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EVOLVING TRENDS IN WORLD AGRICULTURE

(Agenda Item 6)

Objectives of the Discussion

At TAC 46, the Committee decided that before it could examine the potential for expanding the CG System, it would first be necessary to assess the CGIAR in its global context. As an initial step, the Secretariat was requested to prepare a revision of Chapter 2 of the Study on CGIAR Priorities and Strategies. This paper provides an update to this study, particularly with regard to factors determining food needs in developing countries. It also briefly discusses some evolving trends in world agriculture which may be of concern to the CGIAR.

TAC SECRETARIAT

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EVOLVING TRENDS IN WORLD AGRICULTURE

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EVOLVING TRENDS IN WORLD AGRICULTURE

1. Introduction

At the 1988 Mid-Term Meeting of the CGIAR, TAC was requested to examine the potential for expanding the CG System to include the so-called non-associated centres. In considering the nature of its task, TAC decided at its 46th meeting in June 1988 that it would first be necessary to assess the CGIAR in its global context. As an initial step, the Secretariat was requested to prepare an update of Chapter 2 "Evolving Trends in World Agriculture: A Long-Term Scenario" of the Study on CGIAR Priorities and Strategies (TAC/CGIAR, 1987).

This paper provides an update to this study, particularly with regard to factors determining food needs in developing countries, and briefly discusses some evolving trends in world agriculture which may be of concern to the CGIAR. It is important to note that the paper provides an update, and does not replace the information provided in Chapter 2 of the 1985 paper. The arguments presented in the earlier paper on the different challenges to be met in technology development remain largely valid. Reference should also be made to TAC's report on sustainability in agricultural production which provides additional information on environmental concerns (TAC/CGIAR, 1988). An overview of updated selected socio-economic indicators by region is provided in the attached Annex.

2. Factors Determining Food Needs in Developing Countries

2.1. Population growth

World population is projected to grow at 1.6% p.a. between 1988 and 2000, from 5.1 billion to nearly 6.1 billion, of which 4.8 billion will be in developing countries. For developing countries, the expected population growth rate until 2000 is 1.9% p.a. but wide regional differences can be observed: 3.3% in sub-Saharan Africa, 2.5% in the Near East/North Africa, 2% in Latin America and 1.5% in Asia. These are medium-variant projections of the United Nations, and are somewhat lower than those made 10 years ago. Despite the slowdown in growth rates, the population in developing countries is expected to increase until 2000 at the average rate of 85 million people per year.

Asia's population increases will be the largest in absolute terms, despite slower growth rates. The Asian continent will contain in the year 2000 more than two-thirds of the population of developing countries. In general, the areas with the fastest growing population are also those where land resources are least able to meet the additional food needs.

Population growth does not always contribute to aggregate food demand in the same proportion. In low-income countries, high population growth may cause lower average per caput incomes compounding the problems of insufficient effective demand. This situation arises because population growth may lower directly productive investment per

person, or because lower-income groups tend to have higher fertility rates, leading to an increase in the proportion of poor in total population (FAO, 1987).

If agricultural land resources do not expand and productivity does not improve, production per caput declines if population increases. A decreasing land/man ratio normally leads to intensification of production, but inadequate infrastructure, or insufficient effective demand or economic incentives may impede technological change. Population growth may then lead to a further depletion of land resources through the exploitation of land unsuitable for agriculture, soil erosion, deforestation and overgrazing. Approximately 60% of people in developing countries live in agro-ecological zones that have farming systems with a low level of external inputs, i.e. no fertilizer and pesticide applications, and no soil conservation measures (Higgins et al, 1982). In addition to this threat to sustainability, population growth may further lead to a decline in the size of family holdings until they become uneconomic, and are absorbed by larger farms thereby aggravating problems of landlessness, agrarian inequality and rural poverty.

2.2. Income growth

Income growth is a significant factor in determining food demand, both in its size and composition. While per capita incomes in developing countries grew rapidly during the early seventies, the rate of growth has slowed down to 0.5% p.a. since 1980. During this period, growth rates were even negative in Africa and Latin America. For the next ten years, the World Bank has projected an average per capita growth of 2% p.a. for developing countries, but no growth and even stagnation in sub-Saharan Africa. This projection represents the lower variant scenario, which assumes an overall growth of 3.9% p.a. If industrial and developing countries would adopt a variety of medium- and long-term adjustment policies and policy reforms, output would grow on average by 5.9% a year, or 3.9% p.a. per capita. Under this latter high-variant scenario, in sub-Saharan Africa GDP per capita would grow slightly, e.g. 0.7% p.a. According to the World Bank (World Bank, 1987), three sorts of adjustment policies would be needed in developing countries to achieve faster growth: outward-oriented policies (e.g. realistic exchange rates), policies to foster macro-economic stability (e.g. lower fiscal deficits), and policies to improve the allocation of resources (e.g. fewer price controls or investment regulations). Industrial countries would have to adjust their agricultural and trade policies accordingly.

2.3. Urbanization

Urbanization is a third major factor determining food demand, particularly of its composition. It also affects the mode of food supply, which has to be generated through market production rather than through subsistence agriculture. At present, approximately 31% of the population of developing countries live in urban areas although there are strong regional variations. In Latin America, 69% of the population is urbanized, particularly in the temperate zone countries. In Africa,

on average 28% lives in urban areas ranging from 20% in Eastern/Southern Africa to 47% in North Africa. Asia is the least urbanized continent, as only 25% of the population lives in urban areas. In South Asia, this percentage amounts to only 12%. By the year 2000, about 40% of the population in developing countries will be living in towns and cities, and by the year 2025 the urban population would be 60% of the total (United Nations, 1987). The process of urbanization leads to an increased demand for food commodities with a high income elasticity, and which can easily be transported, processed or stored.

2.4. Implications for food demand

The demand for food and agricultural products for all food and non-food uses in the developing countries is projected to grow at 3.1% p.a. over the period 1983/85-2000 (FAO, 1987). This is lower than the 3.7% growth rate achieved between 1970 and 1985. The slowdown in the growth of total demand is caused by the lower growth rates of population and the already relatively high consumption levels in some middle income countries, such as China, and the countries of the Near East and North Africa. In sub-Saharan Africa, per capita consumption will remain low and be largely dependent upon subsistence production and low cost food imports, including food aid.

In a study made by IFPRI (Paulino, 1986), past trends in the domestic utilization of basic food staples in developing countries clearly suggest shifts in their food consumption towards more livestock products.

IFPRI's projections of the total domestic use of these basic staples arising from changes in population and income show average annual growth rates of 2.1% for direct food use and 4.6% for animal feed between 1980 and 2000. By the year 2000 this percentage food and feed uses would be 62% and 23%, respectively, of the total consumption of basic staples in developing countries. This would represent a ratio between feed use and food use of 37%, compared to less than 25% in 1980. The growth in demand for livestock cereal feed until the year 2000 is projected at around 5% a year. The livestock-feedgrain linkage is likely to be a major determinant of future food deficits in developing countries. A key aspect for consideration, is whether feed will be grown on land which is suitable for the production of food crops. Such a competition for land may have implications for the nutritional status of the poor.

Overall, the trend towards diet diversification in favour of higher value commodities such as livestock products, oils, sugar, fruit and vegetables is expected to continue, particularly in urbanizing middle income countries. The development of per caput demand for major commodities is illustrated in Table 1. In sub-Saharan Africa, improved consumption will be largely reflected in an increased consumption of cereals and starchy products.

Many developing countries will face demand constraints, both in their export and commodity markets. This is for example the case in the roots/plantains sector, where there is room for an expansion of production, but where per capita demand declines steadily with increasing incomes.

Table 1. Per Caput Food Demand in 1983/85 and 2000 for Major Commodities - kg/head (calories p.c. per day)

	Cereals	Roots & Tubers	Vegetable Oil	Sugar	Meat	Milk
All Developing Countries						
1983/85	173 (1,283)	63 (163)	7 (188)	18 (174)	14 (100)	34 (70)
2000	174 (1,531)	60 (147)	9 (242)	22 (214)	18 (122)	41 (83)
Sub-Saharan Africa						
1983/85	113 (907)	192 (510)	8 (195)	9 (85)	10 (49)	27 (47)
2000	121 (1,031)	196 (515)	8 (226)	11 (108)	11 (54)	27 (47)
Near East/ North Africa						
1983/85	212 (1,708)	28 (60)	12 (306)	33 (308)	21 (101)	72 (140)
2000	204 (1,671)	28 (54)	14 (363)	37 (363)	24 (114)	77 (155)
Asia						
1983/85	159 (1,339)	30 (115)	7 (166)	19 (135)	5 (90)	34 (52)
2000	173 (1,683)	28 (78)	9 (224)	23 (173)	7 (118)	39 (64)
Latin America						
1983/85	136 (1,050)	73 (168)	9 (235)	44 (427)	37 (212)	94 (161)
2000	143 (1,173)	71 (156)	11 (277)	49 (477)	41 (237)	107 (184)

Source: FAO "Agriculture: Towards 2000" data files.

3. Developments in Food Supply

3.1. The past twenty-five years

According to the FAO "Agriculture: Towards 2000" study, the past twenty-five years have brought a much better fed world despite an increase in world population of 1.8 billion. Average food availability in developing countries rose from 1,960 calories per caput in 1961/63 to 2,420 calories in 1983/85. However, in many developing countries, particularly in sub-Saharan Africa, per capita food supplies remained essentially at the same levels. By contrast, in developed countries food intake diversified and increased from 3,090 calories per caput per day in 1961/63 to 3,370 in 1983/85. In developing countries, almost 500 million people remain seriously undernourished, and the problem of hunger is still acute, particularly in many countries of sub-Saharan Africa and Asia.

Agricultural output increased rapidly, largely through substantial increases in yield. Between 1974/76 and 1984/86, yields of cereals increased from 1,476 kg/ha to 1,983 kg/ha (+34%) in developing

countries as a group, from 1.5 tons/ha to well over 2 tons/ha in both Asia and Latin America, but remained virtually constant at 1 ton/ha in Africa, even decreasing in Central and Sahelian Africa. During the same period, the amount of arable land used for agricultural production in developing countries increased by only 3.9%. Regionally, land expansion amounted to 13.2% in Latin America, 5.3% in Africa and 1% in Asia. Labour productivity in developing countries rose by 50%, but it remained well below that of developed countries, particularly in sub-Saharan Africa.

3.2. Projected increases in agricultural production

Agricultural production in developing countries is projected to rise by 3% a year between 1983/85 and the year 2000 (FAO, 1987). On a per caput basis, growth rates would average 1.1% p.a., the same that was achieved in the period 1970-85. The output of livestock products would grow the fastest, as well as that of coarse grains. Demand constraints would cause lower than average growth rates of the main export commodities and of starchy roots. There would also be strong regional differences in production growth rates until 2000: sub-Saharan Africa, and Near East/North Africa 3.1% p.a.; Asia excluding China 2.6% p.a.; and Latin America 2.6% p.a.

The growth in crop production would largely be spurred by yield increases. According to the FAO 2000 Study (FAO, 1987), increases in the use of arable land would account for more than 20% of growth, and increases in cropping intensity would account for the remainder, or around 15%.

Given the fact that during the last decade the amount of arable land increased by only 3.9%, the FAO projection of 22% over little more than the next decade seems overly optimistic, particularly because it refers to a net expansion. Such a rapid increase would require prior and significant policy changes and investments. It would also pose a threat to sustainability, as the process would involve an expansion of cultivation into tropical forest areas, and into fragile soils. Therefore, TAC believes that rapidly increasing demand for agricultural products will have to be met primarily by a more intensive use of existing arable land (TAC/CGIAR, 1988). FAO's projections are illustrated in Table 2. Regions differ significantly as to the relative importance of these factors in production growth.

Table 2. Source of Growth in Crop Production (1982/84-2000, %)

	Yield Increases	Arable Land Increases	Cropping Intensity Increases
All Developing Countries	63	22	15
Sub-Saharan Africa	57	26	17
Near East/North Africa	77	-	22
Asia (excluding China)	69	11	20
Latin America	49	39	12

Source: FAO (1987). "Agriculture: Towards 2000" (Revised version).

Table 3. Livestock Numbers and Yields in Developing Countries

	LATIN AMERICA			AFRICA			ASIA		
CATTLE	74/76	84/86	change	74/76	84/86	change	74/76	84/86	change
Number (000 head)	256884.4	305169.0	18.8%	140483.6	162465.7	15.6%	342903.4	374336.2	9.2%
Milk yield (kg/hd)	1087.0	1040.7	-4.3%	361.5	390.1	7.9%	550.8	683.1	24.0%
Meat yield (kg/hd)	193.6	198.8	2.7%	127.5	134.2	5.3%	98.6	103.4	4.9%
BUFFALO									
Number (000 head)	270.5	870.6	221.8%	2203.2	2459.7	11.6%	118479.5	137662.7	16.2%
Milk yield (kg/hd)	n.a.	n.a.	n.a.	130.2	136.7	5.0%	130.4	137.0	5.1%
Meat yield (kg/hd)	n.a.	n.a.	n.a.	1148.2	1177.2	2.5%	938.9	1027.7	9.5%
SHEEP									
Number (000 head)	108512.3	113304.9	4.4%	128679.8	153450.5	19.2%	276160.5	309665.7	12.1%
Milk yield (kg/hd)	25.8	25.9	0.4%	36.5	46.9	28.5%	43.6	43.7	0.2%
Meat yield (kg/hd)	14.5	14.9	2.8%	12.6	13.3	5.6%	12.9	13.2	2.3%
GOATS									
Number (000 head)	30611.7	31264.9	2.1%	127902.5	148962.8	16.5%	226734.4	267462.1	18.0%
Milk yield (kg/hd)	71.8	74.8	4.2%	65.8	68.2	3.6%	60.2	64.9	7.8%
Meat yield (kg/hd)	11.3	11.3	0.0%	10.8	11.5	6.5%	11.0	11.2	1.8%
PIGS									
Number (000 head)	70870.0	78816.5	11.2%	6909.3	9842.4	42.5%	310502.9	373211.6	20.2%
Meat yield (kg/hd)	65.9	66.5	0.9%	44.5	44.7	0.4%	45.0	65.6	45.8%
POULTRY									
Number (000 head)	727.1	1112.4	53.0%	474.5	709.1	49.4%	1825.1	3356.5	83.9%
Meat yield (kg/000 hd)	1265.0	1305.4	3.2%	955.7	1048.1	9.7%	1211.6	1194.2	-1.4%

Livestock production can increase in two ways: an expansion of livestock numbers, and higher yield per animal through improvements of management, breeds, feed utilization, or other technology. In the past the dominant source of growth has been increases in livestock numbers and in offtake rates. During the last decade, yields per animal (bovines, sheep and goats, pigs and poultry) have increased only marginally. The performance of smallholder livestock projects has been largely disappointing, primarily because of poor project design and lack of appropriate improved technology (World Bank, 1985). The increase in livestock numbers and yield per animal are illustrated in Table 3. Nevertheless, FAO is optimistic that in the future, higher yields will be an increasingly important source of growth. These will have to come from more intensive management and supplementary feeding. It expects that the overall pattern of increased meat production projected in developing countries is for 46% to arise from higher yields per animal, 20% from greater numbers, and the remainder from increased offtake rates (FAO, 1987).

3.3. Trends in international trade

Despite significant increases in food production in developing countries, there has been a very rapid growth in reliance on international trade as a source of food. Whereas developing countries (excluding China) in 1961/63 imported only 5% of their food supplies, this percentage had risen to 10% in 1983/85. The rapid increase of food imports is illustrated in Table 4. During the same period, developing countries turned from net exporters to net importers of food in terms of calories. The self-sufficiency ratio of agricultural production declined sharply in Africa and the Near East, only slightly in Latin America, and remained constant in Asia.

Table 4. Food Imports by Developing Countries (excl. China, calories per caput per day) 1/

	61/63	69/71	79/81	83/85
All Developing Countries	190	220	400	430
Sub-Saharan Africa	130	160	290	300
Near East/North Africa	400	480	1090	1490
Asia	140	150	190	190
Latin America	270	300	690	640

1/ Calories content of gross imports of food commodities for direct food consumption and for indirect consumption (livestock feed).

Source: FAO (1987). "Agriculture: Toward 2000" (Revised version)

The rise in imports as a source of calories was particularly striking for the middle income countries of the Near East/North Africa and the Latin America region. The rapid increase of food imports in sub-Saharan Africa (between 79/81 and 84/86 with 8% p.a. for cereals and 18% p.a. for non-cereals) included large amounts of food aid which, in fact, did not raise consumption levels, but only helped to prevent drastic declines. Asia is the region least dependent upon imports for its food supply. During the first half of the 1980s, the rapid growth of food imports was halted in Latin America. This slowdown was due to lack of foreign exchange caused by rising debt service burdens and falling prices of export commodities.

The expansion of food imports by developing countries was facilitated by dumping practices and cheap exports from developed countries. Domestic agricultural policies in developed countries had focused on improving farm incomes by providing producer incentives and led to a rapid rise in self-sufficiency, a protection of domestic markets from international competition, and subsidized exports of surplus production.

Imports of cereals have been growing particularly rapidly, tripling in size in 25 years. The increase occurred particularly during the last decade, and by the mid-1980s grain imports in developing countries represented 46% of the world's total, up from 36% in the 1960s. Growth rates of cereal imports were particularly rapid for coarse grains (especially maize) reflecting their expanding use for animal feed as consumption patterns shifted toward animal products in developing countries. However, in recent years China, India and Argentina have rapidly increased production and have become major exporters of cereals.

The increase in per capita incomes in developing countries led to a major expansion in demand for livestock products. As a result, imports of dairy products in developing countries increased by about 11% p.a. from 74/76 to 84/86, and this increase was relatively similar across different regions. Imports of meat also rose rapidly and more than doubled. The increase in meat imports was concentrated in the Middle East/North Africa and Asia. Both these regions accounted for 80% of the increase in meat imports. The gap between domestic supply and demand of livestock products is expected to widen considerably in all developing regions by the year 2000. Nevertheless, per caput consumption levels of livestock products will remain low for the majority of people in developing countries. The poor will continue to depend on alternative sources of protein.

A major recent development is the sharp reduction in cereal production since 1986. For the first time since the second World War, world cereal production fell two years in succession, requiring large reductions of stocks and causing rapid increases in world prices. During the last 12 months, the world market price of major cereals increased as follows: wheat +38%, maize +66% and rice +35% (FAO, 1988). The drought in much of the farm belt of the USA seriously threatens world food security, as the reduction in stocks will also diminish the amount of grains available for food aid. The extent to which food aid varies from year to year above the level which has been institutionalized through successive food aid conventions, has been

shown to depend indeed to a considerable degree on the availability of surpluses in donor countries (Konandreas, 1987). FAO has recently forecasted that in 1989/90 world stocks will amount to only 16% of cereal consumption, which is below the level it considers necessary to safeguard food security.

4. Emerging Global Trends

4.1. Poverty and agricultural development

Strategies to improve nutrition and alleviate hunger should not only focus on improving food supplies, but also on ensuring access to food by the poor, by increasing their purchasing power. In many developing countries, people are malnourished because they are too poor to buy available food, which sometimes is exported subsequently. Efforts to increase food production should, therefore, be accompanied by policies to expand employment opportunities and income generation.

The World Bank has estimated the number of absolute poor in developing countries (excluding China) to be 780 million. Half of the poor live in South Asia, mainly in India and Bangladesh. Alternative FAO projections estimate the percentage of rural population living in poverty as at 65% in sub-Saharan Africa, 50% in Asia, 32% in the Near East/North Africa and 53% in Latin America. In Asia, most of the rural poor are near-landless and work as daily labourers. Elsewhere the poor mainly farm land of marginal quality, or are pastoralists, nomads or small-scale fishermen. In Latin America, the number of rural poor has been increasing rapidly since 1970 largely because of changes in agrarian structure and the decline of peasant farming. The continent also struggles with a substantial problem of urban poverty.

The alleviation of poverty in developing countries depends on a dynamic expansion in employment opportunities for the poor. It has been estimated (Sabolo, 1975) that the combined rate of unemployment and underemployment is 38% in Africa, 28% in Asia and 25% in Latin America. To be effective, an employment-oriented development strategy would require a rapid growth in food production and declining food prices. These can only occur simultaneously through cost-decreasing technological change in agriculture (Mellor, 1984). Redistribution of income without technological change may increase food prices or the cost of food imports. Increased food production without additional employment for the poor may, initially, lead to lower food prices, but these may in turn inhibit the application of the particular technological change that provided the food supplies.

High rates of employment growth, both in the rural and urban sector, can only be sustained if there is a corresponding growth in domestic food production. Indeed, employment growth increases the wage bill the bulk of which, 60 to 80%, in developing countries is spent on food. If employment would increase rapidly and food supply remain constant, food prices will rise (Mellor, 1987). Accelerated agricultural growth through production-increasing technological change in turn generates capital and creates an effective demand for goods and services that can be efficiently produced by other sectors of the economy with low capital-to-labour ratios. IFPRI research has shown

that in Asia, small farmers spend 40% of income increments on locally produced non-agricultural goods and services, and about 20% on labour-intensive produced horticultural and livestock products. It is this link between agricultural growth and labour-intensive non-agricultural growth that needs to be encouraged. This will require a greater attention by governments to infrastructure development, such as roads and educational facilities, services, and the supply of institutional credit. Particular attention is to be given to the development of appropriate livestock technology to meet rapidly growing demand with high employment creation. Fruit and vegetable production are also likely to be important sources of rural employment as incomes rise. In implementing an agriculturally-led development strategy, which increases employment and alleviates poverty, cost-reducing technological change will be the driving force. Agricultural research will necessarily be a key element of this strategy.

4.2. Need for a greater, but well-focused emphasis to marginal areas

By the year 2000, a developing world population of almost 5 billion will require its food production to be at least 60% higher to meet its growing needs. As argued before, a significant share of the increase in food output will have to be provided through more intensive use of existing land under cultivation. To date, the CGIAR has focused its efforts to increase yields in developing countries on relatively well endowed areas, where rapid impact was feasible and in which substantial productivity gains could be achieved. Many regions in developing countries are not or no longer able to meet the food needs of its expanding population however, because of the physical attributes of the land and the low level of external inputs. The extent of these critical regions can be estimated at 75% of the total land area of Southwest Asia, 47% of Africa, 35% of Southeast Asia, 25% of Central America and 12% of South America (Higgins et al, 1982). Usually, population density is expressed in terms of availability of arable land per caput of agricultural labour force. This amounts to 1.4 ha in developing countries as a whole, 1.6 ha in sub-Saharan Africa, 0.8 ha in Asia (excluding China), 2.8 ha in Near East/North Africa, and 4.9 ha in Latin America. Population density should ideally, however, be expressed in terms of resource capacity. Although FAO has made substantial progress in estimating the capacity of land to support its population through its agro-ecological zones project, much work remains to be done. Table 5 illustrates land use and production of cereals by agro-ecological category. Unfortunately, population figures corresponding with this land classification are not available. It is to be noted that more than three quarters of the output of cereals is produced in well-endowed regions.

The CGIAR needs to give greater attention to the less-endowed regions. However, the effort needs to be well-focused. Some marginal regions can be productively developed into well-endowed areas through investments in infrastructure, soil amendments, drainage and irrigation, or other technical innovations. For other regions, this would be too costly or not be possible. In such regions, the efficiency of the use of external inputs remains low, and hence, the possibilities for technological change and yield increases are remote. In the latter case, migration of people to other areas with a greater population

supporting capacity would ultimately be inevitable. Agricultural development of such a marginal area would then become essentially a 'holding' operation, in which people would have to be provided with greater food security without jeopardizing sustainability of the farming system. The objective would have to be not to create a regional food surplus, but rather to focus on income generation and employment creating strategies for a more or less stable population.

Table 5. Developing Countries: Land Use and Production of Cereals by Agro-Ecological Category, 1/ - 1982/84 (million ha)

		Rainfed Use					
	Total	LR	UR	GR	PR	NF	IR
93 Developing Countries							
Harvested land	598	49	76	144	134	63	132
Cropping intensity(%)	78	48	70	75	72	94	118
Arable land	768	102	108	192	187	67	111
Share of cereals output(%)		3	6	18	10	19	44
Africa (sub-Saharan)							
Harvested land	109	19	22	34	29	3	3
Cropping intensity (%)	54	45	53	61	52	67	84
Arable land	201	42	41	55	55	5	4
Share of cereals output(%)		12	19	40	14	8	8
Near East/North Africa							
Harvested land	63	9	7	12	10	7	18
Cropping intensity (%)	68	44	72	77	73	54	98
Arable land	92	21	10	16	13	13	19
Share of cereals output(%)		6	10	22	18	9	34
Asia (excluding China)							
Harvested land	303	19	36	37	66	49	96
Cropping intensity (%)	108	59	100	101	112	118	129
Arable land	280	32	36	37	59	42	74
Share of cereals output(%)		1	2	5	7	27	57
Latin America							
Harvested land	122	2	11	61	29	4	15
Cropping intensity (%)	63	30	51	72	50	50	102
Arable land	195	8	22	85	59	7	14
Share of cereals output(%)		1	11	49	11	5	23

1/ Excluding China. Due to rounding, numbers may not add up to total and cropping intensities may appear to be different than the ratio of harvested to arable land.

LR = low rainfall rainfed land; UR = uncertain rainfall rainfed land;
GR = good rainfall rainfed land; PR = problem lands;
NF = naturally flooded land; IR = irrigated land.

Source: FAO "Agriculture: Towards 2000" data files.

In well endowed areas, research would focus on the development of cost reducing technologies, that would lead to substantial increases in food production. The surplus food generated could then be transferred to urban markets and food-deficit areas. Such a process would keep food prices low, but would also further reduce the profitability of farming in less endowed regions, leading to more outmigration and consolidation of farms. It is to be noted that migration is often a politically very sensitive issue, particularly across-country migration.

4.3. Role of agriculture in economic development

Agriculture is the dominant production sector in developing countries. Although its main role is to provide food for its populations, it is also the dominant source of income and of employment for rural people. Agriculture also has an important role to play in natural resource management and conservation and is a source of foreign exchange.

Accelerated growth in agricultural production is essential to reduce malnutrition and poverty and will stimulate general economic growth. As agricultural growth takes place through land expansion and intensification of production, surplus resources are transferred to other sectors of the economy. The increase in agricultural output, based on cost-reducing technological change, increases incomes and generates effective demand for a wide-range of industrial goods and services. The increase in efficiency and the changing patterns of demand, together with an expansion of industry and service sectors, lead to a gradual decline of the proportion of population engaged in agriculture, and the size of agricultural GDP in relation to total DGP.

Because of high income and demand elasticities, the industrial and service sectors grow much more rapidly than agriculture. In addition, rapid growth in agriculture requires accelerated growth in international trade (IFPRI, 1978). Capital intensive goods, such as fertilizer, pesticides and steel need to be imported, while labour-intensive goods and raw materials are exported. Recent studies by IFPRI have shown that rapid agricultural growth may also lead to increased food imports.

The process of agricultural growth also involves a gradual change in agrarian structure. Increasingly, subsistence farms develop a market orientation and produce food and agricultural products for urban and rural markets. Policy measures to keep food prices low will then lead to declining profitability of farming and consolidation of farms. Increasingly, small farmers are forced into specialization or increasing intensification in order to remain profitable.

In developed countries, only a minor proportion of the population is employed in agriculture. The small-farm sector consists of either highly specialized and intensive enterprises, and of less profitable enterprises that can continue to operate only with assistance of substantial government subsidies and protective trade measures.

In developing countries such a stage is far from being achieved. For the foreseeable future agriculture will remain the engine of

economic growth and provide employment to the majority of the population in developing countries. Smallholder farms will continue to supply the bulk of agricultural output and will remain the focus of research and development efforts.

4.4. Changing trade patterns

International economic conditions and national trade policies have during the last 20 years become of significant importance to agricultural development in the Third World. The debt crisis, fluctuations in exchange rates, recession, and volatile oil and commodity markets have strongly affected developing countries, particularly those with a high dependence on agricultural exports. International agricultural trade is in disarray. Industrial countries have agricultural trade policies to complement domestic support policies designed to redistribute income to agriculture, to keep small farmers operating and to contribute to other domestic objectives. This has led to surplus production, the growth of exports of agricultural products, and dumping practices. Tensions among industrial countries have been mounting and trade conflicts are continuing. In many developing countries, domestic food production is discouraged because of the competition with cheap imports, particularly for dairy products and wheat. Although most economic studies are strongly in favour of measures for trade liberalization, there are many other considerations for governments of industrial countries. Free trade would indeed significantly affect the welfare of some segments of the population, even though the country as a whole may be better off.

For developing countries, the economic impact of trade liberalization would depend on their share in the world markets. They would have to adjust their domestic policies to compensate for changing import prices, but could largely gain from getting greater access to developed country markets. Countries with insufficient land or productive capacity to support their population are dependent on world markets for food security, as political boundaries are often not consistent with ecological boundaries (McCalla, 1988). The effects of alternative trade policies on national food supply require further investigation.

4.5. Emerging national research capacities

National research capacities tend to vary in three respects: among countries, among programmes, and over time (TAC/CGIAR, 1987). As national systems develop greater institutional capacity over time, they increasingly assume more responsibility for the generation of knowledge and technology. Particularly in the larger and more endowed countries, the capacity for undertaking downstream research has improved dramatically in recent years. These countries have benefitted substantially from the CGIAR which will, in the medium-term future, further support their activities with strategic and basic research. The CGIAR has to avoid, however, to give excessive attention to stronger national systems, and to become too demand-driven. Five countries (China, India, Brazil, Argentina and Indonesia) produce almost three quarters of all rice and wheat, and two thirds of maize output in

developing countries. Although it is to be noted that these countries also account for 59% of the population of developing countries, there is a feeling among smaller countries with weak national programmes that the CG Centres are not able to assist them effectively.

The increasing tendency of CG Centres to move upstream may have given stronger national systems a disproportionate share of the benefits of international research, and possibly led to a reduction of cooperation with the weaker national programmes. There is, however, much confusion of what constitutes a "weak" or a "strong" national programme. The attributes of such qualifications are to be defined much more clearly. A set of both quantitative and qualitative indicators to assess the strength of national programmes would have to be developed to assist in this process.

In developing a long-term strategy for maintaining an effective partnership with national systems, the evolving function of the CGIAR system merits further consideration.

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SOCIO-ECONOMIC INDICATORS

	ALL DEV'ING	LATIN AMERICA	AFRICA	ASIA	WORLD
POPULATION (millions)					
79/81	3280.0	361.4	448.3	2506.7	4448.5
84/86	3626.0	404.8	519.9	2741.4	4836.3
growth rate p.a.	2.0%	2.3%	3.0%	1.8%	1.7%
2000 (millions)	4857.7	546.4	819.8	3476.6	6121.8
URBAN POPULATION (%)					
79/81	28.9	65.4	25.2	23.9	39.6
84/86	31.0	69.0	28.0	25.5	41.0
growth rate p.a.	1.4%	1.1%	2.1%	1.3%	0.7%
POPULATION DENSITY/ARABLE LAND (people/ha)					
79/81	4.6	2.6	3.0	5.8	3.3
84/86	5.0	2.7	3.4	6.3	3.5
growth rate p.a.	1.7%	1.4%	2.5%	1.7%	1.5%
GDP/CAPUT ($/head)					
79/81	707.0	2073.1	705.4	499.3	2499.3
84/86	723.1	1951.0	613.5	549.7	2567.4
growth rate p.a.	0.5%	-1.2%	-2.8%	1.9%	0.5%
VALUE OF AGRICULTURAL PRODUCT (billion $)					
79/81	428.6	95.4	50.5	291.1	927.0
84/86	513.0	105.2	57.2	360.5	1049.0
growth rate p.a.	3.7%	2.0%	2.5%	4.4%	2.5%
VALUE OF AGR. PROD./ARABLE LAND ($/ha)					
79/81	605.2	672.8	339.1	673.6	683.6
84/86	713.9	710.5	374.9	831.9	765.0
growth rate p.a.	3.4%	1.1%	2.0%	4.3%	2.3%
FOOD IMPORTS (million $)					
79/81	49011.5	10361.0	10882.8	25815.2	160164.1
84/86	44916.7	7871.5	10617.5	24339.7	152477.0
growth rate p.a.	-1.7%	-5.3%	-0.5%	-1.2%	-1.0%
IMPORTS OF DAIRY PRODUCTS (million $)					
79/81	4791.4	966.4	1284.7	2425.1	13810.2
84/86	4683.0	834.6	1307.4	2416.5	13398.9
growth rate p.a.	-0.5%	-2.9%	0.4%	-0.1%	-0.6%
FOOD AID - CEREALS ('000 mt)					
79/81	8561.6	672.1	4324.6	3526.6	8989.8
84/86	11726.1	1574.2	6440.1	3665.1	11834.7
growth rate p.a.	6.5%	18.6%	8.3%	0.8%	5.7%
FOOD AID - NON-CEREALS ('000 mt)					
79/81	563.9	86.7	175.6	300.9	606.0
84/86	788.7	193.3	292.6	299.7	856.9
growth rate p.a.	6.9%	17.4%	10.8%	-0.1%	7.2%

SOCIO-ECONOMIC INDICATORS by REGION

	TSA	TRSA	CAM	CAR	ESA	CEA	HWA	SAF	NAF	NEWA	IND	SOAS	SEAS	CHINA	OCEA
POPULATION (millions)															
79/81	42.3	197.6	92.0	29.6	129.8	62.1	116.9	50.4	89.1	235.2	688.6	117.7	464.6	995.5	5.0
84/86	45.6	222.1	105.1	32.0	151.3	72.0	137.6	57.6	101.4	270.2	758.5	133.8	513.9	1059.4	5.6
growth rate p.a.	1.5%	2.4%	2.7%	1.5%	3.1%	3.0%	3.3%	2.7%	2.6%	2.8%	2.0%	2.6%	2.0%	1.3%	2.4%
2000 (millions)	55.4	301.0	149.1	41.0	245.0	114.9	229.1	88.1	142.6	394.4	964.1	188.5	666.0	1255.9	7.7
URBAN POPULATION (%)															
79/81	82.3	65.9	60.3	53.1	16.6	24.8	23.1	19.2	44.2	39.5	23.4	11.3	27.4	20.4	22.0
84/86	84.3	70.3	63.2	56.5	20.1	27.4	25.9	21.1	46.7	42.3	25.5	12.5	30.2	20.7	23.6
growth rate p.a.	0.5%	1.3%	0.9%	1.2%	3.9%	2.0%	2.4%	1.9%	1.1%	1.4%	1.7%	2.0%	2.0%	0.2%	1.4%
POPULATION DENSITY/ARABLE LAND (people/ha)															
79/81	1.3	2.6	3.3	6.4	3.2	3.0	3.2	1.7	4.1	2.9	4.2	9.7	6.1	10.2	13.9
84/86	1.4	2.7	3.7	6.7	3.7	3.3	3.6	1.9	4.6	3.4	4.6	11.1	6.4	11.2	14.9
growth rate p.a.	0.9%	1.1%	2.5%	1.1%	2.9%	1.9%	2.6%	2.4%	2.2%	3.0%	1.9%	2.6%	1.1%	1.8%	1.5%
GDP/CAPUT ($/head)															
79/81	2509.2	1915.9	2291.1	1820.6	331.1	403.0	880.0	369.2	1422.6	1820.9	235.0	178.8	669.7	323.5	1495.4
84/86	2190.3	1831.6	2132.0	1844.2	304.7	417.6	647.8	328.0	1328.6	1532.7	271.4	189.7	749.7	442.2	1396.8
growth rate p.a.	-2.7%	-0.9%	-1.4%	0.3%	-1.7%	0.7%	-5.9%	-2.3%	-1.4%	-3.4%	2.9%	1.2%	2.3%	6.5%	-1.4%
VALUE OF AGRICULTURAL PRODUCT (billion $)															
79/81	21.1	49.2	19.4	5.7	13.6	7.1	12.4	6.3	11.0	37.8	63.7	9.6	62.0	117.1	0.9
84/86	22.6	55.6	20.9	6.1	14.4	8.3	14.6	6.9	13.0	44.6	77.0	10.7	74.9	152.3	1.0
growth rate p.a.	1.4%	2.5%	1.5%	1.5%	1.1%	3.4%	3.3%	1.7%	3.3%	3.4%	3.9%	2.2%	3.9%	5.4%	1.7%
VALUE OF AGR. PROD./ARABLE LAND ($/ha)															
79/81	661.5	638.9	687.8	1221.7	338.7	343.8	337.9	214.1	506.9	467.1	386.6	794.1	809.0	1202.7	2593.8
84/86	688.0	678.4	733.5	1284.3	354.3	383.7	383.4	229.6	585.6	555.7	465.5	885.4	932.5	1604.6	2687.3
growth rate p.a.	0.8%	1.2%	1.3%	1.0%	0.9%	2.2%	2.6%	1.4%	2.9%	3.5%	3.8%	2.2%	2.9%	5.9%	0.7%
FOOD IMPORTS (million $)															
79/81	924.8	4575.8	2756.7	2103.7	1255.3	480.5	2517.1	737.7	5892.2	11639.8	1187.2	719.5	7082.6	4720.9	465.4
84/86	344.1	3284.8	2203.6	2038.9	1412.8	512.9	1606.3	794.7	6290.6	12350.0	1468.9	883.3	5984.0	3219.0	434.4
growth rate p.a.	-17.9%	-6.4%	-4.4%	-0.6%	2.4%	1.3%	-8.6%	1.5%	1.3%	1.2%	4.4%	4.2%	-3.3%	-7.4%	-1.4%
IMPORTS OF DAIRY PRODUCTS (million $)															
79/81	81.8	325.5	277.7	281.4	143.3	62.6	372.9	71.2	634.7	1453.1	124.2	60.0	610.0	129.7	48.1
84/86	19.1	283.7	237.5	294.3	164.2	63.0	164.5	108.1	807.6	1461.1	67.4	86.7	562.1	194.5	44.7
growth rate p.a.	-25.3%	-2.7%	-3.1%	0.9%	2.8%	0.1%	-15.1%	8.7%	4.9%	0.1%	-11.5%	7.6%	-1.6%	8.4%	-1.5%
FOOD AID - CEREALS ('000 mt)															
79/81	22.9	208.9	199.4	240.8	1183.8	161.6	179.3	563.7	2236.2	570.8	372.3	1303.5	1229.9	42.3	7.9
84/86	12.8	472.0	610.9	478.6	1939.3	171.6	244.4	1526.4	2558.3	703.6	256.3	1780.6	553.1	370.3	1.3
growth rate p.a.	-11.0%	17.7%	25.1%	14.7%	10.4%	1.2%	6.4%	22.0%	2.7%	4.3%	-7.2%	6.4%	-14.8%	54.3%	-30.5%
FOOD AID - NON-CEREALS ('000 mt)															
79/81	4.1	23.2	30.1	29.3	74.2	15.7	11.2	30.8	43.6	105.4	131.0	21.5	37.6	4.9	0.5
84/86	7.1	53.5	85.7	47.1	140.3	14.2	17.5	66.6	54.0	125.2	122.4	20.4	22.8	8.8	0.1
growth rate p.a.	11.3%	18.2%	23.3%	10.0%	13.6%	-2.0%	9.3%	16.6%	4.4%	3.5%	-1.4%	-1.1%	-9.5%	12.6%	-26.6%

TSA=Temperate South America
TRSA=Tropical South America
CAM=Central America
CAR=Caribbean
ESA=Eastern/Southern Africa
CEA=Central Africa
HWA=Humid West Africa
SAF=Sahelian Africa
NAF=North Africa
NEWA=Near East/West Asia
IND=India
SOAS=South Asia
SEAS=Southeast Asia
CHINA=China
OCEA=Oceania

DEVELOPING COUNTRY AGGREGATES

1. Temperate South America

   Argentina, Chile, Falkland Islands, Uruguay

2. Tropical South America

   Bolivia, Brazil, Colombia, Ecuador, French Guyana, Guyana, Paraguay, Peru, Suriname, Venezuela

3. Central America

   Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama

4. Caribbean

   Anguilla, Antigua and Barbuda, Bahamas, Barbados, Cayman Is., Cuba, Dominica, Dominican Republic, Grenada, Guadeloupe, Haiti, Jamaica, Martinique, Montserrat, Netherlands Antilles, Puerto Rico, St. Christopher, St. Christopher & Nevis, St. Lucia, St. Vincent Grenadines, Trinidad & Tobabo, Turks & Caicos Is., British Virgin Is., U.S. Virgin Is.

5. Eastern/Southern Africa

   Angola, Botswana, Djibouti, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Seychelles, Somalia, Swaziland, Tanzania, Zambia, Zimbabwe

6. Central Africa

   Burundi, Cameroon, Central African Republic, Congo, Equatorial Guinea, Gabon, Rwanda, Uganda, Zaire

7. Humid West Africa

   Benin, Côte d'Ivoire, Ghana, Guinea, Liberia, Nigeria, Sierra Leone, Togo

8. Sahelian Africa

   Burkina Faso, Chad, Gambia, Guinea-Bissau, Mali, Mauritania, Niger, Senegal, Sudan

9. Northern Africa

   Algeria, Morocco, Egypt, Spanish North Africa, Tunisia, Libya

10. Near East/West Asia

Afghanistan, Bahrain, Cyuprus, Gaza Strip (Palestine), Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Pakistan, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, Yemen, A.R., Yemen, PDR

11. India

12. South Asia

Bangladesh, Nepal, Sri Lanka

13. Southeast Asia

Bhutan, Brunei, Burma, East Timor, Indonesia, Kampuchea, Korea PDR, Korea Rep., Laos, Malaysia, Philippines, Singapore, Thailand, Viet Nam

14. China

15. Oceania

American Samoa, Canton & Enderbury Is., Christmas Is., Cocos Is., Cook Is., Fiji, French Polynesia, Kiribati, Guam, Johnston Is., Midway Is., Nauru, New Caledonia, Vanuatu, Niue, Norfolk Is., Pacific Is. (Trust Territories), Solomon Is., Tonga, Tuvalu, Wake Is., Wallis & Futuna Is., Samoa

16. All Developing Countries