and research have been very successful. High-yielding cultivars of rice, maize, wheat and sorghum, developed by international research institutes, have become widely cultivated in the tropics and subtropics since the 1960s. In most countries, cereal farmers have succeeded in meeting national needs. In recent years, however, population growth has outstripped the increase in grain production, and hence per capita production has declined. This trend is caused by the scarcity of new land for cropping, and the levelling off in increase of yield per ha. As research has concentrated on a few major crops (in South-East Asia, mainly on rice), breeding and agronomic research on several secondary cereals and pseudo-cereals with economic potential have been neglected.

This book on cereals, volume 10 of the Prosea series, gives a comprehensive state-of-the-art overview of cereals production and potential in South-East Asia. It is a rich source of information on cereal cropping under South-East Asian conditions. In addition to rice and maize, ten other true cereals are treated as major species although they are grown very locally and in rather small amounts. They are usually grown as secondary food crops or used for feed or industrial purposes. Three non-graminaceous crops, the so-called pseudo-cereals, have been added because of their potential to attain some economic importance in South-East Asia.

This Prosea volume is the result of the collective effort of an international group of scientists. I hope that the information presented will be an inspiration to all those concerned with the improvement of this important group of food and feed crops in the region. Finally, I wish to express my appreciation to the Board and personnel of the Prosea Foundation for making this very useful book a reality.

From the Foreword by G. Rothschild

CGPRT Centre

The Regional Co-ordination Centre to Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific (CGPRT Centre) was established in 1981 as a subsidiary body of UN/ESCAP.

Objectives

In co-operation with ESCAP member countries, the Centre will initiate and promote research, training and dissemination of information on socio-economic and related aspects of CGPRT crops in Asia and the Pacific. In its activities, the Centre aims to serve the needs of institutions concerned with planning, research, extension and development in relation to CGPRT crop production, marketing and use.

Programmes

1. Research, which entails the preparation and implementation of studies covering production, utilization and trade of CGPRT crops in the countries of Asia and the South Pacific.
2. Training of national research and extension workers,
3. Information and documentation which encompasses the collection, processing and dissemination of relevant information for use by researchers, policy makers, and extension workers.

Palawija News

Contributors are invited to submit concise summaries of significant social research related to CGPRT crops for publication. Figures (graphs or tables) may accompany the article. All articles are subject to editing to meet space limitations.

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