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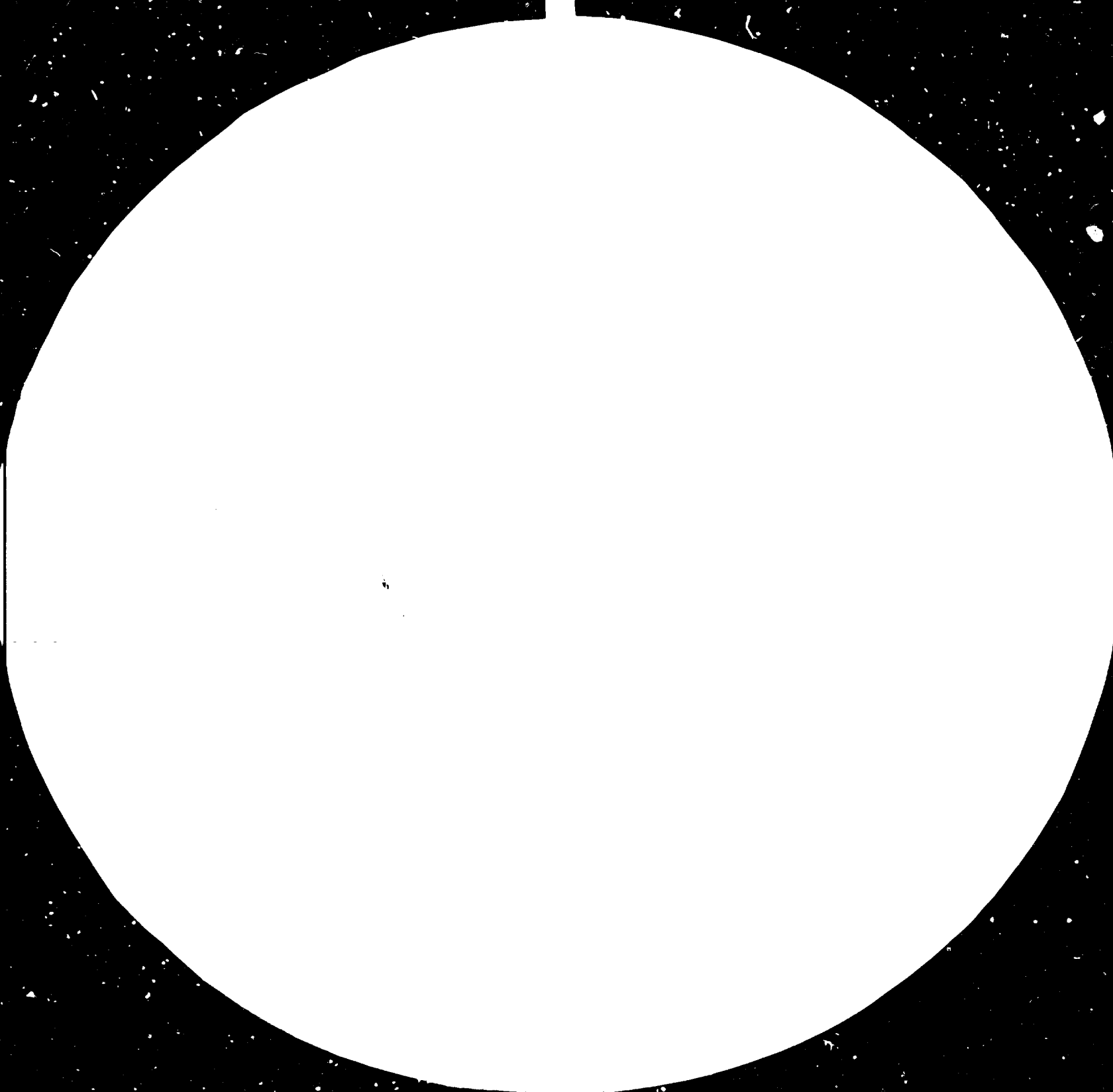
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Item 5(f) of the provisional agenda

INTERNATIONAL CO-OPERATION, RELEVANT NATIONAL ACTIONS
INCLUDING INDUSTRIAL POLICIES, AND UNIDO'S CONTRIBUTION
IN CRITICAL AREAS OF INDUSTRIAL DEVELOPMENT 1985-2000:

Policies and measures for domestic industrial processing
of raw materials in developing countries

Background paper prepared by the UNIDO secretariat

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INTRODUCTION

1. The developing countries have a relatively large share of the world's raw materials. Thus, the domestic processing of these raw materials in order to obtain greater value added continues to be one of the promising possibilities of promoting industrialization in developing countries, a strategy which can create a base for overall economic development. The renewed interest in resource-based industrialization derives in part from the need to find viable alternatives in industrial development. 1/ Domestic processing should be locked upon as a first-resort industrialization strategy.

2. Constraints to resource-based industrialization can be due to the lack of infrastructure, capital, energy, technical and managerial know-how, markets etc. However, in individual countries, a variety of specific reasons serve to explain the present interest in resource-based industrialization. The introduction of continuous casting, for example, will affect the copper, iron and steel and aluminium industries. By making smaller scales of production efficient, such processes can remove some of the obstacles that have hampered attempts by developing countries to process their raw materials. 1/

3. The real prices obtained for exported raw materials have been decreasing, as before the 1973 price boom, and at present real commodity price indices show sharp falls even from 1977 levels. Fluctuations in commodity prices have been a major handicap for developing countries in the past - a problem that has received attention in international forums.

4. The aim of this paper is to discuss issues related to the basic raw materials for industrial processing in developing countries. Basic raw materials of particular importance are minerals and agricultural products including livestock, fishery and forestry, inland water and ocean resources.

I. INDUSTRIAL RAW MATERIALS SUPPLY AND PROCESSING

5. The production of minerals and food and agricultural products, including fishery and forestry products, is the livelihood of nearly two billion people in the world, some 1.7 to 1.8 billion of whom are in the developing countries. These figures do not include those engaged in processing, transportation or other activities related to the utilization of raw materials.

6. What quantities of raw materials (both non-renewable and renewable) will be available for consumption, export or processing in developing countries in the next decade or so? What are the shares of developing countries vis-à-vis the industrialized countries in raw and processed materials? What are the possibilities of expanding further processing of raw materials in developing countries? These are questions that are dealt with in the following sections.

A. Non-renewable resources

7. World activity in the non-renewable resources sector increased during the 1970s, but the growth rates for the various types of resources differed (see table 1). In 1980, the value of world non-renewable resources was \$US 549.3 billion at the current stage of exploration and detection. In 1978, fuels accounted for 87.05 per cent, metal minerals for 9.32 per cent and non-metal minerals for 3.63 per cent of non-renewable resources. ^{2/} The value of the resources can be expected to increase with the detection of minerals in the sea-beds.

8. Although the contribution of mineral processing to gross domestic product (GDP) and foreign exchange earnings has increased significantly, total employment in the mineral processing sector has fallen for developing market economies, for Asia and for the world as a whole from 1968 to 1979. This decrease in employment is because most of the exploitation and production of minerals is being carried out in large-scale establishments that are making increasing use of capital-intensive techniques.

9. Geological surveys are inadequate. However, there are outstanding cases of mineral resources processed in developing countries or areas (other than petroleum production in the Middle East and North Africa): tin and tungsten in South-East Asia, cobalt in Zaire and bauxite in South and Central America. Furthermore, developing countries are among the major suppliers of bauxite, copper, nickel, tin and, to a lesser but still an important extent, lead, iron ore, silver, zinc, manganese, chromium and molybdenum. (There are no complete data on uranium).

10. In spite of the impressive list of the world's mineral resources owned by developing countries, their share in the supply of processed semi-finished and finished mineral products is relatively low, as shown in table 2.

11. For example, in 1979 developing market economies accounted for 47.3 per cent of world bauxite production, but they produced only 6.8 per cent of the aluminium (unalloyed ingot metal). This contrasts with 75.4 per cent produced by developed market economies and 17.8 per cent by centrally planned economies. In the production of alumina, developing countries accounted for 19.2 per cent of world production. The shares of developing countries in the first stage of processing of copper and tin are larger. The important factor is to determine the manner in which the value added is shared.

12. According to table 2, over one third of the minerals mined are from developing countries (the leading nations being Chile, Peru, Zaire and Zambia). However, the share of the developing countries in the first stage production of alumina (from bauxite), lead, nickel and zinc is, on the average, less than one half that of the minerals mined. The distribution and growth of basic metal industries, metal products and equipment by economic grouping are shown in table 3.

Table 1. Average annual growth rate of production and employment in mining and quarrying, 1968-1979

	Coal mining	Crude petroleum and natural gas	Metal ore mining	Other mining	Total
<u>Production</u>					
Developing market economies	3.7	3.5	1.3	4.8	3.0
Caribbean, Central and South America	6.2	2.2	3.1	4.8	2.5
Asia, excluding Israel and Japan	3.2	4.2	1.3	6.8	3.7
World	0.9	3.8	1.4	4.0	2.9
<u>Employment</u>					
Developing market economies	1.3	3.4	- 0.3		1.7
Caribbean, Central and South America		3.7			
Asia, excluding Israel and Japan	1.3	1.7	- 0.6		2.0
World	- 0.8	3.0	- 0.3		0.2

Source: Yearbook of Industrial Statistics, 1980 Edition
(United Nations publication, Sales No. E.82.XVII.11).

Table 2. Mining and processing of selected minerals, by economic grouping, 1979

(Percentage)

Mineral	Mining			First stage processing			Second stage processing		
	Developed market economies	Developing market economies	Centrally planned economies	Developed market economies	Developing market economies	Centrally planned economies	Developed market economies	Developing market economies	Centrally planned economies
Bauxite	41.2	47.3	11.5						
Alumina				64.0	19.3	16.7			
Aluminium							75.4	6.8	17.8
Copper	39.6	42.2	18.2	49.5	32.5	18.0			
Pig iron				60.6	5.3	34.1			
Steel							60.3	5.0	34.7
Lead	52.0	21.3	26.7	58.4	13.1	28.5			
Nickel	47.7	27.9	24.4	58.8	17.2	24.0			
Tin	8.0	68.2	23.8	17.2	59.6	23.2			
Zinc	54.4	21.7	23.9	64.5	8.8	26.7			

Source: U.S. Department of the Interior, Bureau of Mines, "Minerals in the World Economy", in Minerals Yearbook, Vol. I, 1980, Washington D.C.

Table 3. Distribution and growth of basic metal industries, metal products and equipment, by economic grouping, 1963-1980

Branch	ISIC	Developing countries				Developed market economies				Centrally planned economies			
		<u>Growth rate</u>		<u>Share in world MVA</u>		<u>Growth rate</u>		<u>Share in world MVA</u>		<u>Growth rate</u>		<u>Share in world MVA</u>	
		1963-1973	1973-1980	1973	1980	1963-1973	1973-1980	1973	1980	1963-1973	1973-1980	1973	1980
Iron and steel	371	7.9	8.1	6.8	11.0	4.7	-0.4	73.5	65.4	5.5	3.3	19.7	23.6
Non-ferrous metals	372	6.5	5.4	8.2	9.6	5.5	1.7	62.4	54.0	9.1	5.4	29.4	36.4
Metal products, excluding machinery	381	8.0	6.1	6.1	7.2	5.4	1.9	73.0	62.5	10.9 ^{a/}	9.1 ^{a/}	20.9	30.3
Non-electrical machinery	382	11.8	6.2	4.3	5.0	5.9	2.6	76.2	68.3			19.5	26.7
Electrical machinery	383	11.4	9.4	5.2	6.4	8.3	4.1	75.0	67.3			19.8	26.3
Transport equipment	384	9.4	5.0	6.8	7.9	5.4	2.2	75.1	65.0			18.1	27.1

Source: UNIDO data base; information supplied by the United Nations Statistical Office, with estimates by the UNIDO Secretariat.

^{a/} Growth rate for ISIC 38.

Table 4. Extent of industrial processing in the trade of developing countries and developed market economies, 1970-1980 ^{a/}

(Percentage)

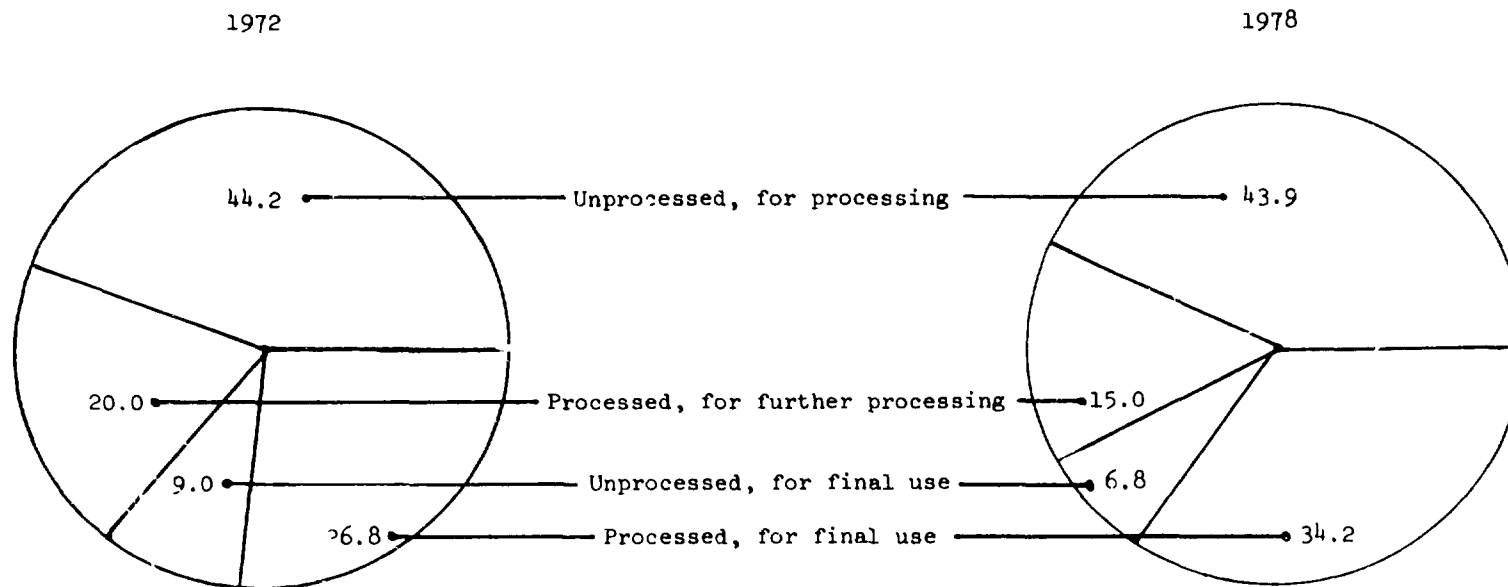
Economic grouping	Period	Unprocessed for processing		Processed for further processing		Unprocessed for final use		Processed for final use	
		Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
Developing countries	1970	14.2	52.5	17.9	14.4	3.4	7.7	64.5	25.4
	1972	14.2	46.4	17.7	14.9	3.3	8.8	64.8	29.9
	1974	21.7	49.2	18.5	14.5	2.5	4.8	57.3	31.6
	1976	21.8	46.2	15.8	13.0	2.0	5.5	59.5	35.3
	1978	19.5	40.7	15.0	13.8	3.2	6.3	62.3	39.1
	1980	23.9	43.0	14.6	13.1	2.9	5.0	58.6	38.9
Growth rate, 1970-1980		28.7	19.8	19.7	21.1	20.1	17.1	21.0	27.6
Developed market economies	1970	21.0	9.3	18.0	17.2	5.8	3.9	55.3	69.9
	1972	19.9	9.1	16.3	16.0	6.1	4.1	57.7	70.8
	1974	27.5	10.0	17.1	18.2	4.8	3.6	50.7	68.2
	1976	27.4	9.2	14.6	15.7	5.8	4.3	52.2	70.8
	1978	24.7	8.7	14.0	15.0	6.0	4.1	55.3	72.2
	1980	28.2	9.7	13.9	15.9	6.1	4.5	51.8	69.9
Growth rate, 1970-1980		23.4	19.3	16.7	17.9	20.3	20.5	19.0	18.9

Source: UNIDO data base; information supplied by the United Nations Statistical Office.

Note: For a statistical definition of individual four- and five-digit SITC items assigned to each processing category, see World Industry since 1960: Progress and Prospects (United Nations publication, Sales No. E.79.II.B.3), chap. VI, appendix.

^{a/} Calculated on the basis of 25 developed market economies and 47 developing countries for which data were available from 1970 through 1980.

Figure. Exports of developing countries according to stage of processing, 1972 and 1978
(Percentage)



Source: UNIDO data base; information supplied by the United Nations Statistical Office.

Note: Figures refer to 72 developing countries including all major exporters.

1. Trade in mineral resources

13. Data on trade between developing and developed market economies also show that while developing countries export the bulk of their metal minerals in unprocessed form, mineral exports from developed to developing economies are predominantly of semi-finished and finished metal products (see table 4 and the figure).

14. The fact that most developing countries export the bulk of their mineral resources in unprocessed or semi-processed form means that they do not obtain the additional economic benefits that subsequent stages of processing may generate. While minerals extraction undeniably contributes to the economic welfare of the mineral producing countries, subsequent stages of processing lead to larger contributions to value added and generate stronger forward and backward linkages.

15. An increase in value added of exports implies additional benefits for the mineral processing country in terms of both greater government revenues and greater domestic incomes. However, the degree of value added obtained will depend on several economic and institutional factors, such as the quality of the resource, the availability of complementary inputs, relative factor costs etc.

2. Mining and linkages

16. Studies of the linkage effects of mining activities in economies where mineral extraction accounts for a high share of gross domestic product (GDP) and where exports are mainly unprocessed minerals support the conclusion that mining has been particularly weak in creating production and consumption linkages. It creates at best only monetary linkages via taxes or royalties on extraction activities. Whether additional indirect linkages are created subsequently depends upon the investment projects for which these funds are used.

17. The impact of the mining sector on the economy depends on the institutional structure and the efficiency of the State in taxing (without stifling the entrepreneurial profit motive) and investing the revenues from mineral extraction in a diversified and productive way for the rest of the economy.

18. On the other hand, the minerals processing industries directly generate backward linkages through the purchases of intermediate goods and services and forward linkages through sales to other sectors of intermediate inputs and thus lead to economic diversification and growth and can be a powerful stimulant to economic development. 3/

19. The impact of mining investments in terms of both income and employment may become a substantial stimulus to development if incorporated with economic activities in other sectors - a possibility that increases with the level of existing economic diversification.

Table 5. Production and reserves for selected major minerals

Mineral	Quantity in 1981 (10 ⁶ tonnes)	Average annual growth rate, 1970-1981 (percentage)	Share of major producing countries in world total, 1979 (percentage)	Share of major producing developing countries (percentage)	Share of major reserves countries in world total, 1975 (percentage)	Share of major reserves developing countries (percentage)
Bauxite	88.1	4.09	Australia (31), Guinea (14), Jamaica (13), USSR (7), Suriname (5), Guyana (4)	36	Guinea (33.9), Australia (18.6), Brazil (10.3), Jamaica (6.2), India (5.8), Guyana (4.1), United Republic of Cameroon (4.1)	64
Chromite	9.25	4.73	South Africa (35), USSR (25), Albania (11), Philippines (6), Zimbabwe (6), Turkey (5)	28	South Africa (74.1), Zimbabwe (22.2), USSR (0.6), Finland (0.6), India (0.4), Brazil (0.3), Madagascar (0.3)	23
Cobalt	.031	2.73	Zaire (53), Zambia (11), USSR (6), Cuba (6), Australia (5)	70	Zaire (30.3), New Caledonia (18.8), USSR (13.9), Philippines (12.8), Zambia (7.7), Cuba (7.3)	77
Copper	8.3	2.73	USA (18), USSR (14), Chile (13), Canada (8), Zambia (7), Peru (5)	25	USA (18.5), Chile (18.5), USSR (7.9), Peru (7.0), Canada (0.8), Zambia (6.4)	31
Iron ore	664 000	1.09	USSR (27), Brazil (11), Australia (10), USA (10), China (8), Canada (7), India (4)	23	USSR (30.2), Brazil (17.5), Canada (11.7), Australia (11.5), India (5.8)	29
Lead	3.475	0.00	USSR (15), USA (14), Australia (11), Canada (9), Peru (5)	5	USA (20.8), Australia (13.8), USSR (13.2), Canada (9.5), South Africa (4.1)	0
Manganese ore	23.6	2.01	USSR (39), South Africa (20), Gabon (9), Brazil (9), India (7), Australia (6), China (6)	29	South Africa (45.0), USSR (37.5), Australia (8.0), Gabon (5.0), Brazil (2.2)	7
Molybdenum	0.1015	2.60	USA (63), Chile (13), Canada (11), USSR (10), China (2)	15	USA (38.4), Chile (27.8), Canada (8.1), USSR (5.6), China (6.0)	34
Phosphate rock	145.8	0.01	USA (38), USSR (21), Morocco (15), China (4), Tunisia (3), Togo (2)	24		
Potash	27.4	-	Canada (28), USSR (26), German Democratic Republic (13), Federal Republic of Germany (10), USA (9)	0		
Tin	0.237	0.01	Malaysia (27), Thailand (14), Indonesia (12), Bolivia (12), USSR (8), China (7)	72	Indonesia (23.6), China (14.8), Thailand (11.8), Bolivia (9.7), Malaysia (8.2), USSR (6.1), Brazil (5.9)	74
Tungsten	0.0491	0.54	China (28), USSR (19), Bolivia (7), USA (6), Republic of Korea (6), Australia (5)	41	China (46.9), Canada (12.1), USSR (10.6), Democratic People's Republic of Korea (5.6), USA (5.4), Australia (2.7)	52

Source: U.S. Department of the Interior, Bureau of Mines, Minerals Yearbook, Vol. I, 1980. Washington, D.C.

20. In view of the above, for a country endowed with mineral resources, a policy of forward processing of minerals is a good way to promote industrial development. For example, successful national policies of individual developing countries have contributed to a high rate of production of cement. These policies have been supplemented by readily available local and regional markets and adequate supplies of inputs. While the developing countries' share of world industrial output in 1981 was 11 per cent, cement production in developing countries already in 1971 accounted for 28 per cent of the world production and rose to 40 per cent in 1981. Although this is not the case of several other industries based on mineral resources, it is a good example for illustrating the possibilities for developing forward processing of minerals when certain preconditions are met.

21. The growth rate of production of minerals from 1970 to 1981, as well as production of minerals in 1981, is shown in table 5. In addition, countries with important shares in production and reserves are indicated. Clearly, the location and production of minerals is highly concentrated.

B. Renewable resources

1. Food and agriculture, including livestock and fisheries

(a) Food shortage *

22. It is a fact that a small portion of the world's population has at its disposal a large portion of the arable land, which is often utilized very intensively. This means a larger production of crops per hectare of land and per farmer. On the other hand, much less arable land is at the disposal of the large portion of the world's population. This land is utilized extensively, with low productivity both per hectare of land and per farmer. By the year 2015, food will have to be provided for some 8 billion people. To meet this need, food production would have to be increased by two to three times.

23. Increased agricultural productivity calls for arable land (or land that could be made arable), proper infrastructure, industrial inputs (tools, agricultural machinery, fertilizers, pesticides etc.) and an industrial structure able to handle, process, pack, store and distribute the products. To this end both short and long-term measures are needed. The food-processing industry should absorb the raw materials before they spoil and make them available to consumers in processed form.

* See also item 5(g) of the provisional agenda for the Conference and the background paper prepared for that item (ID/CONF.5/8)

24. The total amount of agricultural raw materials produced in developed and developing countries has grown during the 1970s, as shown in table 6.

Table 6. Growth of agricultural raw materials, 1971-1981
(1970 = 100)

Year	World	Developing countries	Developed countries
1971	103	103	103
1973	108	107	108
1975	114	116	112
1977	119	123	116
1979	125	131	120
1981	129	139	121

Source: Food and Agriculture Organization of the United Nations Food Outlook, 1982: Statistical Supplement (Rome, 1983), p. 4.

The figures show that, on the average, the growth in food production in developing countries between 1971 and 1981 has been higher than in developed countries.

25. However, the rates of growth are different in each region. The growth as of 1981 (1969 = 100) was for Asia, 137; for Africa, 125; for Central America, 139; and for South America, 147. The Philippines and Thailand have been successful in expanding food production. In Asia, the average annual growth in cereal production from 1972 to 1981 was 3.5 per cent for the developing market economies and 3.2 per cent for the centrally planned economies, compared to the global growth rate of 2.6 per cent. In Africa, most of the area south of the Sahara has had problems in achieving sufficient growth rates in food production. In Latin America, Brazil, which has diversified its agricultural production, has shown the largest increase.

26. In general, growth rates differ according to the type of product, technology applied, climatic conditions etc. Future production is estimated to show continued growth in most countries, owing to better strains, better management, utilization of fertilizers, other improved agricultural inputs etc. Furthermore, the production potential for many crops in developing countries is high in comparison with the yields in developed countries.

(b) Livestock

27. To achieve better and more balanced nutrition, many countries have given higher priority to livestock production during the last years, and keen competition is expected between coarse grains used for animal feeding and bread grains. This should prevent the import of high value-added agricultural products from being too large.

28. Estimates of the growth rates of livestock in different regions are shown in table 7.

29. In many countries, poultry and pork contribute to the faster growth rate, as it takes a much longer time to increase beef production.

Table 7. Estimated average annual growth rate
of livestock products, 1980-2000
(Percentage)

Product	Africa	Far East	Latin America	Near East	Developing countries
Cattle and buffalo meat	3.9	4.5	4.2	4.3	4.2
Sheep and goat meat	4.5	3.6	3.8	2.0	3.6
Pig meat	6.8	5.4	4.4	4.2	5.0
Poultry	8.1	8.8	5.2	10.1	7.5
Eggs	7.3	6.3	4.9	8.6	6.2
Cattle and buffalo milk	4.3	3.6	3.8	3.3	3.7
Aquatic organisms <u>a/</u>	1.8	1.9	1.1	2.7	1.7

Source: Food and Agriculture Organization of the United Nations, Agriculture: Toward 2000 (Rome, 1981).

a/ Production growth rate 1975-2000.

(c) Fisheries

30. As opposed to most other resources, fish are generally considered a "free commodity", i.e., nobody owns them until they are caught. Unlike agriculture, there are no direct expenses connected with production, with the exception of fish farming. In most developing countries fishing, and especially offshore fishing, is marginally developed, which can also be seen from the slow introduction of modern technology and limited investments.

31. Table 8 below shows fish catches over a five-year period. It appears that there is a steady small increase in annual catches.

Table 8. World catches of aquatic organisms, a/
1977-1979, 1980 and 1981

	<u>Average, 1977-1979</u>		<u>1980</u>		<u>1981</u>	
	Millions of tonnes	Percentage	Millions of tonnes	Percentage	Millions of tonnes	Percentage
World	70.1	100	72.3	100	75.1	100
Developing countries (total)	32.7	47	34.2	45	36.2	48
Latin America	8.5	26	9.6	28	10.5	29
Africa	3.4	15	3.2	9	3.3	9
Near East	0.8	2	1.0	3	1.0	3
Other developing countries	20.0	4	10.4	5	21.4	7
Developed countries	37.4	53	38.1	55	38.9	52

Source: Food and Agriculture Organization of the United Nations,
Agriculture: Toward 2000 (Rome, 1981).

a/ Excluding cetaceans and seaweeds.

32. It can be seen from table 8 that the increased catches are mainly due to larger catches in developing countries as a whole. Catches in Latin America, which decreased heavily at the beginning of the 1970s, are on the rise. Developing countries catch nearly half of the total amount of fish but, in spite of increased catches, they are still net importers of fish.

33. The total world catch could be increased by better management of those species caught at present, by better exploitation of less well-known species and by developing the catching of shellfish. However, the total increase in production during the next years will hardly be able to keep pace with increases expected in the overall demand. Estimates indicate that the catches will only increase by approximately 1 per cent compared with a population growth of approximately 2 per cent for the same period. 4/

(d) Training

34. In order to be able to achieve food-production targets, from raw material production to industrial processing, training in various skills is almost equally important as obtaining financial resources for investment. Training in agricultural production (farming, livestock raising, fishing) is by its nature different from training in industrial skills. Many developing countries have facilities for training in the agricultural field, but they can train only a limited number of people and only those who can afford to spend their time in training and who have some basic education.

35. It is often said that farmers need a piece of land, water and sunshine to produce their basic food. This is not enough, if bare hands and traditional methods are used, to be highly productive. The situation is quite different with industrial processing and the operation of industrial plants. For small-scale operations and simple technologies, the training requirements may not be very sophisticated. For large-scale operations, high-level specializations are required, such as mechanical, electrical and chemical engineering, food technology, economy, management etc. There are a number of general skills at the middle level, such as those needed by plumbers, electricians, steam boiler operators etc., as well as specialized skills for operating crystallizers, evaporators, refrigeration equipment, milling tandems, quality control instruments, seaming and packaging machines, spray driers, centrifuges and separators and many others.

36. In order to plan for the industrial processing of domestic raw materials at any level, the training and education requirements - by industrial sectors, by specialization and by the level required - should be determined. A number of plants face great difficulties because personnel have inadequate training, leading to poor quality control, products that do not meet standard requirements, equipment breakdowns, disorganized supply of raw materials, high losses, limited variety of products etc. This may reduce the economic profitability of individual plants as well as the profitability of the whole industrial sector.

2. Forestry and biomass

37. Although wood is a renewable resource, the gestation period for most types of wood is longer than for most other renewable commodities. Developing countries, which account for about 79 per cent of the world's population, account for approximately half of the total wood consumption, mostly of fuel wood, and the rate will probably continue to grow.

38. Table 9 shows the production of various forestry products in 1981. For more than two decades there had been an increase in round wood as well as in sawn wood production but in the last decade there has been a stagnation or even a small fall in the production and trade caused by the current recession in the developed world's construction industry.

Table 9. Forestry production

Product	World		Developing countries		Developed countries	
	Production 1981 (million m ³)	Annual rate of growth 1971-1981	Production 1981 (million m ³)	Annual rate of growth 1971-1981	Production 1981 (million m ³)	Annual rate of growth 1971-1981
Fuel wood	1759	2.8	1514	2.7	245	3.4
Industrial round wood	1359	0.7	315	4.7	1069	-0.11
Sawn logs:						
coniferous	562	-0.1	65	6.2	497	-0.6
non coniferous	242	1.3	134	3.1	107	-0.3
Sawn wood:						
coniferous	308	-0.5	29	3.5	278	-0.8
non coniferous	108	1.2	51	6.2	56	-1.3
Wood-based panels	97	2.5	17	14.0	83	1.8
Wood pulp	125	2	16	-	114	-
Paper	175	3.5	22	10.0	153	2.8

Source: Food and Agriculture Organization of the United Nations, Agriculture: Toward 2000 (Rome, 1981).

39. According to statistics South America, Africa and Asia account for about 50 per cent of the world's forest areas and approximately for 75 per cent of the world's hardwood forest. These three continents produce 15, 25 and 40 per cent respectively of the world's hardwood log. 4/

40. The area covered with tropical forests is decreasing, partly due to clearing for permanent agricultural purposes and shifting of cultivation and partly because of forest depletion, which often results in soil erosion, siltation and at last desertification. A larger part of the world's forest resources has, however, not yet been estimated, and consequently statistics should be treated with caution.

41. Even though tropical forest areas are decreasing, supplies of wood appear to be sufficient to meet demand, at least for the rest of this century. However, the amount of hardwood on the world market is likely to fall as more forests are cleared for agricultural uses and because hardwood

producing countries will continue to increase their processing activities. Many developing countries will need additional supplies of industrial wood for domestic demand, but if the price of logs rises it is expected to affect substitution products such as aluminium or plastic.

42. Countries with low population density and low energy demand but large land areas suitable for planting energy crops offer the best possibilities for producing wood. Becoming more independent in energy terms may mean a better chance for an overall economic development. Good knowledge of energy needs and of potential energy resources is a prerequisite for a good energy programme.

3. Processing of agro-based raw materials

(a) Food industries

43. The food industry (cereals, oil and fat, dairy, fishery, meat, fruit and vegetables, alcoholic and non-alcoholic beverages, sugar and related industries) is an important element of the manufacturing sector in most developing countries. The food industry accounts for up to one-fifth of total employment in all sectors and approximately one-fourth of GDP in the developing countries; these figures are underestimated, however, since the less commercialized part of the food system in villages and smaller urban areas is not included.

44. The food industry in developing countries varies substantially from sector to sector in regard to distribution for exports and distribution for the domestic market. Compared with developed countries, where a very high percentage of the farm produce goes through some sort of processing before being distributed to the final consumer, the percentage of the farm produce going through processing in most developing countries is between 10 and 20 per cent only.

45. Employment, production, value added and distribution in the food industry is shown in table 10. Table 11 indicates that, in general, in developing countries staple food for the domestic market is processed in small-scale traditional production units, brand-name foods for the domestic market in medium-scale modern plants and the export-oriented foods in large-scale and modern plants. The involvement of transnational corporations is mainly in large- and medium-scale enterprises producing products with high value added.

46. In expanding its food-processing activities, a developing country faces a choice between rural districts or fast growing urban centres for further processing of raw materials. The decision may be difficult, particularly if the country's infrastructure is inadequate and supplementary imports are necessary. Small-scale plants of a similar type could be used in villages and smaller rural districts for production of traditional products, while large-scale production may be more appropriate in urban areas. Supplying food products, especially perishable ones, to the urban centres presents a problem; in many developing countries the distances between the rural production areas

Table 10. Output, value added, persons employed and markets of the food and beverage industry, by economic regions and grouping, 1975

Economic group and region	Number of countries	Population (millions)	Food and beverage industries				Total sales of processed food a/ (millions of dollars)	Per capita processed food sales b/	
			Value output (millions of dollars)	Value added (millions of dollars)	Persons employed (thousands)	Value added per person employed (dollars)		Total population (dollars)	Urban population (dollars)
Developed market economies	27	758.9	378 222	112 402	8 234	13 653	381 861	503	563
Western Europe	15	289.4	159 063	51 461	3 540	14 537	160 927	556	606
North America	2	236.3	141 232	39 604	1 869	21 190	143 847	609	628
Japan	1	111.6	35 985	10 979	1 513	7 256	38 323	343	402
Other developed market economies	9	121.6	41 942	10 358	1 312	7 895	38 764	318	442
Centrally planned economies	7	360.5	222 879	57 595	4 419	13 033	c/	c/	c/
Developing countries d/	95	1 889.6	93 934	26 026	9 734	2 673	90 794	48	116
By income groups:									
Low	32	1 147.8	19 735	3 625	5 430	667	19 687	17	53
Middle	40	461.7	29 299	9 163	2 540	3 607	26 732	48	112
High	23	280.0	44 900	13 238	1 764	7 504	44 375	158	252
By region:									
Latin America	26	314.2	51 546	15 430	2 318	6 656	47 896	152	244
Africa	43	381.2	11 570	3 282	1 059	3 105	12 305	32	178
West Asia	10	79.1	5 017	1 260	282	4 468	5 511	70	172
Asia and Pacific	16	1 111.5	25 800	6 047	6 075	995	25 082	23	56
World total e/	129	3 009.0	695 035	196 023	22 387	8 756	675 734	224	398

Source: United Nations Centre on Transnational Corporations, based on: (a) information supplied by United Nations Statistical Office; (b) Food and Agriculture Organization of the United Nations, Production Yearbook (Rome, 1977), vol. 31; (c) World Bank, 1978 World Bank Atlas (Washington, DC, 1978); and (d) Yearbook of International Trade Statistics, 1977 (United Nations publication, Sales No. E.78.XVII.11).

Note: References to dollars are to United States dollars.

a/ Value of food-industry exports and imports of food products for households.

b/ Total sales divided by total population and urban population respectively.

c/ Directly comparable data not available.

d/ Developing countries are grouped according to World Bank estimates of 1975 GNP per capita: "low-income countries" include those with less than \$250 per capita GNP; "middle income countries" include those with from \$250 to \$1,000 per capita GNP; "higher income countries" include those countries classified as developing countries by the United Nations with per capita GNP above \$1,000.

e/ Excluding China and centrally planned economies of Asia.

Table 11.

Types of plants, growth projections and involvement of transnational corporations in the food-processing industries of developing countries

Industry group/ market orientation	Type of plant			Growth project- tions <u>a/</u>	Extent of involvement of transnational corporations, mid-1970s <u>b/</u>
	Small- scale tradi- tional	Medium- scale modern	Large- scale modern		
<u>Domestic staple foods</u>					
Meat (fresh, slaughter)	X			M	L
Poultry	X		X	H	H
Dairy (fresh, cheese)	X	X		M	L
Fish (fresh, dried)	X			H	L
Fruits, vegetables (fresh)	X			M	L
Pulses, roots	X			M	O
Wheat milling	X		X	H	M
Bakery	X			H	L
Corn milling (dry)	X		X	..	L
Rice milling	X			M	O
Vegetable oils (crude)	X		X	M	M
Animal feeds		X	X	H	H
Sugar milling (non-centrifugal)	X			M	O
Beer (local)	X			..	O
<u>Domestic branded foods</u>					
Processed meat		X		..	L
Dairy (processed, ice cream)		X		M/H <u>c/</u>	H
Fruits, vegetables (canned)		X		M	M
Biscuits		X		H	M
Breakfast foods		X		..	M
Refined oils, margarine		X		H	H
Soft drinks (syrup)			X	M <u>d/</u>	H
Soft drinks (bottled)		X		M <u>d/</u>	M
Confectionery		X		H	H
Beer		X		H	M
Wines, spirits			X	L	L
Coffee (extract)		X		H	H
Tea		X	X	M	H
<u>Export food industries</u>					
Beef (chilled, canned)			X	M	L
Fish (speciality)		X	X	M	H
Bananas			X	L	H
Fruit (canned)			X	M	H
Vegetable oil (crude, refined)			X	M	H
Fruit, vegetables (fresh)			X	M	L
Sugar (raw, refined)			X	M	L
Coffee (roasting)		X	X	M	L
(extract)			X	H	M
Cocoa (grinding)			X	H	H
Tea			X	M	H

Source: Estimates by the United Nations Centre on Transnational Corporations, based on reports of the Food and Agriculture Organization of the United Nations, the World Bank and national studies.

a/ L = low, or less than population growth projection (2.3 per cent per year); M = medium, or 2.4-4.6 per cent per year; H = high, or more than 4.6 per cent per year.

b/ O = no identified transnational corporations involvement; L = minor transnational corporation involvement; M = moderate transnational corporation involvement; H = substantial transnational corporation involvement.

c/ Concentrated milk, moderate future growth; dried milk products, high future growth.

d/ Historic growth moderate, but industry estimates indicate high future growth.

and the urban consumption are great and the market infrastructure, such as storage, transportation etc., is inadequate. Recent developments in food technology should be taken into consideration, such as solar drying, freeze drying, irradiation etc.

47. Another bottle-neck to processing is securing an adequate and steady volume of raw materials, which is often not possible because of the length of the growing season and the lack of storage and transportation infrastructure. Other problems that inhibit the development of processing are maintenance and repairs of machines, inadequate institutional framework, pricing policies, inadequate agricultural credit facilities etc.

48. Especially for food and agricultural products a well-functioning system from the producer to the final consumer is important for processing to be feasible and viable. In many countries post-harvest losses and losses during storage and transportation are high, mainly because of lack of infrastructure. The complete utilization of raw materials, by-products and wastes may add to the economic profitability of the sector.

(b) Wood and wood products industry

49. Until the middle of the 1960s, the developing countries processed few tropical logs for export mainly owing to lack of capital, skilled labour and secure export markets. Moreover, shortages of foreign exchange inhibited the development of processing activities.

50. The developing countries are trying to increase their share in the wood-based processing industries. Apart from the added employment possibilities, the converting of logs to sawn wood and plywood reduces the weight and volume of the raw material by approximately 50 per cent, resulting in lower freight costs which often account for up to 50 per cent of the delivered price of tropical timber on the overseas markets.

51. An example of an attempt to promote the wood-processing industries in developing countries is the South-East Asia Lumber Producers Association (SEALPA), a union of countries attempting to regulate production and trade in order to obtain better prices from wood-importing countries. However, owing partly to strong monopolistic structure in processing industries and partly to large balance-of-payments deficits in certain member countries, the success of SEALPA has only been limited. Moreover, in order to protect their own wood-processing industries, some industrialized countries have imposed high tariffs on imported processed tropical wood.

52. There are opportunity costs in developing wood-processing industries, since resources will be diverted from other investments where the return may be more direct and often quicker. This is due especially to the fact that many tropical countries lack a basic industrial infrastructure and productive capacity is underutilized, among other things because of the nature of forest land ownership (often communal, provincial or tribal), periodical shortages of logs, low labour productivity, lack of skills and poor management. Land reforms, appropriate training and the streamlining of research and development institutions are some measures that could enhance further development.

53. Although the total employment in forestry and wood-processing industries only accounts for a small part of the total work-force, it is none the less important because forest industries are often located near the forest owing to the comparatively high cost of transporting unprocessed sawn logs to the sawmill. Thus much needed rural employment is generated.

(c) Textile and leather industry

54. Although agricultural raw materials are primarily intended for human consumption (as source of carbohydrates, protein and oil), a rather large amount is used for other purposes. The textile industry obtains its major raw materials from agriculture (cotton) and from livestock (wool). Although in many countries the textile industry is not as large as other industrial activities, it is nevertheless important because of employment generation, support of agriculture and livestock development (cash crops), local production of consumer goods, export revenues etc.

55. Cotton fibre and seed, about 40 per cent of which is produced in some 70 developing countries, is a crop valued at some \$US 16 billion annually. Cotton production, together with the cotton products manufacturing industry, provides income to some 170 million people (direct labour and dependents).

56. The leather goods industry utilizes hides and skins from slaughterhouses and thus adds to the production value of the livestock sector. Livestock, therefore, should be seen not only as a basic supplier of protein food (meat) but also as a supplier of other semi-products as well. Further processing adds to the better utilization of industrial raw materials, not only hides and skins but also other products or by-products such as hoofs, hair, intestines, glands etc.

C. Water and ocean resources

1. Water

57. Water is the most important of all mineral resources. Unlike almost any other mineral resource, it is used by all people, regardless of their economic status, and without it, no life and civilization could exist. Even in less developed societies, where water used by individuals was estimated to be less than 1 gallon per day, water used for agriculture can be significant. For instance, over 50 gallons of water are required for one corn plant to reach maturity; a pound of wheat requires 60 gallons of water and a pound of rice over 200 gallons. 5/

58. In more technologically advanced countries, per capita water use can exceed several thousand gallons per day for household uses, manufacturing and irrigation. Most important of all these uses are irrigation and thermo-electric power generation.

59. Most methods for processing mineral resources require large amounts of water. Pollution control, however, is a growing concern in the disposal of waters used by the mineral industries.

60. Of the earth's estimated 359 quintillion (10^{18}) gallons of water, 97.2 per cent is in the ocean. Ice caps and glaciers account for most of the remaining water, with the rest in lakes and rivers, underground reservoirs and the atmosphere. There is a constant exchange of water between all these sources at rates controlled by climate, with precipitation being the main method of replenishing the fresh-water supply. 5/

61. Sea water, which contains about 3.5 per cent dissolved solids, is not usable without a desalinization treatment, which is too costly to be widely used except in arid areas where no other options are available. Melted icebergs and water condensed from the atmosphere are of potential interest only in local extreme situations.

62. Most usable water, therefore, is drawn from surface sources and ground-water reservoirs, surface water providing a much larger proportion because it is cheaper to obtain. Ground-water requires expensive investments in drilling and pumping equipment, but it has a more constant temperature and composition as well as freedom from most natural pollutants. However, if a ground-water reservoir is polluted, the water is not fit for consumption for a long period of time and the cost of cleaning it may be prohibitive.

2. Oceans

63. Although the oceans cover almost three quarters of the globe, their exploration has been inadequate. Potentially important mineral resources are found in the ocean, but the methods of recovering minerals and the prevailing legal system pose problems for their exploitation. A distinction between ocean water and the ocean floor should be kept in mind when evaluating the mineral potential of the oceans.

64. Little use has been made of the ocean mineral resources, both on the continental shelf and on the deep-ocean floor, with the exception of oil and gas (the greatest progress in engineering methods to exploit the ocean floor has been made by the petroleum industry). There are no standard engineering methods and uniform laws to aid the development of ocean resources, there are no methods or legal systems to stimulate ocean-floor exploitation and it is not certain whether the development of ocean resources would be competitive. Most equipment being used at present for exploration and recovery of solid submarine mineral resources has been developed recently.

65. The ownership of deep-ocean floor deposits is an unsolved problem; it is the major restraint in deep-ocean mining because it affects investment decisions.

66. If the economic incentive were clear, extensive exploitation of ocean mineral resources could be undertaken in the near future. However, the oceans will increase the reserves of most mineral resources only fractionally (nodule mining might be expected to increase substantially the land-based resources of manganese, copper and nickel). Impending shortages in certain mineral resources may be alleviated, but these will not be inexhaustible.

II. INDUSTRIALIZATION ON THE BASIS OF DOMESTICALLY
PRODUCED RAW MATERIALS

67. The relative importance of the resource-based sector declines considerably in the course of development, while that of industry increases. The manufacturing sector grows at a substantially faster rate than the primary sector, thus gradually transforming the economy from one dominated by raw materials to one dominated by non-primary sectors and new lines of production that are exported on the international market. There are two reasons for this decline:

(a) Raw materials processing has different effects on the growth of the economy. The inputs used in processing, the technological requirements and sociological factors vary from one product to another. The impact of processing on the economy depends on its effectiveness in transmitting growth to other sectors. Thus, if demand for the processed output increases, the quantity supplied will also increase, and this will cause an increase in income. Spending this income will generate investment opportunities in other sectors of the economy, and this inducement arising from increased activity in the resource-based sector generates intersectoral linkages between the primary and non-primary sectors;

(b) Raw materials processing provides investment opportunities in the sector itself, in the sectors supplying inputs to the primary sector, in sectors employing primary sector production as an input and in sectors producing consumer goods. The relevance of the linkages between the primary sector and other sectors of the economy depends on investment growth in the resource-based sector.

68. Although raw materials producing sectors are important contributors to GDP, further processing is relatively weak in developing countries as a whole. Some of the factors decisive in locating and developing the industrial processing of raw materials are discussed below.

A. The concept of surplus

69. The fundamental concept in evaluating the economic prospects for forward processing of raw materials in developing countries, both for domestic and export markets, is the concept of "surplus". For private investments, surplus means profit (pre-tax); for public investments, it could mean net social benefit.

70. If investment were the sole province of private enterprise, locations for industry would be favoured which, taking into account supply, demand and political factors, offered the best prospects of economic return.

71. In the real world, where development strategies may depend in part on collaborative efforts between private and public interests, surplus is still a relevant concept. Co-operation from private interests will be forthcoming only if the prospects for earning a surplus are adequate.

72. Even if investment is the sole province of public authorities, the concept of surplus remains relevant. Public investments that earn surpluses are sources of funds for additional development activities. In contrast, investment in activities that earn no surplus (or worse, generate a deficit) dissipate resources, with no lasting benefit to the economy. A useful tool in evaluating the possibility of surplus is comparative cost analysis. A detailed comparative cost analysis shows that it would not be economically feasible to integrate raw materials processing at the site of the resource (i.e., within a developing country) until one or both of the following conditions are met:

(a) The price of material processed in the developing country is competitive with the world price;

(b) The price of material processed in the developing country is competitive with the developing country import price.

73. As regards the second condition, markets for primary resources, especially metals, are expanding constantly within the developing countries. Consequently, projections of domestic consumption influence the decision to manufacture, particularly in light of the fact that Governments can effectively exclude imports of primary materials. Hence, the domestic consumption of processed materials in a developing country and government attitudes towards import substitution, as well as world market considerations, are of importance.

B. Technology

74. Some significant changes in minerals processing technology may affect the location of copper, iron and steel, aluminium and also paper plants in the future.

75. One of the most pervasive technical improvements has been continuous casting in the metals industries. This process takes molten metal from the final reduction phase of processing and casts it directly into shapes for final use or for subsequent manufacture. In copper, continuous casting from refined copper cathodes results in better quality wire bars which command 30 per cent price premiums on the market. Owing to the quality and delicacy of the product, however, skilled labour is required and the plant must be located near the market to avoid damage in transport. Since wire bar is the semi-manufacture responsible for about half of the demand for copper, it has been predicted that continuous casting will take up to 70-80 per cent of new mill capacity over the next few years.

76. In the case of aluminium and steel, continuous casting is likely to increase the attractiveness of locations in developing countries. Chemical companies are exploring ways of recovering aluminium from the abundant clays found in countries with developed market economies (some plants are already reported to be using such processes, ^{1/} but costs are high). The objective of the companies engaged in research is to free themselves from dependence on imported bauxite supplies, 77 per cent of which is located in developing countries. However, such research may allow firms in developing countries to

compete as aluminium suppliers because the recovery methods eliminate the alumina processing phase and lower the scale of operation and the investment needed to reduce the ore to metal. Although more abundant clays would become sources of aluminium, bauxite should still be the richest source.

77. The second type of research being conducted is aimed at reducing the inputs needed to produce a tonne of aluminium. Results are likely to affect smelting primarily, where increased conductivity of the cathode and the electrolytic solution would reduce both power and capital needs.

78. In the food sector, technology has led to the production of a variety of high value-added products in recent years, although a large portion of the world's population still depends on basic staple foods processed to a limited extent (by milling, salting, smoking, drying) using unsophisticated equipment. Most of the food consumed in developing countries is not industrially processed, in some countries less than 10 per cent. In most developed countries, 70 to 92 per cent of the food consumed is industrially processed.

79. High value-added products are processed in large, often automated, installations using sophisticated technologies, such as freeze drying, high temperature short time (HTST) pasteurization, extruder cooking, continuous aseptic filling etc. An entire industry has evolved to produce various food additives, colourings, aroma enhancers, extracts etc., another to produce packaging materials and packages, such as easy open aluminium cans, flexible pouches, polyfoil-multilayer materials, packages of all shapes, sizes and properties.

80. There is definite interrelation between GDP and the consumption of industrially processed food. With gradually increased income and buying power, people tend to spend a higher portion of their income for leisure and higher value-added products, although the pattern may differ from country to country. Developing countries should obviously not copy everything that is considered advanced, particularly not in staple foods. However, the trend exists. In many larger countries, although the average GDP per capita is low, there is always a portion of wealthy people who can, and do, afford high-value and leisure products, justifying thus the existence or the establishment of modern industrial plants that produce more sophisticated food products.

C. Markets

81. An important factor to consider in the future development of the raw materials processing industry, and especially the agro-industries in developing countries, is that the industrialized markets for many products are reaching a saturation point. The growth in demand for many food items in the Organization for Economic Co-operation and Development (OECD) area is estimated to be low in the coming years. Therefore, it is important that as soon as a processing activity contributes to value added it be integrated in the development of the country.

82. Processing in developing countries is carried out by transnational firms, public enterprises, co-operatives and private firms. These enterprises act at different levels, before and after processing, their course of action

depending on whether the processing is taking place to fulfil the demand of export markets or of the domestic market. Too often processing is discussed from the point of view of international trade. Although most processing is carried out for the domestic market, most minerals are processed for export only, and such tropical products as coffee, cocoa, tea, bananas and others are produced primarily for export. In the agricultural and food sector, the domestic market is the most important for products from locally available raw materials.

83. The size of the market plays an important role in the pattern of industrialization. Countries with large populations can base industrialization on the home market, other countries have chosen an export-oriented strategy of development, which permits high export earnings.

84. The quantity and degree of forward processing of minerals in developing countries is greatly influenced by the size and proximity of the market to which a developing country has access. One of the reasons that some developing countries do not forward process more of their minerals is because their own markets are small, and they would have to depend on markets of developed countries and face trade barriers and disincentives.

85. Regional trade or customs unions partially solve the problems of small internal markets but can not displace the dominance of developed countries in the consumption of minerals. However, if the economy of the developing countries grows faster than is forecasted, the production and consumption of mineral products in developing countries should also grow more rapidly than anticipated.

D. Utilization and recycling of by-products and waste materials 6/

86. Utilization of by-products and recycling extends the life of resources and minimizes the waste entering the environment, even though recycling generates its own wastes and recycling is rarely a homogeneous process. The incentive to recycle secondary resources depends on the price: if the price of a raw material is high, the incentive to recycle is strong; if it is low, the incentive to recycle will be less. Recovering and recycling a secondary material may be more expensive than the raw material.

87. Other factors affecting the recycling of waste materials and the utilization of by-products are the diversion between public and private interests in market economies and the extent to which these interests influence legislated policy promoting or discouraging this economic activity. As recycling of materials and utilization of by-products are not necessarily optimal economic activities in unregulated markets (from the private viewpoint), deliberate government planning may be needed in order to make them optimal and to ensure that sustained activities of resource conservation are promoted.

88. Traditionally, environmental damage and the waste of resources were considered to be matters outside the scope of industry. Now various suggestions have been made to reduce wastage and environmental damage - changes in the durability of products, adoption of technological processes producing less residues, utilization of by-products, recycling of residues

etc. In order to assess the effectiveness of recycling and the utilization of by-products as a component in a waste-management resource conservation system, the costs and benefits must be considered from the public and private viewpoints.

89. From the private viewpoint, the decision to recycle and utilize by-products will be purely economic. Regulations, fiscal tools or other incentives to recycle will influence the decision accordingly.

90. On the other hand, the public decision to encourage recycling or the utilization of by-products will depend not only on a cost-benefit evaluation of privately-owned resources but also on the social welfare function of a given country or region. The costs and benefits include: net additions to the economy from rechanneling wastes back into production and consumption; costs of converting the waste material into useful products; environmental damage if the waste materials were instead disposed of into the environment etc. Economic systems with regulated markets will, therefore, stimulate recycling or the utilization of by-products to the extent that benefits outweigh costs.

E. Energy and productivity

91. Energy costs during the past decade have not only added another dimension to the current world crisis but have also provided incentives to search for new, renewable and non-renewable sources of energy, a complex long-term effort that must be tackled at the national, regional and global levels.*

92. The developing countries' accelerated socio-economic progress will continue to depend, first, on greater access to conventional sources of energy, although a significant contribution may be expected from the new and renewable sources and, second, on assured access to new technologies. The development and utilization of new sources of energy, both renewable and non-renewable, entail not only larger national capacities but also new schemes of international co-operation. Without a doubt, the maximum development of national potentials can be achieved within the framework of self-reliance and co-operation among developing countries.

93. The industrial processing of raw materials requires reliable sources of energy at prices that will not jeopardize the competitiveness of producer countries. Co-operation is therefore required between energy producing developing countries and those with raw materials. Regional joint-ventures should therefore be encouraged, and supportive policies and strategies should be clearly articulated in order to achieve optimal forward processing of raw materials.

* See also item 5(d) of the provisional agenda for the Conference and the background paper prepared for that item (ID/CONF.5/7).

F. Transnational corporations 1/

1. Minerals

94. Many of the markets for mined, semi-processed and processed raw materials are dominated by transnational corporations. The mining and processing of certain minerals are dominated by five or less transnational corporations: the largest transnational corporation is responsible for over one-fifth of world output of bauxite, for example. Table 12 shows the shares of mined and processed output accounted for by one major transnational company and five top transnational companies together. It can be seen that transnational corporations are well established in all seven minerals. They are also important in exporting unprocessed raw materials to trading partners or subsidiaries in developed countries.

95. However, for certain mineral resources the involvement of transnational corporations has been reduced. For example in the copper industry, the nationalization of mines and processing facilities has been successful in reducing the control of the transnational corporations over the market, partly because those firms were not fully integrated forward into intermediate processing stages and also because copper processing technology is widely known and easily acquired.

Table 12. Involvement of transnational corporations in mineral processing (Percentage)

Mineral	Share of mineral output		Share of processed output	
	One major transnational corporation	Five top transnational corporations	One major transnational corporation	Five top transnational corporations
Bauxite	22	54.6	22.4	60.1 <u>a/</u>
Copper	11.1	13.1	50.1 <u>b/</u>	39.5 <u>b/</u>
		8.3	32.8 <u>a/</u>	
Iron ore	12.0	45.0	<u>c/</u>	<u>c/</u>
Steel	<u>c/</u>	<u>c/</u>	7.5	24.7
Lead	<u>d/</u>	<u>d/</u>	7.7	33.7 <u>a/</u>
Nickel	<u>c/</u>	<u>c/</u>	36.8	77.8 <u>a/</u>
Tin	<u>c/</u>	<u>c/</u>	29.6	77.0 <u>b/</u>
Zinc	6.8	27.5	12.2	31.7 <u>e/</u>

Source: Industrial Processing of Natural Resources
(United Nations publication, Sales No.E.81.II.B.1).

- a/ Refining;
- b/ Smelting;
- c/ Data not available;
- d/ Not applicable;
- e/ Reduction.

96. At semi-fabrication and fabrication stage of minerals, ownership is more dispersed. In the case of semi-fabrication, the 22 largest firms account for about one-half of total capacity in developing countries and developed market economies. The degree of concentration falls considerably in copper fabrication and manufacturing, where buyers number about 600, including the electrical, machinery, construction and automobile industries. The capacities of even the largest fabricators is far below the output and sales of major producing units, and, for the most part, they are independent without forward linkages. Value added at the fabrication stage is fairly small, and 80-90 per cent of the value of fabricated products is represented by refined copper itself.

97. Transnational corporations can be important in marketing mineral products. Several developing countries have recognized that the involvement of one or more transnational corporations in a processing plant for mineral resources can help overcome certain marketing problems other than finance and operational know-how. Transnational corporations sometimes enter projects with a "buy-back" clause that obliges the transnational corporations to purchase a proportion of the output of the plant; this reduces the market risk facing developing countries.

2. Food production and distribution

98. Transnational activity in foodstuffs dates as far back as trade itself. In the colonial period, companies with the financial backing, legal charter and military support of their Governments created trade patterns advantageous to the dominant powers. The interests of the developed countries continued to play an important role in the evolution of food production and processing in developing countries after the end of the colonial era. The desire to assure continued sources of food raw materials - particularly of tropical commodities - has been and is still a major consideration. For some developed countries, the major interest in developing countries has been to promote export sales of food products.

99. A distinction may be drawn between the priorities of "surplus" food producers and those of "deficit" producers among the developed market economies in terms of their relations with developing countries. Deficit country producers, of which Japan and the United Kingdom of Great Britain and Northern Ireland are the most prominent examples, have been primarily interested in securing adequate supplies of basic foodstuffs - cereals, oils, vegetables, meat - from foreign sources, including developing countries.

100. The United States, at the other extreme, has been a surplus-food producer since the mid-1800s, and in the period following the Second World War sold increasing volumes of cereals, oils and milk products to developing nations. The United States has combined an interest in expanding the market for the surplus food products with the promotion of foreign investment by private United States firms and with assistance programmes to developing countries. At the same time, a variety of policy instruments were used to promote and facilitate offshore food-industry investment, including investment guarantees through the Overseas Private Investment Corporation, negotiations on trade and tariffs through the General Agreement on Tariffs and Trade (GATT) and various financial support programmes.

3. National sovereignty and transnational corporations

101. Most developing countries sought to encourage foreign direct investment in the 1950s with a view to limiting their reliance on imports of manufactured goods and increasing local industrial activity. In many cases, generous incentives were granted to encourage the establishment of manufacturing facilities, particularly in product lines or geographical regions deemed vital by the Governments to their industrial plans. In some cases, Governments of developing countries sought to develop their domestic resources by encouraging transnational corporation participation both in production and in exports. Most if not all these initiatives have been taken within the framework of safeguarding national sovereignty over natural resources. However, the expectations of the Governments of host countries that sought foreign investments have been only partially met, especially in the case of food products and transfer of technology. Foreign capital has employed domestic labour but has displaced workers from local enterprises. Imports were reduced, but the appropriateness and cost implications of some products have been called into question. In the protected markets offered by many Governments of developing countries, transnational corporations have become an important element in the food system but not always in conformity with the long-term expectations of Governments.

G. Other considerations

102. Many investments in processing facilities have not met the expectations during the last years, owing partly to the complexity of the raw material processing sector, including the processing of minerals, food and agro-based raw materials and partly to the lack of harmony between the individual elements in the supply, processing and marketing of raw materials.

103. It is often claimed that the shortage is not of financial resources for investment (at least in principle), but rather of good, viable and well-prepared investment projects. For large single projects, the preparations are usually more thorough and are supported by large banking institutions, both national and foreign, as well as government authorities. For many small projects, typically agriculture and small-scale industry, the individual project promoter and loan requestor is often too weak to be a partner and has difficulty in providing or obtaining adequate guarantees, in preparing documentation (loan requests, feasibility studies), in dealing with all administrative formalities etc. To overcome this problem, a co-ordinated approach through co-operatives, unions or other organizational form representing a group strong enough to become a partner is one possible solution.

III. MEASURES, STRATEGIES AND POLICIES
FOR PROMOTING INDUSTRIAL PROCESSING

A. Minerals

104. During the early to mid-1970s, the production of the mining sector declined sharply, partly because of political unrest in the major mineral-producing developing countries and partly because of the general economic situation and the energy crisis.

105. The year 1981 may be remembered as a year of world depression and low consumption and revenues for all metals and minerals. Consumption has fallen, supply capacity has been reduced and low demand resulting from the recession has placed unrelenting downward pressure on prices. In many cases, prices fell well below the marginal cost of production for some mines, and thus companies have been forced to close or to increase borrowing at high interest rates.

106. Energy costs among others have contributed to high production costs and to a decline in profitability and in the growth of industry in both developed and developing countries. Developing countries, whose growth depends on export-led industries, have suffered most since increasing costs have rendered their industries unprofitable. Mining activities in many developing countries have also been hampered by internal and external political problems.

107. In the face of declining productivity and economic adversity, several mineral-producing developing countries have reorganized their institutional machinery and introduced a range of measures intended not only to stimulate the development of minerals but also to promote their general economic development. These measures are discussed below.

1. Increasing productivity and financing capabilities
through mergers and internal reorganization

108. The benefits of merging of mining companies are expected to be: co-ordination of planning and management of extraction, production and capital expenditure; creation of a stronger fund-raising capability in the international money market; more efficient utilization of scarce resources, such as technical skills; strengthening of the ability to develop research and development, prospecting, exploration and exploitation; development of greater capability in marketing and services; achievement of greater economies of scale.

109. Institutional machinery has been reorganized not only to stimulate the development of minerals but also to promote general economic development. Overvalued currencies and other chronic problems have allowed only marginal progress in improving the economic infrastructure. Several developing countries have been suffering from lack of foreign exchange and credits and insufficient supplies of fuel and spare parts, resulting in productivity that is below capacity.

110. Several developing countries, however, still rely heavily on small mining companies for the development of their mineral resources. In spite of their contribution to the economy, during periods of economic adversity, small mining concerns appear to suffer more than the larger ones.

2. Reorganization of institutions and streamlining of legislation to attract new investment and to promote development of resources through domestic or foreign investment

111. Governments have recognized the importance of industrial minerals to national development (and that such materials are of little interest to outside mining houses) and have made efforts towards developing their industrial and construction minerals with internal capital and borrowing. Certain developing countries have established ministries of mines and announced short-, medium- and long-term mineral development plans. As a result of such efforts, cement production in developing countries, for example, increased by 40 per cent between 1971 and 1981.

112. Furthermore, in order to attract new investment, maximize national benefits and solidify existing ones, Governments of several developing countries have enacted minerals legislation that endeavours to clarify and simplify contractual arrangements and are establishing appropriate institutional apparatus.

3. Diversifying the industrial base and exports in order to promote self-sustained industrial development

113. In those developing countries that are clearly mono-product economies, conscious efforts are being made to diversify. In Nigeria, for example, petroleum dominates the economy, and oil exports constitute the primary source of export earnings. The years 1981 and 1982 have been bad years for the oil industry because of the glut in the world market for crude oil. The Nigerian Government, conscious of the problems of a mono-product economy and aware of the country's potential to diversify, is encouraging the development of the mining sector in the areas of iron ore, coal, tin, lead, uranium and industrial minerals (barytes, granites etc.).

114. Often mono-product problems are compounded when developing countries must sell to monopsony or quasi-monopsony markets.

4. Fending off rising energy costs by developing indigenous energy sources and diversifying non-conventional sources of energy

115. Rising oil costs have prompted research on and development of oil, as well as the development of alternative sources of energy, not only in developed but also in developing countries. For the countries that can generate the necessary capital, substantial investments have been directed towards developing one or more sources of energy such as hydroelectric power, oil, gas and shale oil.

116. Developing countries that produce and export oil or natural gas and that have reinvested their export revenues in diversifying their industrial base have not been severely affected by the economic depression.

117. Inadequate infrastructure is a problem for almost all developing countries but for certain countries, such as Chad, the world's largest land-locked country, the lack of transportation infrastructure is almost total. Any minerals or petroleum projects would require substantial investments in infrastructure. The infrastructure problem is compounded by the lack of maintenance, transportation, spares and equipment.

118. Several developing countries are making concerted efforts to develop infrastructures. To this end, in addition to allocating indigenous capital when available, they seek actively both international and bilateral financial assistance.

5. Increasing domestic processing in order to achieve higher value added, employment and general economic development

119. The domestic processing of minerals in developing countries appears to be the trend of the 1980s, with several international companies and consortia involved with host Governments in developing both infrastructure (hydro-electricity, transportation etc.) and processing plants and equipment. The factors that encourage such trends are several, such as:

(a) Changes in technology which allow the economic production of some semi-processed minerals at or near to their source (for example the rapid growth of iron ore pelletization plants and the development of direct reduction processes to produce an economic scrap substitute);

(b) Inadequacies and inflexibilities in management and the labour force in the traditional metal-making centres result in relatively low productivity and high production costs (for example these are problems faced in steel making in several Western European countries).

6. Increasing regional co-operation and trade in order to deal more effectively with industrialization and development problems

120. By and large, developing countries have close economic ties with the industrialized markets. For the few developing countries that fail to attract foreign interest, stronger regional relations seem to be a good alternative.

121. Co-operation between non-oil-producing developing countries and oil-producing countries has been increasing. In general, co-operation and ventures between developing countries in developing mineral resources are relatively few.

122. Interregional trade takes place mostly in construction minerals and fertilizers. However, in terms of the consumption of minerals (especially refined ones), the developing countries, and especially Africa, could be classified as marginal consumers, and this fact affects the development of interregional co-operation in minerals.

123. The policies and strategies for the mining industry in various developing countries are aimed at:

(a) Co-ordinating planning activities and management in extraction, production and capital expenditure;

(b) Creating a stronger fund-raising capability in the international money markets;

(c) Achieving a more efficient utilization of technical skills and retraining personnel;

(d) Strengthening the ability to develop research and development, prospecting, exploration and exploitation;

(e) Developing infrastructure, marketing and related services;

(f) Competing successfully in international markets by lowering production costs;

(g) Achieving greater economies of scale;

(h) Promoting the development of industrial and construction minerals with internal capital and borrowing in view of the fact that these minerals are important to national development but of little interest to outside mining companies;

(i) Attracting new investment by enacting mining legislation that endeavours to both clarify and simplify contractual arrangements by streamlining internal monetary policies;

(j) Reducing mono-product and monopsony dependence by diversifying production, by enlarging the industrial base and by seeking actively trading alternatives and reducing political dependencies through regional associations and international contracts;

(k) Developing indigenous sources of energy;

(l) Promoting regional co-operation especially between oil- and non-oil-producing developing countries. 7/

B. Agro-based industries

1. The price instability of agricultural products and its effects on the rest of the economy

124. Direct and indirect linkages exist between the domestic food situations and the external economic and financial conditions of developing countries. For most low-income and least developed countries, as well as several middle-level income countries, agricultural activities are the major source of income for a large proportion of the population. A decrease in employment and production in the agricultural sector without commensurate increases in

employment opportunities in the manufacturing or service sectors affect not only the supply of food but the general economic welfare as well. Many developing countries are particularly dependent on agricultural exports for their foreign exchange needs. Thus, a slow-down in the agricultural sector may lead to a general decline of the economy. Similar effects are produced when prices of agricultural products decline.

125. Since many of the commodities exported by developing countries are subject to price fluctuations, many developing countries suffer from declining agricultural income and frequent shifts in export revenues and foreign exchange earnings. Such price fluctuations have a destabilizing effect on the domestic economy and affect not only resource allocation decisions but also general price levels.

126. The problem of price instability has been approached in two ways: the provision of subsidies for producers or consumers and the implementation of trade restricting regulations are usual ex-post measures: ex-ante measures opt to mitigate agricultural price fluctuations through international arrangements for certain commodities or through stocking schemes, tariffs, export quotas etc. These measures have been more effective for industrialized countries than for developing countries, since industrialized countries have diversified economies (with manufacturing sectors being larger than the agricultural sectors) and thus having the economic ability to manipulate quantities and prices.

2. Agricultural policies of industrialized countries and their effects on developing countries

127. The declining rates of growth and higher unemployment levels all over the world have caused the industrialized countries to adopt protectionist policies that have resulted in fewer agricultural imports and reductions of the international market prices of agricultural products. The instability of world market prices affects the welfare of all trading nations and especially of those that depend heavily on agricultural incomes.

128. The agricultural policies of industrialized nations also have indirect effects on developing countries. For example, the agricultural surpluses of industrialized countries, which are mainly the result of price protection schemes to assist the agricultural sector, are often disposed of through the system of food aid to developing countries. Although much of this aid may be desperately needed for emergencies in low-income countries, it may also, in many cases, depress the internal prices of domestic products and distort domestic agricultural production.

3. Agricultural policies of developing countries and their effects on agricultural productivity

129. The agricultural sector in developing countries is often heavily taxed since it represents the main source of revenue for Governments. This, however, discourages the improvement of production methods, techniques and agricultural output in general. The net result, of course, is loss of

revenues, since exports are affected. Real prices received by farmers in developing countries are lower than prices received by farmers in developed nations. This discrepancy is due not only to the protectionist policies and measures of industrialized countries but also to the pricing policies of developing countries affecting not only pricing but also supply, demand, foreign exchange and the economic welfare of both producers and consumers.

4. Structural and demographic constraints

130. Besides the constraints imposed by policies that inhibit the development of the agricultural sector in developing countries, there are also constraints imposed by the structural and demographic situations in several developing countries. These constraints can be dealt with by developing technological capabilities, through the availability of investible funds and foreign exchange and through increasing the level of farm purchasing power.

5. Developments in agricultural trade

131. Although the overall volume of world trade slowed down in the second half of the 1970s, world trade in agricultural products increased. In general, trade in agricultural products has withstood better than trade in other products the declining of the world's economic growth. However, the interdependence between agricultural trade and the economy is strong, and the measures taken with respect to agricultural trade have an impact on the allocation of economic resources in the agro-food sector.

132. Domestic measures affecting agricultural trade should not distort the use of resources and reduce the structural mobility within the agricultural sector or the interaction between the agricultural sector and other sectors of the economy.

133. General trends in the economy and the composition and level of demand, both on the domestic market and abroad, also have a direct effect on agricultural trade. Furthermore, agricultural trade may be affected by fluctuations in exchange rates, by financial and monetary policies, by energy costs (direct and indirect) and, last but not least, by the various barriers imposed by actual and potential trading partners.

6. Objectives of an agricultural strategy

134. Because of the strong interrelations between the agricultural sector and other sectors in developing countries, it is important to evaluate agricultural measures and strategies in terms of their intersectoral effects, as well as their effects on farm productivity and incomes. Measures and strategies should aim at:

(a) Providing increased quantities of food and raw materials to meet the needs of the population and expanding non-farm sectors;

(b) Achieving a better income distribution and higher employment;

(c) Promoting exports in agricultural products in order to increase the foreign exchange earning capacity;

(d) Securing a net flow of capital in order to contribute to the financing of infrastructural needs and capital formation in general;

(e) Promoting the financial and economic strength of the periphery.

These are necessary preconditions for achieving a diversified economy and a diversified industrial base. Higher farm incomes lead to higher rural demand for inputs and consumer goods, which stimulates domestic industrial growth.

135. In order to promote and sustain the interrelations between agricultural growth and overall economic and industrial growth, an integrated economic system with increased degrees of specialization and interdependence between the various sectors is needed. This requires a well-functioning system with emphasis on flexible market networks and efficient infrastructure.

7. The importance of a well-functioning agricultural system

136. Before selecting any policy for an industrial sector, the authorities should determine what the country's potentials are and what they expect to achieve by developing a specific sector. The common goals of increasing employment, import substitution, export promotion, better utilization of domestic resources and meeting market requirements are generally valid for all industrial sectors. In the case of agro-based industry, an important element in the industrialization process is to develop a well-functioning food system. Since the manufacture of food differs to some extent from most other industrial activities, employment, import and export and raw material utilization are not the only aspects to be considered.

137. Many investments in food and agro-business have not met expectations, perhaps owing to inefficient and malfunctioning marketing, transportation and other types of infrastructure and supportive systems.

138. Policies relevant to a well functioning agricultural industrial system may include the following:

(a) Training and education of producers;

(b) Locating processing units strategically. Considering that in many developing countries a rather large portion of people are making their living from food production, the strategy regarding location of processing units is usually not limited to pure economic profitability. Socio-economic elements are often taken into consideration as well, particularly when the development of a certain region and employment generation in secondary and tertiary activities are given top priority. Government policy in this respect should be based on a thorough analysis of all technical, economic, social and political considerations and should be in line with the country's long-term development plans;

(c) Controlling the quality of both raw materials and finished products. Because of the specific properties and use of food products, legislation on their production, quality, composition, storage, including food additives and colouring matters, packaging materials etc. have become very complex. It is, however, necessary, and no country can afford to have industrial food processing or even to import food products without legislation intended for consumer protection. Veterinary, health, phytopathological and sometimes market inspection services should be responsible for ensuring that everything put on the market is fit for human consumption, has a definite nutritional value and is properly declared;

(d) Introducing nutrition policies in order to stabilize demand for individual products;

(e) Optimally distributing arable land;

(f) Properly utilizing arable land for the production of products that are required for the nutrition of the country's population. Incentives for this purpose may include price incentives which are stimulative and secure a fair return to the producers through an adequate pricing system for their products and for various industrial inputs, such as tools, machinery, fertilizers, pesticides etc.;

(g) Providing adequate infrastructure, including storage and transport facilities, and promoting organizations of producers and their relations with processors and consumers;

(h) Establishing organizations and institutions that provide extension services to the producers and assist them in the selection of seeds, breeds of animals, vaccination, fighting diseases and pests, selection of inputs and technologies, organization of training courses etc.;

(i) Expanding existing banking institutions to offer soft credit facilities to the producers, if necessary on a selective basis;

(j) Establishing or expanding existing research and development institutions and financing research and development activities aimed specifically at solving technical and production problems, application of research results etc.

139. In addition to various incentives, which may also relate to the export promotion of food products, some restrictive measures may be necessary as well. Such measures may aim at reducing imports or at reducing the production of products which may not be essential for the country.

140. Most food products are perishable, and in order to save them until they are consumed, proper harvesting (slaughtering), preparation, storage, processing, packaging and distribution are necessary.

141. Bearing in mind a country's nutritional needs and tradition and local customs in the production and consumption of food, it would be advisable to determine what basic food products are usually consumed, what quantities of each are required for healthy nutrition and what the country's total requirements are in these products. Once food requirements have been determined, the next step would be to determine the country's potential for producing these products or their substitutes.

8. Energy considerations in food production

142. Food policy in principle is based not only on a country's requirements and potential (including that for exports) but also on other factors. One is the cost and availability of energy, because the production of some food products can be energy intensive. The ratio between energy input in the production of various products and the energy content at the consumption stage may vary very much. Higher value added usually means higher energy input, not only in production and processing but also in packaging, storage, transport, preparation etc. As products become more sophisticated and of a higher stage of processing, more energy is required for their production. Also, increasing productivity in agricultural production and a shift from cereals to more protein production and consumption usually mean higher energy inputs. There are products, however, which have high energy value, such as cane sugar - its production may be energy self-sufficient owing to the use of bagasse as a source of energy in sugar plants. Sugar-processing plants may even produce surplus energy and thus compensate a portion of the energy required for cultivation, cutting and transport of the sugar cane to the processing plant.

143. All these measures and considerations should be included in developing a well-functioning agro-based products system, which constitutes the base of a healthy and dynamic agricultural sector. Once these preconditions are met, questions of regional or international agricultural policies and measures could be dealt with more effectively. However, there is no clear order of preconditions and policies in achieving a vigorous agricultural sector. There is a great degree of interdependence and interaction. Concerted efforts should aim at several fronts simultaneously at the regional, national and international levels.

144. In conclusion, industrialization faces many challenges and taxing demands which need to be tackled through concerted efforts on national, regional and international levels. UNIDO can contribute to the goal of a resource-based strategy of industrialization meaningfully by entering into new and imaginative areas of industrial activities such as in becoming actively involved in the selection, promotion and development of technologies that will accelerate the various phases of the industrial processing of raw materials, as well as in areas that will facilitate the financing of industrial investment in developing countries.

Notes

1/ Industrial Processing of Natural Resources (United Nations publication, Sales No.E.81.II.B.1).

2/ United States Bureau of Mines, Minerals Yearbook (Washington D.C., 1980).

3/ "The mineral industry of Zaire" (UNIDO/IS.414).

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