No. 3 · 1968

asian industrial development news

UNITED NATIONS

ASIAN INDUSTRIAL DEVELOPMENT NEWS

The Asian Industrial Development News is a regular publication of the United Nations issued on a bi-annual basis. The News contains current information pertaining to the following: —

- — Industrial development plans
- — Research
- — Investment opportunities
- — Trade opportunities
- — Market data
- — Economic policies
- — Trade and economic agreements
- — Regional projects sponsored by the AIDC

The News maintains correspondents in each of the member countries and the authoritative information contained in the News will be of use to —

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25 July 1968

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Bangkok, Thailand

ASIAN INDUSTRIAL DEVELOPMENT COUNCIL

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- News from Asian Industrial Development Council
- Brief survey of industry 1967
- Regional news in brief
- Peace and industry
- Research news — rice milling — fertilizer — cement
- Articles — Strategy for industrial development
  — Oils and fats industry in the ECAFE region

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FOREWORD

As we have already indicated to our readers in our second issue of the *Industrial News*, there will be two issues of the *News* a year from 1968. The fourth issue is scheduled for December 1968. There is no significant change in the subjects covered by the *News* but the information available for dissemination has increased considerably, due mainly to the co-operation extended by the country correspondents who have sent us almost continuously a large quantity of material for publication. A great deal of interest has also been evinced and is evidenced by the numerous requests for the *News* which we have received from various governmental as well as non-governmental organizations.

ECAFE regional news is now assuming greater importance with the concrete steps taken by the AIDC to establish co-ordinated regional projects. Progress in these fields is given full and continuous coverage in the *News*. Apart from this there are new and rapid changes in technology and the economics of the application of technology in the field of industry of particular relevance to developing countries, for example progress in fertilizer manufacture, new developments in the field of rice milling, etc. The *News* will pay increasing attention to these aspects.

An effort is made in this issue to focus attention upon industrial development plans of the region. The general information pertains to over-all plans of all countries and an attempt has been made to bring out some of the salient features in the industrial sector. This issue also contains articles dealing with (1) strategy for industrial development; and (2) the oils and fats industry in the ECAFE region.

The *News* in its endeavour to give full coverage to all member countries of the region, is assisted by the co-operation of the correspondents designated by member countries and conducts special research of its own. If, despite these efforts, some areas are not adequately covered we would like to assure readers that it is due to unavoidable delays in obtaining the country reports.

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Section One

NEWS IN BRIEF

ASIAN INDUSTRIAL DEVELOPMENT COUNCIL NEWS

Feasibility studies for regional iron and steel projects

The third session of the AIDC held in Bangkok from 12-19 February 1968 made real progress in forging the links of regional industrial co-operation. The most tangible achievement was the official endorsement of the specific recommendations of the Iron and Steel Survey Mission by the six participating countries and the Council's approval of immediate pre-investment feasibility studies on four projects:—[1]

(1) Hot rolled coils and plates mill or mills in Taiwan
(2) Billets mill in Singapore
(3) Cold rolling mill in Thailand, and
(4) A merchant bar mill in Indonesia.

Production in Taiwan is to cover the eastern sub-regional requirements for hot rolled coils and plates. A cold rolling mill is presently under construction at Iligan in the Philippines and the Taiwan project would become supplementary to the sub-regional demand for flat products — 52 per cent of which occurs in this area. The Singapore project will take into purview the supply of billets for the whole region, while the cold rolling mill in Thailand will take the entire western sub-regional market into consideration. The development of the latter project is to be planned on the possible participation of Indonesia in cold rolled products. The merchant bar mill recommended in Indonesia will take the domestic market as its immediate target.

The Mission has estimated that the annual demand for crude steel products within the sub-region will reach 12 million tons by 1985[2] and for the manufacture of which a capital expenditure of about US$2,200 million[3] would be required. Investment decisions would be made on completion of the pre-investment feasibility studies now in progress.

The decisions of the Council were given a further boost by the offers of free and immediate feasibility studies from Japan and Koppers Co. Inc. The Council endorsed the recommendation of its Working Group that the offer made by Koppers Co. Inc. be pursued so as to commence work on feasibility studies without delay. Besides feasibility studies, offers were also made for facilities in training, preparation of designs and specifications, and manufacture of equipment by India and Japan. The secretariat has been requested to co-ordinate these offers.

The Council's recommended scheme of continuing work in the field of iron and steel (based on the recommendations of the Mission) provides feasibility studies in respect of three projects. (1) A hot strip flat products mill in Malaysia — Malayawata at Prai, (2) an electrolytic tinning line in Thailand and (3) a slabbing mill in the Philippines. Before final decisions on location are made comprehensive techno-economic studies are to be undertaken.

The Mission's recommendation that an iron and steel institute be established was endorsed by the Council. The secretariat and the countries concerned were requested to undertake prior investigations with regard to objectives, functions and terms of reference of such an institute.

Requests were made by Cambodia, Iran, India, Laos, Pakistan and the Republic of Viet-Nam that a similar survey mission be organized to cover their territories. Steps are being taken to initiate exploratory investigations in the requesting countries. The Council indicated however that additional financial resources would be required for this purpose and expressed the hope that international agencies as well as the developed countries would render all possible support and assistance to undertake the completion of this work.

Pulp, paper and rayon industry

Pulp, paper and rayon studies conducted by the Survey Mission indicated the following possibilities —

(1) A sub-regional pilot plant at Bandung for pulping of mixed tropical hardwood.
(2) A newsprint mill in the vicinity of Takigeun in north Sumatra.

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[1] The Mission recommended the consideration of rolled products as an initial step. The advantages of this procedure being the flexibility of timing and spread of investment and a gradual reduction in the tonnage of imported semi-finished and finished products.

[2] The demand estimate of the Asian Conference on Industrialization for 1985 was 16.8 million tons per annum. The revised estimates prepared by the Mission were based on more recent statistical data for the separate countries.

[3] The Mission estimated capital expenditure on modern mills producing various product mixes to range from $170 to $250 per ton of annual ingot capacity.

(3) Utilization of the Philippine and Thai kraft paper potential for the needs of "two or more countries".

(4) A paper mill in Malaysia — on imported pulp; and a 250 t/d integrated pulp and paper mill in Singapore.

The Council agreed with the Mission's emphasis upon the need to initiate action on the expansion of available raw material resources, the extension of coniferous plantation, activating commercial utilization of substitutes; it also agreed to support as a regional venture Tjian's method of pulping mixed tropical hardwood, after obtaining more details regarding the technical and economic implications involved, and requested that UNIDO and other international agencies extend technical assistance for research on the utilization of rubber wood.

The report of the Mission contains useful technical and economic data covering supply and demand for various types of pulp and paper within the sub-region as well as the techno-economic aspects of regional plants with particular reference to the availability, supply and requirements of raw material and process materials, transport costs, infrastructure and tariff on wood, pulp, paper and paperboard. The demand estimates for the five countries between 1967 and 1970 indicate that despite increasing domestic manufacture there will be continuing deficits of substantial proportions; the only exception being in kraft paper wherein with a five-fold increase in production from 28,500 t/y in 1967 to 133,500 t/y by 1970, the deficit is likely to be reduced to 57,900 t/y.

After examining the basic techno-economic parameters worked out by the Mission, the Council endorsed the recommendations of the Mission that detailed surveys of raw materials, extraction methods and costs and feasibility studies should be undertaken. The recommendations also include the establishment of regional research facilities.

Fact-finding mission on forest-based industries

In pursuance of the recommendation of the Asian Industrial Development Council (third session), the secretariat is organizing a fact-finding mission on the development of forest-based industries. This mission is expected to be in the field in July-September, 1968. The purpose of this mission is to ascertain the wishes of the countries concerned as to the area and emphasis of investigations to be undertaken by the action group or groups to be formed at a later date; and also collect any available information to be used by such action group or groups. The report of the mission will be submitted to the forthcoming session of the Asian Industrial Development Council to be held early in 1969. Subsequent action groups will be organized in accordance with the recommendation of the Council.

Action groups — work progress

I. Fertilizer and allied chemical industries

Participation: *India, Indonesia, Iran, Japan, the Philippines, Singapore and Brunei.*

The Action Group which met at Bangkok from 18 to 23 October 1967, examined the present status of the industry among the five countries. Its work included such aspects as demand and supply, plans for the expansion of the industry and availability and supply of raw materials. The Group indicated the possible areas of co-operation as follows:—

	Type of product	*Country which will have a surplus and has signified its intention of supplying the product and/or is willing to establish joint-venture projects*	*Country needing the product*
(1)	Ammonia	Iran, Brunei, Japan	India, Philippines, Singapore
(2)	Sulphur	Iran, Philippines	India, Indonesia, Singapore
(3)	Pyrite	Philippines	
(4)	Phosphate rock	Philippines[1]	India, Indonesia, Iran, Philippines, Singapore
(5)	Phosphoric acid	Iran	Philippines, Singapore
(6)	Nitrogenous fertilizers	Iran, Philippines, Singapore, Japan	Brunei, India, Indonesia
(7)	Phosphatic fertilizers	Iran, Philippines, Singapore, Japan	Brunei, India, Indonesia

[1] Subject to the economic feasibility of exploiting the guano and phosphate rock on a commercial scale.

The following table shows the different types of interest shown by the participating countries:

Type of product	*Type of interest*
(1) Ammonia	(*a*) The Philippines and Singapore are interested in importing ammonia and for that purpose are willing, on general principles, to enter into long-term purchase agreements with the suppliers.
	(*b*) India is interested in the possibility of establishing a joint-venture project in Iran to produce sulphur and ammonia from the sour gas of the southern gas fields of Iran.
	(*c*) Japan is interested in establishing joint-venture projects in the countries of the ECAFE region. Brunei is interested in establishing ammonia plants in its territory based on its available natural gas on a private joint-venture basis with interested participants from other countries; the Philippines is interested in joint-venture possibilities by virtue of the existence of four major petroleum refineries with a total rated capacity of 220,000 barrels of crude oil per day plus the intensive exploration being undertaken for crude oil; Singapore is also interested in joint-venture possibilities because of the existence of four major oil refineries with a total refining capacity of 160,000 barrels of crude oil per day.
(2) Sulphur	India, Indonesia and Singapore are interested in the importation of sulphur and for that purpose, on general principles, are willing to enter into long-term purchase agreements with the suppliers.
(3) Phosphate rock	India is interested in developing the phosphate deposits of the Philippines on a joint-venture basis with the Philippines.
(4) Phosphoric acid	(*a*) The Philippines, India, Indonesia and Singapore are interested in ascertaining the comparative advantages of the use of imported phosphoric acid from Iran over the use of imported phosphate rock and sulphur.
	(*b*) The Philippines and Singapore are interested in the possibility of establishing joint-venture projects with Iran in their respective countries to produce ammonium phosphate, diammonium phosphate, superphosphate and N-P-K type fertilizers from phosphoric acid to be supplied by Iran.
(5) Nitrogenous fertilizers	(*a*) Brunei is interested in the establishment of joint-venture projects in its territory.
	(*b*) India is interested in the establishment of joint-venture projects in the interested countries. Investment will be in the form of capital equipment and technical know-how.
	(*c*) Indonesia is interested in the importation of fertilizers. It is also interested in establishing joint-venture projects in Indonesia.
	(*d*) Japan is interested in establishing joint-venture projects in the fields of production, distribution and agricultural services in the interested countries.
	(*e*) The Philippines is interested in the establishment of joint-venture projects in its territory.
(6) Phosphatic fertilizers	(*a*) India is interested in establishing joint-venture projects in interested countries. Investment will be in the form of capital equipment and technical know-how.
	(*b*) Indonesia is interested in importing the fertilizers. It is also interested in establishing joint-venture projects in its territory.

The Action Group recommended the establishment of the following joint-venture projects:—

(1) Establishment of a sulphur-ammonia complex in Iran by India and Iran on a joint-venture basis.
(2) Development of phosphate deposits in the Philippines jointly by India and the Philippines.
(3) Establishment of joint-venture projects in the Philippines, between the Philippines and Iran, and in Singapore between Singapore and Iran to produce ammonium phosphate, diammonium phosphate, superphosphate and NPK fertilizers from imported phosphoric acid from Iran.
(4) Establishment of joint-venture projects in Indonesia between Indonesia and India, and also between Indonesia and Japan.
(5) Establishment of joint-venture projects in Brunei, Iran, the Philippines and Singapore between the respective countries and Japan.

Project (1) India and Iran

The Iranian plant has been planned for the production of 2 million tons of sulphur, 340,000 tons of ammonia and 450,000 tons of urea p/y. The plant will be sited at Bandar Shahpoor (Persian Gulf) and will cost US$168 million consisting of the sulphur recovery plant US$112 million, the ammonia plant US$20 million and the urea plant US$36 million. India's growing fertilizer industry will by 1971 require large quantities of ammonia and one million tons of sulphur.

Project (2) India and Philippines

India showed an interest in the joint exploitation of phosphate deposits in the Philippines if they are found economically feasible. The Group recommended a two phased programme backed by AIDC to establish the commercial viability of the deposits — (*a*) the preparation of a programme of prospecting, laboratory study and beneficiation tests showing the costs involved and (*b*) the carrying out of bore tests to determine quality and extent.

Project (3) Iran and Philippines
Iran and Singapore } **to produce**
(1) ammonium phosphate
(2) di-ammonium phosphate
(3) superphosphate
(4) NPK

The Philippines and Singapore showed an interest in utilizing phosphoric acid to be produced in Iran by mid-1969 (production capacity 143,000 t/y) to produce the above mentioned products on a joint basis with Iran. The Group recommended that AIDC backed feasibility studies be undertaken in respect of this proposal.

Project (4) India and Indonesia
Japan and Indonesia

Indonesia expressed interest in Japan and India setting up joint ventures in Indonesia for the manufacture of nitrogenous and phosphatic fertilizers to meet the internal demand. The countries concerned are to follow up these proposals.

Project (5) Japan (Brunei
(Iran
(Philippines
(Singapore

Japan showed an interest in setting up nitrogenous fertilizer plants in these countries to utilize available marketing and raw material resources. The respective countries will follow up the proposals.

The Group recommended that a regional committee on fertilizers be set up with the Action Group as the nucleus to promote the rationalization of inter-regional trade in raw materials and products and encourage the development of joint ventures within the region.

II. Petro-chemical industries

Participation: *China (Taiwan), Indonesia, Iran, Japan, the Philippines, Singapore and Brunei.*

The Group met at Bangkok from 25 to 28 October, 1967. The work of the Group was based upon a careful examination of the present status and future plans of the industries among the seven countries, and the demand for and supply of raw materials and intermediates among them.

The Group observed that the most promising areas of co-operation appeared to be in the manufacture of petro-chemical intermediates such as carbon black, and finished products based upon imported intermediates such as methanol, caprolactam and ethylene, and made the following recommendations:—

Project (1) AIDC to set up a survey mission to look into the possibilities of establishing regional or sub-regional plants for (i) methanol, (ii) caprolactam, (iii) ethylene, and (iv) carbon black.

Project (2) Japan and Iran
Japan and other interested countries

The Group recommended that Japan and Iran should consider the joint-venture prospects for the establishment of an ethylene plant in Iran based upon Iran's plan for a 454,000 t/y ethylene plant, production of polyethylene therefrom as well as other petrochemical products. At the same time Japan may also consider joint-ventures in other interested member countries for polyethylene based upon Iranian ethylene.

Project (3) Japan and Indonesia

Japan and Indonesia to follow up their interests in setting up a joint-venture for a petro-chemical complex in Indonesia based upon Indonesia's resources of natural gas and crude oil.

Project (4) Japan and Brunei

Japan and Brunei to follow up the interests already shown by Japanese firms for setting up joint-venture projects in Brunei for petrochemicals for export based upon natural gas and crude oil in the latter country.

Project (5) China (Taiwan) and Singapore

The two countries to continue consultations on setting up joint-venture projects in Singapore to produce polyethylene and polystyrene from expanded output of EDC and styrene in China (Taiwan).

Project (6) China (Taiwan) and Philippines

Interest shown by China (Taiwan) and the Philippines to set up joint-ventures to utilize excess chlorine in the Philippines to produce PVC and other chlorine derivatives to be followed up.

The Action Group also recommended that a regional training programme in the petrochemical industry be established and that the scope of the proposed regional committee on fertilizer be extended to include petrochemicals and allied industries.

Fact-finding mission on petrochemical industries

As a follow-up to the recommendation of the Asian Industrial Development Council, the secretariat is also organizing a fact-finding mission on petrochemical industries. This mission is expected to be in the field from September to October 1968. It will consult generally with the authorities concerned on the nature and extent of interest in the manufacture of specific petrochemical products on a co-operative basis, and also look into the availability of the necessary technical and economic data, and suggest collection of other data for the use of the survey mission or missions that may be organized at a later date.

III. Engineering industries

Participation: *India, Indonesia, Iran, Malaysia and the Philippines.*

The Action Group met in Bangkok from 30 October to 2 November 1967 for a preliminary examination of the prospects for joint-venture or market sharing arrangements. In order to identify possible areas for co-operation the Group studied problems of the individual countries taking into purview such matters as demand for, and supply of, engineering products, availability of raw materials, existing state of the industries, and plans for future development. In order to facilitate implementation, engineering industries were categorized into 3 groups of priorities:—

Priority I — The manufacture of machinery for agricultural production i.e. tractors, attachments and small engines.

Priority II — The manufacture of machine tools, motor vehicle components and parts, and pipe manufacture.

Priority III — The manufacture of electrical machinery (motors and transformers; electrical appliances (TV, radio, air-conditioners etc.); telecommunication equipment, heavy steel fabrication (bridges or buildings), rolling stock or locomotives (without engines) shipyard facilities and industrial tractors.

The Group observed that the manufacture of these items should be considered on the basis of a complementary division of specialization which would provide for the participating countries to manufacture progressively an increasing proportion of the components and finally achieve full production.

While recommending a survey team to study possibilities of such co-operation in the sphere of agricultural machinery the Group suggested that action groups be set up for priority groups II and III at a later date.

Fact-finding mission on the manufacture of agricultural machinery

The Secretariat is also organizing a fact-finding mission on the manufacture of agricultural machinery, which is expected to visit the countries in November 1968. This mission has similar objectives as the proposed fact-finding mission on petrochemical industries, viz. to consult the authorities concerned on the nature and extent of interest in the manufacture of specific types of agricultural machinery on a co-operative basis and also to look into the availability of the necessary technical and economic data and suggest collection of further data for the use of the survey mission that may be organized at a later date.

Council approves long-term perspective study

An important recommendation of the Advisory Group adopted by the Council pertains to the study on long-term perspectives for industrialization and regional co-operation in the ECAFE developing region. This study is to be undertaken in 1968/69 at an estimated cost of $500,000. The Netherland's Government has already made a contribution of $100,000 towards the project. This project would involve the work of 14 man-year experts consisting of economists and technicians.

The Council noted that such a study ". . . . would provide a comprehensive and consistent framework for the identification and promotion of industries or projects that should be developed on a wider than national basis". The proposed study would cover the following topics: —

(*a*) Formulation of a macro-economic framework for the future, with a breakdown by categories of expenditure and by major sectors of production;

(*b*) Preparation of a series of detailed industry studies, including projections for demand, production, investments, employment, foreign trade and location studies; those sectoral studies will have to be made for at least the following industries: agro-industries, textiles and clothing, chemicals, fertilizers and petro-chemicals, iron and steel, engineering, paper and pulp, building materials and construction, mining and energy;

(*c*) Estimation of the energy, transport and man-power requirements of the projected industrial development;

(*d*) Estimation of future expansion and structure of trade flows between countries of the ECAFE region;

(*e*) Analysis of opportunities and needs for industrial regional co-operation and formulation of investment and trade policies conducive to that co-operation.

Several international agencies such as ILO, UNESCO and the ADB are expected to participate in the survey.

Regional centres sponsored by AIDC

With regard to the Philippines offer of facilities for the establishment of a regional pilot plant for iron and steel industries (vide News No. 2, 1967) the Senior Adviser of UNIDO reported that it was necessary to examine facilities already available in countries of the region such as India, Japan etc. UNIDO is to examine the proposal early on the basis of complementary training facilities from all available sources within the region, the objective would be to build up such facilities with assistance from the UNDP Special Fund.

At the Metal Industries Development Centre (Taiwan) (Vide News No. 2, 1967) the first regional training course was organized from 21.8.1967 to 18.11.1967; nineteen participants from China (Taiwan), Iran, the Republic of Korea, the Philippines, Thailand and the Republic of Viet-Nam took part in the course. China offered fellowships for six participants.

The Centre is now organizing the second course and has indicated that fellowships will be offered for five participants.

REGIONAL NEWS IN BRIEF

Iran — Fourth plan — priority for industry

Iran's fourth development plan (1967-1972) has provided for a high rate of investment in industry. The annual growth rate of industrial production is estimated at 15 per cent, the growth rate for mining is estimated at 17 per cent. Investment by the State in the public sector will amount to approximately US$1,230 million of a total of US$2,800 million. Over 50 per cent of the investment would be directed towards mechanical, electrical and vehicle industries, petro-chemicals and basic metals and metal products industries.

Major products in the private sector include a steel mill, aluminium plant, two major petrochemical projects, a pipe manufacturing plant, an engineering complex with a tractor factory, two machine building plants and three paper mills.

The first stage of the steel plant provides for a capacity of 600,000 t/y and the final capacity at the end of the plan is estimated at 1.2 million t/y. The plant will be located at Isfahan. Investment aid amounting to $250 million is being provided by the USSR against gas supplies. The aluminium plant at Khuzistan, expected to cost $38 million will have a rated capacity of 45,000 t/y. The three petro-chemical plants will be sited at Bandar Shahpur, Abadan and Kharg. Provision has been included to produce, apart from ammonia, sulphur and liquified gas such items as fertilizer over 400,000 t/y, caustic soda, pvc and detergents, the three paper plants would increase present output by over 10 fold — to nearly 92,000 t/y.

China (Taiwan) — Fertilizer production target to exceed 1.2 million (metric) tons by 1969

In almost all Asian countries plans for production of fertilizer have received considerable attention during the past few years. In China (Taiwan), fertilizer is important owing to the emphasis on domestic agricultural production as well as to its role as an important export item. From 34,000 metric tons output of fertilizer in the late 1940's, China (Taiwan) has reached an output of 836,250 metric tons in 1967. This has been made possible both by renovation and expansion of existing plants as well as the setting up of new plants. At present there are eleven factories manufacturing chemical fertilizer; eight of these units are ownd by the Government.

According to the trend of consumption, Taiwan needs approximately 150,000 metric tons of nitrogen (equivalent to 715,000 metric tons of ammonium sulfate, or 326,000 metric tons of urea) and 33,000 metric tons of P_2O_5 (equivalent to 183,000 metric tons of calcium superphosphate) for agricultural use, and 13,000 metric tons of nitrogen for industrial use. The excess of production is sold in the international market, mostly southeast Asia, and a good market reputation has been established.

In the course of 1968 three new plants are expected to be commissioned. A new nitrogen fertilizer plant using natural gas as raw material to produce 545 metric tons urea and 450 metric tons of ammonium sulfate per day. This plant is nearing completion and it is expected to be ready for commission in mid-1968. Two new compound fertilizer plants — one to produce 90,000 metric tons of 20-5-10 (N-P_2O_5-K_2O) or 45,000 metric tons of 15-20-0 compound fertilizer p/y and the other for 90,000 metric tons of 20-5-10 or 14-7-14 of compound fertilizer annually. The latter plants are to be completed by December 1968.

With the completion of these new plants capacity of chemical fertilizer production in Taiwan is expected to reach 1.3 million metric tons p/y.

India — Visible signs of recovery

Internal economic problems spearheaded by a serious food crisis led to a recession in industry and suspension of investments in terms of the fourth five-year plan in 1967. The preliminary document of the revised fourth plan has been submitted to the Union Cabinet and it is expected that the final report will be available shortly. Recent information indicates a slow but steady recovery in industrial production. The engineering group of industries, with the exception of the machine tool industry which was the hardest hit, have made fair progress. In the automobile industry the last quarter of 1967 showed an increase of 24 per cent in output over the level of the two previous quarters — recovery was most notable in the field of tractors which showed a 42 per cent increase. The recovery of the automobile industry is expected to have its secondary effects in the light mechanical engineering industries whose production generally moves close to the supporting industries. Production increases were recorded in ball and roller bearings, typewriters, sewing machines, industrial machinery, heavy electrical and electricals.

The decline in production in the heavy mechanical engineering industry was the worst the industry had so far experienced. Production in 1967 was 44,000 metric tons as against 82,000 metric tons in 1966; production of cast iron and pipes was around 150,000 metric tons in 1967/68 as against 223,000 metric tons in 1966/67.

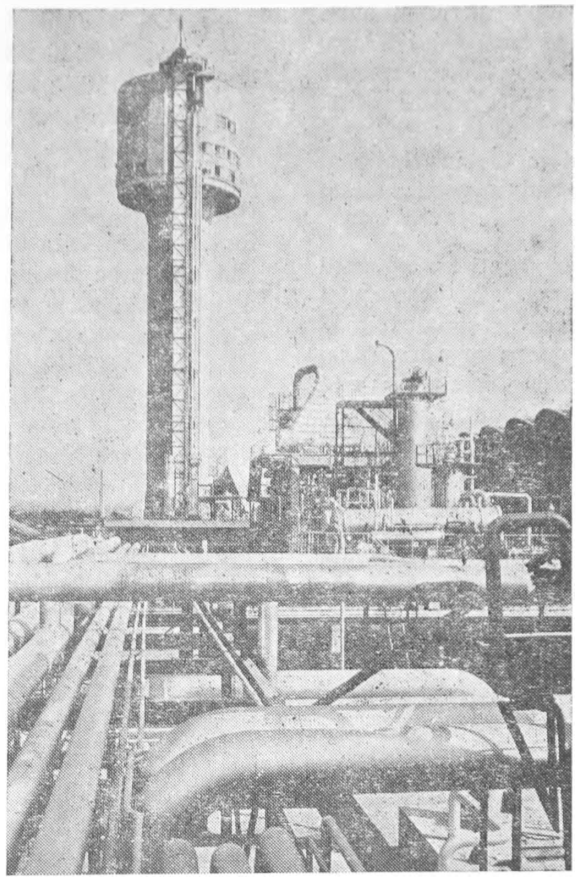
A new Rs 330 million fertilizer plant was formally commissioned at Gorakhpur on 20 April by the Prime Minister. The plant built with Japanese assistance, has a capacity of 800,000 t/y (metric) urea based on naphta from Barouni. The consumption of fertilizer has been increasing steadily in India and it has been estimated that the increased output of cereals in 1967, which is expected to be in the region of 95 million metric tons, has been due partly to greater use of fertilizer and agricultural equipment. Sulphuric acid which is to be produced at the Khetri Copper Complex will be used to produce over 2 million metric tons of triple super-phosphate fertilizer. Expansion of capacity elsewhere and the new plants would thus make available larger quantities of fertilizer to the Indian farmer.

In March, a new paper mill for the production of security paper was opened at Hoshangabad close to Bhopal. The mill was set up in collaboration with a British firm and has a capacity of 28,000 t/y (metric). The cost of the plant has been estimated at Rs 120 million and is expected to save Rs 350 million in foreign exchange annually.

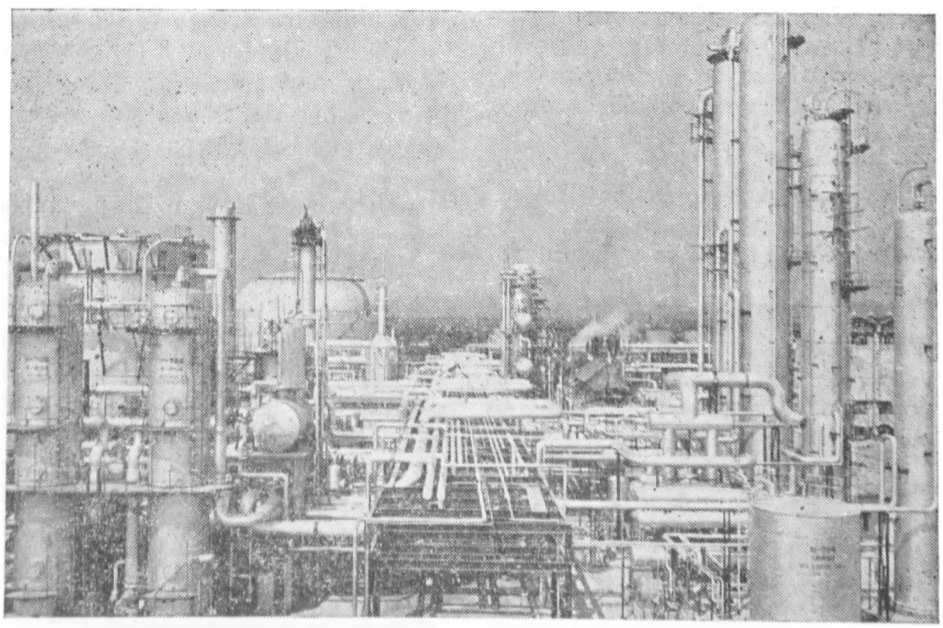
Hong Kong — A boost for export of woollen manufactures

The devaluation of the pound sterling caused considerable difficulties to many countries dependent on maintenance imports. The effects were particularly severe on Hong Kong's textile industry which was faced with an almost 20 per cent increase in the cost of raw cotton, apart from shipping costs which are likely to go up by 51 per cent. Available information indicates that the textile manufacturers have been able to cushion the severity of the impact by an agreement which provides for an 8 per cent surcharge to the East African raw cotton suppliers. Devaluation of the Hong Kong dollar has also brought the question of wages to the forefront.

The Hong Kong woollen manufacturers have been successful in obtaining "Woolmark" licences which were granted to them on 1 March 1968. Licences could only be obtained on attainment of high quality production. Exports of woollen manufactures amounted to nearly US$100,000,000 in 1967, and since the 1950's the industry has been expanding rapidly into woollen spinning, dyeing and finishing, knitting, weaving and carpet making. With the increase in demand for suitably qualified personnel, the Hong Kong Government, in collaboration with the International Woollen Secretariat and the Hong Kong Manufacturers, has set up a Wool Workshop at the Hong Kong Technical College to provide training for technologists and technicians.

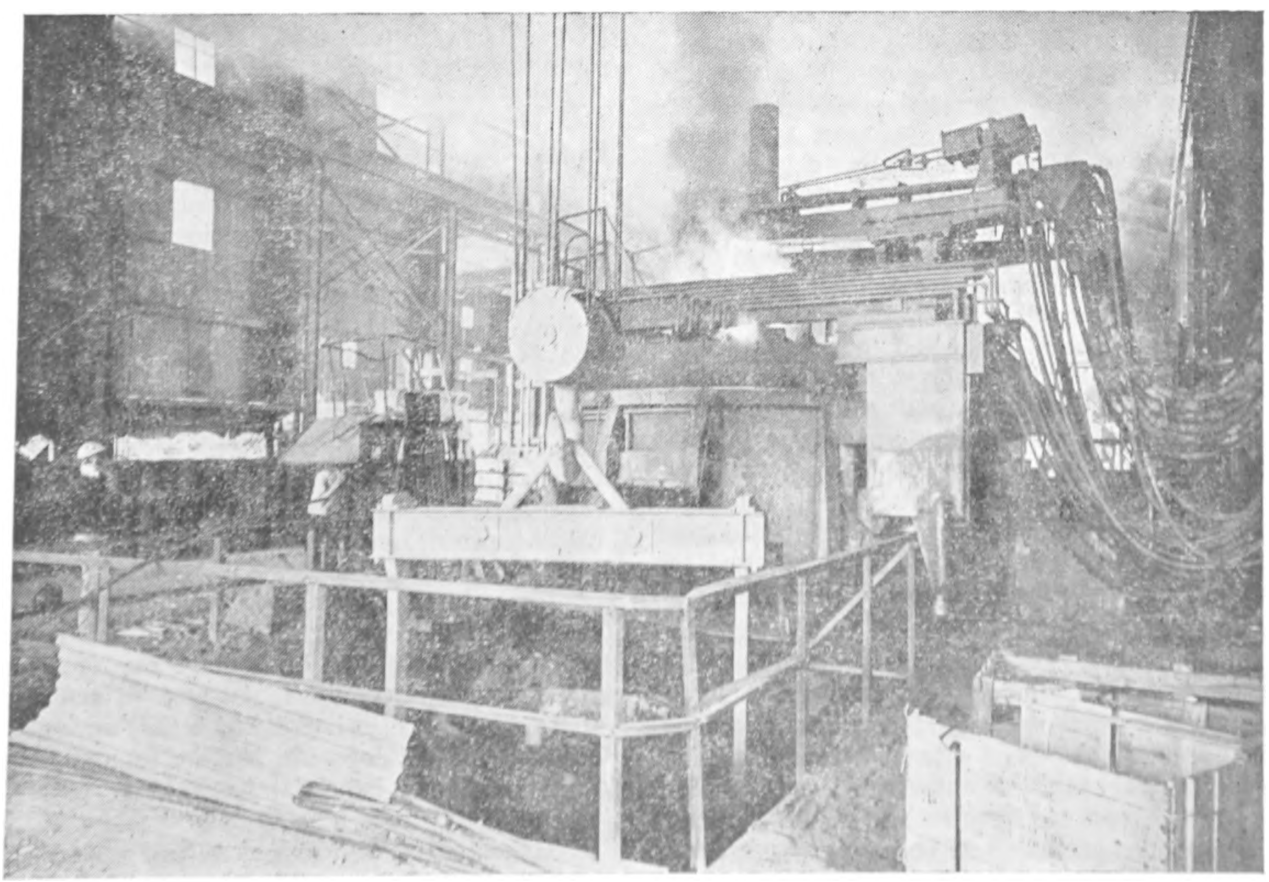


New Urea Plant at Hsinchu, Taiwan, Republic of China.



New Ammonia Plant at Hsinchu, Taiwan, Republic of China.

Workers stock steel rods, products of the National Iron and Steel Mills Ltd., the first major heavy industry to establish a plant on the Jurong Industrial Estate in Singapore.



An electric arc furnace at the National Iron and Steel Mills Ltd., the first major heavy industry to establish a plant on the Jurong Industrial Estate in Singapore.

Nepal — Increasing investment in industry

The total paid up capital in Nepal's private sector investment in industry for 1966/67 increased to Rs 500.8 million. The additional paid up capital amounted to Rs 64.3 million and was less than that of Rs 1.3 million reached in 1965/66 the highest on record. The growth of investment has been marked during the 1960's. Much of the investment since the fifties has been concentrated in light consumer goods industries — approximately 30 per cent in jute mills and jute press, while production of rice, oil, flour and textiles, including handwoven fabrics, has figured prominently. During the last two years considerable investment has been made in mining. Plywood, chipboard and strawboard came second and were closely followed by flour milling and agricultural processing. The trend in investment in the engineering industries and workshops appears to have been extremely erratic. High rates of investment were reached in 1960/61 (Rs 6 million) in 1962/63 this declined to Rs 351,000, rising once again to Rs 5.6 million in 1964/65, and declining to Rs 302,000 in 1966/67.

Singapore — attracts more foreign investment

Japanese interest in heavy engineering, specifically related to the construction of ships, by the expansion of existing facilities, augurs well for Singapore's industrial future. Previously Jurong Shipyard Ltd. (51 per cent owned by Ishikawajima — Harima, Japan) built steel ships of over 300 n.r. tons, cranes and heavy equipment such as conveyors. A report by this group is now before the Government and proposals relating to manufacture of ocean-going steamers are under active consideration. Much of Singapore's development has so far been in the field of light consumer goods industries. The rate of growth in 1967 was, as had been expected, high, output increasing 12 per cent over that of 1966. It has also been revealed that an average of five factories per month went into operation — total new employment created amounted to nearly 15,500. The expansion of existing boat yards and the setting up of new units with foreign participation will boost the engineering industry and the growth rate in this area is likely to improve. Two other sectors within this group which are expanding are the steel pipe industry and manufacture of cylinders for liquefied gas. Asphalt lined steel pipes are now being exported to Zambia and a contract for the supply of US$3.7 million worth of pipes has been signed.

Apart from the existing light engineering units, which number approximately 1000, new lines of manufacture under consideration are diesel engines for pumps, industrial vehicles and small craft, motor vehicle components and accessories, simple machine tools, pumps, compressors and power presses.

Malaysia — Substantial export contribution by cement industry

An US$11 million contract by two Malaysian cement plants (Tasek Cement Ltd. and Associated Pan-Malaysia Cement Ltd.) to export 750,000 tons clinker to East Pakistan Industrial Corporation marks a new stage in Malaysia's industrial progress. Not only does it indicate the growing competitiveness of Malaysia's cement industry, more significantly it is a shot in the arm to increased sub-regional trading in semi-manufactures.

There has been much progress with regard to new industries at Batu Tiga (see News No. 2). Several new units, with foreign collaboration, have started manufacture or are actively proceeding with investments. With government encouragement, however, a scheme of broadbased industrialization is proceeding. Initial work has already commenced on the Mamut copper exploitation programme. The Japanese Overseas Mineral Resources Development Co. Ltd. is to invest US$51 million for the drilling operations to be completed in three or four years. Preliminary estimates indicate that there are over 35 million tons of copper bearing ore (0.7% copper content). A special feature is the government's decision to encourage the development of several engineering industries such as the manufacture of moulds for plastic goods and casting of iron and steel. Mention should be made of decisions to set up, with foreign collaboration, two synthetic textile mills and the decision to expand the Malayawata Steel Mill. New facilities have been included at the Dunlop Malayan Industries, Berhad, for a tractor and earth-mover plant at Petaling Jaya.

Ceylon — New incentives for industry

The shortage of foreign exchange during the last few years created near recessionary conditions in Ceylon's newly emerging industrial sector. Besides arresting the momentum of growth which had received a fillip during the early sixties it inhibited fuller utilization of capacities in several areas. For nearly two years no new industries, with the exception of those in the public sector, were started. This situation is now changing and the Government has approved nearly 170 new private industries, apart from approvals for expansion schemes for certain essential units in the existing private sector.

In early May the Government introduced certain changes to the existing foreign exchange regulations which were designed to encourage exports mainly of manufactures or semi-manufactures of industry — as well as to liberalize imports of certain specified items required for development. At the same time import duties on many industrial items were reduced. The schemes provide for the issue of transferable foreign exchange entitlement certificates (FEECS) to exporters

and other specified categories of foreign exchange earners. The certificate can be sold or used for imports. Weekly auction of certificates by the Banks will act as open market operations to prevent undesirable price increases which could be reflected in price hikes on imported articles. The scheme will provide an incentive to exporters and also prevent leakages of foreign exchange.

Indonesia — Moves to attract foreign investment

The Government of Indonesia has decided to hand over most of the nationalized undertakings to their previous owners. Arrangements to hand back such enterprises are proceeding and agreements have already been signed with Unilever, Bata, Goodyear, Naspro, Heineken and Phillips. At the same time several new projects for mining, exploration and manufacture are being approved and foreign investors have shown a keen interest in several projects particularly in oil, tin, bauxite nickel and copper resources. The new draft plan emphasis upon agricultural development and such industries as fertilizer, agricultural implements and chemicals, which are directly concerned with the improvement of the agricultural sector have been given priority.

Projects that are now under active consideration are a petroleum refinery in Central Sumatra (Dumai) to be undertaken by Sumitomo Shoji Kaisha of Japan for the State. The refinery will have a capacity of 100,000 bpd and is expected to come on stream in early 1970. An Italian firm is to continue its work on a petro-chemical complex in East Java, which would, among other items, produce 200,000 tons of fertilizer. In the field of mining, the International Metal Co., Ltd., of Canada is to explore the nickel deposits of Central Celebes. Three Japanese firms will explore the Indonesian bauxite deposits and the firms are to set up an aluminium factory with a capacity of 200,000 metric t/y; the Freeport Sulphur Co. of U.S.A. has already started work on a survey for copper in West Irian, and this will involve an investment of about US$75 million. Several proposals for joint investments are under scrutiny. These involve electronic appliances between the state corporation P. N. Maetrika and Dutch van Swaay, preparation of cattle fodder (German/Indonesian), cultured pearl production (Japanese/Indonesian), radio and television (Holland/Indonesia). The latter projects involve a sum of about US$8 million.

Pakistan — Foreign private investments exceed plan target

A mid-term appraisal of Pakistan's third five-year plan indicates that foreign private investment in industry exceeded the plan target of Rs 700 million by Rs 72 million. As is common to many other countries of the region, Pakistan has had to approach the problems of industrialization against the background of scarce foreign exchange resources. As a result the emphasis is still primarily upon agricultural self-sufficiency and increasing import substitution. For this reason exports have received considerable attention and investment in the domestic private sector has received priority. Approval of private enterprise has proceeded in terms of the original estimates of the plan. The Government has also introduced a greater degree of selective approval of investment with a bias towards heavy industries in order to economize on imports of capital goods the demand for which has been increasing continuously.

Pakistan has made rapid progress in the field of electronics. In 1967, the output of the radio industry was estimated at about Rs 65 million and production of radios and transistors exceeded 300,000 units. Although production was limited to 40 per cent of capacity, it was more than a tenfold increase over 1955. At present plans are under examination for the manufacture of basic electronic components between a local private firm and Philips of Holland. The third plan proposes to increase the number of items manufactured in order to reduce the dependence upon imported components.

JOINT PROSPECTING FOR ASIAN OFFSHORE MINERAL RESOURCES

"....in the final analysis the sea may hold the key to the world's supply of mineral fuels as well as metals". U. Nyun.

It is now nearly three and a half years since the proposal pertaining to the possibilities for joint offshore geophysical surveys of the marine areas of the ECAFE region was submitted to the Committee on Industry and Natural Resources in February 1965. A meeting of an Expert Working Group of interested countries was convened by the Executive Secretary in July 1965. The Group agreed that co-ordinated surveys on a large scale in geographically contiguous areas would be advantageous for many reasons, the chief among them being the considerable reduction of costs and the speeding up of prospecting activity by co-ordination of joint planning. Its recommendation to set up a co-ordinating committee was further examined in November 1965 by a meeting of representatives of the Governments of Burma, Ceylon, the Republic of China, India, Iran, Japan, the Republic of Korea, Malaysia, the Philippines and Thailand. The meeting specifically emphasized the importance of joint prospecting for smaller nations handicapped by lack of financial and technical resources. It was recommended that an immediate start be made by setting up a Co-ordinating Committee of the geographically contiguous countries of the western Pacific area which had proceeded to an advanced stage of planning such surveys. It was intended that the scope of the Committee could be expanded progressively with the inclusion of other

OFFSHORE PROSPECTING PROJECTS SPONSORED OR ASSISTED BY ECAFE

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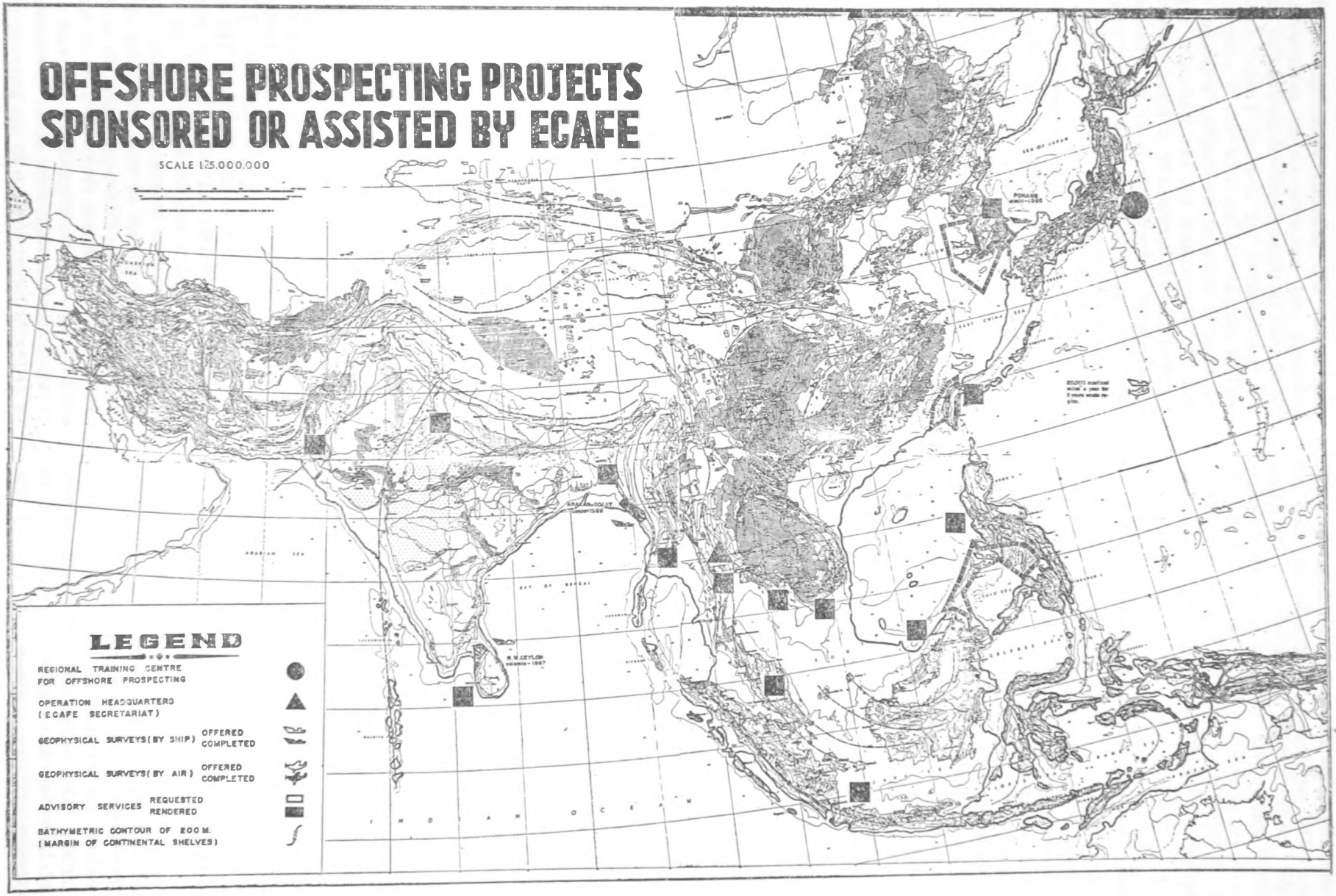


interested countries. This recommendation was endorsed by the Committee on Industry and Natural Resources and adopted by the Commission. The Co-ordinating Committee was accordingly set up in May 1966.

Co-ordinating Committee — CCOP

At present the Committee consists of six member countries of the ECAFE region — China (Taiwan), Japan, Republic of Korea, the Philippines, Thailand and the Republic of Viet-Nam. A Technical Advisory Group consisting of experts from Australia, Japan, France, the Federal Republic of Germany, the United Kingdom and the United States provides technical guidance to the Committee. The UNESCO and IOC (Inter-governmental Oceanographic Commission) have provided an expert to serve on the Technical Advisory Group while the ECAFE secretariat functions as the technical secretariat. The Co-ordinating Committee has held five meetings upto June this year and among its notable achievements are:—

(*a*) Establishment of a Regional Advisory Group on Offshore Prospecting, consisting of two regional advisers provided by UNDP, experts of the secretariat, one geophysicist provided by the Government of Japan and all the special advisers from advanced countries;

(*b*) Establishment by Japan of a Regional Training Centre on Offshore Geophysical Prospecting. The Centre, which began operation in May 1967, has accepted trainees from member countries of the Committee and also from other countries in the ECAFE region;

(*c*) Regular printing of the reports and technical bulletins of the Co-ordinating Committee by its member countries;

(*d*) Completion of a sonic and magnetic survey of the Pohang offshore area along the east coast of Korea.

The Co-ordinating Committee's activities have been greatly helped by support from developed countries. Australia has provided expert services to evaluate the prospects for economic exploitation of detrital heavy minerals in member countries. The United States is to undertake, beginning in March 1968, a total of 20,000 nautical miles of aeromagnetic traverses each year for the next five years in the offshore areas of the member countries of the Co-ordinating Committee. Japan has established a regional training centre, provided a geophysicist to the Co-ordinating Committee's secretariat and will assist in undertaking geophysical surveys in the offshore areas of the member countries. The Federal Republic of Germany is expected to provide assistance in various ways for aeromagnetic and seismic surveys in 1968. France has offered the services of an expert geologist for offshore prospecting. It is understood that the United Kingdom is considering supplying some types of geophysical equipment for the Co-ordinating Committee's survey projects.

With the above assistance and through the initiative taken by the governments of member countries themselves, the Co-ordinating Committee at its November 1967 session formulated nine major projects for implementation in 1968-1969. The first of these, concerning the co-ordinated programme of offshore surveys, contains nineteen sub-projects relating to prospecting for mineral resources in the offshore areas of the member countries; of these, seven are currently under way, three of which commenced early in 1968, another three are scheduled to commence later in 1968, and the remaining nine are already planned for 1969 or will be undertaken when resources permit. Other projects in the work programme of the Co-ordinating Committee relate to advisory services, training in offshore prospecting, establishment of an equipment pool, investigation of detrital heavy mineral deposits, technical publications, library and documentation centre, co-operation with related organizations, and strengthening of the Co-ordinating Committee's technical secretariat.

Field services to member governments

Apart from the assistance provided to the Co-ordinating Committee the secretariat continues to extend field services and technical advice to member governments upon request. For this purpose the services of the secretariat expert, two regional advisers on off-shore prospecting (Geology and Geophysics), and a Geophysicist (provided by the Government of Japan) are available and they have rendered continuing services to the following countries:—

Burma. In 1966, offshore reconnaissance surveys were conducted in Burma along the west coast of Arakan under the technical supervision of ECAFE experts, with UNDP providing assistance in engaging foreign contractors and supplying the necessary equipment. The Government of Burma provided personnel, ships and local services. The first phase of the survey was successfully concluded and further work has been carried out by Burmese technical personnel.

Cambodia. The regional adviser on offshore prospecting (geology) visited Cambodia in April/May 1967. Field trips were made to study the geology of the coastal area to determine what types of rocks are likely to exist under the sea in the adjoining portion of the Gulf of Thailand and a preliminary reconnaisance programme for assessing mineral potentials on the continental shelf of Cambodia was formulated.

Ceylon. At the request of the Government, the secretariat serves as the technical supervisor for the seismic survey being undertaken on land and in ad-

jacent offshore areas in northern Ceylon, under contract for the state-owned Ceylon Petroleum Corporation. The secretariat expert, together with the regional advisers, visited the country at regular intervals to check the work in progress and to suggest subsequent programmes of work. The services to Ceylon will continue in 1968.

China (Taiwan). A number of visits to the country were made by the two regional advisers, the geophysicist provided by Japan and the secretariat expert to advise on various matters concerning its survey programmes both on land and offshore.

India. At the request of the Oil and Natural Gas Commission of the Government, the regional adviser on offshore prospecting (geophysics) visited the country in November 1967.

Japan. The regional adviser (geology) lectured at the Regional Training Centre on offshore Prospecting on marine geological problems relating to mineral prospecting and their economic implications. The regional adviser on Geophysics gave a talk at the Centre on offshore geophysical prospecting. Technical films were exhibited during the lectures.

Korea, Republic of. In 1966, an offshore reconnaissance survey of an area of 700 sq km along the east coast of Korea, in the vicinity of Pohang, was conducted under the technical supervision of the ECAFE secretariat, with operators and some equipment provided by UNDP. The Government contributed personnel, ships and local expenditure. Following the completion of this survey, drilling is being carried out on land. The secretariat expert, together with the regional advisers, also examined the sedimentary sequences of that country with regard to their petroleum potential and evaluated the results of drilling. The advisory services to that country are expected to continue in 1968.

Malaysia. The two regional advisers visited both east and west Malaysia at the request of the Government to advise on matters relating to offshore prospecting.

Pakistan. The regional adviser (geology) visited Pakistan in August/September 1967 and offered recommendations concerning future programmes of exploration. The regional adviser (geophysics) may also have to visit that country, particularly in connexion with the comparison of seismic data with the results of drilling which in many places have shown definite discrepancies.

Singapore. The secretariat expert and the regional adviser on geology visited Singapore in 1967 in connexion with the establishment of a geological survey unit in the country.

Thailand. Frequent consultation took place between the authorities concerned and the secretariat experts in regard to offshore prospecting and other work relating to prospecting for oil and natural gas. Lectures were given to the officers of the Department of Mineral Resources concerning future prospects of the offshore mineral potentials of the country.

Viet-Nam (Republic of). The two regional advisers on offshore prospecting assisted the Government in establishing a reconnaissance geophysical programme for offshore prospecting and suggestions were made for offshore aeromagnetic surveys and seismic refraction profiles to be undertaken in selected areas.

In addition to the above, Fiji, the British Solomon Island, Tonga and the New Hebrides have requested the services of regional advisers. Although these latter are not within the ECAFE region as such assistance would be rendered upon availability of adequate financial resources by the United Nations Office of Technical Co-operation.

BRIEF SURVEY OF INDUSTRY 1967

Asian Industry shows signs of maturity

Although the rates of growth of industry in Asia are not as high as one could theoretically expect, particularly against the background of the rapidly increasing technological gap between the developed and the developing countries, analytical data for the last decade or two show the emergence of a clear pattern of relationships which indicates that the industrial sector is becoming increasingly mature and is beginning to make its impact upon the major factors which influence the well-being of the Asian economies. An examination of the Economic Survey 1967[1] as well as the discussions of the Committee on Industry and Natural Resources (20th session) confirms this conclusion.

The survey points out that despite the traditional problems besetting industrial progress considerable industrial development had taken place during the last decade, so much so, that manufacturing in several of the region's less developed countries had begun to contribute significantly to total output. At the same time the structural changes induced by such growth ensured higher productivity and a growth process which increased the over-all rates of growth of all important sectors of the economy.

Manufacturing growth rates during the last decade have exceeded those of the gross domestic product. The share of industry in the total product, however, still ranged below 25 per cent and manufacturing per-

[1] Economic Survey of Asia and the Far East, 1967. ECAFE, Part Two, Current Economic Developments.

ECAFE advisor meets Korean experts.

Interpretation of recording data.

formance in several countries were still heavily conditioned by the vissisitudes of agricultural development.

For example, the drought and harvest failures which plagued several countries, particularly during 1965 and 1966, entailed in varying degrees deleterious effects on industrial production. The survey observes, "The direct effects appear as shortages of agricultural products destined for industry — foods for processing, vegetables fibres for textiles, and other industrial inputs (such as water shortages and consequently its adverse effects on power supply). Increased prices due to reduced agricultural output raised the costs of material inputs and wages in industry. Decreased export of primary products and the necessity of greater imports of foods reduced the availability of foreign exchange for industrial inputs and spares. Reduced incomes in the country side and, secondarily, among industrial workers in urban areas contributed to tighter domestic markets for consumer goods manufactures".

Table 1

DEVELOPING ECAFE COUNTRIES: AVERAGE ANNUAL CHANGE IN AGRICULTURAL AND INDUSTRIAL PRODUCTION, 1960 - 1966
(PERCENTAGE)

Country[a]	*Sector*	*1960-1963*	*1963-1965*	*1965-1966*
India	A	2.2	-1.5	-1.6
	M	7.5	6.2	3.0
Pakistan	A	3.4	0.8	-3.8
	M	15.1	8.8	8.8
Republic of Korea	A	8.0	14.0	6.7
	M	11.4	13.7	17.9
Philippines	A	4.0	-1.1	11.8
	M	6.1	5.5	8.7
China (Taiwan)	A	2.2	9.1	1.3
	M	11.4	22.9	12.9
Malaysia (West)	A	4.2	4.2	6.0
	M	9.2	13.9	12.5e
	v			
Thailand	A	6.1	0.7	12.8
	M	7.9	15.4	9.0
	v			
Iran	A	3.9	2.6	0.0
	M	9.6	7.6	13.8p
	v			
Indonesia	A	-0.5	2.8	4.4
	M	1.7	1.8	1.3e
	v			
Burma	A	4.2	1.0	3.8
	M	11.5	...	...
	v			
Ceylon	A	4.4	0.4	3.7
	M	13.8	0.2	5.9
	v			

Source: Agriculture: FAO, Index of Agricultural Production. Manufacturing: national publications.
A: Agricultural production index.
M: Manufacturing production index.
Mv: Manufacturing, value added at constant prices.
e: Estimated.
p: Preliminary.
[a]: Ranked by size of manufacturing value added in 1965.

An important consideration in the internal structure of industry is its ability to generate productivity in other sectors. Thus manufacturing industries which could produce the machines and intermediate goods for use in other industries, in agriculture, mining, and transport would have wider and stronger spread effects than a sector which produces only consumer goods. The survey also emphasises the importance of increased exports of manufactured goods in order to supplement the increasing requirements of foreign exchange as well as to overcome the limitations of the domestic markets.

Structural changes

Structural changes within industry are shown in table 2 below:

Table 2

DEVELOPING ECAFE REGION: BROAD CHANGES IN THE STRUCTURE OF MANUFACTURING INDUSTRY, 1960 - 1966
(PERCENTAGE)

Industry group	*Contribution to total manufacturing value added*		*Growth rate 1960-1966*
	1960	*1966*	
Light Industry	64.0	58.7	7.0
Food products	24.5	21.7	(6.5)
Textiles	16.2	13.6	(5.3)
Others	23.3	23.4	(8.5)
Heavy Industry	36.0	41.3	11.1
Chemicals and petroleum products	11.7	13.2	(10.7)
Basic metals	5.8	6.0	(9.5)
Metal products	13.2	16.7	(12.9)
Others	5.3	5.4	(8.9)
All manufacturing	100.0	100.0	8.6

Source: United Nations, Monthly Bulletin of Statistics, op.cit. derived from the index of manufacturing production for Asia excluding Japan; 1958=100.

While there does appear to be a fairly close positive correlationship between agricultural prosperity and industrial growth, it is not so much the negative aspect of the adverse agricultural fortunes upon industry that need be emphasized, it is rather the positive contribution which industry could exert upon agriculture that needs to be stressed. This is particularly so in regard to agricultural productivity where heavy industry does play an important role. For example, chemical products such as fungicides, weedkillers and fertilizers, and engineering products such as implements and tools, are essential to increasing agricultural productivity.

The impact of progressive change in industrial structure was discussed at the twentieth session of the Committee on Industry and Natural Resources. Two

documents, one of which is reproduced in this issue, examined the nature of this change and its importance. The other, a review of twenty years of industrial development stated: "Heavy industry is the base of industrial development and studies relating to the growth and development of industrial societies have demonstrated the positive relationship between the rate of growth of industry and the growth of the heavy industries sector. As a country progresses in industry, the relative share of the heavy manufacturing sector increases". At the same time, and this is of significant importance in the context of industrial contribution to national income, value added per person employed in heavy industry is higher, more or less double that in light industry. The latter study proceeded to examine the pattern of growth of the key industries, in both light and heavy sectors of manufacturing, in greater detail which threw interesting light upon the qualitative and quantitative aspects of the development process in the manufacturing sector.

Table 3

THE STRUCTURE OF MANUFACTURING CONTRIBUTION TO TOTAL MANUFACTURING (VALUE ADDED), BY INDUSTRY GROUP (PER CENT)*

Country	*Year*	*Manufacturing as share of total product*	*Food, beverages, tobacco*	*Textiles, garments, leather*	*Wood, paper, publishing*	*Mineral, rubber products*	*Chemicals, petroleum products*	*Metals, metal product*	*Machinery, transport equipment*
Ceylon[j]	1963	5.4	37.1	12.6	5.2	8.0	27.0	3.1	5.9
Malaysia (West)	1963	9.0	25.4[a]	2.1	21.3	22.4	11.1[h]	6.2	6.0
Korea, Rep. of	1963	9.6	31.6	20.0	11.9	12.0	9.1	5.8	7.9
Pakistan	1962/1963	10.2	13.8	67.7	2.3	1.7	3.7	3.0	2.7
Singapore	1964	11.4[c]	24.1	3.8	19.8	8.8	14.8	11.8	12.5[d]
Thailand	1963	11.7	55.9	8.6	9.8	9.0	6.6	1.8[e]	5.6[e]
Indonesia	1960[b]	12.2	45.4	13.9	7.9	9.3	8.9[b]	1.9	10.8
India	1960/1961[f]	13.7	16.9	32.4	7.9[e]	8.2[e]	6.7	9.0[e]	12.5[e]
	1962[g]	14.6	13.4	32.0	5.4	7.2	10.9	12.0	18.1
Burma	1961	14.1	32.6	12.8	9.9	5.1	33.8	3.2	1.9
Philippines	1962	18.1	38.9	9.2	10.2	8.0	16.9	5.9	10.0
China (Taiwan)	1961	18.8	36.5	12.7	9.4	10.0	14.0	7.9	8.3
Iran	1963	19.9[b]	31.2	32.1	9.2	8.4	2.6[b]	8.6	6.7
Hong Kong	1961/1962	23.4	7.5	38.0	11.2	— 15.1[h]	...	9.1	13.2
New Zealand	1963/1964	24.9	22.2	12.7	21.8	5.1	7.1	7.1	21.2
Australia	1963/1964	27.8	13.8	11.0	13.0	9.0	6.7	16.1	27.9
Japan	1963	30.3	9.1[i]	10.3	12.2	12.3	6.7	13.7	30.4

Sources: United Nations, Yearbook of National Accounts Statistics, 1965; United Nations, Growth of World Industry, 1953-1965, vol. II, national tables (1967) and national sources. Hong Kong estimates unofficial, see Far Eastern Economic Review, vol. LII:8 (26 May 1966).

* Miscellaneous (n.e.s.) group omitted; rows do not add up to 100 per cent.

[a] Excludes breweries.

[b] Excludes petroleum refining.

[c] Estimated.

[d] Excludes motor vehicle repair.

[e] Estimated by distribution of values to sub-categories.

[f] All manufacturing; from revised national product estimates (1967).

[g] Large enterprises only; all manufacturing share of total product.

[h] Chemical and mineral products.

[i] Excludes tobacco products.

[j] Basic data refer to value of gross output at market prices.

The Survey traces the observable relationships between the internal and the external structure of manufacturing in data from several Asian countries. Taking into consideration major manufacturing groups; food, beverages and tobacco; textile, garments and leather products (including leather footwear); wood products, furniture, paper products, printing and publishing; rubber and non-metallic mineral products and chemical and petroleum products; and metal products and engineering trades the Survey concludes as follows:—

(*a*) The food, beverages and tobacco industries group does not increase in step with the manufacturing sector. Generally, the growth of the manufacturing sector is accompanied by a relative decline in the share of value added produced by the food, beverage and tobacco group.

(*b*) The textile, garments and leather products group shows a wide variation in its significance in the manufacturing sector. The main reason for this being the importance of this group in exports for several of the countries. The Survey observes that "... the median value among the less developed countries is only marginally greater than that of the three advanced economies in the region".

(*c*) Wood products, furniture, paper products, printing and publishing generally tend to be larger in advanced than in under-developed countries. Per caput consumption of paper products and published materials is higher among the developed countries.

(*d*) No firm conclusions could be drawn with regard to rubber and non-metallic mineral products and chemical and petroleum products. Their importance in particular countries depends on natural resources. The share of rubber products, except for West Malaysia is relatively small and with the exclusion of petroleum products it did appear that the mean percentage share was higher for the developing countries than for the three advanced countries.

(*e*) The most significant difference appears in the group comprising metal products and engineering trades. A clear positive association is shown between the size of the sector and the size of this industry group. The Survey observes, "While the relative under-development of the metal, machinery and transport equipment group reflects the inability of a less developed economy to produce its own capital and other durable goods, this is perhaps not the most meaningful interpretation of the facts. It is perhaps more important to recognize that neither consumer demand nor the demand derived from that for the products of other industries is generally sufficient to support an engineering industry which could produce more than a few lines of product at efficient scales of production. Thus it is less the inability to produce durable goods than the ability to produce manufactures in general which is the crucial issue".

These relationships are undoubtedly of considerable importance in effective planning, in particular of industrial programming and in general in over-all economic planning. A clear appreciation of the structural relationship would enable industrializing countries to overcome several bottlenecks and, indeed, prevent waste of capital which might otherwise be idle.

Exports of manufactures

For reasons well known, exports of manufactures are assuming increasing importance. For some countries access to external markets alone could assist in further industrial development and for all countries export incomes provide a means of supporting the balance of payments — more importantly for those countries which have relied largely upon exports of primary commodities. The Survey observes that exports of manufactures bulk large, particularly among those countries for which exports are small compared to aggregate output e.g., Japan, India, Pakistan and the Republic of Korea — Indonesia being the exception. Export/GDP ratios for countries which are largely dependent upon exports of primary commodities are high and in 1965 ranged as follows:—Australia, Burma — 15%; Iran, New Zealand and Ceylon, 20-30%, Malaysia, almost 50%. The situation with regard to Hong Kong, Singapore and China (Taiwan) is different in many ways. Hong Kong and Singapore figure mainly as entrepot manufacturers where imported manufactures are further processed for export. However, in China (Taiwan), as well as to some extent in Hong Kong, domestic production bulks large in exports, contributing half or more. China (Taiwan) shows a low ratio of exports to total product and ... "much of the manufactured exports is, however, composed of entrepot manufactures".

Table 4 EXPORTS OF MANUFACTURES, 1960 - 1965

	Merchandise exports as per cent of GDP (at factor cost)		*Manufactured goods* in total merchandise exports (per cent)*		*Average annual change in value of exports 1960-1965 (per cent)*	
	1960	*1965*	*1960*	*1965*	*Total*	*Manufactures*
India	4.5[d]	4.2[d]	45.1	48.0	5.1	6.5
Pakistan	5.4	5.0	27.1[1]	36.0	7.4[1]	16.7[1]
Korea, Rep. of	1.5	6.5	14.1	61.0	41.2	102.8
Indonesia	8.8	7.1[3]	0.7	n.a.	-3.2	n.a.
Burma	16.9	16.0	2.4	n.a.	2.0[3]	n.a.
Philippines	16.7	16.9	3.2	8.3	7.3[a]	29.7[a]
Thailand	16.8	17.6	1.4	2.0[b]	9.0	17.0[b]
China (Taiwan)	11.5	18.1	47.1[2]	42.5	25.8	23.3[2]
Iran	18.5	21.5	3.5	3.5[3]	10.5	13.8[3]
Ceylon	29.0	26.9	0.9	0.8	1.7	2.2
Malaysia (West)	55.8	45.1	4.2[b]	8.9[b]	1.4	14.8[b]
Singapore[c]	11.4	14.1	51.4	48.8	13.3	12.1
Hong Kong[c]	51.3	n.a.	89.6	93.4	12.0	12.9
Japan	11.4	10.1	89.2	92.0	16.2	16.9
Australia	15.5	14.9	13.4	17.7	9.3	15.5
New Zealand	24.8	20.5	3.1	5.4	2.6	11.1

Sources: United Nations, International Trade Statistics, 1965; United Nations, Yearbook of National Accounts Statistics, 1965, and national sources, Hong Kong domestic product from Far East Economic Review, vol. LII:8, 26 May 1966.

Note: * SITC commodity sections 5 to 8.
1 1961 or 1961-1965.
2 1962 or 1962-1965.
3 1964 or 1960-1964.
a Compound rate to eliminate effect of non-comparable data for 1963.
b Excludes tin metal.
c Excludes entrepot trade.
d Net domestic product.

Table 5

AVERAGE ANNUAL CHANGE IN MANUFACTURES AND EXPORTS, 1960 - 1965 (PER CENT PER YEAR)

	Manufacturing		*Exports*	
	Value added	*Production index*	*Manufactures*	*Total*
India	7.3	7.0	6.5	5.1
Pakistan	6.5	12.6	16.7[1]	7.4[1]
Korea, Rep. of	13.3	12.3	102.8	41.2
China (Taiwan)	12.8	16.6	23.3	25.8
Philippines	7.4[b]	5.9	29.7[a]	7.3[a]
Thailand	10.9	—	17.0[c]	9.0
Malaysia (West)	15.6[d]	—	14.8[c]	1.4
Iran	8.8	—	13.8[3]	10.5
Ceylon	8.4[e]	—	2.2	1.7
Singapore	13.5[f]	—	12.1[g]	13.3[g]

Sources: Table 4 and national publications.

Notes: a Compound annual rate.
b Discontinuous series.
c Excludes tin metal.
d Excludes rubber processing.
e Excludes construction materials.
f Estimated.
g Excludes entrepot trade.
1 1961-1965.
2 1962-1965.
3 1960-1964.

The Survey considers that during the period 1960-1965, the growth rate of manufactured goods exports exceeded that of manufacturing production in all five countries for which production indices are available, with the exception of India. Exports of manufactures grew more rapidly than total exports in all five countries and for China (Taiwan), Republic of Korea, Pakistan and Hong Kong it provided the base for an expanding industrial sector. In Singapore while exports did provide a stimulus for some industries such as textiles and garments, rubber footwear, veneer and plywood, sawn timber, metal and electrical products the industrial sector as a whole has not been fundamentally affected. Exports of manufactures expanded rapidly in Thailand but remain a minor part of manufacturing. Malaysia's exports of manufactures did not assume importance of any significance and Ceylon's share remained "miniscule".

In an evaluation of cotton textile exports the Survey observes that while textiles remained the most important export for the region its production share as well as its exports share of total export of manufactures declined between 1960 and 1966. Table 6 below reflects this relationship and the trend between these years.

Table 6

SELECTED ECAFE COUNTRIES: SHARE OF TEXTILES IN MANUFACTURING OUTPUT AND SHARE OF TEXTILE EXPORTS IN EXPORTS OF MANUFACTURES, 1960 - 1966
(PER CENT)

	1960	*1963*	*1965*	*1966*
India				
Production share	38.6	35.5	33.7	31.6
Export share	77.6	75.2	71.5	70.0
Pakistan				
Production share	32.4[1]	30.6	26.8	26.2
Export share	83.8[1]	80.0	79.7	...
Korea, Rep. of				
Production share	29.1	23.1	25.8	24.2
Export share	53.3*	19.7	24.6	22.5
China (Taiwan)				
Production share	13.2[1]	11.7	10.2	9.5
Export share	28.6[1]	26.0	23.0	22.8
Hong Kong[2]				
Export share: Textiles	21.6	18.5	17.8	17.0
Export share: Garments	39.3	39.4	37.7	37.7

Sources: United Nations, International Trade Statistics, and national publications.

Notes: Production share: Per cent of manufacturing output contributed by textile production.
Export share: Per cent of exports of manufactures contributed by textile products.
* Total exports of manufactures small.
1 1961.
2 No production index available.

However, with the exception of India, the ratio of exports to production increased between 1960 and 1965 as shown below:—

Table 7

SELECTED ECAFE COUNTRIES: PRODUCTION AND EXPORTS OF COTTON TEXTILES, 1960 - 1965

	Production of cotton fabrics 1965 (million meters)	*Ratio of exports to production (per cent)*		*Growth rate 1960-1965 (per cent per annum)*		*Export share of production increment 1960-65 (per cent)*
		1960	*1965*	*Production*	*Export*	
India[1]	4,588	13.8	11.0	-0.1	-4.4	...[5]
Pakistan[1,2]	632	8.9	29.8	1.3	24.0	287
Hong Kong[3]	543[4]	67.6	72.0	7.1	8.4	83
China (Taiwan)	230	45.6	49.7	5.5	7.3	63
Korea, Rep. of	190	9.1	51.8	6.6	50.9	166

Sources: National publications. Original data in physical units.
1 Mill production.
2 Terminal year, 1966/67.
3 Registered mills.
4 Million square metres.
5 The 460-per cent (negative) contribution of export decline to the fall in production, 1960-1965, is misleading. Exports were large in the initial year and neither exports nor production declined continuously over the period.

The decline in India's mill production of textiles has been attributed to many causes, such as shortage of raw cotton, rising production costs, domestic consumer resistance and since 1964, falling exports. In Pakistan with the exception of 1965, when supply shortages intervened, there had been an annual increase in production. Exports have increased, accounting for nearly 30% of total production in 1966. Much of the production in China (Taiwan) and Hong Kong is entrepot manufacturing, major inputs being imported. During the first half of the sixties, exports from Hong Kong accounted for nearly 70% of total output. In both Hong Kong and China (Taiwan), indirect demand for cotton fabrics, for garments and made up textile products provided an additional demand for the industry's output. But states the Survey, "Even disregarding the export-oriented garment production using domestically produced cotton fabrics, the growth of cotton fabric production is seen to be largely export-determined."

The highest rates of expansion of textile exports were recorded in the Republic of Korea. During the first half of the decade, the share of exports to annual production increased from 9% to over 50%. The industry has had a continuous boom, due to increasing consumer demand at home, increasing exports as well as the expansion of the garments industry.

Continuing work on export possibilities of manufactures and semi-manufactures by ECAFE.

During 1967 the ECAFE secretariat had completed, in co-operation with the UNCTAD secretariat, six country surveys on the export possibilities of manufactures and semi-manufactures for China (Taiwan), Hong Kong, Indonesia, the Republic of Korea, the Philippines and Thailand. The main objective of the exercise was to focus attention on concrete prospects for potential exports and or measures to be taken by the countries to promote their exports. They will also provide a basis for technical assistance in export promotion to the countries concerned. The twentieth session of the Committee on Industry and Natural Resources (1968) commended the reports and supported the recommendation of the UNCTAD Committee on Manufactures that "Country studies should be extended to cover additional countries in the different regions....," and unanimously endorsed that such reports be undertaken for as many countries of the region as possible. The ECAFE secretariat with the co-operation of UNCTAD is making every endeavour to undertake such studies for other countries of the region.

The six surveys which were completed in 1967 adopted a uniform technique in the presentation of the reports. Having dealt in each case with the broad macro-economic indicators emphasizing general trade trends and the position of manufactures and semi-manufactures, a detailed survey was made of the export industries with an evaluation of past trends and prospects of growth area projections upto 1970. Finally the reports discussed policies and measures to promote industrial exports.

Information collected in respect of the six countries indicate that Hong Kong led in export value with a total of US$991 million, followed by China (Taiwan) with US$268 million, South Korea US$160 million, the Philippines US$119 million and Thailand US$72 million. In per capita terms Hong Kong achieved a strikingly high rate of $261, and was followed by China (Taiwan) US$21, South Korea US$5.5, the Philippines US$3.5 and Thailand US$2.1. Similarly, with regard to the share of industrial exports to total exports, Hong Kong, South Korea and China (Taiwan) showed over 50%, with as high as 97% for Hong Kong and 64% for South Korea and 60% for China (Taiwan). In the case of the Philippines and Thailand the proportion was less than 20% being 15% and 12% respectively. Projections upto 1970 indicate a rate of increase of 18.2% during 1965 - 70 for Thailand, South Korea 19.7%, China (Taiwan) 17.3%, the Philippines 13.5% and Hong Kong 7.4%. It will be noticed that with the exception of Thailand, the percentage rate of increase will be dropping. This trend has to be expected in countries which have attained a fairly high rate of increase.

ASIAN INDUSTRIALIZATION AND PEACE

Peace and settled conditions in Viet-Nam and the neighbouring countries would greatly assist the efforts of the member countries in regional co-operation which, despite recent progress achieved by the AIDC in designing the framework for a pattern of several major regional enterprises, has been seriously handicapped by the virtual exclusion of almost an entire sub-regional area from the geographical scope of overall planning. Besides, the war has also caused a misallocation of resources within several member states. Although there has been a temporary resurgence and an aura of prosperity among a few industries geared to supply war induced demands, it vitiated the long term interests and the urgency for concerted regional efforts towards economic integration. While in Japan, China (Taiwan), Singapore, Hong Kong, Republic of Korea and Thailand the war has had its direct economic impact, several other countries of the region have also undoubtedly had to face severe problems.

The major industries which were effected by the war are, iron and steel (plates, sheets and shapes, etc), building materials including cement, textiles in particular yarn and thread and fertilizer. Exports to Viet-Nam from the Republic of Korea consisted, mainly of iron and steel, cement and building products. Between

87 - 100% of the exports of the former category were imports to Viet-Nam. Galvanized iron sheets constituted 77% of the total export value of iron and steel products during 1963 - 1966. In 1966 the total export of iron and steel products was US$8.7 million. Exports of cement were US$.5 million and had in fact dropped from US$.8 million in 1965. In so far as the iron and steel industry is concerned, exports constituted only 5.7% in value of total export of manufactures and semi-manufactures for 1966. In the increasing trend of exports, veneer sheets have not only gained phenomenally over the years but occupy a significant position with almost 23% in value of total exports of manufactures for 1966. Beside veneer sheets, clothing has made an important contribution. What is of greater significance however is the fact that exports of iron and steel products constitute only about 30% of imports of iron and steel products. It is therefore highly unlikely that the domestic industry will be effected. At the same time planners have taken into consideration the increasing domestic demand which in 1971 is expected to reach 800,000 metric tons and, have already planned for a declining export target. Similarly, exports of cement while occupying a minor portion in the export trade at present, is only a fraction of imports of cement — total exports in 1966 amounted to 24,704 tons while imports amounted to 177,665 tons.

Important items of export from China (Taiwan) to Viet-Nam include textiles (yarn and thread), cement and building products, manufactured fertilizers and iron and steel shapes. Textile exports constitute the most important and largest single item of export in terms of value at approximately 18% of total value of exports of manufactures and semi-manufactures — a proportion which is expected to be unchanged in terms of projections made upto 1970. Of the total exports of textiles, export of yarn and thread of all sorts constituted approximately 30% in value. Exports to Viet-Nam grew rapidly, particularly in 1966, and this increase induced rapid growth particularly in the cotton spinning sector, wherein, the number of spindles increased to 700,000 in 1966, two years ahead of the plan schedule. Taking into view that large quantities of textile fibres are imported into Taiwan and exports in many respects of processed yarn and filament constitute a support for such imports, the textile industry is likely to be extremely sensitive. One advantage is that China (Taiwan)'s export market is somewhat diversified but there is a growing tendency among the countries which now import textiles to set up their own mills and, further, release of yarn and thread from Japan which would indeed for the same reasons be searching for new export avenues may produce additional complications.

With regard to cement, almost 50% of total exports (in value) of 1965 was destined to Viet-Nam. Evaluations made by the secretariat of ECAFE indicate that production between 1960 and 1965 increased at 15.4% per annum, domestic consumption at 10% and exports at 59.9%. Projected growth rate between 1966 and 1970 is 3.3% p.a. constituting 3.3% of total industrial exports, more or less the same proportion as for 1965. In volume, exports amounted to nearly 30% of production and a high growth rate has undoubtedly stimulated the expansion of the industry. In 1967 five plants expanded their capacity by 600,000 tons, bringing the total capacity to over 3 million tons per year.

Iron and steel shapes and manufactured fertilizer from China (Taiwan) went almost wholly (99% and 100% respectively of total value of export of the particular items) to South Viet-Nam. Output of chemical fertilizers, particularly ammonium sulphate and urea, have increased rapidly since 1960. In 1965, 185,000 (metric) tons of urea (46% N) and 279,900 (metric) tons ammonium sulphate (21% N) were produced. Production is expected to increase by 1970 to 270,000 (metric) tons and 480,000 (metric) tons respectively. In 1965, 31,698 (metric) tons of urea was exported — the entire quantity to South Viet-Nam under United States aid funds at higher than world market prices. In the total share of exports of manufactures it constitutes not more than 1.4% even by 1970, with a cumulative growth prospect of 1.5% per year. Fertilizer is in short supply in the ECAFE region and exports are not likely to be adversely effected but prospects will depend entirely upon costs. Exports of iron and steel, in particular bars and shapes, have been on the increase since 1963. Total exports of iron and steel products amounted to a little over US$11 million per year in 1965 and are expected to grow at 2.1% per annum to nearly US$18 million by 1970. The bulk of exports went to Viet-Nam. Problems associated with any curtailment of war stimulated demand would not be severe when the arrangements under AIDC (vide AIDC news) are finalized.

In so far as Thailand is concerned, the most important item of export to Viet-Nam is cement. Present production is in the region of 1.5 million t/y of which less than 10% is exported — 59% of which is accounted for by exports to Viet-Nam. Plans are to increase production to 2.8 million t/y of which 800,000 tons would be for export.

In order to realize the magnitude of the impact of any shifts in demand there are several factors which need to be examined in greater detail. First, the total volume of trade, its value and relative importance within the export trade; second, the type of industry involved, and finally, the actual or estimated reduction of trade in the particular commodities. Of these the most significant is the type of industry involved. None

of the items of trade involved, textiles, cement, fertilizer, iron and steel shapes, building materials could be taken as items, the demand for which would be directly stimulated by war, as for example, in the aircraft or munitions industries. They are in fact industries which should flourish more in peace than in war. As already indicated several industries could continue to supply an already existing domestic demand e.g. the steel and cement industries in the Republic of Korea. However, in China (Taiwan) where the textile and cement industries had reacted sharply to the war stimulated demand, the situation would be more complex if no alternative markets could be found for possible reduction in exports of textiles. The industry would have to reappraise its production targets. The position with regard to cement could be more difficult. In Thailand, the cement industry would indeed have to take note of its expansion programme which has been blueprinted for a possible expansion of exports to the Asian market. An additional problem would be the reaction of the domestic building boom. How much of it has in fact been stimulated by the war and what would be the reaction in domestic demand to a reduction of such expenditures? Long term planning could alone answer this question and as the demand for cement is a derived demand a closer evaluation of development in demand stimulating sectors would prove profitable.

The relative importance of the export trade in respect of industries which are heavily dependent upon the Viet-Nam market has been discussed earlier; it is now necessary to consider some aspects with regard to the anticipated extent of the possible reduction of Viet-Nam demand. This is influenced to a large extent by the nature of the industries discussed earlier and by the extent Viet-Nam itself will be able to rehabilitate its own industries, and indeed the very magnitude of schemes of reconstruction and rehabilitation. It is generally correct to assume that termination of war does involve an increase in demand for consumer goods and construction materials so the demand for such products should therefore increase. The main issue is the source of imports to Viet-Nam. To what extent was the pattern established during the war a natural one? Were the trends established under competitive conditions or has there been a conscious direction? If the fertilizer exports from China were a result of United States aid policy (the prices were higher than world market prices) will such policies be continued and can the industries adapt to changing patterns? To countries which have established a more significant export link with Viet-Nam, namely China (Taiwan) and Republic of Korea, these questions are of greater relevance. To Japan (in particular), Hong Kong, Singapore and Thailand (to a lesser extent) the process of adjustment would not be difficult. In fact, it is likely that their trade with Viet-Nam will increase because of their competitive position.

In so far as South Viet-Nam itself is concerned, the country is marked by a paucity of raw materials; until 1955 there was hardly any industry of significance. Rubber and rice exports have been the mainstay of the economy. However, development programmes in the field of industry were under consideration from 1957. These were aimed at self sufficiency in textiles, sugar, cement, paper, glass and plastics. The projects received priority consideration for well known reasons, the chief reason being the trade deficit, which had been consistent since 1950, and which in 1960 amounted to US$155.4 million. Imports of textiles and related items, such as yarn, amounted to US$47 million — almost 30% of the deficit. Cement was another big single item of import. It is believed that by 1960/61 foreign exchange savings from industrialization amounted to $37 million, textile, cement, paper, tyres and tubes accounted for a large part of this saving. It may perhaps take two to three years before full scale production can re-start so that it may be safe to conclude that the demand for commodities which have figured significantly in the external trade of neighbouring countries will not diminish. On the contrary it would be reasonable to expect an increase in demand. But the pattern of trade is certainly one which cannot be anticipated.

Of special significance will be the impact of exportable rice from Viet-Nam on the Asian economies. In 1938 the total yield in South Viet-Nam from 2.5 million hectares amounted to 5.3 million metric tons, of which 1.2 million was exported. The yield, as well as total output, declined in the years after 1954, and in 1956 only 8 tons was exported. In 1960 however, yields increased to nearly 5 million metric tons and exports to 340,000 metric tons. Peace in Viet-Nam would undoubtedly mean a return to stability from the perennial food crises in most countries of the area. It would mean an all round improvement in industrial investment. The importance of rice exports has been underscored in the second five year plan of Viet-Nam and it was expected that acreage as well as total yield would surpass that of 1938. Exportable surplus was however estimated at only half the 1938 quantity — nevertheless if 600,000 tons of rice could be available for export (in reality it would mean much more since Viet-Nam is now importing rice) it would help to relieve much of the pressure upon other economic resources.

It would indeed be a hazardous exercise to quantify the pattern of re-adjustment, but the countries of the region could certainly look forward to the beginning of a rational system of regional economic growth as peace and stability alone can ensure growth possibilities in the ECAFE region.

UNCTAD — Special Committee on Preferences

As its second conference held in New Delhi early this year the UNCTAD adopted two resolutions, Nos. 21 (II) and 25 (II) on preferential or free entry of exports of manufactures and semi-manufactures of developing countries to the developed countries and a programme for the liberalization and expansion of trade in manufactures and semi-manufactures (including processed and semi-processed primary commodities of interest to developing countries — restrictive practices). The former rsolution authorized the setting up of a Special Committee on Preferences as a subsidiary organ of the Trade and Development Board. The first meeting of the Special Committee will be held in November 1968, and the second in the first half of 1969. It is envisaged that the final arrangements, covered by legislative authority, will be given effect early in 1970. Resolution 25 (II) authorizes a study on the question of restrictive business practices adopted by private enterprises of developed countries and their effect upon the export interests of the developing countries.

The trend of the discussions indicate that the question of tariff preferences assumed adequate importance to become the central issue of the conference. The importance of tariff and the need for the removal of trade barriers in order to foster the progress of industrialization cannot be overemphasized. As important as tariffs and trade barriers is the question of shipping and agreements reached at the conference are designed to pave the way towards eliminating discriminatory transport barriers.

It is expected that the final arrangements by the Special Committee on Preferences will deal with specific items of manufactures and semi-manufactures to be worked out in consultation with all member countries. This is undoubtedly a formidable task and is likely to create considerable procedural difficulties both among the developing countries as well as between the developed and developing countries. However, the UNCTAD secretariat has already a considerable amount of background data towards facilitating the reaching of agreements. Besides these reports there are also the individual country studies on export prospects, prepared in collaboration with the regional Economic Commissions of the United Nations, which are now in process and the working out of demand and supply for individual products. Of particular importance are the following reports:—

(1) The Question of Granting and Extension of Preferences in Favour of Developing Countries (A system of preferences for exports of manufactures and semi-manufactures from developing to developed countries) — Report by UNCTAD secretariat TD/B/C2/AC.1/7 (also see supplement — TD/12/Supp.2)

(2) Programme for Liberalization and Expansion of Trade in Manufactures and Semi-manufactures of Interest to Developing Countries. (Examination of Tariffs on products of export interest to the developing countries — Report by UNCTAD secretariat TD/B/C.2/25. (also see additional)

(3) Expansion and Diversification of Export of Manufactures and Semi-manufactures of Developing Countries — (Review of the trade in manufactures and semi-manufactures) — Report by UNCTAD secretariat TD/10 (also see TD/10/Supp.1)

The preparatory work of UNCTAD and the time limit placed by the resolution should ensure that concrete and specific measures provide increasing opportunities for the growth of trade in manufactures between developing and developed countries.

An important development was the agreement by the centrally planned economies against re-sale of goods procured from the developing countries. This would ensure not only an increase in the bargaining position with deficient markets but also enlarge the scope of trade on a multilateral basis. This is contained in resolution 15(II) para 9 which reads that the Socialist countries of Eastern Europe, "Refrain from re-exporting the goods purchased from developing countries, unless it is with the consent of the developing countries concerned".

A NOTE ON INDUSTRIAL DEVELOPMENT PLANS OF SELECTED ECAFE COUNTRIES

Main features of industrial plans

Afghanistan

First plan 1956/57 to 1960/61 (5 years)

Investment in textiles, cement, bricks, foundry and machine shop, cotton ginning and sugar. (Revision of plan reduced expenditure on industry and increased that on infrastructure).

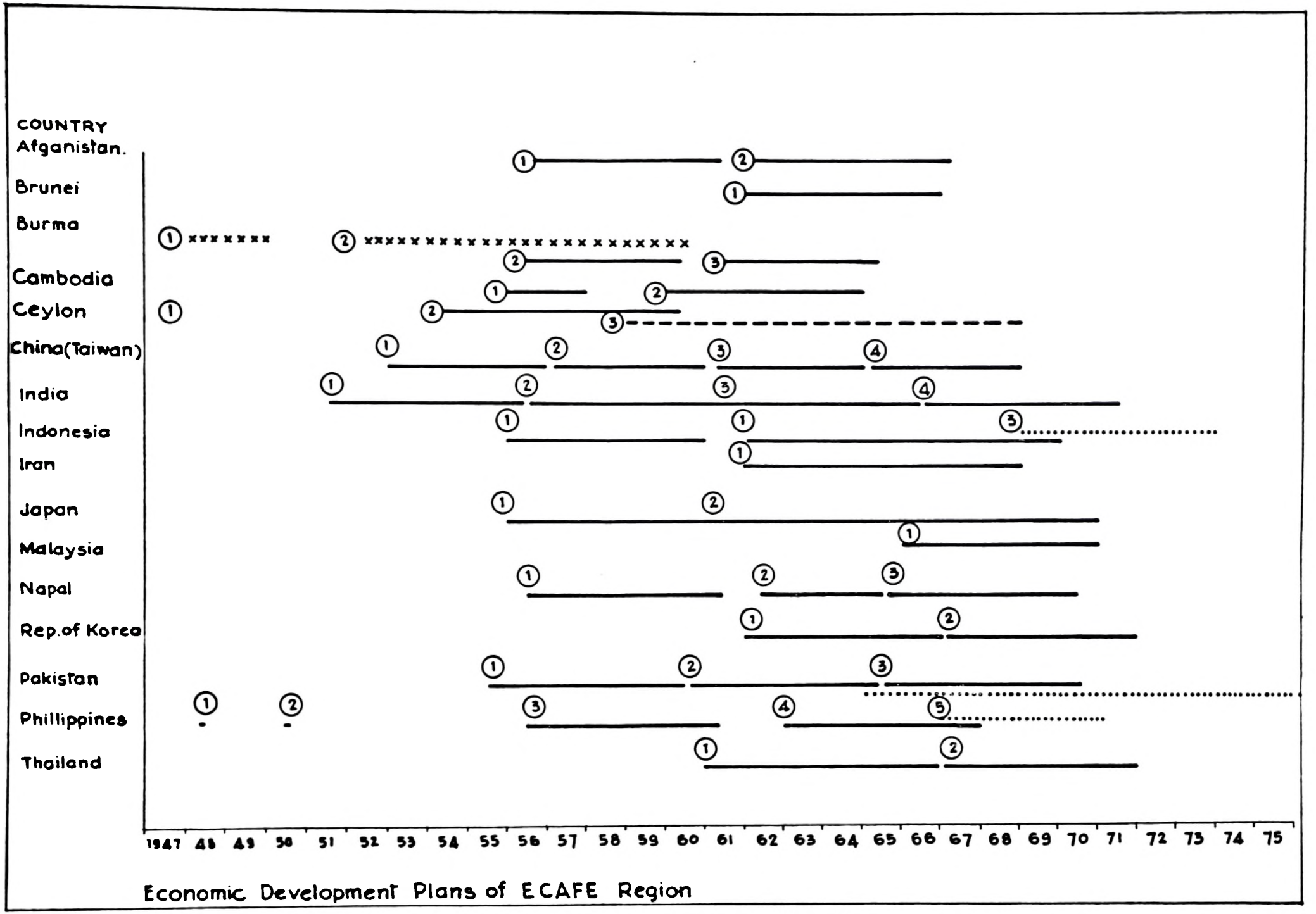
Second plan 1962/63 to 1966/67 (5 years)

Investment in refinery, thermal electricity plant and fertilizer plant (56,000 t/y nitrate) — 27.5% of investment allocated to industry.

Brunei

First plan 1962 to 1966 (5 years)

Feasibility survey for industry — e.g. glue, glucose, industrial alcohol, glass, fish meal and fertilizer (fish by-products), processing of fish food, plastics, chemicals, cement, chemical fertilizer (natural gas), pulp, paper and veneer, bricks and tile and silicate products.



Economic Development Plans of ECAFE Region

Burma

First plan 1948 to 1949 (2 years)

Emphasis on infrastructure.

Second plan 1952/53 to 1959/60 (8 years) revised 1956/57 to 1959/60 (4 years)

Several new projects planned but implementation delayed.

Third plan 1961/62 to 1964/65 (4 years)

Basic features were: Expansion of existing industries such as sugar and alcohol, new plants — cement, cotton spinning, chemicals, metal products, transport equipment, pulp and paper and fertilizer.

Cambodia

First plan 1956 to 1957 (2 years)

Mainly concerned with a mineral resources survey.

Second plan 1960 to 1964 (5 years)

Continuation of mineral resources survey and emphasis upon a policy of import substitution.

Ceylon

First plan 1947 (proposals of the Board of Ministers)

Concentration on agriculture and infrastructure.

Second plan 1954/55 to 1959/60 (6 years)

Light consumer goods industries.

Third plan 1959 to 1968 (10 years)

Emphasis on heavy industry — iron and steel foundries, chemical fertilizer and refinery.

China (Taiwan)

First plan 1953 to 1956 (4 years)

Main objective was the allocation and co-ordination of United States economic aid.

Second plan 1957 to 1960 (4 years)

Emphasis upon agro-based industries and industries based upon domestic mineral resources. Basic industries such as aluminium refining, iron and steel, machinery and shipbuilding and chemical industries were also taken for investment. Public sector investment reached 81.2% of plan but private sector and United States aid projects exceeded the plan targets (133.6% and 112.3% respectively).

Third plan 1961 to 1964 (4 years)

Priorities similar to the second plan — emphasis upon expansion of capacities, textiles, cement and chemical fertilizer. Bias towards export oriented projects.

Fourth plan 1965 - 1968 (4 years)

Special emphasis on export industries — textiles both cotton and synthetic, refinery of petroleum and petro-chemicals, fertilizer, cement and glass were the main fields of expansion. In the metal industries capacities in aluminium smelting were to be increased. Expected annual growth rate in industry 11% per annum and the industrial sector contribution to GNP is expected to reach 34.9% in 1968.

India

First plan 1951/52 to 1955/56 (5 years)

Particular emphasis on iron and steel, machine tools, chemicals, scientific instruments and shipbuilding.

Iron and steel — investment increased from Rs 300 million to Rs 800 million.

Realized investment reached only 50% of plan (Rs 998 million)

Short fall in production targets —

pig iron realized only	17%	of target
finished steel	45%	„
superphosphate	13%	„

Production realized in —

cement, fertilizers, locomotives, cotton manufactures, bicycles, sewing machines and sugar.

Production growth rate — 7%

Second plan 1956/57 to 1960/61 (5 years)

17.5% of total investment was allocated to industry — in 1956 production targets revised on advice of World Bank.

Textiles scaled down by 1007 million yards, heavy industries sector consisting of the "hard core" projects improved progressively.

Index of industrial production rose from 139 — 1950/51 to 194 - 1960/61.

Machinery production increased fastest - 194 to 503.

Production growth rate 7%.

Third plan 1961/62 to 1965/66 (5 years)

25% of total investment to industry and minerals production.

Emphasis on heavy industry.

Consistent growth of the heavy industry sector despite difficulties.

8% growth rate reached, falling short of plan target of 11%.

Fourth plan 1966/67 to 1970/71 (5 years) (held in abeyance)

As in third plan 25% of total investment outlay towards industry. Heavy emphasis upon development of manufacturing industrial inputs for agriculture — fertilizer, pesticides, farm equipment etc. Iron and steel, machine building, metals, chemicals and petroleum.

Indonesia

First plan 1956 - 1960

25% of capital outlay towards industry and mining -- amounting to Rp 3,125 million, plan included projects for the manufacture of aluminium, iron and steel, chemicals including chemical fertilizer and rayon. Foreign exchange requirements (of a total of Rp 4,688) Rp 1,797 for industry and mining. The plan envisaged a series of five-year plans upto 1975.

First plan envisaged textile weaving to increase from 80 million metres p/y in 1955 to 120 million metres p/y in 1960. Spindle capacity from 91,600 to 100,000, paper 8,000 t/y to 50,000 t/y. Ramie — 6,000 spindles to 20,000 (Medan factory), cement 150,000 t/y to 900,000 t/y, fertilizer 100,000 t/y (ammonium sulphate), rayon 10,000 t/y by 1962; in mining, crude petroleum from 11.8 million t/y to 15 million t/y, tin ore 34,000 t/y to 40,000 t/y, coal 800 thousand t/y to 1.5 million t/y, plans for aluminium and pig iron production of 18,000 t/y in 1962, and 350,000 t/y 1963 respectively.

Second plan 1961 - 1969

Plans for iron and and steel plant with 100,000 t/y, oil refining capacity 50,000 bpd, cement 1.8 million t/y, establishment of a basic chemical complex and increase of asphalt production to 50,000 t/y.

Iran

First plan 1962 - 1968

Emphasis upon import substitution industries e.g. sugar, textiles, vegetable oils, cement, paper, iron and steel, chemicals and pharmaceuticals.

In the course of 1967 a new investment programme was under consideration and included such projects as a large steel mill, an aluminium plant, capacity 95,000 t/y, heavy duty pipe manufacturing plant, a tractor plant, a telecommunications manufacturing plant, a petro-chemical complex and a fertilizer plant. Total estimated investment US$1,500 million.

In the private sector the plan includes provision for a rolling mill with a capacity of 250,000 t/y, diesel engine plant, glass and viscose rayon plants.

Malaysia

First plan 1966 - 1970 (5 years)

Emphasis on import substitution and development of industries such as sugar, textiles, motor vehicle assembly, flour milling, chemicals, iron and steel, jute, pulp and paper and fertilizer. Envisaged growth rate in industry 10% p/y.

Nepal

First plan 1956/57 to 1960/61 (5 years)

Second plan 1962/3 to 1964/65 (3 years)

Third plan 1956/6 to 1969/70 (5 years)

In all three plans investment was directed towards building up an adequate infrastructure.

Republic of Korea

First plan 1963-67 (5 years)

Emphasis on import substitution of intermediate goods — development of chemicals, steel, machinery, petroleum and petro-chemical industries.

Exports in textiles to be increased — high growth rates envisaged in petroleum products, nylon yarn, cement, glassware, steel products, wires and cables, coal and automobiles.

Second plan 1967 - 1971 (5 years)

Emphasis upon heavy industry and an expected change in the ratio of heavy to light industry from 27.8:72.2 in 1965 to 33.6:66.4 in 1971.

Pakistan

First plan 1955/56 to 1959/60 (5 years)

Emphasis upon large scale manufacturing enterprises in consumer goods industries — basis for import substitution — included such items as sugar, vegetable oils, textiles and matches. Most intermediates were imported. Total investment Rs 3,018 million, more or less equally distributed between producer and consumer goods. Priority producer goods were cement, heavy chemicals, fertilizer, newsprint and shipbuilding.

Second plan 1960/61 to 1964/65 (5 years)

Total investment in industry Rs 3,390 million (Rs 4,050 million including working capital and revolving funds for working capital).

Investment was divided as follows:—

Rs 728 million — textiles
Rs 549 „ — chemicals
Rs 375 „ — food
Rs 362 „ — basic metal

Emphasis between consumer and producer goods industries remained as during the first plan. Foreign capital was encouraged, imports liberalized.

Third plan 1965/66 to 1969/70 (5 years)

The 1965 contribution of industry to GNP was Rs 5,620 million. Third plan anticipates expansion of this in 1970 to Rs 8,950 million, and according to the perspective plan, by 1985 this would increase to Rs 31,850.

Emphasis upon the development of intermediate sector and investment goods sector.

Philippines

First plan 1956/57 to 1960/61 (5 years)
Second plan 1963 - 1967 (5 years)

Emphasis on import substitution. Consumer and producer goods to increase 45% during the plan period. The larger projects included in the plan were: an integrated iron and steel mill, manufacture of aluminium, fertilizer, pulp and paper, insecticides, cement, newsprint, and plywood and veneer.

Third plan 1967 - 1970 (4 years)

Total envisaged investment in industry $189.2 million. 15 priority projects, including integrated wood processing mills, two integrated pulp and paper units, an industrial salt complex, a fertilizer plant, a polyethylene plant, an antibiotics plant, seven cement plants, a refractory, two coke plants, a plant for nickel and steel from laterite, a copper plant, a ferro alloy plant, a plant for the manufacture of agricultural tools and a shipbuilding yard.

Thailand

First plan 1961 to 1966 (6 years)
Second plan 1967 to 1971 (5 years)

Both plans provided for an increase of investment in industry particularly in major industries such as cement, sugar, gunny bags, textiles and tobacco.

Summary of Industrial Development Programmes

In this section an attempt will be made to consider development in industrial planning and programming and connected aspects pertaining to resource allocation. In most ECAFE countries, the development of large scale industry has been of recent origin. Although the rates of growth of the heavy industries sectors have been high compared with the consumer goods industries sector, the latter is still predominant. From the trends of growth and in terms of achievemens in selected important industries, one can assess that, apart from Japan, the most notable progress in industry has been achieved by the Republic of China (Taiwan), the Republic of Korea, Hong Kong, the Philippines and Pakistan. Among the industrially more advanced countries of the region, Japan has achieved rates of growth which have surpassed even the rates of growth of the more advanced countries of the world and has become "a country which had pulled itself breathlessly out of the rubble of 1945 to make one of the most exciting and extraordinary sudden forward leaps in the entire economic history of the world.[1]"

Within the region, taking into consideration the socialist economies, the techniques of planning range from "indicative" or "prevision" planning to "centralized" planning. The three countries with centralized planning are the People's Republic of China, North Korea and North Viet-Nam. The rest of the region's plans vary from the Indian mixed economy variety to the "indicative" plans of the Philippines, Thailand, China (Taiwan) and the Republic of Korea. Some countries of the region had experience in planning even prior to he war; for instance, Japan achieved much of her basic development in rapid industrialization through direct government "planning", so much so, that every industry after 1868 was initiated either under government ownship or sponsorship. These state activities in the sphere of economic development were also responsible for raising the country's rate of capital formation to a substantial extent.[1] Conscious state direction in this manner was particularly evident during the Meiji Era (1968 - 1912) and was continued till 1938. Afghanistan had an investment programme with major emphasis upon transport, communications, hydro-electric power and the textile industry (1932/33 - 1938/39). In China, attempts at planning have been made since 1935, and during the war, a Central Planning Board was set up, which in 1945 prepared a postwar economic development plan. These were, however, more symbolic of the changes in the pattern of the socio-economic responsibilities of the state in sympathy with the great shocks suffered by the system of free enterprise during the thirties' than attempts at systematic planning of over-all economic development arising from any ideological associations with socialist principles of economic direction. Attempts at more serious planning with welfare socialism as the objective have been conciously undertaken only since the war.[2]

The first postwar plan in the ECAFE region was launched by Ceylon in 1947. This was followed by Burma and the Philippines in 1948, by Afghanistan in 1949, India and Pakistan in 1951. China (mainland and Taiwan) started in 1953 and others commenced in 1955 or 1956. By 1954 Cambodia, Indonesia, Nepal and Thailand had as yet no over-all co-ordinated development plans. It should be observed that several plans of regional countries consisted primarily of a combination of projects; in other words, there was no over-all planning to any appreciable degree.

[1] London Economist, May 27, 1967, Special Supplement, The Rising Sun. Japan's average annual percentage growth rate of GNP between 1956-63 was 10.1 against 6.3 for West Germany; 6.0 for Italy; 4.9 for France; 3.8 for Canada; 3.7 for Sweden; 3.0 for Belgium; 2.8 for U.S.A. and 2.6 for Britain.

[1] Economic Survey of Asia and the Far East, 1956—Chapter on Salient Features of Economic Development Plans.

[2] The basic co-ordination prior to the war was that of generating development and stimulating development activity by creating conditions suitable for private investment and in certain areas by direct government investment not with a view to controlling the "commanding heights of the economy" but solely because of the refusal of private capital to enter into certain fields. On the contrary, the postwar techniques have taken into consideration reservations for public control as well as income re-distribution and prevention of monopolistic trends and many other socialist measures.

Some of the more important aspects of regional planning will be considered on the basis of a country-wise analysis below:—

Afghanistan: The first five-year plan[1] was formally adopted in August 1956 and covered the period 1956/57 to 1960/61. The second plan came into effect in March 1962 and was operative between March 1962 and March 1967.

According to the revised target of the first plan much of the investment was devoted to irrigation and infrastructure activities. Among the industrial projects, highest priority was given to textiles, for which a sum of $25.7 million was allocated. Other items of industry were cement and bricks, foundry and machine shop, cotton ginning, and sugar. The plan was subsequently revised, involving a reduction of expenditure on industry while increasing investment in irrigation, mining and some other infrastructure activities.[2]

Much of Afghanistan's investment was related to the development of the infrastructure and construction of a number of light consumer goods industries such as sugar, cotton yarn and textiles and woollen fabrics, cement and soap.

Proposals in the second five-year plan included provision for the construction of a petroleum refinery, a thermal electricity plant based on gas and a fertilizer factory. The latter was to have a capacity of 56,000 tons nitrate per annum. Construction of the fertilizer plant has just commenced.

Allocation towards industry which included electric power during the second five-year plan amounted to 27.5 per cent of the total proposed investment. During 1962/66 investment in industry has been maintained at above 26 per cent, and in 1965/66 it had increased to 39 per cent, and at present constitutes the highest expenditure in the distribution of investment towards sectors.

Brunei: The first national development plan was introduced in 1962 and covered the period 1962/66. Although a programme for establishing manufacturing industries was included in this development plan, the main concentration was on feasibility surveys for industrial projects, such as glue, glucose and industrial alcohol, glass, fish-meal and fertilizer as by-products of the fishing industry, processing of fish foods, plastics and other petro-chemical products from petroleum and natural gas, cement, chemical fertilizer from natural gas, pulp and paper and veneer, bricks and tiles and silicate products. An ECAFE study group was invited, in 1964, to conduct the natural gas resource survey of the country.

Burma: *The first two-year plan* was promulgated in 1948. Following the two-year plan steps were taken to formulate an eight-year plan which covered the period 1952/53 to 1959/60. The earlier plan did not give priority consideration towards investment in industry. Much of the expenditure was allocated towards improvement in infrastructure, power, railways and highways which accounted for over 50% of the total plan allocation. During the mid-fifties, however, economic problems necessitated the revision of planning procedures and the plan was revised with the introduction of two four-year plans covering the periods 1956/57 to 1959/60 and 1961/62 to 1964/65.

The four-year plans highlighted the necessity for increased investment in industrial development. Plans were provided for the expansion of existing industries which included two sugar factories with a total capacity of 37,500 long tons of sugar and 860,000 gallons of alcohol, a new cement factory with a capacity of 120,000 long tons, and a cotton spinning factory with 200,000 spindles. The first four-year plan allocated 9.7% of the total investment in industry and the second plan 10.6%. Approximately 25% of the investment was in respect of building up heavy industry such as manufacture of chemicals, metal products and transport equipment. Seventy-five per cent was devoted to the light consumer goods industry. Major industries planned were a 60-ton per day pulp and paper mill and a fertilizer plant. One of Burma's major problems, both in the first and in the second plan, has been the continuing existence of substantial under-utilization of capacity in industry.

Cambodia: Cambodia's first plan called the two-year equipment plan was initiated in December 1955 and covered the period 1956-57. This was followed by a five-year plan for 1960-64. At present much of the concentration in industry is in respect of the conduct of mineral resource surveys which were started in 1965 and are being continued with the second prospecting operation.

The Ministry of Planning has concentrated upon the problems pertaining to import substitution, which is in fact the beginning of the first phase of industrialization.

Ceylon: The first six-year plan[1] covering the the period 1954/55 — 1959/60 laid considerable emphasis on agricultural development and the allocation for industry accounted for only 5% — approximately $25 million. In 1959 a new ten-year perspective plan

[1] Although the first five-year plan was considered to have been in effect from 1949/1950 to 1953/54, the plan adopted in 1956 by the Government has officially been taken as the first five-year plan. (Economic Survey of Asia and the Far East 1956, p. 46).

[2] Vide — Obtaining Final Aid for a Development Plan, Export/Import Bank of Washington Loan to Afghanistan, September 30, 1953.

[1] Ceylon's first attempt at planning which was undertaken in 1947 — known as the Proposals of the Board of Ministers — was a mere collection of projects and proposals with investment targets.

was drawn up which gave greater importance to industry, increasing the total investment to $220 million which constituted 30% of the total outlay. By 1968 it is expected that imports of consumer goods will be reduced from 58% in 1958 to 40% of the total imports. Capital and intermediate goods, however, were to increase upto 60% of the total imports. In the investment outlay, importance was given to building up the heavy industries sector, providing for an iron and steel plant, foundries, chemical fertilizer plant and a petroleum refinery. Investments covered both the public and private sectors.

China (Taiwan): China's first four-year plan was enunciated in November 1952. Subsequently, it was re-named and introduced in July 1953 to cover the period 1953 - 56. The second four-year plan was introduced in 1957 and covered the period 1957-60. The third plan, introduced in 1960, covered the period 1961 - 64. China (Taiwan) is at present operating her fourth four-year plan for 1965 - 68.

Many of the earlier problems of planning were connected with the allocation and co-ordination of United States economic aid, mainly pertaining to agriculture and industry.

India: In India the first five-year plan (1951/52 — 1955/56) was introduced in July 1951. Since then India has had a series of five-year plans and the fourth five-year draft plan has just been introduced. The final planned target of the first plan provided for 8.4% investment in industry which was an increase from the original draft outline estimate of 6.7%. In the revision, public sector industries were also given greater attention, investments increasing from Rs 790 million to Rs 1,400 million. Cottage industries were allocated an investment of Rs 270 million. The broad order of priority in the industries field was as follows: iron and steel, machine tools, chemicals, scientific instruments and shipbuilding. A notable feature was the increase of investment in iron and steel from Rs 300 million to Rs 800 million. The first five-year plan outlay, which in terms of the adjusted plan anticipated an investment in industry of Rs 1,880 million amounting to 7.9% of the total planned outlay, was able to realize only 50% amounting to Rs 990 million. There was a heavy shortfall in the anticipated planned programme of implementation which was particularly observable in the industries sector. With the exception of cement, fertilizer, locomotives, cotton manufactures, bicycles, sewing machines and sugar production, all other items fell far short of the anticipated targets. Pig iron production was only 17% of the target, finished steel 45%, superphosphate 13% (as against ammonium sulphate 86%). The second plan allocated 17.5% of total investment to industry, amounting to Rs 7,900 million. This was a revision from the original draft estimate which provided for a 19% investment in industry amounting to Rs 8,910 million.

Village and small scale industries were given a separate allocation which accounted for 3.6%. In 1956 the planned targets pertaining to industry were revised at the instance of the World Bank. Textiles production was severely effected and production targets were scaled down by 1,007 million yards, reducing the per capita expected increase from the original 22 yards per person to 18.5 yards per person. The plan ran into considerable difficulty due to shortages of foreign capital, but the subsequent revisions did not effect industrial investment in the heavy industries sector which was considered "the hard core" of the plan. By 1955/56 the industrial index had risen to 139 from the 1950/51 base, and subsequently increased to 194 by 1960/61. Machinery production index rose to 194 and 503 respectively. The average industrial growth was 7% in both plans. Production, of steel fell short of the targets and from an expected 4.3 million tons was able to realize only 2.4 million tons.

The third plan (1961/62 - 1965/66) allocated 25% of expenditure to organized industry and minerals production. The heavy industries sector, as in other plans, continued to receive considerable emphasis. In the implementation of the plan the government came up against considerable difficulties, and there were shortfalls in achievement in many fields. Industrial growth rate was expected to be 11%, but in 1962/63 it was 8%, being slightly higher than the 1961/62 rate of 6.5%. Despite these difficulties, however, the heavy industries sector, which was concerned with the manufacture of iron and steel and production of capital goods, was able to show a consistent improvement in relation to the consumer goods sector. This was in fact a major achievement as it eventually provided a solid base for all round development.

The fourth draft plan has allocated to industry Rs 39,360 million out of Rs 160,000 million, or 25% of the total planned outlay. The programme provides for high priority for industries, manufacturing industrial inputs for agriculture, such as fertilizer, pesticides, farm equipment etc. As in the previous plans, emphasis has been accorded the development of the heavy industries sector which includes iron and steel, machine building, metals, chemicals and petroleum.

Indonesia: Indonesia is presently operating her first national development plan which covers the 8-year period 1961 - 69. During the period of implementation Indonesia has had to face considerable political and economic difficulties. One factor which seriously affected Indonesia's plan implementation was the drastic reduction in import income. In 1964 alone, while exports decreased by 5%, imports decreased by almost 43%. The major exports of the country are petroleum, petroleum products and natural rubber.

Industrial projects included in the first plan were an iron and steel plant with a capacity of 100,000 tons

per year, increase of oil refining capacity by 50,000 barrels per day, increase in cement output to 1.8 million tons per annum, the establishment of a basic chemical industry, and an expansion of asphalt production to 50,000 tons per year.

Iran: In the seven-year programme of Iran 1962 - 68 attention has been given to import substituting industries such as sugar, textiles, vegetable oil, cement, paper, iron and steel, chemicals and pharmaceuticals. The industrial growth in Iran was 11% during 1965/66, but the country still depends to a large extent on oil resources which have now become the main support of the Iranian economy.

A new programme of investment which includes provision for a large steel mill, an aluminium plant with an increased capacity of 45,000 tons per year, heavy duty pipe manufacturing plant, a tractor plant, a tele-communications equipment manufacturing plant and petro-chemical and fertilizer plants is now under consideration. All these new projects are estimated to involve an investment of approximately $1,500 million dollars during the next few years. Provision has been made for increased investment in the private sector, where it has been indicated that a rolling mill with a capacity of 250,000 tons per year, manufacture of diesel engines, glass and viscose rayon, will be set up during the period of the plan.

Japan: Japan introduced a comprehensive long-term economic plan in 1961 to cover a ten-year period up to 1970. Although planning in the conventional sense has not been adopted in Japan, a considerable amount of guidance and co-operation between industrialists is introduced through the planning agency as well as other institutions of the government.

During 1956 - 1960, the first economic self-support five-year plan was in operation. This plan envisaged a growth rate of 5% per year.

Malaysia: The first malaysian plan of economic development (1966 - 1970) was introduced in November 1965. The plan envisages a comprehensive scheme of import substitution, and a growth rate in industry of 10% per annum. It is expected that during 1966 - 70, attention will be paid to the development of sugar refineries, textile mills, motor vehicle assembly plants, flour mills, a chemical complex, an iron and steel mill, a jute mill and a pulp and paper plant. Further, the government expects to set up a petro-chemical plant to supply feed stock requirements of the chemical fertilizer complex.

Much of the development in the private sector is expected to be promoted through protective tariffs, tax incentives and the provision of credit facilities. The public expenditure on infrastructure and feasibility studies is planned at $M115.8 million during this period.

Nepal: Nepal completed its first five-year plan (1956/57 - 1960/61) in 1962 and initiated a three-year plan (1962/63 - 1964/65) in July 1962. This was followed by the second five-year plan for 1965/66 - 1969/70. Much of the investment has been earmarked towards building up an adequate infrastructure in the country. Of a total of Rs 204 million investment during the first five-year plan period, only Rs 14 million was allocated to industry.

There were, however, no attempts at over-all planning, the first five-year plan itself being rather a collection of public projects in different fields. The second development plan expects to invest in a few large industrial projects in the public sector. However, "..... more emphasis has been placed on encouraging private enterprise, improving the administraive machinery and the adoption of necessary measures to maintain economic stability".[1] The third plan does not expect any radical changes in procedure or emphasis.

Republic of Korea: The first five-year plan of the Republic of Korea commenced in 1962. The second five-year plan (1967 - 1971) was presented in July 1966. The Korean planning system is similar to that of China (Taiwan), the Philippines and Thailand, which have all been concerned with laying the guidelines of growth and investment.

The main objective of the first five-year plan was to lay down an economic basis for the rapid expansion of the economy. The plan envisages the reduction of imports of intermediate goods which are expected to be produced in increasing quantities within the Republic. However, capital goods will continue to be imported during the plan period.

A higher rate growth is expected in the mining and manufacturing sectors. Specific emphasis has been placed upon the chemical, steel, machinery, petroleum and petro-chemical industries and cement industries.[2]

Output of steel is expected to increase during the plan period by 2.6 times the 1965 level and chemicals by 2.5 times. In the textile field it is anticipated that production will increase to meet an increasingly growing export market.

Highest rates of growth are expected in petroleum products, nylon yarn, cement, glassware, steel products, wires and cables, coal and automobiles. It will be observed that the heavy industries have been given particular attention during the second plan period. The proportion of heavy to light industry is expected to change from 27.8:72.2 in 1965 to 33.6:66.4 in 1971.

Pakistan: Pakistan's first five-year plan covered the period 1955/56 to 1968/70. The second five-year plan was adopted in June 1960 and covered the period

[1] Y.P. Pant, Economic Development of Nepal, Kitab Matal, 1965.

[2] Government of the Republic of Korea, Second Five-Year Economic Development Plan 1967-1971, July 1966.

1960/61 - 1964/65. Pakistan is at present in its third five-year plan, 1965/66 - 1969/70. While formulating its third five-year plan, Pakistan also worked out the framework of a twenty-year perspective plan covering the period 1965 - 1985. In this perspective plan is included the 4th, 5th and 6th five-year plans in broad outline, as determined by the perspectives of development anticipated during this period. Although the total realized development expenditure during the first five-year plan fell short of expectations industrial growth was impressive at the end of the plan period. From the very beginning of the plan emphasis was laid upon the introduction of large scale manufacturing enterprises in a variety of major consumer goods industries, particularly with the objective of import substitution. Mention should be made of the developments in sugar, vegetable oils, cotton textiles and matches which recorded satisfactory rates of growth. During the first plan period a large proportion of the intermediate products, such as petroleum, chemicals, fertilizer and non-metallic minerals, and virtually all capital goods and metallic mineral products, were imported.

The first plan envisaged an investment of Rs 3,018 million in large scale industry, the largest proportion of which was to be devoted to textiles and clothing, chemicals and liquid fuels and food products industries. Slightly more than 50% of the investment was devoted to producer goods industries and the rest to consumer goods industries. The producer goods industries which received priority consideration were cement, heavy chemicals, fertilizer, newsprint and shipbuilding. Total investment in industry during the second plan period increased to Rs 3,390 million, totalling to Rs 4,050 million, with working capital and revolving funds for working capital. Of this, Rs 728 million was devoted to textile manufacture, Rs 549 million to chemical industries, Rs 375 million to food manufacture and Rs 362 million to basic metal industries. The emphasis with regard to the growth of the producer goods and consumer goods sectors has more or less remained the same as during the first plan period. Beginning with 1960/61, which was the commencement of the second five-year plan, development expenditures were accelerated with an additional inflow of foreign capital. This was supported also by the process of liberalization of imports. The largest increases in imports were recorded for capital goods and processed raw materials and intermediate products, particularly iron and steel items.

The perspective plan expects to increase the GNP from about Rs 44,000 million in 1965 to Rs 145,000 million by 1985 at constant 1965 prices, envisaging a growth rate of 6.2 per cent per annum. The perspective plan lays considerable stress upon the development of industry, from which sector is expected the highest annual growth rate. In 1965, the manufacturing sector contribution to the GNP was Rs 5,620 million. By 1970, it is expected that this would increase to Rs 8,950 million and by 1985 to Rs 31,860 million, at an annual average growth rate between 1965 and 1985 of 9.1 per cent. The rate of growth of the intermediate products sector is expected to be higher (10.6% per annum) than the average rate for industry, thereby augmenting its contribution to the GNP from Rs 1,400 million in 1965 to Rs 10,540 million in 1985; and the investment goods sector is to increase at 15.1 per cent per annum, its contribution increasing from Rs 3,000 million in 1965 to 5,000 million in 1985. The industrial sector contribution to the GNP is expected to increase to 23.2 per cent, by 1985.

Philippines: The first five-year economic development programme, 1956/57 to 1960/61, was preceded by two development programmes, namely, 1948 rehabilitation and development programme and 1950 agricultural and industrial development programme. The second five-year socio-economic programme of the Philippines was announced in 1962 for the period 1963-67. A four-year economic programme for the Philippines covering the period 1967-70 has just been prepared.

During its second five-year programme the government emphasized imports of capital goods which, in terms of anticipation, were to be in the region of 75 per cent of total imports. Producer and consumer goods production was to increase by 45 per cent during the plan period. Much of the development activity was related to import substitution, projects included an integrated steel mill, plants for the manufacture of aluminium, fertilizer, pulp and paper, insecticides, cement, newsprint, and plywood and veneer.

The new four-year plan (1967 - 70) envisages a total $189.2 million to be spent on fifteen priority projects, including four units for integrated wood-processing, two units for integrated pulp and paper manufacture, an industrial salt complex, a soda ash plant, a fertilizer plant, a polyethylene plant, an anti-biotics plant, seven cement plants, one refractory, two coke plants, one Surigao laterite plant for the production of nickel and steel, one copper plant, one ferro-alloy plant, one agricultural machinery plant, and one shipbuilding yard.

Thailand: Thailand's first national economic development plan came into operation in 1961 and covered the period upto 1966. Provision has been made, both in the first plan as well as in the second five-year (1967 - 1971) plan for an increased expenditure in industrial development. Major manufacturing industries are cement, sugar, gunny bags, textiles and tobacco. Since 1961 Thailand has been self-sufficient in sugar. The cement industry has also received considerable attention and production has increased from 800,000 tons in 1961 to 1.2 million tons in 1965. Basic planning of development is undertaken on the basis of guidelines mainly for the private sector.

RESEARCH AND TECHNOLOGY

SCIENCE AND TECHNOLOGY

The Advisory Committee on the Application of Science and Technology to Development of the Economic and Social Council held its ninth session from 1 to 12 April 1968 at United Nations Headquarters New York. ECAFE was represented in the meeting by Dr. C. Y. Li, Deputy Chief, Division of Industry and Natural Resources. Among the items in the agenda were (1) World Plan of Action for the Application of Science and Technology to Development; (2) development and rational utilization of natural resources; (3) regional activities in science and technology; (4) population problems; (5) survey of present state of knowledge of the resources of the sea; (6) mobilization of the scientific community for the application of science and technology in developing countries.

The World Plan of Action for the Application of Science and Technology to Development aims "to elaborate a globally co-ordinated plan to mobilize the resources of science and technology for a more rapid economic and social progress of developing countries, and to concentrate the effort over a few selected priority areas". Among the priority problems identified by the Advisory Committee is the provision of adequate food supplies for the expanding world population. The population of the world will increase by more than one thousand million in fifteen years, or will double the present population by the year 2,000. However, the increase in food production is not keeping pace with the population increase. Hence, if the trend is not averted, serious imbalances in the quantity as well as the quality of food production is anticipated.

The Advisory Committee considered the fourth draft of its report entitled "Natural Resources of Developing Countries: Investigation, Development and Rational Utilization". The report discusses among other matters policy guidelines for developing countries, the role of the United Nations family and areas for specific action.

The protein crisis

The report of the Advisory Committee entitled "Feeding the Expanding World Population: International Action to Avert the Impending Protein Crisis" has just come out in printed book form. It is being given the widest circulation throughout the world among governmental organizations, interested institutions, private foundations and industry, as well as among informed people in both developed and developing countries. The report gives seven policy objectives for increasing the production of protein from conventional and new sources, and the promotion of protein utilization. It suggests fourteen specific proposals for the attainment of the objectives, and describes how the United Nations family can help in closing the "protein gap".

Philippine Coconut Research Institute

As requested in the resolution adopted unanimously by the United Nations Economic Commission for Asia and the Far East at its twenty-third session in Tokyo, the Food and Agriculture Organization of the United Nations recently sent a consultant to the Philippines to look into the existing facilities for coconut research in the Philippines and to determine what assistance is required in setting up the facilities for the Philippine Coconut Research Institute. The ECAFE and the UNIDO also dispatched their consultants to study the research required for the industrialization of the coconut industry.

Ministerial Conference on Science and Technology

The United Nations Educational, Scientific and Cultural Organization (UNESCO) with the co-operation of ECAFE, is sponsoring the Ministerial Conference on the Application of Science and Technology to the Development of Asia (CASTASIA) which will be held in New Delhi, India from 9 to 20 August 1968. Ministers for Science, Education and Planning or their equivalents of countries of Asia were invited to attend the Conference. The conference will (1) review the status of science and technology in Asia: present priorities, position, prospects and problems; (2) study the needs and possibilities for scientific manpower and financing; (3) implantation of science as a condition for development: the role of basic sciences; (4) prerequisites for and promotion of the application of science and technology for development; (5) science policy and its relation to economic planning; (6) coordination of educational policies and science programmes; and (7) targets and priorities of scientific development.

RECENT DEVELOPMENTS IN UREA SYNTHESIS

The basic difference in modern urea processes is the method by which the carbamate is decomposed into its constituent parts, ammonia and carbon dioxide, for recycle to the urea synthesis unit.

The decomposition can be effected simply by lowering the pressure. But both ammonia and carbon dioxide, which are thus formed, have then to be re-compressed, and this inevitably means a high utility charge. This method is usually called the "total recycle" process.

Tokyo Koatsu modified the total recycle process by using the carbamate to absorb carbon dioxide formed in the shift reaction of the ammonia plant. The resulting mixture of dissolved carbon dioxide, ammonia, carbamate, water and urea is passed to the urea synthesis unit. This is the "integrated ammonia-urea" process.

DSM adopted another approach. It caused carbamate to decompose by subjecting it to the atmosphere of carbon dioxide. The principle here is that carbamate will decompose if its partial pressure, rather than the total pressure of the system, is reduced. This "carbon dioxide stripping" process avoids the problem of pumping highly corrosive carbamate.

SNAM-Progetti's new variation is a logical extension of this thinking. It uses an atmosphere of ammonia rather than carbon dioxide to decompose the carbamate.

Presented below are the total production costs for a 330,000 ton/year prilled urea plant for various processes. Ammonia has been charged at £20/ton and no charge has been made for the carbon dioxide.

Production costs in £/ton for 330,000 ton/year prilled urea plant

Item	*NH_3 stripping*	*CO_2 stripping*	*Integrated NH_3*	*Total recycle*
Raw materials	11.5	11.4	11.5	11.5
Utilities	2.2	1.7	1.4	2.5
Labour, maintenance, overheads	0.7	0.8	0.8	0.8
Depreciation and interest	0.9	1.2	1.0	1.2
Total production costs ...	15.3	15.1	14.7	16.0

NEW DEVELOPMENT IN MODERN RICE MILLING

A new rice milling method called X-M, in which chemical processing techniques are being applied, has been developed by Riviana Foods Inc., Houston, Texas. This new method combines solvent extraction with gentle wet-milling to minimize grain breakage, and produces food-grade rice bran and oil. The basic invention was patented in U.S. 3,261,690 (19 July, 1966) and related apparatus patents have also been issued (U.S. 3,165,134, 12 January, 1965; U.S. 3,217,769, 16 November, 1965). These patents and their related patents-pending are exclusively licensed to Food Engineering International, Inc., a Riviana subsidiary, which will license the process to interested parties.

This new process has many advantages over the conventional rice milling method. It is reported that this new process reduces rice breakage appreciably. Whole grain yield increase of up to 10 per cent have been achieved to-date. Another advantage is that this process produces a light cream colour, bland, food-grade rice bran. This bran is reported to have a normal protein content of 18 to 20 per cent with fractions running as high as 24 per cent. This process also yields high grade rice bran oil that will be able to sell competitively with similar grades of cottonseed and soy bean oils.

According to the Food Engineering International, Inc., the economic incentives for a X-M installation must be evaluated in terms of a number of key criteria by each potential licensee in terms of its own competitive environment. The capital requirements depend upon location, volume, use of installation in juxtaposition to dehulling and other factors. Very roughly, the X-M system unit for a new 165,000 ton/per year (paddy basis) is estimated at $1 million. The economic advantages of X-M milling of rice are firstly dependent upon the throughput, the varieties being processed, grade of the rice being processed and the differential price between whole grain rice and brokens in the particular competitive environment. The economics are also dependent upon the yield and price of rice bran oil. In the United States, about two kilograms of rice bran oil is produced for every 100 kilograms of brown rice processed. The third principle determinant of the economic incentive for X-M milling would be the volume of X-M bran produced and its unit sales value. At the present time, the sale of X-M bran has been largely to cattle feed producers at prices comparable to regular bran, and its volume is lower with X-M than the bran produced by conventional milling. Therefore its contribution to returns on investment is negative. As it achieves greater use, because of its property advantages over conventional bran, as an ingredient in formulated foods or becomes exploited as a source of rice protein isolate, its unit sales value and contribution to X-M profitability should both be increased. Because of the large volume of bran produced in rice-milling, even a small increment in bran value represents a major increase in profit potential.

Technical description of process in brief

There are three main streams in the process — rice, bran, and oil. The new process sequence begins when the automatic scale feeds brown rice to the treater. Here the rice flows by gravity over a conical spreader and is sprayed with rice oil as it falls in a cylindrical curtain. This pretreatment and the subsequent tem-

pering residence softens the bran prior to solvent extractive milling. Treated brown rice goes into holding bins for tempering. Treated grain feeds to the milling apparatus via a mass-flow conveyor that runs full at all times. This feeds screw conveyors supplying the first-break mills. Rice oil-hexane miscella flows into the mills through flow meters. The rice passes in series through first-and second-break mills, which are identical. Milling is done at a low temperature which represents an optimum for extraction rate and low thermal shock, thus reducing formation of brokens. With conventional milling, the rice heats up to as high as 150 or 160 deg. This makes the rice more susceptible to breakage, while X-M milling helps to avoid grain breakage. The discharging rice goes through a hexane washer bran-separator. After draining, the rice goes to a desolventizer via massflow conveyor. Clean, solvent-free rice moves by belt back to the conventional plant to be sized, graded and packaged.

Bran slurry from the mills is held in a settler for about 1 hr. Additional solvent extraction takes place here, and the clear miscella is withdrawn at the top as recycle stock. The slurry concentrate moves to a resettler and it is pumped to a bran mix tank. Here the slurry is propeller-agitated to keep consistency uniform and to continue extraction. Then the slurry moves to the first of two centrifuges in series. In the second centrifuge, hexane is introduced for a final bran wash. Hexane is removed from the bran in subsequent operations.

The miscella effluent from the first centrifuge goes through a series of unit operations for the removal of suspended and soluble solic particles. Next the miscella is heated and the concentration of the oil is raised to 92 per cent in an evaporator. The oil now goes to a hexane stripper that takes out all remaining solvent.

AN INVESTIGATION OF POZZOLANIC CEMENT

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Mixtures of lime and finely-divided siliceous materials have been used as cements for over two thousand years. These siliceous materials, which were employed in concrete-making from times of the ancient Romans until less than two hundred years ago, were generally derived from rocks of volcanic origin; large quantities are known to have been taken from Pozzuoli, Bay of Naples, and the name "Pozzolan" has been given to materials which impart cementitious and hydraulic properties to lime mortar.

Since the beginning of the century, pozzolanic materials have been used extensively in many industrially-developed countries where the usual practice has been to employ pozzolan either as a replacement of, or as an addition to, Portland cement.

Pozzolanic materials in general use have been classified as follows:—

Natural pozzolans

Those derived from rocks of volcanic origin in which the amorphous silica is produced by fusion; they include:—pumicites, scorias and volcanic tuffs.

Those derived from rocks or earth for which the silica constituent contains opal; e.g.:—diatomite.

Artificial pozzolans

The residue from the burning of powdered coal:—fly ash.

Certain fired clays:—The well-known "surkhis" of India.

If a suitable pozzolan is included in a concrete mix, it will combine with the free lime liberated from Portland cement during the process of hydration to form insoluble compounds capable of bonding together the concrete aggregates thereby contributing to both water-tightness and over-all strength. Pozzolan has also been found to effect concrete in other respects: tests have shown that it may improve workability and reduce segregation in fresh concrete, increase resistance to sulphate attack in hardened concrete, and lower the heat of hydration.

During the past few months, the Industrial Research Unit, in co-operation with a Singapore cement company, has been studying the feasibility of manufacturing a pozzolanic cement for the local market. The stage has now been reached where the material has been produced on a small scale and sufficient information has been collected to predict its performance under normal concreting conditions.

The basic cement used in the manufacture of the pozzolanic cement employed in this investigation was a Portland cement made by intergrinding clinker and gypsum imported from overseas. The cement complied fully with the requirements of the British Standard Specification, BSS 12-1958. The pozzolan was diatomaceous earth, commonly, called diatomite, imported from New Zealand.

At the Singapore factory, clinker, gypsum and diatomite (the latter having previously been dried and pre-ground to a fineness of approximately 4,000 sq.cm./g.) were fed into a small ball-mill and ground to produce a Pozzolanic cement of the quality shown in table 1. Materials were employed in the following proportions (by weight):—

Portland-cement clinker	85.75%
Gypsum	1.75%
Diatomite	12.50%

Laboratory and field tests were conducted on concretes, mortars and grouts made from these Portland and pozzolanic cements for which certificates of quality had been obtained. The results obtained were as follows:—

Strength of concrete

Compressive strength — lbs. psi. (Mean of 3 tests on 4" cubes)

Cement	*Age 3 Days*	*Age 7 Days*	*Age 14 Days*	*Age 28 Days*
Portland	1625	2445	3385	3892
Pozzolanic	1780	2910	3515	4018

(Insufficient material was available to conduct tensile tests on 3 beams in accordance with the B.S. requirement. Tests on single beams, however, gave 424 and 510 lbs. psi. at 28 days for Portland and pozzolanic concretes respectively.)

Mix detail.

		Portland	*Pozzolanic*
Cement	lbs.	7	7
Sand	lbs.	17.5	17.5
Crushed aggregate	lbs.	35	35
Mix proportions		1:2½:5	1:2½:5
Water	lbs.	4.2	4.2
Water/cement		0.6	0.6
Slump	ins.	3/4	½
Compaction factor	(C.F.)	0.84	0.84
Aggregate/cement		7½	7½
Density	lbs./cu.ft	154	154

Note: Since mix-proportions, water/cement ratios and workability (acc. to C.F.) were the same for both Portland and pozzolanic mixes, it may be assumed that the gain in concrete strength was due to pozzolanic reaction.

Strength of mortar

Compressive tests on standard-sand/cement mortars in accordance with BSS 12 gave the following results:—

LBS. PSI.

	Age 3 Days	*Age 7 Days*
Portland	3210	4450
Pozzolanic	3455	4638

Characteristics of grout

Figure 1 shows the settlement characteristics for water/Portland-cement and water/pozzolan-cement mixtures. The settlement of the solid grout, or bleeding, is considerably less with pozzolanic cement. Effect on pozzolan in pre-cast concrete products.

Pozzolanic cement could probably be used to best advantage in the manufacture of these products. A short investigation of the effect of pozzolan in hollow blocks and concrete roofing-tiles showed a marked improvement in surface finish and a considerable reduction in permeability (about 50% for the roofing-tiles).

To produce a water-tight concrete building-block or roofing-tile, workability at low slump is an important factor. Pozzolanic cement was found to be most effective in this respect.

Asbestos-cement pipes should be more resistant to attack from acid solutions if they were made from pozzolanic cement. These pipes would have satisfactory strength, especially if steam-curing is used, since the rate of pozzolanic reaction is increased with elevated temperatures.

Conclusions

An assessment of all the qualities attributed to pozzolan would require an extensive testing programme and larger quantities of materials than were available at the time of this investigation. The following conclusions, however, can be drawn from the results obtained:—

1. Pozzolanic cement which meets a recognized specification could be made available in Singapore.
2. The compressive strength of pozzolanic cement concrete is similar to, if not better than, Portland-cement concrete. Shrinkage cracking could be expected to be less due to a higher tensile strength which is a characteristic of concrete containing pozzolan.
3. The improvement in workability could be used to overcome sand (grading) problems particularly in the manufacture of pre-cast concrete e.g. hollow-blocks and roofing-tiles. These products would be more dense, stronger and less permeable to the passage of moisture.
4. Segregation and bleeding of concretes, mortars and grouts are considerably reduced when pozzolanic-cement is employed.
5. There should be an improvement in the durability of concrete made from pozzolanic-cement. Portland-cement concrete exposed to weather deteriorates due to the leaching of free lime generated by chemical reaction. If a suitable pozzolan is present, the free lime cannot leach out since it is used to form further strength-giving compounds.

Table POZZOLANIC CEMENT (packed 7/7/67)

		Specification requirement
Fineness (sieve tests)	3.9%	10% maximum
Specific surface (B.S. 12)	4732 sq.cm./g.	2250 sq.cm./g.
Soundness		
Le Chatelier (B.S. 12)	1 mm.	10 mm. maximum
Setting times (B.S. 12)		
Initial	1 hr. 47 mins.	45 mins. minimum
Final	3 hrs.	10 hrs. maximum
Compressive strength (Mortar cubes—B.S. 12)		
3 days	3455	2200 psi. minimum
7 days	4638	3400 psi. minimum
Loss on Ignition (B.S. 12 and ASTM C 340—58T)	2.58%	3% maximum (4% maximum under tropical conditions acc. to B.S. 12)
Water requirement (ASTM C 340—58T)	40%	64% maximum
Drying shrinkage*	0.15%	(ASTM C 340—58T) 0.15% maximum
Sulphuric trioxide (ASTM C 340—58T)	1.8%	2.75% maximum
Magnesium oxide (ASTM C 340—58T)	2.19%	5.0% maximum
Insoluble residue	8.33%	(B.S. 12) 1.5% maximum (Portland). (ASTM C 340—58T) not specified for pozzolanic cement.
Tri-calcium aluminate	7.31%	—

* Specimens were measured on a 6" gauge length. ASTM specifies 10".

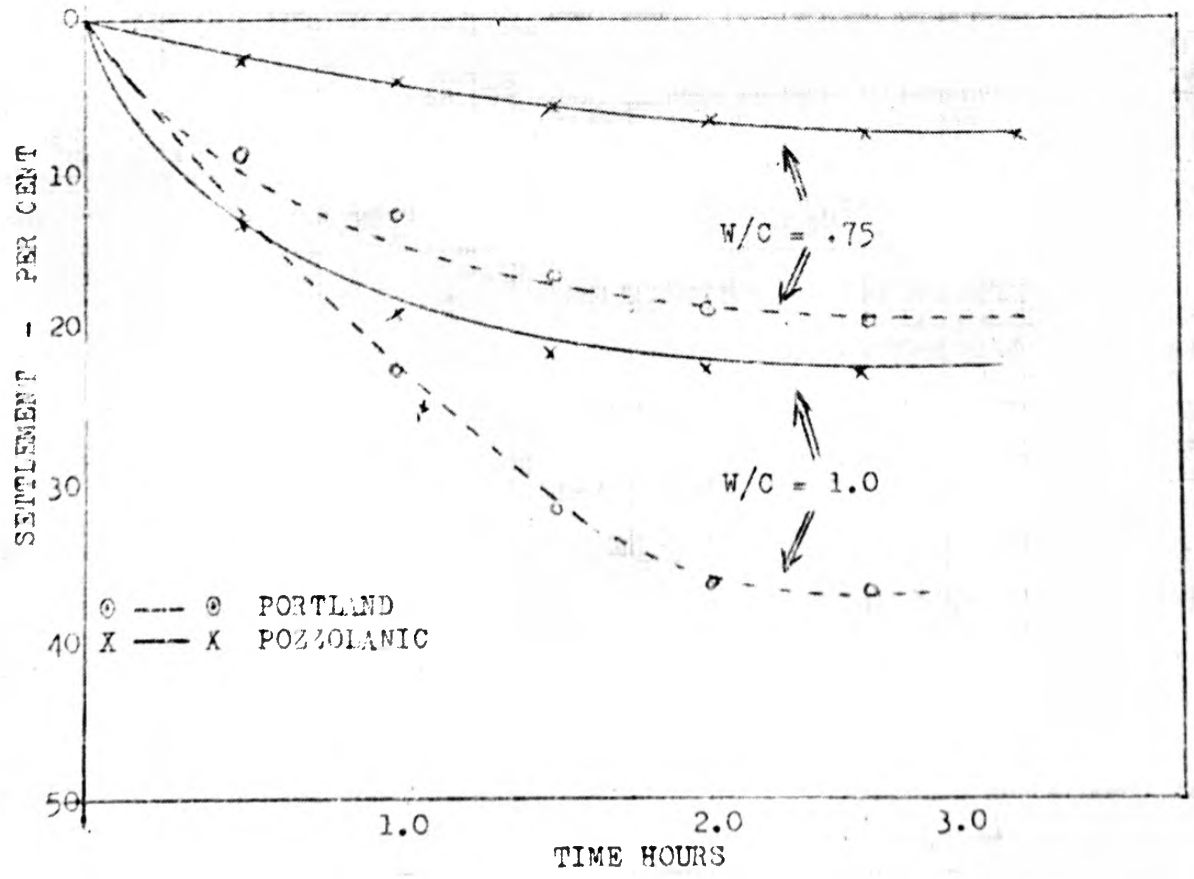

Fig. 1 Settlement or Bleeding Characteristics Portland vs. Pozzolanic Cements Cement and Water Grouts

CALENDAR OF ECAFE MEETINGS — INDUSTRY AND NATURAL RESOURCES 1968/69

Meetings held upto 30th June 1968

Dates	*Meeting*	*Venue*
January 8 - 15	Seminar on the Development of Building Materials	Bangkok, Thailand
February 12 - 19	Asian Industrial Development Council (third session)	Bangkok, Thailand
February 20 - 27	Committee on Industry and Natural Resources (twentieth session)	Bangkok, Thailand
May 30 - June 6	Sub-Committee on Electric Power (eleventh session) to be followed by,	Singapore
June 6 - 8	A Seminar on Nuclear Power organized jointly with IAEA	
June 10 - 19	Committee for Co-ordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (fifth session)	Tokyo, Japan

Meetings scheduled for period June 30, 1968 to June 30, 1969

1968		
July 22 - 27	Working Party of Senior Geologists (seventh session)	Teheran, Iran
August 5 - 9	Meeting of the Regional Group for Asia and the Continuing Committee of the Advisory Council for Industrial Research	Bangkok, Thailand
September 10 - 16	Meeting of the Advisory Group, Asian Industrial Development Council	Bangkok, Thailand
December 9 - 17	Advisory Committee on Regional Housing Centre (sixth session), together with Sub-Committee on Housing, Building and Planning	Bangkok, Thailand
December 12 - 22	Workshop on Promotion of Industrial Research (second meeting)	Bangkok, Thailand
1969		
February 17 - 24	Committee on Industry & Natural Resources (twenty-first session)	Bangkok, Thailand
March 3 - 8	Asian Industrial Development Council (fifth session)	Bangkok, Thailand
May	Asian Standards Advisory Council	Bangkok, Thailand
June 2 - 11	Committee for Co-ordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (seventh session)	Manila, Philippines
June 17 - 23	Working Party on Small-Scale Industries (ninth session)	Bangkok, Thailand
November/December	Second Asian Conference on Industrialization	Open

PART II

ARTICLES

A STRATEGY FOR INDUSTRIAL DEVELOPMENT AMONG ECAFE DEVELOPING COUNTRIES

I. Summary and Conclusions

The course of world industrial development during the two centuries up to the end of the Second World War has generally followed a set pattern, from consumer goods to capital goods industries, in four different stages. In the first stage, consumer goods industries dominate. In the second stage, capital goods industries become increasingly important and have a net output nearly half as great as the consumer goods industries. In the third stage, balance of consumer goods industries and capital goods industries is established, with a tendency for the capital goods industries to expand rather more rapidly than the consumer goods industries. In the fourth stage, capital goods industries appear to be more important than the consumer goods industries.

However, with the emergence and rapid spread of economic planning throughout the developing countries, governments, instead of market forces, have played an increasingly important part in determining the pattern of industrial development, with a view to accelerating the rate of economic growth and achieving economic independence at an early date. Emulating the examples set by countries like Soviet Russia and mainland China, ECAFE developing countries have in postwar years encouraged the development of light industries while promoting, as far as natural endowment and resources permit, the development of heavy industries. Thus, for the developing countries in East and South-East Asia, excepting Japan, the share in the value added in 1958 US dollars by manufacturing of the world (excluding the USSR and Eastern Europe) grew from 0.7 per cent in 1953 to 1.3 per cent in 1961, for heavy manufacturing, as compared with a rise from 3.0 per cent to 3.9 per cent during the same period for light manufacturing. The development of heavy industries requires, of course, a higher rate of capital formation than the development of light industries. This in poor underdeveloped countries as in the ECAFE region calls for the exercise of restraint in present consumption in favour of future consumption.

The development of heavy or producer goods industries requires a higher rate of capital formation, as these industries are usually capital intensitive. Capital intensive industries have, however, an important role to play even in capital scarce underdeveloped countries embarking upon a course of industrialization. In the first place, capital intensive industries like the generation of power embody external economies; they must be undertaken before one can take advantage of opportunities for investment in labour intensive industries. Secondly, capital intensive industries maximize growth, not in the short run, but over a longer period of time. Thirdly, the developing countries, in order to improve their payments position, should alter their pattern of exports from primary to industrial exports, and in so doing, should develop the capital intensive industries in their export sector, so as to be fully competitive in the world market. Finally, economically backward countries should adopt the most modern and efficient techniques in order to achieve success in industrialization, as industrialization always seemed the more promising the greater the backlog of technological innovations which the backward country could take over from the more advanced country.

Viewed from another angle, the developing countries usually started their industrialization by the process of import substitution, at first of consumer goods for which there was already an assured market developed by the very imports to be substituted, and then of industrial intermediates used for the production of consumer goods themselves, such as iron and steel, paper, basic chemicals, and petro-chemicals. As the production capacity grew and became too large for the domestic market, some of the industries originally designed for the production of import substitutes in the domestic market, began to look beyond the national boundaries for market outlets. The import substitution industries gradually catered to the export market, and became known as export industries.

Among the ECAFE developing countries, several countries, notably the smaller ones like Hong Kong and China (Taiwan), have entered into the stage of export promotion, so as to derive the benefits arising from optimum scale operation of industries requiring a market larger than the total purchasing power that a small country with limited resources, both physical

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[1] Document E/CN.11/I8NR/L.69 prepared by the ECAFE secretariat for the 20th session of the Committee on Industry and Natural Resources.

and democraphic, can offer. The smaller developing countries, however, cannot embark upon the production of capital goods on any significant scale, whether for import substitution or for export, as can a large self-contained country like India, which is ahead of both China (Taiwan) and Hong Kong in the export of engineering goods, though not in the export of consumer goods or industrial intermediates in which the smaller developing countries like China (Taiwan) and Hong Kong have advantage because of efficient but cheap labour, infrastructural facilities, a high degree of capital formation, etc.

A compilation of the 1965 data from the secretariat of the United Nations Conference on Trade and Development (abbreviated as UNCTAD) shows that of a total import of selected industrial products into the developed countries of $28.9 billion in 1965, $3 billion or 10.4 per cent came from the developing countries of the world. Among the imports from the developing countries, the light industry supplied five-sixths, as compared with one sixth for the heavy industry. Similarly, the share of light industry imports into the developed countries reached 13.5 per cent, as compared with one of only 4.8 per cent for the heavy industry imports. On the other hand, the growth rate during 1961-65 for the heavy industry imports from the developing countries, 17.3 per cent, is higher than that for light industry imports, 10.6 per cent.

Among the light industry imports into the developed countries from the developing countries in 1965, three fifths were from the labour intensive and craftsmanship oriented industries, and only less than one fourth from industries processing local materials for final consumption. During 1961-65, the growth rate for craftsmanship oriented and labour intensive industries, at 16.9 per cent and 15.8 per cent, are much higher than that for processing industries,which is only 0.3 per cent. It appears therefore that for the developing countries, the export prospect *at present* is far greater for labour intensive or craftsmanship oriented industries than for processing industries. However, taking a *longer run* view, the growth potentialities appear greater for heavy than for light manufacturing industry, and among the heavy manufacturing industries, the industrial intermediates, whose value of import into the developed countries from the developing countries in 1965 is seven times that of capital goods, hold out a greater promise than capital goods, whose production requires superior technique and a huge amount of capital.

II. Stages of Industrial Development in World History

In a study by a German scholar prior to the Second World War on "The Growth of Industrial Economies", it is shown after a detailed and careful statistical analysis that "whatever the relative amounts of the factors of production, whatever the location factors, whatever the state of technology, the structure of the manufacturing sector of the economy has always followed a uniform pattern. The food, textile, leather and furniture industries — which we define as consumer-goods industries — develop first during the process of industrialization. But the metal working, vehicle building, engineering and chemical industries — the capital-goods industries — soon develop faster than the first group. This can be seen throughout the process of industrialization. Consequently, the ratio of the net output (value added) of the consumer-goods industries continually declines as compared with the net output of the capital-goods industries."[1]

A survey of the four historical phases[2] of industrial development spreading from Great Britain to Continental Europe, thence to North America, Australia, New Zealand, South Africa, Japan and other countries, shows the evolution of industrial development in four stages, which can be identified for all "free" or private enterprise economies, according to the changes in the net output ratio between consumer-goods industries and capital-goods industries, as follows:

Stage I has a ratio of 5 ($\pm$1):1
Stage II has a ratio of 2.5 ($\pm$1):1
Stage III has a ratio of 1 ($\pm$0.5):1
Stage IV has a still lower ratio.[3]

In other words, in the first stage, the consumer-goods industries dominate. In the second stage, capital goods industries become increasingly important and have, in terms of net output, an output nearly half as great as the consumer-goods industries. In the third stage, balance of consumer-goods industries and capital-goods industries is established, with a tendency for the capital-goods industries to expand rather more rapidly than the consumer-goods industries. In the fourth stage, capital goods industries appear to be more important than the consumer-goods industries.[4]

For the first three stages, the net output of consumer and capital goods industries as a percentage of total net industrial output in different countries covered in Mr. Hoffmann's study is shown to be as follows:

	Consumer goods industries	*Capital goods industries*
Stage I	83%	17%
Stage II	71%	29%
Stage III	50%	50%

[1] W. G. Hoffmann, *The Growth of Industrial Economies*, translated from the German by W. O. Henderson and W. H. Chalonier, Manchester University Press, 1958. A revised and expanded version of a book first published in German in 1931 by the Institut fuer Weltwirtschaft, University of Kiel, under the title *Stadien und Typen der Industrialisierung*, p.2.

[2] These four phases are: 1770-1820, 1821-60, 1861-90 and 1891 and after.

[3] *Ibid*, pp. 2-3.

[4] *Ibid*, pp. 88, 89.

By the middle of the 20th century the third stage of industrialization had been reached by the old industrial countries (which had passed through the first stage between 1770 and 1860) including Britain, Switzerland, the United States, Belgium, France, Germany, Austria, Russia and Sweden, but even by some of the new industrial countries (which had begun to be industrialized in the 1890's or in the early years of the 20th century) including Italy, Japan, Australia and South Africa.[5]

It is admitted that "there are no theoretical grounds for describing this third stage as the final stage of industrialization. Indeed statistics for the United States, Great Britain, Germany and the Soviet Union indicate the existence of a fourth phase of industrialization in which the capital goods industries appear to be more important than the consumer goods industries".[6] Thus, the net output ratio between consumer-goods industries and capital-goods industries reached 0.7 for the United States (1939 and 1947), 0.7 for Great Britain (1948), and 0.6 for Germany (1951).

The dominant industries have, in general, been the food and textile industries during the first two stages of development and the iron, steel and engineering industries during the third and fourth stages of development. In some cases, however, the textile industries have continued to occupy the dominant place even during the third stage of industrialization.

The main reason why consumer goods industries develop first seems to be that expansion of capital goods industries requires large amounts of capital and advanced techniques of production as well as a skilled labour force. Manufactures such as the food and textile industries have to be developed before conditions favourable to the growth of capital goods industries appear. Such consumer goods industries can utilize the technical knowledge already possessed by skilled craftsmen from domestic industries to a greater extent than is possible in the case of capital goods industries. Manufactures such as the food and textile industries generally require considerably less initial capital than such capital goods industries as the manufacture of machinery and vehicles.[7]

III. Economic Planning and the Strategy for Industrial Development Among Developing Countries

While history shows that industrialization has always followed a set pattern, from the consumer goods industries to the capital goods industries, recent developments, especially after the Second World War, tend to indicate alternative courses of development, because of the emergence of economic planning.

Economic planning, which originated with the first five year plan of the Soviet Union in 1928, has spread, especially after the Second World War, to almost all countries, the developed and the developing countries. As recently as two decades ago the term "economic planning" was usually understood to refer to centralized control of the economy as practised in the Soviet Union. More recently, economists have sometimes contrasted the terms "planned economies" and "market economies". In the United Nations terminology, it has become a common practice to refer to these two groups of countries as "centrally planned economies" and "private enterprise economies." The term "planning" as applied to both types of economies, implies merely that the government has organized its decision-making processes so as to take account of all the economic effects of each of its acts, the total programme of actions being a coherent one designed to achieve as rapid economic growth as is consistent with other national goals.[8] This definition also carries in the last phrase that "the object of economic planning is for the Government (or State) to use the national resources in the best interests of the nation as a whole."[9]

The Government in different countries may interpret the best interests of the nation as a whole in different ways, but in all developing countries, the main objective has been to hasten the course of industrialization by allocating the limited resources of the country, with or without foreign aid, as much as possible to the manufacturing sector. In so doing, the Government does not necessarily have to follow the course of history, so that capital goods industries may not be developed unless consumer goods industries have reached a certain stage of development. Capital goods industries can be developed simultaneously with consumer goods industries, and at a greater speed than is usually possible, so that a country may attain a greater degree of economic independence and a higher rate of economic growth than is otherwise possible, despite the need to restrain consumption in order to hasten capital formation. Capital formation is a pre-requisite for the development of capital goods industries having generally a much longer period of gestation than consumer goods industries. Economic planning has thus introduced a new element in the strategy for industrial development since the end of the war, that is, government planning and intervention, so as to produce a pattern of industrial growth which, if left alone to the forces of the market, would have followed the course of the last two hundred years. That this has been the case is clear from an examination of the United Nations statistics on the percentage distribution of the value added in 1958 US dollars by heavy and light manufacturing industries between the industralized coun-

[5] *Ibid*, pp. 68-88, 97-98.
[6] *Ibid*, pp. 88-89.
[7] *Ibid*, pp. 3-4.
[8] Everett E. Hagen (ed.), *Planning Economic Development*, Richard D. Irwin, Inc., Homewood, Illinois, 1963, p.1.
[9] John Mitchell, *Groundwork to Economic Planning*, Secker & Warburg, London, 1966, p. 13.

tries and the less industrialized countries.[10] According to the United Nations the share of industrialized countries in the value added by heavy manufacturing declined from 95.5 per cent in 1953 to 93.4 per cent in 1961, while the share of less industrialized countries in the value added by heavy manufacturing rose correspondingly from 4.5 per cent to 6.6 per cent during the same period. This gain in the relative importance of heavy manufacturing for the less industrialized took place largely in East and South-East Asia (excluding Japan) and Latin America, where light manufacturing also gained in relative importance, although to a lesser extent than heavy manufacturing (see table 1)

Table 1.

PERCENTAGE DISTRIBUTION OF VALUE ADDED IN 1958 US DOLLARS BY MANUFACTURING IN DIFFERENT REGIONS AND SUB-REGIONS OF THE WORLD, 1953 AND 1961
(World=100)

	All	*Light manufacturing*	*Heavy manufacturing*
Africa, except South Africa			
1953	...	...	...
1961	...	...	0.4
East and South-East Asia (except Japan)			
1953	1.6	3.0	0.7
1961	2.3	3.9	1.3
Latin America			
1953	3.1	4.9	2.0
1961	3.6	5.2	2.6

Source: United Nations, *The Growth of World Industry, 1938-1961*, New York, 1965, table 22.

The various branches of light and heavy manufacturing industries have all gained in percentage distribution of the value added in 1958 dollars by manufacturing in the sub-region of Asia and South-East Asia except Japan, as shown in table 2.

Table 2

EAST AND SOUTH-EAST ASIA EXCEPT JAPAN:[a] PERCENTAGE DISTRIBUTION OF VALUE ADDED IN 1958 DOLLARS BY MANUFACTURING, 1953 AND 1961
(World=100)

	1953	*1961*
Light manufacturing	3.0	3.9
Food, beverages and tobacco	3.2	4.1
Textiles	5.7	6.4
Heavy manufacturing	0.7	1.3
Paper and paper products	0.4	0.7
Chemicals and chemical, petroleum and coal products	1.7	2.2
Non-metallic mineral products	1.4	2.2
Basic metals	0.8	1.5
Metal products	0.4	1.0

Source: Same as for table 1.

[a] Including India, Pakistan, the Republic of Korea, the Philippines and China (Taiwan), and others (Burma, Ceylon, Indonesia, Malaya, Thailand). See *Ibid*, pp. 147-148, 290.

The emphasis on heavy or capital goods industries in preference to light or consumer goods industries, with a view to achieving rapid economic growth and independence, is most clearly seen in centrally planned economies, first of the USSR and then of mainland China. In the Soviet Union, the industrial structure has gone through a revolutionary change since the first five year plan commencing with 1928, as shown by the percentage change of producers' goods and consumers' goods in total industrial output. Whereas in 1928 consumers' goods accounted for 60.5 per cent of total industrial output, and producers' goods for only 39.5 per cent, in 1956, that is, within less than three decades, the share for producers' goods went up to 70.8 per cent, with a corresponding decline of consumers' goods to 29.2 per cent of total industrial output.[11] In the meantime, while the official index of industrial output rose from 84 in 1928 to 1,910 in 1956, that is, by 23 times, the index of output for producers' goods rose by 44 times from 76 to 3,369 during the same period, as compared with a rise of barely 10 times from 88 to 861 for the index of output for consumers' goods.[12]

This rapid growth of industrial output, accompanied by a drastic change in industrial structure, within a short period of 30 years, was made possible by high rates of capital formation as well as low and sometimes (1928 - 1937), negative rates of growth of consumption expenditures. According to Bergson, the percentage of capital formation in gross national product in the USSR at 1937 factor cost rose from 12.5 per cent in 1928 to 28.1 per cent in 1955, while the share of

[10] United Nations, *The Growth of World Industry, 1938-1961*, New York, 1965, table 22. This classification applies to all countries of the world except the USSR and other countries of Eastern Europe.

[11] Quoted in Alexander Gershenkron, *Economic Backwardness in Historical Perspective*, Harvard University Press, Cambridge, Mass., 1962, p. 258.

[12] *Ibid*, p. 255.

household consumption and communal services, according to Kuznets, fell from 84.1 per cent in 1928 to 56.7 per cent in 1955.[13]

Kuznets, after a comparative appraisal of the economic development in the Soviet Union and other countries, thus concluded that the economic growth of the USSR "is a case of high rates of growth, with large inputs of resources and heavy human costs; of rapid shifts in industrial structure, away from agriculture and with emphasis on the industrial sector — both in terms of shares and relative product per worker — that differed in its speed and concentration from other countries; of limiting consumption and maximizing capital investment, achieved in combination with relatively moderate capital -output ratios to permit rapid aggregate growth; and of deliberate isolation from the rest of the world, so that the selective borrowing of production devices and the very limited exposure to the example of high and free consumption levels in other countries could be assured."[14]

In Mainland China, the share of consumer goods in the gross product of modern manufacturing industries fell from 71.2 per cent in 1949 to 47.8 per cent in 1957, with a corresponding rise in the share of producer goods from 28.8 per cent to 52.2 per cent during the same period.[15] During this period, the index of real value of gross output rose ten-fold from 31 to 310 (with 1952 as base=100) for heavy industry, as compared with only a four-fold rise from 47 to 183 for light industry.[16]

This rapid growth of industrial output, especially for heavy industry, was achieved through high rates of investment and low rates of consumption, as was the case with the USSR. At constant 1952 prices, the share of gross domestic investment in gross domestic expenditure rose from 19 per cent in 1952 to 26 per cent in 1957.[17] On the other hand, also at constant 1952 prices, the share of personal consumption and communal services in gross domestic expenditure fell from 74 per cent in 1952 to 68 per cent in 1957.[18]

Aside from mainland China, other centrally planned economy countries, including North Korea and North Viet-Nam, have similarly stressed the development of heavy industries.

Among the market economy countries in the ECAFE region, the strategy has generally been from the development of consumer goods industries to that of producer goods industries. The stress on heavy industries in India under the Second Five Year Plan (1956/57-1960/61) was influenced by the developments in mainland China, but had to be abandoned in the third Plan because in a market or mixed economy, the democratic system of government does not provide the necessary means of control over consumption and investment which are essential to a rapid change in industrial structure in favour of heavy industries. This is especially so in a low-income country like India where a majority of the people suffer from low level of consumption and cannot afford to undergo further encroachments on the living standard for the sake of higher capital formation and economic growth.

The market economy countries in the ECAFE region, like those elsewhere, have however realized the need for simultaneous development of heavy or capital goods industries, though at times for the sake of prestige, but mostly on account of the felt need for economic self-sufficiency. In a majority of the ECAFE developing countries, whether large or small, there are plans for the establishment of iron and steel plants, irrespective of the economy of scale. In Burma, Ceylon, China (Taiwan), Hong Kong, Indonesia, Iran, South Korea, Malaysia, New Zealand, Pakistan, Philippines, Singapore, and Thailand, steel mills are proposed to be established for a total installed capacity of about five million tons per year during 1965-1970; but only China (Taiwan), Iran and Pakistan have plans for the establishment of integrated mills having an annual capacity of one million tons or more to reap the benefits arising from the economy of scale, while for the other countries the size in terms of annual capacity is to be as small as 100,000 tons for Ceylon, Indonesia and Malaysia; 200,000 tons for Hong Kong and Singapore; 300,000 tons for Burma, the Philippines and Thailand; 500,000 tons for South Korea; and 600,000 tons for New Zealand.[19]

In other capital goods industries, such as cement, basic chemicals (soda ash, caustic soda, sulphuric acids), chemical fertilizers, paper and pulp, and engineering, there are plans for production and development in many ECAFE countries. But here as in the case of iron and steel, plants in many countries are operating or planned for operation on a sub-optimal scale, and call for co-operation between two or more countries with a view to amalgamation and efficient production.

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[13] Abram Bergson and Simon Kuznets, (ed.) *Economic Trends in the Soviet Union*, Harvard University Press, Cambridge, Mass., 1963, pp. 352, 359.

[14] *Ibid*, pp. 367-368.

[15] United Nations, *Economic Bulletin for Asia and the Far East*, December 1958, p. 11.

[16] State Statistical Bureau, *Ten Great Years*, Peking, 1960.

[17] Ta-chung Liu and Kung-chia Yeh, *The Economy of Chinese Mainland*, Princeton University Press, Princeton, New Jersey, 1965, p. 80.

[18] *Ibid*, p. 80.

[19] ECAFE, Regional Co-operation — Integration of Steel Production in Some of the Less Developed Countries of the ECAFE Region (E/CN.11/I&NR/Sub.2/L.38, 17 July 1967), pp. 23-24.

Statistics on percentage distribution of value added between light and heavy manufacturing have been compiled by the United Nations Statistical Office in a recent publication entitled *The Growth of World Industry, 1938 - 1961*. As summarized in table 3, they afford only a very rough idea as to the relative importance of these two branches of industry, mainly because the coverage applied varies greatly from country to country, both in respect to the nature (using power or machinery or not) and size (number of employees engaged, 4 or more to 20 or more) of establishments and the year to which the statistics apply. Nevertheless, these statistics do tend to show two trends of development in respect of industrial structure. In the first place, over a period of years which may vary from three (for the Philippines) to six (for Burma), the share of heavy manufacturing tends to rise at the expense of light manufacturing. Secondly, the more developed countries, for instance Japan, India and China: Taiwan, tend to have a higher share in heavy manufacturing than the less developed ones, for example Federation of Malaya, Pakistan and Thailand. The high share for heavy manufacturing in Burma and Indonesia is attributed to the role played by petroleum refining in ISIC 31 - 32 for chemicals and chemical, petroleum and coal products (44.8 per cent in Burma and 12.2 per cent in Indonesia), that in Ceylon and Singapore is accounted for by the important role assigned to ISIC 35 - 38 for metal products (23.6 per cent in Ceylon and 24.4 per cent in Singapore).

Table 3

ECAFE COUNTRIES: PERCENTAGE DISTRIBUTION OF VALUE ADDED BY LIGHT AND HEAVY MANUFACTURING

Country	*Year*	*Size of establishment (no. employees)*	*Percentage distribution*		
			Light	*Heavy*	*All*
Burma	1952/53	10 or more in urban areas	89.5	10.5	100
	1958/59		50.4	49.6	100
Ceylon	1951		40.9	59.1	100
China (Taiwan)	1954		68.1	31.9	100
Federation of Malaya	1959	5 or more or utilizing machinery	74.4	25.6	100
India	1953	20 or more or 10-19 and utilizing power	67.4	32.6	100
	1957		60.7	39.3	100
Indonesia	1958	50 or more or power equipment of 5 H.P. or more	72.0	28.0	
Japan	1953	4 or more	39.1	60.9	100
	1958		37.3	62.7	100
Korea, South	1958	5 or more	68.1	31.9	100
Pakistan	1955	20 or more and using power	74.8	25.2	100
Philippines	1956	5 or more	75.5	24.5	100
	1958		73.8	26.2	100
Singapore	1959	10 or more	61.3	38.7	100
Thailand (Distribution in per cent of number engaged)	1954 (Jan.-June)		79.4	20.6	100

Source: United Nations, *The Growth of World Industry, 1938-1961*, New York, 1963. Volume two.

Notes: Light manufacturing embraces the following, according to International Standard Industrial Classification (ISIC):

20-22 Food, beverages and tobacco
23 Textiles
24 Clothing, footwear and made-up textiles
25-26 Wood products and furniture
28 Printing and publishing
39 Other manufacturing

Heavy manufacturing embraces, also according to ISIC, the following:

27 Paper and paper products
31-32 Chemicals and chemical, petroleum and coal products
33 Non-metallic mineral products
34 Basic metals
35-38 Metal products

IV. The Role of Capital Intensive Industries in Developing Countries

The underdeveloped or developing countries are generally short of capital but abundant in manpower, while economic development through time involves an increase in capital/labour ratio and permits capital intensity. An important question arises as to whether the developing countries should, in view of their factor proportions, place greater importance on the development of labour intensive industries in the initial stage, and gradually encourage the growth of capital intensive industries when both capital and technology have been accumulated in the course of industrialization. The extreme view as advanced by Professor Hayek over ten years ago, that "a country which cannot hope to reach within foreseeable time a capital supply equal per head to that of the United States will not use its limited resources best by imitating American production techniques, but ought to develop techniques appropriate to a thinner and wider spreading of the available capital",[20] has been considerably modified in recent years, especially since the endorsement by the 1964 United Nations Conference on Trade and Development of the need for the developing countries to promote and accelerate the development of export industries using capital intensive techniques.

In the first place, capital intensive industries like the generation of power embody external economies; they must be undertaken before one can take advantage of opportunies for investment in labour-intensive industries. When industries are linked together in complementary interacting fashion, the capital intensity of a single industry is not an appropriate index of its suitability for investment until one has traced through and imputed to it its total return.[21]

Secondly, capital intensive industries maximize growth, not in the short run, but over a longer period of time. Different projects not only have different outputs immediately because of difference in productivity, but also have different impacts on future investment because the productivity of each is associated with a different marginal propensity to save. If one project is labour intensive and results in large wage payments, whereas another has a high proportion of income accruing to rent or to interest and dividends, the amount reinvested in the future from the income produced is likely to be higher from the second than from the first. This model of development, as advanced by Galenson and Leibenstein,[22] implies however the readiness to sacrifice present for future consumption, at heavy social cost for today's population, as has been the case of Soviet Russia and mainland China referred to above.

Thirdly, it is argued that the developing countries, in order to improve their payments position, should alter their pattern of exports from primary to industrial exports, and in so doing, should develop the capital intensive industries in their export sector, so as to be fully competitive in the world market. They should, in view of their shortage of skilled labour, "take the greatest advantage from the inverse relationship which exists between the degree of sophistication of equipment and processes and the complexity of their actual current operation."[23] The developing countries, in adopting sophisticated equipment and processes, are reaping the advantages of being late-comers; they are achieving success as imitators. Whatever disadvantages they may have to encounter in other respects, the developing countries will thus have achieved a structural advantage over the developed countries, since innovations and changes which are marginal in the industrialized countries and affect the average only in the long run, can significantly affect the total structure in the less industrialized countries. The more sophisticated type of technology calls for a larger capital investment. However, it is also true that, in the case of sophisticated equipment and processes, the output from a given amount of capital is likely to be greatest. Sophisticated industries, in other words, are not only capital intensive, but also capital saving.[24]

Finally, Gershenkron, after a study of the experiences of European industrialization, points out the close relationship between economic backwardness and the development of capital intensive industries. According to him, "industrialization always seemed the more promising the greater the backlog of technological innovations which the backward country could take over from the more advanced country. Borrowed technology, so much and so rightly stressed by Veblen, was one of the primary factors assuring a high speed of development in a backward country entering the stage of industrialization ..... To the extent that industrialization took place, it was largely by application of the most modern and efficient techniques that back-

[20] F. A. Hayek comment on S. Kuznets, "Toward a Theory of Economic Growth", in R. Lekachman (ed), *National Policy for Economic Welfare at Home and Abroad*, Doubleday, Garden City, N.Y., 1955, p. 89.

[21] Bruton, H.J., "Growth models and underdeveloped countries", *Journal of Political Economy*, August 1955.

[22] W. Galenson and H. Leibenstein, "Investment Criteria, Productivity and Economic Development", *Quarterly Journal of Economics*, August 1955, pp. 343-370.

[23] United Nations Centre for Industrial Development, "General study of exports of manufactures and semi-manufactures from developing countries and their role in development," in United Nations Conference on Trade and Development, *Trade in Manufactures* (UN Publication Sales No.:64.11.B.14), New York, 1964, p. 68.

[24] ECAFE, Prospects for industrial exports, and measures for their increased production and trade, with special reference to ECAFE developing countries (E/CN.11/I&NR/L.66, 20 December 1966), p. 24.

ward countries could hope to achieve success ..... The advantages inherent in the use of technologically superior equipment were not counteracted but enhanced by its labour-saving effect."[25]

V. Import Substitution in Postwar Industrial Developments[26]

Now that we have surveyed the strategy for industrial development in general terms, we may next take a look at the actual developments in this regard among the ECAFE developing countries. Insofar as ECAFE developing countries, with the exception of perhaps China and India, started their industrialization only in postwar years, such industrialization commenced naturally with import substitution, at first of consumer goods for which there was already an assured market developed by the very imports to be substituted, and then also of industrial intermediates used for the production of consumer goods themselves, such as iron and steel, paper, basic chemicals (soda ash, caustic soda, and sulphuric acid), and petro-chemicals. As the production capacity grew and became too large for the domestic market, some of the industries originally designed for the production of import substitutes in the domestic market, also began to look beyond the national boundaries for the market outlet. The import substitution industries gradually catered to the export markets, and became known as export industries. export markets, and became known as export industries. It is therefore pertinent, in this connexion, to make a brief analysis of import substitution and export diversification in postwar manufacturing industries.

In prewar years going back to the nineteenth century, it is upon a primary industry base (mainly of food and raw materials) that the economies of ECAFE developing countries were built up. These were precisely the products that the food-hungry, industrializing countries of Europe and the New World demanded; in exchange they could offer manufactures. This arrangement benefited both types of economy to the extent that they enjoyed a faster rate of growth than would otherwise have been possible. However, by the end of the World War II, there began the wholesale move towards industrialization on the part of the ECAFE developing countries. It was from this time that manufacturing production began to grow significantly, concomitant with moves on the part of most ECAFE developing countries towards political and economic independence and the achievement of ultimate economic self-sufficiency through economic development. The achievement of these goals was to be assisted by — among other measures — import substitution and export diversification.

Motives for import substitution. The motives for import substitution in the postwar industralization of ECAFE developing countries are three-fold, namely, profit maximization, economic independence and self-sufficiency, and foreign exchange savings. Profit motives are uppermost in the minds of entrepreneurs in private enterprise economies, notably Hong Kong. In prewar years before the emergence of economic planning, they were also at work in countries that industrialized, especially India and China. Import substitution may aim at economic independence and self-sufficiency. Industries developed in hinterland China under the Japanese blockade during the Second World War were designed to meet immediate requirements. After the war, political independence in many countries prompted them to aim at economic independence, not only in basic consumption goods, such as food and clothing, but also in capital goods. In these cases, especially in regard to capital goods, cost may be a secondary consideration, and plans go ahead in spite of the shortage of domestic saving and foreign exchange, mainly by hastening capital formation at the expense of private consumption, as in the case of centrally planned economies of mainland China and other countries. Finally, when foreign exchange is the scarce factor, as in the postwar years for the region, a separate element is added to other criteria considered by governments with regard to the selection of alternative projects. The stronger the foreign exchange constraint relatively to other scarcities, the greater is the weight that must be given to a project promising to reduce future calls on foreign exchange or to increase its availabilities. However, import substitution in any plan does not aim at a reduction of total imports, but at a saving of foreign exchange in order to allow for imports of capital goods or certain basic consumption goods which cannot be adequately produced at home in the near future.

Criteria for selection of industries. The choice of industries for the purpose of import substitution is affected by the motives outlined above, and other relevant considerations. Many ECAFE developing countries started their course of industrialization by pursuing the orthodox road of developing the consumer goods industries, in accordance with the local availability of raw materials, labour and markets. However, in large self-contained countries like mainland China and India, where natural resources are abundant, development needs large, and the export surplus small in relation to the import requirements of development, the governments, besides promoting self-sufficiency in basic consumption goods, give top priority to heavy industries. Nevertheless, the establishment of a series of basic industries requires large capital resources and the process takes a considerable time to "ripen" to the stage of final consumption goods. Although neither of these countries neglects the development of agriculture and of consumer goods industries, the commitment of large resources to early stage intermediate goods has

[25] Gerschenkron, *op. cit.*, pp. 8-9.

[26] The present section has drawn heavily on a special study on "Import substitution and export diversification" in the United Nations, *Economic Survey of Asia and the Far East, 1963*, Part I.

left inadequate resources for the production of final consumption goods including foodstuffs. Finally, for small countries with high population density, emphasis is placed on the development of export industries, as in the case of Hong Kong and China (Taiwan). These industries, while taking advantage of an abundant supply of industrious but low cost labour and providing the much needed employment for the surplus labour, are spreading to other developing countries in the region like South Korea and the Philippines, and are tending to shift from consumer goods industries like textiles and clothing to industries producing intermediate products which have considerable forward and backward linkage effects, and therefore enjoy the benefits of dynamic growth so much desired by the developing countries.

Extent of import substitution. To what extent import substitution and export diversification has proceeded in ECAFE developing countries may be gauged indirectly from their import statistics, on the understanding that a change in the composition of imports may show a trend of economic development leading to import substitution. Table 4 shows how imports of material for consumption goods have been substituted for imports of final consumption goods, excluding food.[27] In general, an increase in the ratio of the import of material for consumption goods to the import of consumption goods indicates, especially in countries where domestic production of material is inadequate, a more developed consumption goods industry. With the exception of Cambodia, Laos, Sabah and Sarawak, all countries show a significant substitution of material for imports of consumption goods (see columns 3 and 6), indicating either industrialization or stricter control over the import of final consumption goods, or both. Needless to say, the percentage change is highly dependent on the industrial development in the initial period, 1953 - 1954, and this factor has inflated the figures for certain countries. In Burma, India, the Philippines and the Republic of Viet-Nam, the import of final consumption goods other than food has actually declined. However, the reduction in the import of consumption goods, for example in Burma, without a corresponding increase in the import of materials, may have reduced the domestic supply of certain consumption goods because of import control. In contrast, dependence on imports of material has been very large in Japan and is still increasing. This may be the direction of development which many developing countries without adequate domestic material resources may take in the future.

[27] Food is excluded from consumption goods because, with the exception of China (Taiwan), imported input for food production is very small. The same applies to table 5.

Table 4

SUBSTITUTION OF IMPORT OF MATERIAL FOR CONSUMPTION GOODS, FOR IMPORT OF CONSUMPTION GOODS (EXCLUDING FOOD) (IN PERCENTAGES)

Country	*Ratio of import of material for consumption goods to import of consumption goods*			*Annual compound rate of change at constant prices*		
	1953-1954	*1961-1962*	*Per cent change*	*Import of material for consumption goods*	*Import of consumption goods*	*(4)-(5)*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Burma	43	60	+ 40	+ 0.9	− 3.1	+ 4.0
Cambodia	20[a]	17	− 15	+ 2.8	+ 6.0	− 3.2
Ceylon	41	65	+ 59	+ 8.5	+ 2.4	+ 6.1
China (Taiwan)	374	660	+ 76	+20.7	+12.5	+ 8.2
India	179	426	+138	+ 6.3	− 4.6	+10.9
Indonesia	63	95[b]	+ 51	+ 8.1	+ 2.3	+ 5.8
Korea, Republic of	211	685	+225	+17.3	+ 1.2	+16.1
Laos	31[a]	26	− 16	+14.7	+17.7	− 3.0
Malaysia						
Federation and Singapore	64	100	+ 56	+ 8.5	+ 2.6	+ 5.9
Sabah	38	31	− 18	+13.8	+16.6	− 2.8
Sarawak	624	395	− 37	− 3.0	+ 2.7	− 5.7
Pakistan	119	193	+ 62	+12.3	+ 5.6	+ 6.7
Philippines	56	253	+352	+ 6.2	−12.1	+18.3
Thailand	25	45	+ 80	+11.6	+ 3.7	+ 7.9
Viet-Nam, Republic of	27[a]	101	+274	+ 7.1	−12.8	+19.9
Average of developing ECAFE countries[c]	96	152	+ 58	+ 7.5	+ 1.4	+ 6.1
Japan	1,670	1,993	+ 19	+12.4	+ 9.9	+ 2.5

[a] 1955.
[b] 1961.
[c] Excluding Cambodia, Laos and the Republic of Viet-Nam, for which statistics for 1953-1954 are not available.

Since developing countries depend mainly on imports for the supply of capital goods, additional evidence of industrial development may be deduced from the substitution of imports of capital goods for imports of consumption goods. In Table 5, all countries except Laos show such substitution, indicating the progress of industrial development. Again, the relative change depends upon the initial position. Countries with a high rate of substitution and high ratios of capital goods import to consumption goods import include China (Taiwan), India, the Republic of Korea, Pakistan, the Philippines and the Republic of Viet-Nam. In these countries, there appear to have been considerable industrial activities with a high rate of development.

Table 5

SUBSTITUTION OF IMPORT OF CAPITAL GOODS FOR IMPORT OF CONSUMPTION GOODS (EXCLUDING FOOD) (IN PERCENTAGES)

Country	*Ratio of import of capital goods to import of consumption goods*			*Annual compound rate of change at constant prices*		
	1953-1954 average (1)	*1961-1962 average (2)*	*Per cent change (3)*	*Import of capital goods (4)*	*Import of consumption goods (5)*	*(4)-(5) (6)*
Burma	63	139	+121	+ 6.7	− 3.1	+ 9.8
Cambodia	33[a]	83	+152	+22.2	+ 6.0	+16.2
Ceylon	70	103	+ 47	+ 7.4	+ 2.4	+ 5.0
China (Taiwan)	221	507	+129	+24.8	+12.5	+12.3
India	181	766	+323	+14.3	− 4.6	+18.9
Indonesia	94	116[b]	+ 23	+ 5.2	+ 2.3	+ 2.9
Korea, Republic of	78	289	+271	+19.2	+ 1.2	+18.0
Laos	71[a]	39	− 45	+ 7.6	+17.7	−10.1
Malaysia						
Federation and Singapore	45	80	+ 78	+10.1	+ 2.6	+ 7.5
Sabah	60	72	+ 20	+19.2	+16.6	+ 2.6
Sarawak	65	82	+ 26	+ 5.8	+ 2.7	+ 3.1
Pakistan	212	505	+138	+17.8	+ 5.6	+12.2
Philippines	71	446	+528	+10.5	−12.1	+22.6
Thailand	89	126	+ 42	+ 8.4	+ 3.7	+ 4.7
Viet-Nam, Republic of	28[a]	166	+493	+14.8	−12.8	+27.6
Average of developing ECAFE countries[c]	89	193	+117	+11.8	+ 1.4	+10.4
Japan	281	589	+110	+20.6	+ 9.9	+10.7

[a] 1955.

[b] 1961.

[c] Excluding Cambodia, Laos and the Republic of Viet-Nam, for which statistics for 1953-1954 are not available.

Substitution of imported material to be used in manufacturing capital goods for imported capital goods, as shown in table 6, has more complicated implications. It depends on both the nature of the requirements for capital goods and the development of capital goods industries. As the capital goods industries in developing countries are still at an infant stage, it can hardly be expected that the import of material for capital goods will provide complete substitution for the import of capital goods. While the large rate of increase in the import of capital goods as well as of material for capital goods (columns 4 and 5) in China (Taiwan), India, the Republic of Korea and Pakistan was for development, the higher rate of increase in column 4 over column 5 in Burma, Cambodia, Laos, Sarawak, and Thailand was the result not of the development of capital goods industries but of the nature of the investments. By contrast, Japan, which is building up its capital goods industry, is substituting the import of material for capital goods for the import of capital goods.

Table 6. SUBSTITUTION OF IMPORT OF MATERIAL FOR CAPITAL GOODS, FOR IMPORT OF CAPITAL GOODS (IN PERCENTAGES)

Country	*Ratio of import of material for capital goods to import of capital goods*			*Annual compound rate of change at constant prices*		
	1953-1954 average (1)	*1961-1962 average (2)*	*Per cent change (3)*	*Import of material for capital goods (4)*	*Import of capital goods (5)*	*(4)-(5) (6)*
Burma	28	39	+ 39	+11.4	+ 6.7	+ 4.7
Cambodia	56[a]	58	+ 4	+22.5	+22.2	+ 0.3
Ceylon	70	48	− 31	+ 2.4	+ 7.4	− 5.0
China (Taiwan)	24	22	− 8	+23.2	+24.8	− 1.6
India	33	18	− 45	+ 6.3	+14.3	− 8.0
Indonesia	22	14[b]	− 36	− 0.8	+ 5.2	− 6.0
Korea, Republic of	61	51	− 16	+16.5	+19.2	− 2.7
Laos	46[a]	87	+ 89	+18.6	+ 7.6	+11.0
Malaysia						
Federation and Singapore	109	143	+ 31	+ 4.2	+10.1	− 5.9
Sabah	32	27	− 16	+16.8	+19.2	− 2.4
Sarawak	24	28	+ 17	+ 7.7	+ 5.8	+ 1.9
Pakistan	39	30	− 23	+13.9	+17.8	− 3.9
Philippines	51	11	− 78	− 8.5	+10.5	−19.9
Thailand	25	27	+ 8	+ 9.5	+ 8.4	+ 1.1
Viet-Nam, Republic of	49[a]	35	− 29	+ 8.8	+14.8	− 6.0
Average of developing ECAFE countries[c]	43	28	− 35	+ 5.9	+11.8	− 5.9
Japan	189	208	+ 10	+22.0	+20.6	+ 1.4

[a] 1955.

[b] 1961.

[c] Excluding Cambodia, Laos and the Republic of Viet-Nam, for which statistics for 1953-1954 are not available.

Progress in individual commodities. Progress in the import substitution of individual industrial goods varies with countries. ECAFE, in its 1963 annual economic survey, has made a tabulation to show the proportion of 1962 total supply met by domestic production for a number of countries including Burma, Ceylon, China (Taiwan), India, Indonesia, South Korea, Federation of Malaya, Pakistan, the Philippines, and Thailand.[28] *India,* which has a wider industrial base than other developing ECAFE countries, shows successful import substitution not only in consumption goods, but also in industrial intermediates and capital goods. In regard to consumer goods, India in 1962 was completely self-sufficient in cotton piece goods and sugar, and almost so in electric bulbs (99%), sheet and plate glass (92%), gasoline (91%), and diesel oil (78%). For industrial intermediates, India was completely self-sufficient in cotton yarn, basic chemicals (sulphuric acid, nitric acid, caustic soda, hydrochloric acid), super phosphate and automobile tyres, and almost so in crude steel (98%), printing and writing paper (97%), aluminium sheet and circle (88%), soda ash (85%), rayon filament (83%), finished steel (82%), electric wires and cables (71%) and caustic soda (59%). She however had to depend largely on imports for newsprint (21 per cent self-sufficiency) and ammonium sulphate (42 per cent self-sufficiency). Finally, India was self-sufficient in durable consumer goods (100 per cent for bicycles and electric fans, 99 per cent for automobiles, room air conditioners, and sewing machines, 98 per cent for typewriters and radios, and 94 per cent for refrigerators) as well as in capital goods (100 per cent for sugar machinery, 84 per cent for diesel engines, 75 per cent for electric motors, and 64 per cent for cotton textile machinery). It was only in respect of machine tools that she had to depend on imports to the extent of 66 per cent of total supply. In short, by 1962, India had achieved more than 90 per cent self-sufficiency in two thirds of the commodities selected, for which comparable production and trade statistics were available. Furthermore, one third of the commodities had also achieved a varying degree of export, to the extent of from 1 to 51 per cent of production in 1962. These commodities, with percentages of export in total production in backets, included: automobile tyres (51), gasoline (23), sewing machines (17), sugar (14), electric fans (10), Diesel engines (8), cotton piecegoods (7), typewriters (3), electric bulbs (2), cotton yarn, room air conditioners and sugar machinery (1 each).

[28] United Nations, *Economic Survey of Asia and the Far East, 1963,* tables 11-13, pp. 41-43.

China (Taiwan) forms an interesting contrast to India. Because of the considerably smaller domestic market it is easier to reach, in a relatively short period, full or near-full self-sufficiency in a number of commodities whose optimum scale is large relative to the domestic market or whose establishment and operation require small capital and simpler techniques (e.g. textiles). Also, heavy industries and machines are much less developed than in India; import substitution of engineering products, though proceeding rapidly, is less than has been achieved in India. The major import substituting activities in China (Taiwan) after the Second World War were in textiles, including cotton and synthetic yarn and fabrics. By 1962 China (Taiwan) was therefore more or less self-sufficient in a larger number of industrial intermediates than in India, and had in some cases achieved a fairly high degree of export. But in capital goods industries, China (Taiwan) was behind India.

By 1962 China (Taiwan) was completely self-sufficient in consumer goods articles like cotton and woollen fabrics, wheat flour, gasoline and plate glass, and nearly so in others like synthetic fabrics (99%) and electric bulbs (82%). For industrial intermediates, she was completely self-sufficient in basic chemicals (sulphuric acid, nitric acid, hydrochloric acid, caustic soda and soda ash), aluminium sheet, plywood, newsprint, cotton and synthetic yarn, and cement, and nearly so in aluminium foil and gunny bags (99%), fire bricks (97%), automobile tyres and tubes, paper boards and woollen yarn (96%), paints and asphalt (95%), crude steel (94%), printing ink (84%), dry cells (68%), and iron wire (60%). She was, however, half self-sufficient in pulp (50%) and nitrogenous fertilizer (49%). For durable consumer goods, China (Taiwan) was completely self-sufficient in bicycles, and partly so for trucks and buses (73%) and sewing machines (17%). For capital goods, she was self-sufficient by 80 per cent in electric meters but by only one per cent in prime movers.

By 1962, of the 37 items listed China (Taiwan) was 90 per cent or more self-sufficient in three fourths; she had also achieved an export share equal to 1-74 per cent of production for 31 items. In 12 items the share of export in production exceeded one fifth or more; these items, with the percentages in brackets, are as follows: plywood (74), gunny bags (68), asphalt (55), synthetic yarn (51), prime movers (44), cotton fabrics (41), paper board (39), plate glass (30), woollen yarn (29), cement (27), aluminum sheet (21) and iron wire (21).

The lists of commodities for which statistics are available are much shorter in other countries. In *Burma,* production met only a part of total supply in 1961, being 72 per cent for sugar, 28 per cent for cement, 27 per cent for cotton yarn, and 23 per cent for gunny bags. In *Ceylon,* the new industries are progressing fast. In 1962, production met over 90 per cent of supply for footwear, bicycle tubes and bicycle tyres, but around 40 per cent for caustic soda and printing and writing paper. In *Indonesia,* also in 1962, production met 84 per cent of supply for gasoline and 80 per cent for cement. Fifty-eight per cent of the gasoline production was exported. In the *Federation of Malaya,* cement achieved a 62 per cent self-sufficiency in 1962. In the *Republic of Korea* in 1962 self-sufficiency was achieved in rubber tyres, cotton yarn and thread, and cotton fabrics. In other industries, a smaller share of production in supply was recorded: 94 per cent in newsprint, 90 per cent in printing paper and kraft paper, 81 per cent in cement, 50 per cent in urea fertilizer, and 16 per cent in uncoated steel plates and sheets. Twenty-three per cent of the steel plates and sheets produced and 15 per cent of cotton fabrics were exported. In *Pakistan,* 7 of the 12 industries listed had achieved by 1962 a self-sufficiency of 80 per cent or more, these being cotton yarn and jute manufactures (100%), cotton piecegoods (99%), tyres and tubes (95%), cement (93%), steel (87%) and paper (84%). The other five industries showed the following percentages of self-sufficiency: sugar (63%), soda ash (53%), motor spirit (38%), ammonium sulphate (37%), and kerosene (10%). The share of production exported reached the following proportions: 76 per cent for jute manufactures, 19 per cent for paper, 18 per cent for cotton piecegoods, 2 per cent for cement, and 1 per cent for cotton yarn. In the *Philippines* in 1961 the increase in the extent of import substitution was rather high, because of the relatively small domestic market. In 1961, 8 of the 13 industries selected had achieved a self-sufficiency of 80 per cent or more; these industries, with the percentages in brackets, were as follows: tin cans (100), cement and writing paper (99), automobile tyres (98), cotton yarn, air conditioners, and refrigerators (97), gasoline (82). For the other five industries the share of production in supply was from 20 to 76 per cent: distilled fuel oil (76), cotton fabrics (67), kraft paper (60), fertilizer (38) and caustic soda (20). In *Thailand* in 1962, import substitution made sugar self-sufficient, and cement to the extent of 97 per cent. For gunny bags and paper, the share of production in supply was 26 per cent and 9 per cent respectively. The share of production exported reached 19 per cent for cement, 7 per cent for sugar, and 1 per cent for both paper and gunny bags.

In this connexion six industries, all of which figure prominently in the import substituting policies of a number of countries, are tabulated in table 7 in regard to the extent of self-sufficiency and/or possibility for export, in 1961 or 1962. These are cotton, sugar, paper, cement, fertilizer and steel. Cotton textiles, sugar and paper are commodities in which increased

production and substitution will assist in raisng living levels as well as assisting growth generally. Cement, fertilizer and steel, essentially strategic producer goods, have problems distinct from those affecting the first group. Some of the commodities, for example cement and fertilizers, are bulky in relation to their value; while several rely on bulky inputs: refined sugar, crude steel and cement. Most are heavy users of power and fuel; their development depends crucially on the expansion of these inputs and where power generation has to be provided by the individual producer himself, the over-all cost of investment is greatly increased. Several of the commodities, for example sugar, steel, cement and fertilizers, are capital intensive well above the average of general manufacturing.

As shown in table 7, most countries have developed cotton, paper, sugar and cement industries to a varying extent, with some countries having a surplus for export. On the other hand, only a few countries have developed fertilizer and steel industries solely for the purpose of import substitution, without any export to other countries. Export industries are especially developed in a small country like China (Taiwan), where many import substituting industries have already met limited local demand and hence for the economy of scale must expand to foreign markets for optimal scale operation. A large country like India, on the other hand, has to rely on foreign markets since the domestic market may be limited by small demand owing to low incomes and there is need for the country to earn foreign exchange to pay for developmental imports. For products in which the country enjoys the availability of raw material and labour, as in the case of several industries, India has advantage in promoting experts provided importing countries provide facilities, encouragement and assistance.

Table 7. ECAFE DEVELOPING COUNTRIES: EXTENT OF IMPORT SUBSTITUTION IN SELECTED INDUSTRIES, 1962[1]

	Production as per cent of total supply	*Export as per cent of production*
Cotton yarn		
Burma	27	—
China (Taiwan)	100	15
India	100	1
Korea, South	100	
Pakistan	100	1
Philippines	97	—
Cotton fabrics		
China (Taiwan)	100	41
India	100	7
Korea, South	100	15
Pakistan	99	18
Philippines	67	—
Paper		
Ceylon		
Printing and writing paper	37	—
China (Taiwan)		
Newsprint	100	18
Paper board	96	39
Pulp	50	1
India		
Newsprint	21	—
Printing and writing paper	97	—
Korea, South		
Newsprint	94	—
Printing paper	90	—
Kraft paper	90	—
Pakistan	84	19
Philippines		
Writing paper	99	—
Kraft paper	60	—
Thailand	9	1
Sugar		
Burma	72	1
India	100	14
Pakistan	63	—
Thailand	100	7
Cement		
Burma	28	—
China (Taiwan)	100	27
Indonesia	80	—
Korea, South	81	1
Malaya, Federation of	62	1
Pakistan	93	2
Philippines	99	—
Thailand	97	19
Fertilizer		
China (Taiwan) — Nitrogenous	49	—
India		
Ammonium sulphate	42	—
Super phosphate	100	—
Korea, South		
Urea	50	—
Pakistan		
Ammonium sulphate	37	—
Philippines	38	—
Steel		
China (Taiwan)		
Crude Steel	94	—
India		
Crude steel	98	—
Finished steel	82	—
Pakistan	87	—

Source: United Nations, *Economic Survey of Asia and the Far East, 1963*, tables 11-13.

[1] For Burma and the Philippines the data are for 1961.

VI. Development of Export Industries

Import substitution, which has been the principal feature of industrialization in ECAFE developing countries during the past two decades of the postwar period, cannot proceed further, especially among the smaller countries whose size in terms of population, income, and natural resource endowment affords only a relatively narrow domestic base for industrial development. In these and other countries faced with increasing balance-of-payments difficulties arising from a decline in the capacity to import caused by adverse terms of trade and other difficulties, the trend has increasingly been to alter the composition of exports, from the primary materials with a stagnant growth to the more dynamic manufactured goods. An export-oriented pattern of industrial development thus answers two key requirements of economic growth. First, it is needed to increase the import capacity of the developing countries, particularly with respect to the capital goods which are crucial to their continued development. Secondly, and equally important, a more pronounced orientation towards exports is needed to broaden the market base for the industrialization efforts of the developing countries, thus enabling them to take advantage of the opportunities afforded by the application of modern techniques of large-scale production, and to avoid industrial inefficiencies inherent in production for a small sheltered domestic market.[29]

A. Over-all position in 1965

In 1965, of a total import of $7,380 million of manufactures and semi-manufactures from the developing countries to the developed countries of the world, $2,254 million or 30.5 per cent came from the ten ECAFE developing countries of China (Taiwan), Hong Kong, India, Indonesia, Iran, South Korea, Malaysia, Pakistan, the Philippines and Thailand. Five countries, namely, China (Taiwan), Hong Kong, India, Iran and Malaysia, supplied as much as 85 per cent of the total, with Hong Kong taking the leading position (33.2%), followed by India (22.3%), Malaysia (16.0%), Iran (7.3%), and China (Taiwan) (6.5%). During 1961-1965 the Republic of Korea, starting with a small base of less than one million dollars' industrial export in 1961, had the highest average annual growth rate of 187 per cent, followed by China (Taiwan) (40.2 per cent), Hong Kong (23.4 per cent), Malaysia (17.4 per cent), Iran (15 per cent), Pakistan (11.8 per cent), the Philippines (10.8 per cent), Indonesia (7.5 per cent), India (5.1 per cent), and Thailand (3.5 per cent). The rates of growth, as given here to cover industrial exports from the ECAFE developing countries to the developed countries only, may however differ if another compilation, which would be highly laborious and time-consuming, could be made to cover industrial exports from the ECAFE developing countries to both the developed countries and the developing countries.[30] UNCTAD, in concentrating its statistical analysis on the import of manufactures and semi-manufactures from the developing countries into the developed countries, is merely stressing the importance of a greater export to the developed rather than the developing countries of industrial products from the developing countries, as it is from the developed countries mainly that the developing countries have to import most of their capital goods required for the purpose of industrialization, which have to be paid for, in the long run, mainly through the export of dynamic industrial items rather than stagnant primary products.

Of the total import of $2,254 million in 1965 from the ECAFE developing countries to the developed countries, 19 items, each having an import value of one per cent of the total or more, accounted for 88.5 per cent of the total import. Percentage-wise, these may be grouped together as follows:

Textiles and clothing	39.3 per cent
Tin	11.5 per cent
Petroleum products	6.6 per cent
Processed wood, veneer, plywood etc.	6.2 per cent
Floor covering, tapestry	5.2 per cent
Processed fruits and vegetables	4.3 per cent
Leather	3.0 per cent
Perambulators, toys, games and sporting goods	2.6 per cent
Pearls, precious and semi-precious stones	2.4 per cent
Other items	7.4 per cent
Total	88.5 per cent

The major groups of industrial exports from the ECAFE developing countries, as shown above, are light industry products for final consumption, including textiles and clothing, footwear, processed fruits and vegetables, floor covering and tapestries, pearls and stones, etc., although industrial intermediates such as tin and processed wood, and capital goods such as tele-communications apparatus, are increasing in importance. Many of these exports, such as textiles and clothing, canned food, processed wood, and handicraft products like tapestries, pearls and stones, perambulators and toys, are labour intensive. Some export items are

[29] United Nations Industrial Development Organization (UNIDO), Report of the Activities and Programme of Work of UNIDO (ID/B/4 14 March 1967), para. 55-56.

[30] In the case of Thailand, while the rate of growth of imports of manufactures and semi-manufactures into developed countries from Thailand during 1961-65 is, as shown in table 8a, to be 3.5 per cent, it is much lower than the rate of growth during 1960-65 of Thailand's exports of manufactures and semi-manufactures to all countries, including the developed countries. (See UNCTAD, Short and medium-term prospects for export of manufactures from selected developing countries — Thailand (TD/B/C.2/42, 15 June 1967), p. 13, para. 21 table 5.) The discrepancy arises mainly from the high rate of growth of industrial exports like cement, petroleum products, unwrought tin, maize meal, etc. from Thailand to other developing countries.

processed from the locally available materials, especially unwrought tin, petroleum products, processed wood, canned fruits and vegetables, etc.

Textiles and clothing, accounting for almost 40 per cent of the total industrial exports from the ECAFE developing countries to the developed countries, are exported mainly from six countries listed according to importance as follows: Hong Kong, India, Pakistan, the Philippines, China (Taiwan) and South Korea. Clothing comes mainly from Hong Kong, while textile yarns and fabrics are exported, in order of importance, from India, Hong Kong, Pakistan, South Korea, China (Taiwan) and the Philippines. The share of ECAFE developing countries in all developing countries, reached as high as 87 per cent in 1965.

EXPORTS OF TEXTILES AND CLOTHING FROM MAJOR ECAFE COUNTRIES, 1965

(in million dollars)

	Textiles	*Clothing*	*Textiles and clothing*
China (Taiwan)	10.5	15.7	26.2
Hong Kong	107.4	301.2	408.6
India	333.2	4.5	337.7
Korea, South	12.6	17.1	29.7
Pakistan	44.8	0.5	45.3
Philippines	1.4	29.6	31.0
Total major ECAFE developing countries	509.9	368.6	878.5
Total ECAFE developing countries	514.2	373.0	887.2
Total all developing countries	593.2	431.6	1,024.8
% of ECAFE in all developing countries	86.7%	86.5%	86.6%

Over three quarters of tin exports in 1965 from the ECAFE developing countries are from Malaysia alone, while only less than one quarter is supplied by Thailand and Indonesia. ECAFE developing countries supplied 83 per cent of the total tin export from all developing countries in 1965.

Ninety-seven per cent of petroleum products exported from ECAFE developing countries in 1965 came from Iran, Indonesia and Malaysia[31] (mainly Brunei). ECAFE developing countries supplied, however, only 8.6 per cent of total exports of petroleum products from all developing countries in that year.

Processed wood, veneer and plywood are exported from five ECAFE developing countries listed according to importance as follows: Malaysia, Philippines, China (Taiwan), South Korea and Thailand. Processed wood is mainly from Malaysia, while veneer and plywood are from the Philippines, China (Taiwan), South Korea and Malaysia. The ECAFE developing countries supplied 33 per cent of processed wood export, and 58 per cent of veneer and plywood export, from all developing countries in 1965.

Preserved fruits and vegetables are exported mainly from four ECAFE developing countries listed according to importance as follows: China (Taiwan), Malaysia, Philippines, and Thailand. The ECAFE developing countries supplied 34 per cent of preserved fruits export, and 59 per cent of preserved vegetables export, from all developing countries in 1965.

Three quarters of the export of floor coverings and tapestry in 1965 from the ECAFE developing countries came from Iran, while the other quarter was from India, Pakistan and Hong Kong. The ECAFE developing countries supplied 84 per cent of the total export under this item from all developing countries in that year.

Leather export is from India and Pakistan, both supplying in 1965 69 per cent of total export under this item from all developing countries.

Export of perambulators, toys, games and sporting goods is almost exclusively from Hong Kong, followed by Pakistan, China (Taiwan), India and South Korea. These countries in 1965 supplied 92 per cent of the total from all developing countries.

Pearls, precious and semi-precious stones are exported mainly from India and Hong Kong (noted for workmanship), but also from Thailand. The total export from ECAFE developing countries in 1965 constituted only 15 per cent of total export under this item from all developing countries.

Among the other smaller items, footwear is exported mainly from Hong Kong, and tele-communications apparatus also from Hong Kong. For the composite group of manufactured articles n.e.s. over 90 per cent of the export from all ECAFE developing countries in 1965 are from Hong Kong, with a small share from South Korea and China (Taiwan). These three countries, it may be noted, had the highest rate of growth for industrial exports during 1961-1965.

[31] UNCTAD in a footnote to its tabulation for Malaysia under SITC item 332 on petroleum products specifies that Malaysia covers "North Borneo, Brunei, Malaya, Sarawak and Singapore". (UNCTAD, Statistics of Imports of Manufactures and Semi-manufactures from Developing Countries into Selected Developed Countries in 1965, Geneva, 1967).

Table 8a. IMPORTS[1] OF MANUFACTURES AND SEMI-MANUFACTURES INTO DEVELOPED COUNTRIES[2] FROM ECAFE DEVELOPING COUNTRIES[3] FOR 1965

(Value in '000 US$)

Manufacture or Semi-Manufacture	SITC		China (Taiwan)	Hong Kong	India	Indonesia	Iran	Korea Rep.	Malaysia	Pakistan	Philippines	Thailand	Total ECAFE developing countries		Total developing countries	% of ECAFE in total developing countries
													Value	%		
M	053	Fruit, preserved and preparations	22,696	2,145	344	—	—	—	13,238	—	13,092	—	51,515	2.3	153,819	33.5
M	055	Vegetables, roots and tubers, preserved or prepared, n.e.s.	30,892	516	—	—	—	—	949	117	158	12,222	45,727	2.0	77,913	58.7
S	243	Wood, shaped or simply worked	8,016	1,081	—	756	—	—	47,902	—	4,975	8,438	71,168	3.2	216,241	32.9
M	332	Petroleum products	—	—	3,732	48,745	62,561	—	33,327	496	—	208	149,069	6.6	1,739,130	8.6
S	611	Leather	—	—	54,744	—	—	—	—	11,926	—	—	66,670	3.0	96,559	69.0
S	631	Veneer, plywood boards, "improved" or reconstituted wood, and other wood, worked, n.e.s.	22,249	109	—	—	—	14,684	2,954	—	28,715	—	68,712	3.0	117,611	58.4
S	651	Textile yarn and thread	—	6,581	18,138	—	—	—	—	618	—	—	25,337	1.1	55,702	45.5
S	652	Cotton fabrics, woven	8,853	70,068	63,925	—	—	7,558	2,252	13,986	525	—	167,167	7.4	194,021	86.2
S	653	Textile fabrics, woven, other than cotton fabrics	1,043	4,125	211,831	—	—	4,574	—	19,909	292	494	242,268	10.8	252,244	96.0
M	656	Made-up articles, wholly or chiefly of textile materials, n.e.s.	581	26,599	39,389	—	—	406	1,563	10,302	583	—	79,423	3.5	91,309	87.0
M	657	Floor coverings, tapestries, etc.	821	3,138	18,484	—	88,254	806	—	4,332	375	—	116,210	5.2	138,248	84.1
M	667	Pearls, precious and semi-precious stones, unworked or worked	—	22,201	27,875	—	256	—	496	—	—	3,028	53,856	2.4	364,918	14.8
S	687	Tin	—	382	—	2,966	—	—	239,798	—	—	15,152	258,298	11.5	308,737	83.7
M	724	Telecommunications apparatus	4,013	25,827	617	—	112	479	354	177	—	—	31,579	1.4	42,502	74.3
M	831	Travel goods, handbags and similar articles	110	21,901	—	—	—	—	—	—	—	—	22,011	1.0	24,272	90.7
M	841	Clothing (except fur clothing)	15,656	301,226	4,476	—	—	17,121	4,338	514	29,551	115	372,997	16.5	431,630	86.4
M	851	Footwear	2,599	24,146	2,653	—	—	3,740	157	501	—	—	33,796	1.5	42,594	79.3
M	894	Perambulators, toys, games and sporting goods	789	55,355	209	—	—	182	—	2,767	—	—	59,302	2.6	64,564	91.8
M	899	Manufactured articles, n.e.s.	1,413	72,958	231	287	—	3,095	—	—	974	—	78,958	3.5	90,976	86.8
		Sub-total	119,731	638,358	447,521	52,754	151,183	52,646	347,328	65,645	79,240	39,657	1,994,063	88.5	4,502,990	44.3
		Others	26,297	111,251	56,416	11,073	12,741	9,773	13,919	5,576	8,496	4,503	260,045	11.5	2,876,958	9.0
		1965 Total	146,028	749,609	503,937	63,827	163,924	62,419	361,247	71,221	87,736	44,160	2,254,108[3]	100.0	7,379,948	30.5
		1961 Total	37,825	323,933	412,365	47,888	93,661	927	190,099	45,540	58,117	38,508	1,670,183		4,911,227	
		Average annual growth rate 1961-65	40.2%	23.4%	5.1%	7.5%	15.0%	186.5%	17.4%	11.8%	10.8%	3.5%	7.8%		10.7%	

Source: UNCTAD, Statistics of Imports of Semi-manufactures from Developing Countries into Selected Developed Countries in 1965, Geneva, 1967.

Notes:

1 Only items having an export value in excess of $20 million are included.

2 Developed countries, referring to developed market economies, cover the United States, Canada, EEC countries (Belgium-Luxembourg, France, Federal Republic of Germany, Italy and Netherlands), EFTA countries [United Kingdom, Norway, Sweden, Denmark, Austria, Switzerland, Portugal and Finland (associate member)], Australia, New Zealand and Japan.

3 Total in Asia in 1965 reached $2,771 million. The smaller ECAFE countries of Afghanistan, Burma, Cambodia, Ceylon and Nepal which together accounted for $32 million, as well as non-ECAFE countries in Western Asia, are excluded.

Table 8b. PER CENT DISTRIBUTION OF IMPORTS OF MANUFACTURES AND SEMI-MANUFACTURES INTO DEVELOPED COUNTRIES FROM ECAFE DEVELOPING COUNTRIES FOR 1965

Manufacture or Semi-Manufacture	SITC		China (Taiwan)	Hong Kong	India	Indonesia	Iran	Korea Rep.	Malaysia	Pakistan	Philippines	Thailand	TOTAL
M	053	Fruit, preserved and preparations	44.0	4.2	0.7	—	—	—	25.7	—	25.4	—	100
M	055	Vegetables, roots and tubers, preserved or prepared, n.e.s.	67.6	1.1	1.9	—	—	—	2.1	0.3	0.3	26.7	100
S	243	Wood, shaped or simply worked	11.3	1.5	—	1.1	—	—	67.3	—	7.0	11.8	100
M	332	Petroleum products	—	—	2.5	32.7	42.0	—	22.4	0.3	—	0.1	100
S	611	Leather	—	—	82.1	—	—	—	—	17.9	—	—	100
S	631	Veneer, plywood boards, improved or reconstituted wood and other wood, worked, n.e.s.	32.4	0.1	—	—	—	21.4	4.3	—	41.8	—	100
S	651	Textile yarn and thread	—	26.0	71.6	—	—	—	—	2.4	—	—	100
S	652	Cotton fabrics, woven	5.3	41.9	38.2	—	—	4.5	1.4	8.4	0.3	—	100
S	653	Textile fabrics, woven, other than cotton fabrics	0.5	1.7	87.4	—	—	1.9	—	8.2	0.1	0.2	100
M	656	Made-up articles, wholly or chiefly of textile materials n.e.s.	0.7	33.5	49.6	—	—	0.5	2.0	13.0	0.7	—	100
M	657	Floor coverings, tapestries, etc.	0.7	2.7	15.9	—	76.0	0.7	—	3.7	0.3	—	100
M	667	Pearls, precious and semi-precious stones, unworked or worked	—	41.2	51.8	—	0.5	—	0.9	—	—	5.6	100
S	687	Tin	—	0.1	—	1.2	—	—	92.8	—	—	5.9	100
M	724	Telecommunications apparatus	12.7	81.8	1.9	—	0.4	1.5	1.1	0.6	—	—	100
M	831	Travel goods, handbags and similar articles	0.5	99.5	—	—	—	—	—	—	—	—	100
M	841	Clothing (except fur clothing)	4.2	80.8	1.2	—	—	4.6	1.2	0.1	7.9	0	100
M	851	Footwear	7.7	71.4	7.8	—	—	11.1	0.5	1.5	—	—	100
M	894	Perambulators, toys, games and sporting goods	1.3	93.3	0.4	—	—	0.3	—	4.7	—	—	100
M	899	Manufactured articles, n.e.s.	1.8	92.4	0.3	0.4	—	3.9	—	—	1.2	—	100
		Sub-Total	6.0	32.0	22.4	2.7	7.6	2.6	17.4	3.3	4.0	2.0	100
		Others	10.0	42.8	21.7	4.3	4.9	3.8	5.3	2.1	3.3	1.7	100
		Total	6.5	33.2	22.3	2.8	7.3	2.8	16.0	3.2	3.9	2.0	100

B. Criteria for the development of export industries

That the ECAFE developing countries supplied less than one third (30.5 per cent) of the total imports of manufactures and semi-manufactures from the developing countries into the developed countries in 1965 is evidence of the very weak position in the world market for industrial exports from the ECAFE developing countries. Both Latin America and Africa have a combined population of only a little over one half of the ECAFE developing countries, but together they supplied almost twice as much of imports of manufactures and semi-manufactures from the developing countries into the developed countries in 1965.[32] As shown in table 9, the non-ECAFE developing countries, as compared with the ECAFE developing countries, accounted in 1965 for a higher share in the import into developed countries of the following items: petroleum products, processed wood, pearls and precious and semi-precious stones, preserved fruits, and other items for which import from the ECAFE developing countries accounted in 1965 for less than twenty million dollars, notably copper, chemicals (organic and inorganic chemicals, medicinal and pharmaceutical products, chemical fertilizer), canned meat, iron and steel.

Table 9 also shows that the over-all share of ECAFE developing countries in the world import of manufactures and semi-manufactures in 1965 was only 2.9 per cent, as compared with 6.6 per cent for the other developing regions. This share varies, of course, for different manufactures and semi-manufactures. It is the highest for tin (59.4 per cent), the monopoly product of Asia, followed by other industrial exports consisting mainly of processed articles using local labour, skill and raw materials. Arranged according to the size of shares, these exports are: floor coverings and tapestries (24.5 per cent), clothing (except fur clothing) (18.5 per cent), leather (17.3 per cent), travel goods (17.0 per cent), preserved and prepared vegetables (16.1 per cent), textiles (12.5 per cent), veneer and plywood (12.3 per cent), perambulators, toys, games and sporting goods (10.9 per cent), preserved and prepared fruits (10.0 per cent), footwear (6.4 per cent), petroleum products (4.1 per cent), pearls and precious and semi-precious stones (3.9 per cent) and processed wood (3.8 per cent). Telecommunications apparatus, the only capital goods item, had a share of only 2.4 per cent in the world import into developed countries in 1965.

[32] In 1965, total imports of manufactures and semi-manufactures into developed countries reached the following totals (in million dollars) for the various developing regions: Asia 2,771 (ECAFE 2,254), Latin America 2,703, Africa 1,542, Europe (Yugoslavia) 280, Oceania 85, All developing countries 7,380. (See UNCTAD, Statistics of Imports of Semi-manufactures and Manufactures from Developing Countries into Selected Developed countries in 1965, Geneva, January 1967). As to 1965 population, the total is 243 million for Africa, 310 million for Latin America and around 900 million for the ECAFE developing countries.

Table 9. IMPORTS OF MANUFACTURES AND SEMI-MANUFACTURES FROM DEVELOPING COUNTRIES INTO DEVELOPED COUNTRIES, 1965 (in million dollars)

Manufacture or Semi-Manufacture	SITC		ECAFE developing countries	All developing countries	World	% of ECAFE developing countries in world	% of all developing countries in world
			(A)	(B)	(C)	(A/C)	(B/C)
M	053	Fruit, preserved and preparations	51.5	153.8	516.2	10.0	30.0
M	055	Vegetables, roots and tubers, preserved or prepared, n.e.s.	45.7	77.9	284.7	16.1	27.7
S	243	Wood, shaped or simply worked	71.2	216.2	1,843.6	3.8	11.7
M	332	Petroleum products	149.1	1,739.1	3,585.6	4.1	48.5
S	611	Leather	66.7	96.6	385.3	17.3	25.1
S	631	Veneer, plywood boards, improved or reconstituted wood and other wood, n.e.s.	68.7	117.6	560.4	12.3	21.0
S	651	Textile yarn and thread	25.3	55.7	1,205.7	2.1	4.6
S	652	Cotton fabrics, woven	167.2	194.0	782.0	21.4	24.8
S	653	Textile fabrics, woven, other than cotton fabrics	242.3	252.2	1,804.8	13.4	14.0
M	656	Made-up articles, wholly or chiefly of textile materials n.e.s.	79.4	91.3	308.2	25.8	29.6
M	657	Floor coverings, tapestries	116.2	138.2	476.6	24.5	29.0
M	667	Pearls, precious and semi-precious stones, unworked or worked	53.9	364.9	1,395.8	3.9	26.1
S	687	Tin	258.3	308.7	436.5	59.2	70.7
M	724	Telecommunications apparatus	31.6	42.5	1,288.2	2.4	3.3
M	831	Travel goods, handbags and similar articles	22.0	24.3	142.5	15.4	17.0
M	841	Clothing (except fur clothing)	373.0	431.6	2,018.7	18.5	21.4
M	851	Footwear	33.8	42.6	530.5	6.4	8.0
M	894	Perambulators, toys, games and sporting goods	59.3	64.6	562.5	10.9	11.5
M	899	Manufactured articles, n.e.s.	79.0	91.0	435.7	18.1	20.9
		Sub-Total	1,994.0	5,002.8	18,563.5	10.7	27.0
		Others	260.0	2,377.2	49,504.4	.005	4.8
		Total	2,254.1	7,380.0	78,067.9	2.9	9.5

Table 10. GROWTH IN THE IMPORT OF MANUFACTURES AND SEMI-MANUFACTURES FROM DEVELOPING COUNTRIES INTO DEVELOPED COUNTRIES, 1961-1965 (value in million dollars)

	ECAFE developing countries	All developing countries	World
Manufactures			
1961	602	2,742	29,244
1965	1,261	4,080	47,007
Semi-manufactures			
1961	646	2,169	21,033
1965	993	3,300	31,061
Total			
1961	1,248	4,911	50,277
1965	2,254	7,380	78,068
Annual growth rate, 1961-65 (%)			
Manufactures	20.3	10.5	12.6
Semi-manufactures	11.4	11.0	10.2
Total	15.9	10.7	11.6

Source: UNCTAD, Statistics of Imports of Semi-Manufactures and Manufactures from Developing Countries into Selected Developed Countries in 1965.

A redeeming feature in this connexion is the faster rate of growth during the past five years 1961-65 in the import of manufactures and semi-manufactures from the *ECAFE developing countries* into the developed countries than that from *all developing countries* or for the *world* as a whole. The average annual growth rate during 1961-65 for the import of manufactures and semi-manufactures from the ECAFE developing countries, at 15.9 per cent, is higher than that of 10.7 per cent from all developing countries, or 11.6 per cent from the world as a whole. From the ECAFE developing countries, also, the rate of import is higher for the import of manufactures (20.3 per cent) than that for the import of semi-manufactures (11.4 per cent). (see table 10).

This faster rate of growth of import of manufactures and semi-manufactures into the developed countries from the developing countries, particularly ECAFE developing countries, than from the developed countries themselves, is possible because of a much smaller initial base for industrial exports from the developing countries, particularly ECAFE developing countries. The latter, in order to maintain or even

accelerate this faster rate of increase than that for the former, would have to alter the composition of its industrial exports, from light consumer goods to heavy producer goods and industrial intermediates. This trend to structural change, gradual as it necessarily has to be, is seen in the slowly increasing share of chemicals, as well as machinery and transport equipment, in the export of manufactured goods from the developing countries for 1955 1960 and 1965, as shown in the table below.[33]

Year	*Share of manufactured goods in total export from developing countries*	*Share of chemicals and machinery and transport equipment in export of manufactured goods from developing countries*	
		Chemicals	*Machinery and transport equipment*
1955	12.8	8.0	4.0
1960	14.0	7.6	5.0
1965	17.5	8.1	6.2

However, as stated in an earlier ECAFE document, "for the exports of manufactures from the developing countries to grow at a higher rate than hitherto, it is imperative to develop export industries for which the products must command not only a high income elasticity of demand, but also be able to compete in respect of costs in the world market. The requirements are therefore rigorous, and the task of export promotion is far more difficult than that of import substitution, for which there is a ready market at home that can be sheltered from foreign competition by means of tariff barriers, import controls and many other measures. Indeed, a developing country may have to develop the two sectors — domestic and export — according to different criteria, resulting in a dual structure in which the export sector has to be highly advanced, while much of the domestic sector may remain somewhat backward."[34]

In order to be able to compete in the world market, export industries in the developing countries, except those which have enjoyed the advantages of cheap labour, availability of raw materials, and traditional craftsmanship and which have been examined in the preceding section, should be more advanced than the rest of the economy and should build ahead of the existing structure and factor proportions. A change in the existing structure and factor proportions, which is the essence of development, means for the developing countries, in particular, an increase in the share of capital and in the application of new technologies, as has been touched upon in an earlier section on "The role of capital intensive industries in developing countries." The developing countries, which can enjoy the advantages of being late-comers, should choose the most advanced alternative technology within their horizon, mainly because such a choice can be capital-saving, and can prevent the increase of the technological gap between the developed and developing countries.

The more sophisticated a manufactured commodity, the higher is the income elasticity of demand likely to be in both developing and developed countries. For any increment in income is likely to be spent on new goods, especially of a sophisticated variety. These goods will have an income elasticity of demand higher than one. However, some of the manufactured products with a very high income elasticity of demand are likely to be beyond the capacity of most developing countries to turn out; these include entirely novel commodities, the production of advanced capital goods, products dependent on original and novel design and some products protected by patents. However, since the income elasticity of the demand for all manufactured goods is considerably in excess of unity, the income elasticity of demand for industrial intermediates is not likely to be much lower than the average. These industrial intermediates "generally serve as inputs to a wide range of industries, lend themselves to mechanized production, are subject to economies of scale, and are dynamic in their technical progress. At the same time, they are likely to have considerable forward and backward linkage effects. This would include a number of resource-based industries, such as wood, pulp and paper, glass, some ceramic goods, industrial chemicals, petrochemicals, synthetic fibres, etc., rolled metal products and a wide range of components, standard machine parts, tools and equipment parts. It would exclude, in most cases, the production of complex equipment, of consumers' durables and semi-durables, the demand for which mainly depends on differentiation of design, except where joint undertakings make these new designs accessible. It would generally exclude complex assembly industries which depend on a highly developed industrial hinterland."[35]

Before closing this section on the criteria for the development of export industries, it is highly instructive to note the experience of the developing countries as a whole in regard to the composition of industrial exports and their relative importance, as well as their rate of growth during 1961-65.

[33] United Nations, *Statistical Yearbook 1966*, p. 412.

[34] ECAFE, Prospects for industrial exports, and measures for their increased production and trade, with special reference to ECAFE developing countries (E/CN.11/I&NR/L.66, 20 December 1966), p. 20.

[35] UNCTAD, *Trade in Manufactures, op. cit.*, p. 69.

Table 11. IMPORTS OF SELECTED INDUSTRIAL PRODUCTS FROM DEVELOPING COUNTRIES INTO DEVELOPED COUNTRIES, 1965
(value in million US$)

	World A	*Developing countries B*	*Share (%) B/A*	*Developing countries' annual growth rate 1961-65*
Light industry	18,409	2,491	13.5	10.6%
Processing of local material for final consumption	2,613	575	22.0	0.3%
Labour intensive	11,336	1,305	11.5	15.8%
Craftsmanship	1,260	211	16.7	16.9%
Other	3,200	400	12.5	11.4%
Heavy industry	10,474	503	4.8	17.3%
Industrial intermediates	7,700	439	5.8	19.0%
Capital goods	2,700	64	2.3	8.1%
Total	28,883	2,994	10.4	11.6%

Source: See Appendix I.

As shown in table 11 above, of a total import of $28.9 billion of selected industrial products into the developed countries in 1965, the developing countries supplied only 10.4 per cent. The share of the developing countries in total import into the developed countries is much higher for light industry imports (13.5 per cent) than for heavy industry imports (4.8 per cent). However, the growth rate during 1961-65 is much higher for heavy industry imports (17.3 per cent) than for light industry imports (10.6 per cent). Taking the light industry imports from the developing countries alone, the growth rate during 1961-65 is much higher for craftsmanship oriented and labour intensive industries (16.7 per cent and 15.8 per cent) than for processing industries (0.3 per cent). Among the heavy industry imports the growth rate for industrial intermediates, 19.0 per cent, is much higher than for capital goods, 8.1 per cent.

Taking the absolute value of the different categories of imports from the developing countries into the developed countries in 1965, over one half of these imports is supplied by industries which are labour intensive or craftsmanship oriented.

Appendix I. IMPORTS OF SELECTED INDUSTRIAL PRODUCTS FROM DEVELOPING COUNTRIES INTO DEVELOPED COUNTRIES, 1965
(value in million US$)

	SITC	*Item*	*World A*	*Developing countries B*	*Share B/A*	*Annual growth rate 1961-65*
A. Light Industry						
1. Processing of local materials for final consumption			2,612.7	575.2	22.0	0.3
	053	Fruit, preserved, prepared	516.2	153.8	29.8	11.5
	055	Vegetables, etc. prepared, preserved	284.7	77.9	27.4	9.1
	013	Meat tinned n.e.s. or prepared	506.0	143.5	28.4	0.2
	112	Alcoholic beverages	1,162.6	200.0	17.2	-7.3
	071.3	Coffee extracts, essences, concentrates and similar preparations of coffee	42.6	4.5	10.5	...
	072.3	Cocoa butter and paste	100.6	37.5	37.3	...
2. Labour Intensive			11,335.9	1,305.2	11.5	15.8
	893	Articles of artificial plastic materials n.e.s.	330.0	18.9	5.7	65.8
	696	Cutlery	157.4	4.3	2.7	60.7
	697	Household equip. of basic metals	212.0	8.2	3.8	46.1
	894	Perambulators, toys, games and sporting goods	562.5	64.6	11.5	31.8
	891	Musical instruments, etc.	541.7	3.6	0.7	26.6

Appendix 1 (*Continued*)

	SITC	*Item*	*World A*	*Developing countries B*	*Share B/A*	*Annual growth rate 1961-65*
	841	Clothing (excl. fur clothing)	2,018.7	431.6	21.4	24.9
	851	Footwear	530.5	42.6	8.0	16.1
	861	Optical elements	1,257.0	10.8	0.9	14.9
	652	Cotton fabrics, woven	782.0	194.0	24.8	13.4
	632	Wood manufactures n.e.s.	223.0	18.3	8.2	12.6
	653	Woven textiles, non-cotton	1,804.8	252.2	14.0	9.7
	698	Metal manufacture n.e.s.	657.8	10.7	1.6	9.3
	611	Leather	385.3	96.6	25.1	8.3
	651	Textile yarn and thread	1,205.7	55.7	4.6	8.1
	656	Textile, etc., products n.e.s.	308.2	91.3	29.6	7.1
	864	Watches and clocks	359.3	1.8	0.5	...
3. Craftsmanship			1,260.2	210.6	16.7	16.9
	831	Travel goods, handbags and similar articles	142.5	24.3	17.0	60.7
	657	Floor cover, tapestry, etc.	476.6	138.3	29.0	15.7
	612	Manufactures of leather or of art. or reconst. leather n.e.s.	56.8	4.1	7.1	15.6
	821	Furniture	401.5	30.8	7.7	14.4
	897	Jewellery and goldsmith's and silversmith's ware	182.8	13.1	7.2	12.8
4. Other			3,199.7	399.8	12.5	11.4
	541	Medicinal and pharmaceutical products	707.7	39.3	5.5	21.3
	899	Manufactured articles n.e.s.	435.7	91.0	20.9	18.7
	243	Wood, shaped	1,843.6	216.3	11.7	9.3
	551	Essential oils, perfume, etc.	212.7	53.2	25.0	4.4
B. Heave Industry						
1. Industrial Intermediates			7,708.6	438.7	5.8	19.0
	674	Iron, steel universals, plate, sheet	1,889.0	13.8	0.7	112.0
	682.2	Copper alloys, worked	507.8	53.4	10.5	110.0
	686.2	Zinc alloys, worked	18.4	3.0	16.3	39.2
	631	Veneers, plywood, etc.	560.4	117.6	21.0	26.3
	561	Fertilizers, manufactured	542.0	28.1	5.2	23.0
	684.2	Aluminium alloys, worked	296.8	4.6	1.5	18.9
	678	Iron, steel tubes, pipes	684.1	10.2	1.5	17.8
	513	Inorganic chemicals, oxides, etc.	567.9	86.2	15.2	16.6
	671	Pig-iron, etc.	609.7	65.1	10.7	15.7
	685.2	Lead alloys, worked	7.5	1.4	18.7	3.9
	684.1	Aluminium alloys, unwrought	655.6	22.3	3.4	1.8
	599	Chemicals n.e.s.	885.3	29.6	3.3	-0.8
	521	Coal, petroleum, etc. chemicals	65.5	2.6	4.0	-9.1
	672	Ingots and other primary forms (incl. blanks for tubes and pipes) of iron and steel	414.8	0.8	0.2	-45.8
	687.2	Tin alloys, worked	3.8	—	—	...
2. Capital Goods			2,764.6	63.9	2.3	8.1
	724	Telecommunications apparatus	1,288.2	42.5	3.3	43.6
	711	Power generating machinery other than electric	1,476.4	21.4	1.5	-12.9

Source: United Nations Conference on Trade and Development, Review of imports of manufactures and semi-manufactures from the developing countries 1961-1965, (TD/B/C.2/24) 25 May, 1967.

THE IMPORTANCE OF DEVELOPMENT OF OILS AND FATS INDUSTRY IN THE ECAFE REGION*

Summary

Oil seeds, vegetables oils, oil cakes, and fats and oils are important to the economies of all the countries in Asia. The production and processing of edible oil is an important food industry. The by-products, oil cakes and meal and in the case of some countries the vegetable oils themselves, are important sources of earning foreign exchange.

In oil extraction, refining, and further processing for industrial utilization, the techniques employed in most of the Asian countries are somewhat primitive. Improvement in the handling, transport and storage of the raw material, adaption of the most modern techniques in processing, and modernization of the handling, storage and distribution of the processed products is required in all the developing countries of the ECAFE region.

The vast resources of the region are not being fully utilized to the best advantage of these countries. Cottonseed in north-west Asia, a source of valuable edible oil apart from many by-products of industrial importance, has been tapped to a limited extent only. In middle and south-east Asia, the coconut crop is of great importance. In the processing of coconut for production of copra, oil, cake/meal and further processing of coconut oil into fatty acids and fatty alcohols there is a large scope for improvement of processes. In fact the adoption of the most modern techniques in the solely or predominantly coconut based economies of the countries, is likely to bring increased prosperity. The problem is the transfer of know-how, and the willingness of the authorities concerned to adopt modern techniques.

Rice bran is yet another source of edible oil which remains to be developed. This is a resource commonly available in all the important rice producing countries in Asia. It is a relatively new source of edible oil and many technical and economic problems need to be solved before the utilization of this vast resource is made a reality.

In the adaptation of technology of modern design the solvent extraction process has to be used more extensively. The improved methods of refining have to be adapted. Wherever feasible, the hydrogenation process has also to be used for the production of shortening and other plastic or semi-solid fats.

Closely connected with oil seed processing is oil seed protein development. The ECAFE region, in common with other developing regions of the globe, is known to be deficient in the per capita consumption of protein. Malnutrition in general and protein shortage in particular is likely to have very serious and far reaching effects on future generations as it is likely to retard mental development, apart from other adverse effects. The vast source of oil seeds of cotton seed, groundnut, soybean and coconuts should be utilized for the production of protein concentrates.

In the matter of regional and subregional co-operation, rice bran oil and coconut processing industries seem to offer scope for such collaboration for the economic advantage of the participating countries. Oil palm is still another plantation crop which needs to be developed in some Asian countries where the soil and climatic conditions are suitable. This is also an area where regional co-operation would be to the advantage of the region as a whole.

Introduction

Fats and oils are of great economic importance to most of the countries in the ECAFE region. They provide higher calorific energy than proteins and carbohydrates. They serve as media for the fat soluble vitamins. The polyethenoid acids, known as essential fatty acids play a vital role in the metabolic activities. While their largest single use is for edible purposes, generally being consumed as crude and refined oil and also in a more processed form as refined and salad oils, shortening and margarine, other industrial uses are in the manufacture of soap, synthetic detergents and drying oil used in the manufacture of surface coatings.

The fats and oils which are of predominant importance in the region are soybean, cotton seed, groundnut, castor, coconut, palm and rice bran oils. They are important sources of foreign exchange earning, either in the form of oil seed/copra/palmkernel, or oil cake/meal and the fats and oils themselves. Some countries in the region are largely dependent on imports traditionally, such as Iran, Japan and Republic of China (Taiwan). Some other countries which were important exporting countries (net exports) have turned into importing countries, notably India, where domestic production has not kept pace with the ever increasing demand caused by the population increase.

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* Paper prepared for the News by Dr. H. G. R. Reddy, regional adviser — oils and fats.

By-product utilization, viz, the oil cake/meal is largely confined to use as a feed stuff or fertilizer within the countries and substantial quantities are exported to the developed countries principally for use as feed stuff for live stock. There is a world wide shortage of protein and it is a matter for deep concern that these sources of protein have not been developed for human consumption in the developing countries where the gap between per capita requirement and consumption of protein is widest.

The technology of handling, transport and storage of oil seed/copra, fats and oils and cake/meal requires to be improved; this would result in substantial advantages in processing, improved productivity, maintenance of standard quality etc. The oil extraction and processing techniques, have largely remained antedated despite the introduction of modern and advanced techniques in some of the developing countries. There are problems in modernizing the industry, as at present oil extraction is largely carried out in decentralized sectors. Substantial capital investment, partly in foreign exchange will be called for, if the industry is to be modernized with installation of new machinery in most of the developing countries in the ECAFE region.

Some of the important resources still remain to be exploited, such as cotton seed which has traditionally been used as a cattle feed without extraction of oil. There is scope for development of fish oil and meal and also fish protein concentrates. The extraction of oil from the oilcake and rice bran needs development. All these developments call for adoption of modern techniques and also transfer of know-how, at least to some of the developing countries in the region, which are at a low level of development so far as this industry is concerned.

In some countries where these commodities are of export importance, the intervention of government to organize price support boards, or commodity credit corporations and marketing boards appears to be necessary. In some commodities, there is scope for regional co-operation in the development of processing techniques and common marketing arrangements. Coconut processing is a case in point. The development of rice bran oil also falls into this category where there is scope for regional co-operation. The development of oil palm on a plantation scale in the region also requires close attention and some of the developing countries would benefit by regional co-operation. There is an acute necessity to develop protein concentrates from oil seeds to bridge the wide gulf in the per capita requirements and actual consumption of protein in the region. Fish protein concentrate needs to be developed for human consumption in the ECAFE countries to fortify the starchy diet.

The development of the oils and fats and associate industries such as edible protein and animal feeding stuff will be developing agro-based industries. It is hardly necessary to emphasize the importance of developing these industries in the predominantly agriculture oriented economies of the developing countries in the ECAFE region.

Important oil seeds producing countries in the ECAFE region

In the region Afghanistan produces around 40,000 tons of cottonseed. In Australia, the emphasis is more on the production of tallows and greases. Burma has considerable potential for groundnuts. Ceylon is predominantly a coconut producing country (copra 250,000 tons) per annum. The Republic of China produces groundnut and soybean, India has considerable production of groundnut, cottonseeds, sesame, rape/mustard, linseed castor and copra, Indonesia produces groundnut, soybean, copra and oil palm, Iran is predominantly cottonseed producing; Japan produces groundnut; soybean and rape seed and the Republic of Korea, principally soybean and rapeseed, Malaysia largely copra and palm oil; in Pakistan groundnut, cottonseed, and rape/mustard are produced; the Philippines like Ceylon are predominantly coconut growing and Thailand produces groundnut, soybean and coconut. In nearly all the developing countries there is potential for development of rice bran oil. This vast resource has only been tapped to a very limited extent at present.

The vegetable oil production in the ECAFE region is reported to be about 30 per cent of world production. The oil seed/copra/oil palm production in the ECAFE region is indicated in Table 1.

Table 1. PRODUCTION OF OIL SEED/COPRA/OIL PALM IN THE ECAFE REGION
(In 1000 tons)

S.No.	Country	Groundnut unshelled	Cotton seed	Sesame seed	Soybean	Rape seed	Copra	Palm Kernel	Palm Oil	Oilseed	Castor	Total
1.	Afghanistan	—	75	—	—	—	—	—	—	—	—	75
2.	Australia	13	25	—	—	—	—	—	—	—	—	44
3.	Brunei	—	—	—	—	—	—	—	—	—	—	—
4.	Burma	283	44	70	—	—	—	—	—	—	—	397
5.	Cambodia	15	4	10	10	—	—	—	—	—	3	42
6.	Ceylon	4	—	15	—	—	270	—	—	—	—	289
7.	China, Rep. of (Taiwan)	124	—	3	65	23	—	—	—	—	—	215

Table 1. *(Continued)*

S.No.	Country	Groundnut unshelled	Cotton seed	Sesame Seed	Soybean	Rape Seed	Copra	Palm kernel	Palm Oil	oilseed	Castor	Total
8.	Hong Kong	—	—	—	—	—	—	—	—	—	—	—
9.	India	3,958	1,962	400	—	1,248	262	—	—	324	70	8,224
10.	Indonesia	511	—	—	400	—	475	32	150	—	—	1,568
11.	Iran	—	314	6	—	—	—	—	—	—	10	330
12.	Japan	134	—	4	226	123	—	—	—	2	—	489
13.	Korea, Rep. of	—	8	4	172	—	—	—	—	—	—	184
14.	Laos	—	—	—	—	—	—	—	—	—	—	—
15.	Malaysia	—	—	—	—	—	124	34	146	—	—	204
16.	Mongolia	—	—	—	—	—	—	—	—	—	—	—
17.	Nepal	—	—	—	—	—	—	—	—	—	—	—
18.	New Zealand	—	—	—	—	—	—	—	—	—	—	—
19.	Pakistan	22	822	31	—	274	—	—	—	13	9	1,171
20.	Philippines	13	—	—	—	—	1,431	—	—	—	—	1,454
21.	Viet Nam, Rep. of	—	—	—	—	—	23	—	—	—	—	23
22.	Thailand	119	32	17	32	—	23	—	—	—	32	253
23.	Western Samoa	—	—	—	—	—	13	—	—	—	—	13
Total of ECAFE Region		5,196	3,286	460	905	1,668	2,621	66	296	345	124	14,975
World Total		15,168	20,923	1,562	35,784	4,897	3,420	839	720	3,330	536	95,127

Source: Vegetable oils and oil seeds—A review—Published by the Commonwealth Secretariat, United Kingdom—1967 (Compiled)
Note: With the exception of palm oil, these figures refer to oil seeds production.

The per capita consumption of oils and fats in the region is 4-5 kg as against the minimum nutritional requirement of 20 kg and a still higher rate of consumption in some of the developed countries.

The world's total annual production of oils and fats is over 35 million tons and of vegetable oils it is over 20 million tons; in the ECAFE region about 6.5 million tons of vegetable oils are produced annually. The rate of increase in production is barely expected to keep pace with the increasing population and therefore, the per capita consumption is likely to remain at the current level in the foreseeable future.

The potential for development of the rice bran oil industry is estimated to be one million tons, valued at US$300 million per annum in the entire ECAFE region. If this source of oil is developed, it will increase the oil availability by about 15 per cent. Among the developing countries, this industry has been developed in Burma, China (Taiwan), India, the Republic of Korea and Thailand to a limited extent. There is scope for development of this important source of edible oil in all other large rice producing countries in Asia.

The manufacture of compound cooking fat, in which cottonseed, soybean, groundnut, palm and rice bran oils are used, is well developed in Australia, Iran, Pakistan, Malaysia, India, Japan, the Philippines and Singapore. In most of these countries, margarine is also produced to an appreciable extent.

There is an urgent need to call the attention of the ECAFE member countries to the improvement of agricultural techniques, to increase yield per acre of oil seeds and thereby increase the total production. Likewise, attention needs to be paid to plantation crops such as oil palm and coconut.

Processing techniques

Since the supply of fats and oils in the world as a whole and particularly in the developed countries is not keeping pace with demand, it is but logical that technological progress should aim at producing substitutes. Significant progress has been made in the development of substitutes for fats and oils. The emergence of the synthetic detergent, a soapless soap, and more recently the production of fatty acids from petroleum base, which are being increasingly used in the manufacture of soaps and synthetic detergents, have to a large extent relieved the pressure on fats and oils used for industrial purposes. Significantly the development of synthetic fatty acids has taken place to a large extent in countries of the centrally planned economies. Manufacture of synthetic glycerine from petro-chemicals has been in progress for many years. On the other hand it is constantly necessary to improve the processing techniques, not only for increased productivity but also to come up with discoveries which may totally alter the consumption pattern of individual oils and fats. The discovery of the hydrogeneration process at the turn of the century is regarded as a distinct land mark in the progress of fat technology. This has made possible the production of shortening and margarine and permitted a wide interchangeability in the general group of fats and oils. Fat splitting and fatty acid distillation, which has enabled the upgrading of low quality fats and production of fatty acids of the desired specifications for varied end uses, was another important improvement in technique. In oil extraction, the refinement of the technique of solvent extraction has made it possible to adapt this process for the recovery of oils from widely differing oil bearing materials, and it is not only regarded as the most efficient technique but is also being adopted extensively in replacement of the

time honoured methods of hydraulic presses and also more recent innovations in high pressure screw presses or expellers. The conversion of fatty acids into fatty alcohols, and further processing, such as the production of surfactants and synthetic detergents, should also be regarded as a logical progress in the development of techniques.

In an earlier paragraph reference was made to the somewhat outdated techniques employed in the extraction and processing of fats and oils in the developing countries in the region. Improvement in techniques should aim (1) to give higher yield i.e. improve productivity, (2) to produce a better quality product or (3) to reduce the cost of production. In the continuous processes, as distinguished from batch processes, the last objective mentioned above is largely achieved. By proper instrumentation, a reproduceable and constant quality of product and also minimum process losses are secured. In continuous processes, with the larger capacity of a unit, less wastage of utilities, such as electric energy, steam, and water occur. The consumption of chemicals e.g. solvent in extraction process, and caustic soda in refining are kept as low as possible.

Pretreatment of oilseeds, nut and kernels

The main operations prior to extraction of oil are (1) cleaning and grading, (2) hulling, and decortication where necessary, (3) size reduction by crushing, cracking, flaking, etc. and (4) adjustment of moisture content. The machines employed for these operations are sieves, screens, reels, magnetic separators, aspirating fans, dust collecting systems, pneumatic transports, elevators and conveyors, hullers, shellers, decorticators, delinters for cottonseed; cracking rolls, breakers for coconut, reducing rolls, flaking rolls, tempering troughs, driers, stack cookers and others.

The continuous process

The hydraulic intermittent press which was in use for a long time has been superseded to a large extent, by the modern 'Expeller' a proprietary name for the continuous screw press, which was first introduced in 1904 and has undergone a number of improvements. Screw presses are truly continuously working machines. They consist essentially of a cylindrical cage, called usually the pressing barrel, which can be either horizontal or inclined or vertical. The wall of the barrel is in most, but not all cases composed of accurately machined steel or alloy bars or staves rigidly clamped together. In other cases the cage is a perforated barrel. Inside the cage centre a helical screw revolves. The raw material is fed into the annular space between the centre shaft and the barrel. Pressure can be generated in various ways. The cross-section of the barrel may decrease gradually or by steps or the diameter of the shaft may be increased. A solid spiral replaces the screw in some other constructions. By these or similar means, pressure is generated, which must be maintained throughout the passage of the raw materials through the barrel. Since the quantity of raw materials fed into the expeller is larger than the quantity of expelled cake obtained, and since a higher pressure is required near the discharge end of the barrel, where the oil content is relatively small, the annular space must decrease towards the discharge spout. To regulate the pressure inside the barrel, and consequently throughout the expeller, an adjustable pressure orifice is provided, where the cake issues from the barrel. The cone point allows the forming of the cake to the thickness desired. Average pressure on the cake is 10-15 tons per square inch against 2-4 tons per square inch in hydraulic presses. Hence expellers give higher oil yields than hydraulic presses, leaving 4-8 per cent oil in the cake, against 8-12 per cent in press cake. The friction of the cake against the wall of the barrel also contributes considerably towards high efficiency. Friction is particularly intensive on partly expressed stock undergoing a second pressing. The oil exudes through the openings of the barrel and is collected in a reservoir underneath the barrel. The oil contains gummy impurities, some moisture and suspended fines. The expelled oil may be held in settling tanks and then filtered.

Solvent extraction

The rate of penetration of the solvent into the solids and the diffusion of the oil through the cell membrane are factors on which the mechanism of extraction depends. The rate controlling factor in the solvent extraction of seed flakes is probably the internal resistance of the flakes to molecular diffusion. The extraction rate is inversely proportional to the square of the flake thickness. Direct solvent extraction is not well suited to oil bearing materials in which the pressed flakes disintegrate badly. The fines impede flow through the extractors and the cost of purification is raised as these fines must be filtered from the oil/solvent system. Also the mechanical strength of the flaked oil seeds is inversely proportional to the oil content which means direct solvent extraction is mechanically simpler with low oil content seeds.

The first solvent extraction plants were of the batch type. Vertical stationary and horizontal rotating drum extractors were employed and the mode of operation was usually according to the "simple contact" methods, in which the solvent is merely added to the raw material and after a while the miscella is drained off. In the counter-current multiple contact method, the fresh solvent is pumped through a batch of extractor bodies meeting first the extractor which contains the charge with the highest oil content as rich miscella. This system is sometimes referred to as semi continuous operation.

In the modern "true continuous counter-current contact" method both the oil bearing material and solvent move continuously in counter current flow. There are quite a large number of design of continuous solvent extraction plants which are being manufactured in the United States of America, the Republic of China, Europe, Japan and India.

The great advantage of solvent extraction over mechanical methods of oil production is the fact that only 1 per cent, and usually less oil is left in the meal. In the case of soybean, oil recovery is over 97 per cent when solvent extraction is used, against about 87 per cent when mechanical pressing is employed.

Table 2

COMPARATIVE YIELDS BETWEEN PRESSING AND SOLVENT EXTRACTION

	Yields, percent of total	
	continuous screw press	*continuous solvent extraction*
Oil	14.0	17.4
Meal	83.4	79.0
Moisture, dust etc.	2.6	3.6

Comparison between the materials margin ratio and the processing cost ratio shows that the advantages are on the side of direct continuous solvent extraction rather than pressing.

While there exists an amazing variety of continuous extractor constructions, the equipment used for desolventizing the extracted meal and for separating miscella into oil and recycle solvent, is uniform. The miscella from continuous extractors contains 15-30 per cent of oil. Modern and efficient equipment yields a miscella with higher concentration. This is important with regard to the amount of solvent in circulation, and to heat economy. The more diluted the miscella, the more costly it is to evaporate all the solvent. Equipment for miscella concentration varies somewhat but the principle consists of providing an adequate steam heated surface to evaporate the solvent. It is necessary to filter the miscella prior to being heated. Miscella desolventizing in the first stage is a concentration of the oil and in the second the oil is completely freed from the solvent.

From the concentration stage, the oil which contains only a few per cent of the solvent, enters the first stage, where it is freed from any solvent, a process sometimes referred to as steam stripping or distilling. It consists of injecting live steam into the oil at ordinary or reduced pressure.

The exposed meal which contains a considerable amount of solvent has to be desolventized. In practice most meal desolventizers comprise a battery of horizontal tubes, placed one above the other, to avoid excessive length. The material flows in a zig-zag fashion through these tubes until it emerges at the bottom through an airlock. The meal is then cooled and if necessary its moisture content is adjusted by spraying it with water.

Refining

Crude oils contain various non-fatty substances. They are therefore processed, before they can be used for edible or technical purposes. It is however well known that in developing countries crude oils are consumed without refining for edible purposes notably coconut, groundnut (peanut), sesame, and rapeseed oils. Some of the undesirable substances are gummy and mucilaginous matter, phosphatides, carbohydrates, nitrogen compounds and free fatty acids. Pigments are also undesirable. Tocopherols, however, serve as antioxidants and prevent the development of rancidity. Most oils contain fat-soluable vitamins. The refining technique varies widely depending on the type of crude oil that is being processed, and the purpose for which it is intended. Solvent extracted oils are usually darker in color than expelled oils, due to the solvent dissolving a certain amount of pigment and other substances along with the oil.

Degumming is a process of hydration, in which the gums and phospholipids are precipitated and removed. Degummed oils are easier to neutralize than oils which have not been so treated and soap stock losses are lower.

The free fatty acid content of edible oils should not exceed 0.01-0.03 per cent of the oil. The average FFA content is 1-3 per cent, however not infrequently higher percentage is noticed, which is largely to do with poor handling and storage of oilbearing materials, prior to extraction of oil. The free fatty acids are neutralized with caustic soda of desired strength, and the resulting soapstock which is insoluable in it, is separated. The soap is finally washed out with water, which separates out again due to the difference in specific gravity. The oil may then contain up to 0.5 per cent moisture, which is removed by subsequent drying.

The disadvantages of batch neutralizing and washing are (1) large equipment is required due to the long time taken for gravity settling and (2) neutralizing losses are high due to the long time the alkali is in contact with the oil, and the resulting saponification of the oil (3) batch neutralizing requires considerable skill on the part of the operator and (4) washing by the batch method and gravity settling tend to give higher losses of neutral oil through emulsion formation.

The introduction of continuous neutralizing and washing has been successful, using centrifugal separators. Among the first applications of the centrifuge in the oils and fats industry, was the separation of neutral oil from the settled soapstock, and the substitution of the centrifuge for gravity settling. In the old semi-continuous process the oil and alkali solution are mixed at room temperature and after the break has occurred the mixture is passed through a tubular heater immediately before it is centrifuged. Two processes have acquired international reputation. In the sharples process, the crude oil is passed through a deaerating tank and by means of a control device and instrumentation, the flow of the crude oil is made to regulate the continuous flow of caustic soda solution, the strength of which has been previously determined. The amount of alkali solution delivered can be changed during the operation by means of a direct reading indicator. Measured quantities of crude oil and caustic soda solution run into mixers in which they stay just long enough for the free fatty acids to be neutralized, and the soap particles to begin to agglomerate. The mixture then passes through a heat exchanger, in which the heating medium is hot water or low pressure steam. While the mixture is passing through the heater its temperature is raised to 130°-160° F (50°-70° C) to facilitate agglomeration of the soap particle, and to decrease the viscosity of the oil, to give a better separation. From the heater, the mixture flows into continuous centrifugal separators which cause the oil to flow through one discharge nozzle and the soapstock through another nozzle. The time of contact between the oil and the alkali solution is almost three minutes. The neutralized oil contains up to 500 parts of soap per million parts of oil. This is reduced to 25-40 ppm by continuous double washing. All the soap is then dissolved in the water. The wash water from the centrifuge is discarded. The process is repeated and the oil discharged contains 0.4-0.5 per cent moisture, which is quickly removed in a continuous process. In the sharples continuous system the neutralizing and washing losses are 20-30 per cent lower than in the batch method. The loss of neutral oil due to saponification depends on the free fatty acids in the raw oil, the strength of the alkali solution used and the excess of it added to the oil. For a degummed oil with 3 per cent FFA, the amount of neutral oil saponified is 0.3 per cent.

In the Delaval short mix plant, degumming always precedes caustic soda neutralizing. The oil and caustic soda solution are *only a few seconds in contact* in normal cases before the soap and oil are separated in a hermetic centrifuge.

Drying

Oils neutralized and washed continuously may contain up to 0.5 per cent of moisture. This should be removed as quickly as possible to prevent any increase of free fatty acids in the neutralized oil. Commercially dry oil contains less than 0.05 per cent of moisture. In a continuous drier, the oil is dehydrated under a vacuum of 2-3 inches of mercury (50-75mm) by flash evaporation.

Bleaching

In the neutralizing process, a certain amount of coloring matter is removed with the soap stock. The remaining color is removed by the addition of absorbents such as fuller's earth or activated carbon. Edible oils are not subjected to chemical bleaching. In the coventional method of bleaching 3-5 per cent of activated earth is added to the oil in a kettle, holding the oil for 30-60 minutes at 175°-250° F (80°-120° C) under agitation for about 30 minutes, and the oil is filtered through a filter press. The cost of adsorbents is usually less than that of the oil retained by the spent bleaching agent.

Deodorizing

The neutralized dry oil is deodorized to remove odoriferous volatile constituents from the oil. The process also destroys any peroxides in the oil and removes any aldehydes or other volatile products which may have resulted from atmospheric oxidation, destroys carotenoid pigments in the oil and thus decolorizes it, and reduces the free fatty acid content of the oil to almost 0.01-0.02 per cent. Basically, modern deodorizing consists of heating the oil to 360°-425° F (180°-220° C), and injecting steam under a vacuum of about 0.3 inches (about 7 mm) of mercury or less. The steam used for injection should be of the same or nearly the same temperature as the oil. Injected steam serves as a carrier for the volatile substances. The loss of oil due to hydrolysis should not be greater than about 0.02-0.03 per cent at a pressure of 0.25 inches (less than 7 mm) of mercury and a temperature of 452° F (230° C).

In the conventional batch system, deodorizing is carried out in vessel containing up to ten tons or more of oil. Steam is injected into the bottom through specially designed distribution devices, and a vacuum is pulled on the top through which the volatiles escape. Heating is in most cases applied by means of steam heated coils. After deodorizing, the oil is either cooled inside the vessel or transferred into a separate cooler. Heating, deodorizing, cooling and filtering may take 5-8 hours depending on operating conditions, the size and quality of the equipment, and the type and quality of oil.

In the continuous system some of the disadvantages have been overcome. Operating time is short and steam consumption is low. It is automatically controlled and hence the labour requirement is low. In commercial practice different designs have been developed and patented.

The status of the fats and oil industry in some of the countries in the ECAFE region is briefly reviewed in the following paragraphs:

1. Burma

The principal oil seeds produced in Burma are groundnut, cottonseed and sesame. The production of groundnut seed is of the order of 325,000 tons, sesame seed 53,000 tons and cottonseed 38,000 tons per annum. Some experimental work is reported to have been initiated on oil palm, coconut palm and soybean cultivation.

It is reported that there are two hundred oil milling units, producing crude oil; very few units are reported to be equipped with oil refining machinery. The mechanical methods of extraction used seem to be somewhat outdated. However in addition to hydraulic and screw presses, the solvent extraction process has also been adopted, particularly for extraction of rice bran oil.

The total production of oils in the country is estimated to be 80,000 tons/year all of which are domestically consumed. The oils imported are groundnut oil 1,500 tons and coconut oil 2,300 tons, and other edible fats about 10,000 tons per annum.

The annual production of unpolished rice in Burma is 7.5 million tons with a potential of 447,000 tons of rice bran, having an oil content of 14-22 per cent i.e. 62,000 tons of oil. It is estimated that Burma produces about 20,000 tons of rice bran oil per annum. The initial success achieved in the development of rice bran oil industry is ascribed to the existence of rice mills of large capacity from which sizeable quantities of rice bran is available for extraction of oil.

While Burma is an importer of fats and oils, it is reported that the country exports oil cakes and defatted bran.

2. Cambodia

There is production of some quantities of groundnuts, sesame and soybean. According to recent reports increasing importance is being attached to the development of rice bran oil industry in the country in view of the potential of over 20,000 tons of oil per annum. The pattern of consumption of fats is largely lard in common with other countries in the subregion.

3. Ceylon

The oil economy of the island is solely based on coconuts. The single largest acreage among commercial crops is devoted to the cultivation of coconuts which extends over 1.1 million acres. The acreage yield is 2,500 nuts per acre, which, with better agronomic practice, could be increased to 3,000 nuts per acre. The domestic consumption shows that 2/3 of the nuts are used as coconut milk and 1/3 as oil and about 6 per cent for industrial use, such as soap and margarine manufacture. The foreign exchange earned by the export of coconut products is the third largest, next to tea and rubber. The exports are in the form of oil, desiccated coconut, copra and the nuts and in terms of nuts these work out 50.3, 25.9, 17.2 and 0.6 per cent respectively. In common with other Asian countries the installed capacity for extraction of oil is reported to be in excess of the production of copra.

There is a strong urge to restrict the export of copra and permit only export of cocout oil. This is expected to provide enough raw material to the local copra crushing industry and also to earn increased foreign exchange to the country. It has been suggested that the Government of Ceylon may set up a Marketing Board for price stabilization and also to give price support to the producer of coconut/copra.

It has been estimated that there is a potential of 10,000 tons of rubberseed oil, which could be developed for industrial uses. The disadvantage however is that the cake is not a valuable feedstuff. There is a possibility of developing rice bran oil, the potential having been estimated at 9-10,000 tons per annum. However, there are some problems in the development of this source of oil, and immediate attention will have to be paid towards the modernization of the rice mills. The industrial oil that could profitably be developed is palm oil, as oilpalm cultivation is well suited to the climatic and soil conditions of Ceylon. The conversion of the existing unproductive coconut and rubber cultivation areas for oil palm cultivation would also be a wise move. From the point of view of the returns, it has been estimated that the income from coconut cultivation is Rs 206, rubber Rs 150 and oil palm Rs 460 per acre.

There is a state owned oils and fats corporation, which is fully equipped with copra crushing, solvent extraction, fat splitting, fatty acid distillation, glycerine concentration and a provender mill. The complex has been working with limited success. The reorganization of the corporation with a view to utilizing more fully the installed machinery involving advanced fat technology is reported to be receiving the attention of the Government of Ceylon.

4. China (Taiwan)

The production of oilseeds includes groundnut (peanut), soybean, rapeseed and mustard, totalling 170,000 tons per annum. Soybean is also imported, both for production of oil and also for food-processing industry. The production of soybean oil is around 18,000 tons and peanut oil around 12,000 tons per annum. A significant development in Taiwan is the

production of rice bran oil of edible quality, the total production of which is estimated to be 6,000 tons per annum.

The rice milling industry is to be modernized by the installation of modern sheller type of mills and this is expected to make substantial quantities of raw rice bran available for oil extraction. Efforts are also under way to carry out experimentation on some of the problems impeding the development of rice bran oil.

The fats and oils industry is equipped with modern machinery such as screw presses, solvent extraction plants and refineries.

5. **India**

India is the largest producer of oilseeds in the ECAFE region. The principal oilseeds are groundnut (largest in the world), cottonseed, rape and mustard, sesame, linseed and castor totalling nearly 8.5 million tons per annum. There are quite a large number of minor oilseeds such as safflower, nigerseed and a host of forest oil seeds. India is also a large producer of copra. It is reported that work has been initiated on oil palm cultivation in Kerala and the Andamans.

The oil milling industry could be broadly divided into (1) organized sector — employing modern machinery such as screw presses and solvent extraction (2) small scale electric power operated sector using expellers, rotaries and chekkus of low capacity and (3) the village Ghani — operated without the aid of electric power. The installed capacity is far in excess of the oilseed production. It is estimated that there are 20,000 units in the power operated sector. It has been recognized that the method of oil extraction in the non-power sector is wasteful, but the change over to modern methods of processing is beset with socio-economic problems.

India has, during the last decade, developed a strong solvent extraction industry which has helped to extract the residual oil from oil cake, and also from cottonseed and rice bran. Considerable progress has been achieved in the indigenous manufacture of oil expellers, solvent extraction plants, refining and hydrogenation machinery of modern design.

It is reported that there are more than one hundred solvent extraction plants in operation with an installed capacity of more than 1.8 million tons of oil cakes per year. It is expected that by 1970 - 71, the installed capacity will rise to 2.5 million tons. Against a production of 75,000 tons of solvent extracted oil in 1966, it is expected that the quantity will be doubled by 1970 - 71. The problem of allowing solvent extracted oil to be used for human consumption and the defatted meal for cattle feeding seems to have been overcome and the current Indian regulations do not seem to impose any ban for such uses.

It has been estimated that the per capita consumption of fats & oils in India works out 4 kg. per annum which is 1/4 of the minimum nutritional requirement. The additional annual requirement on account of increase of population alone is estimated to be 60,000 tons. Taking other factors into consideration, the demand for fats and oils will be higher than this figure in the coming years. On the basis of these assumptions, by 1970 - 71, the country will be in need of an additional quantity of 900,000 tons of oil per annum as against the 1966 availability of 2.4 million tons.

The domestic prices were nearly 100 per cent higher than the world market prices in 1966 - 67. The latest information indicates that in early 1968 the prices were in parity with the world market prices. The country is grossly short of industrial fats such as coconut oil, tallow and palm oil, the last two are being imported and in addition there is also a substantial import of copra. Since 1964, the country has been importing soybean/cottonseed oil and tallow under PL 480 programme. Some sunflower seed oil is also reported to have been imported from the Soviet Union.

In order to bridge the formidable gap of 900,000 tons of oils intensive and extensive measures are being taken by the Agricultural Department to increase the productivity, i.e. yield per acre, and the total production of oil seeds — principally groundnuts, which will give an additional 650,000 tons of oil. Increasing attention has been paid to the development of the cottonseed oil industry on modern lines. It is estimated, that the additional availability of oil from this source will be 100,000 tons per annum. Another source of development is rice bran oil. It is estimated that the additional quantity of rice bran oil that may become available is 35,000 tons. Considering the increased production of solvent extracted oil of about 100,000 tons, the country should be able to meet its minimum requirements of fats and oils by 1970 - 71 from domestic production. From the point of view of per capita consumption, the position is likely to remain the same for many years to come, unless, there is a break through in agricultural production. The additional requirements of about 150,000 tons every year, owing to the population increase of over 2.5 per cent of 510 million people, is staggering. This only emphasises the magnitude of the problem.

Some attention should also be paid to the development of industrial fats, such as mahua oil. It is reported that the Kerala Plantation Corporation has been engaged in taking up oil palm cultivation on a plantation scale. Coconut planting requires closer attention to overcome plant diseases and to increase the production of nuts.

6. Indonesia

The country produces groundnuts and soybeans, copra and oil palm. The oil milling industry employs mechanical methods of extraction of oil such as the screw presses but the solvent extraction process has not been introduced on a commercial scale. The country's oil economy is important from the point of view of copra., and palm oil producton. It is the third largest oil producing country in the ECAFE region.

7. Korea

There are 186 oil factories, 85 of which produce vegetable oil and the rest fish oil. Mechanical methods of oil extraction are being replaced by the solvent extraction process.

It is estimated that in 1965, the total domestic consumption of oils and fats amounted to 30,000 tons. Nearly 59 per cent of this amount was used in the manufacture of soap, almost 30 per cent for edible consumption, the balance for miscellaneous uses.

The total domestic demand is 44,000 M.T., 55.5 per cent of which was met by import, out of which tallow was an important item. Domestic production of vegetable oils is about 14,000 tons (12,000 vegetable oils and 4,000 fish oil).

The production of rape seed has shown a phenomenal increase from about 3,000 tons in 1963 to 12,700 tons in 1966. Out of 160, 000 tons of soybeans, it is reported that only 1 per cent is used for oil production. Other important oilseeds are cottonseed, sesame and castor seeds.

The oil that holds some promise, is rice bran oil, the potential of which has been estimated at over 45,000 tons per annum.

7. Iran

The oil economy of Iran, as in Ceylon, and the Philippines is based solely on one commodity; this is coconut in the latter two countries, in the former it is cottonseed oil. The country is however dependent on imports of vegetable oils to the extent of 70 per cent of the total requirements. The expenditure of foreign exchange on the import of oils is US$30.2 million per annum. The per capita consumption of fats and oils in Iran is 6.5 kg. which is better than most other developing countries in the region. It has been assessed that against the total availability of 185,000 tons of fats and oils in 1965-66, the projected increase will be another 55,000 tons in 1973, the bulk of which will have to be met from vegetable oils.

Increase of cotton cultivation and the consequent availability of the seeds for oil extraction will make possible, according to present plans, additional production of 12,000 tons of oil per annum. If adequate solvent extraction capacity is established, the additional recovery of oil will be 3,000 tons. The Government plans to take up the cultivation of sunflower, soybean and sesameseed, and according to tentative estimates, it expects to get 44,000 tons of oils from these new sources.

The oil extraction, refining and shortening industries have developed well during the past seven or eight years using modern machinery imported from the United States and Europe. The authorities seem to be paying attention to the development of fish oil and fish meal, particularly in the gulf area.

Considerable progress has been achieved in the preparation of national standards for oils and oil cakes. The question of prevention of adulteration of shortening — a vegetable oil product, with tallow and animal fat is reported to be exercising the minds of the authorities.

8. Japan

The main oilseeds produced are soybeans, groundnuts and rapeseed, totalling 570,000 tons per annum. Japan imports over 2 million tons of oilseeds per annum.

The technology of fat & oil processing is advanced in Japan as is shown by the adoption of solvent extraction, continuous refining and hydrogenation processes. In the extraction and refining of rice bran oil, Japan has made the most significant progress in the world, having already developed up to 80,000 tons of oil per annum, which is 50 per cent of the total potential of rice bran oil in the country.

Japan produces 500,000 tons of vegetable oils, 250,000 tons of marine oils and imports around 280,000 tons of other oils, making a total availability of more than one million tons per annum.

There are 935 oil mills in Japan, of which the thirty modern units, account for 50 per cent of the production: As in other Asian countries, the unused capacity is estimated to be 55 per cent in the large scale sector.

The development of fish oil and fish meal production is an interesting feature of the Japanese oils and fats economy. The fish oil production is around 40,000 tons/year, which is processed for edible use. Japan is also a large producer and exporter of whale oil.

10. **Laos**

The feasibility of setting up a pilot scale vegetable oil extraction and refining plant has been examined. The preliminary study indicates that it is possible, based on the increased production of ground nuts. At present there is no organized production, refining and marketing of edible oils. Small quantities of refined oils are imported to meet domestic requirements.

11. **Malaysia**

The oils and fats of importance are coconut and oil palm. The country imports groundnuts, soybean and also copra. In addition it is reported that about 7,000 tons of oil are imported per annum.

Though Malaysia produces about 125,000 tons of copra per annum, an appreciable quantity is imported from Indonesia; it thus becomes a net importer of copra and a net exporter of coconut oil. Out of the total production of 35,000 tons of palm oil, nearly 85 per cent is exported.

The oil milling industry consists of 70 units for copra crushing, out of which 19 produce refined oil, and 28 units produce other vegetable oils.

12. **Pakistan**

Pakistan is the second largest producer of oilseeds in the region, with a total production of 1.2 million tons per annum. The principal oilseed is cottonseed, which has an annual availability of 830,000 tons, followed by rapeseed 300,000 tons, and other oilseed such as sesame and groundnuts. The country imports copra to the extent of 3,000 tons per annum. There is a potential of rice bran oil development to the extent of 80,000 tons per annum.

The domestic production of vegetable oils is gradually increasing and during the early 1960's the increase was three fold. This is largely ascribed to the development of cottonseed oil industry on modern lines.

In the organized sector, there are 180 mills which have an installed capacity of 220,000 tons/year. Steps have been taken to modernize the industry by installation of solvent extraction plants.

The entire production of vegetable oils is domestically consumed. The shortening manufacturing industry has also made considerable progress; in East Pakistan, rape/mustard oil is widely used as cooking oil. The country has been importing substantial quantities of soybean and cotton-seed oils during recent years, and the total imports, inclusive of coconut oil, have been estimated to be 120,000 tons per annum.

13. **Philippines**

The oil economy of Philippines is solely based on copra and coconut oil, as in the case of Ceylon. It is also the largest producer of desiccated coconut and copra in the world, the copra production being 1.5 million tons per annum.

The country imports vegetable oils for processing into shortening; there are eighteen factories mostly engaged in the production of copra. The production of coconut oil is 350,000 tons and other cooking fats constitute 50,000 tons per annum.

About 80 per cent of copra production is exported as copra and coconut oil, and coconut products are reported to constitute 40 per cent of total foreign exchange earnings.

There have been reports of plans to set up a large coconut oil processing complex for production of fatty acids, fatty alcohols and detergents in collaboration with a Japanese firm. Recent reports indicate that the collaboration is with a West German firm.

Although the potential of rice bran oil in the islands is 30,000 tons per annum, no attempt seems to have been made to produce rice bran oil on a commercial scale.

A number of government and semi-government agencies are in operation in the country mainly connected with the development of coconut industry and manufacturing coconut products.

14. **Singapore**

There are eleven factories engaged in the production of coconut and vegetable oils and other fats. Details are not readily available.

15. **Thailand**

Groundnut, soybean, cottonseed, kapok and copra are produced and nearly 30 per cent of the total 320,000 tons of oilseeds are exported as a primary raw material without being processed. The oil mills are of small capacity and a very limited quantity of peanuts and copra are crushed for oil production.

The most interesting development in Thailand in the field of oils and fats is the development of rice bran oil. The potential is estimated to be 75,000 tons per annum. There are two plants of batch type extraction which are processing rice bran for oil production. A modern continuous solvent extraction plant has recently gone into production in which, apart from rice bran oil, other oils, such as kapok and cottonseed oils are planned to be produced. Copra production is not adequate for domestic requirements. Lard is widely used for cooking.

There is scope for converting the existing oil-bearing materials into oil and exporting oils instead of oilseeds and utilizing the cake/meal for domestic consumption as a feedstuff for livestock. Oil palm cultivation could be taken up as it is climatically suitable for cultivation on a plantation scale. The rice ban oil production could be well organized and developed and to this the Government of Thailand is reported to be paying close attention.

Regional and subregional cooperation

There are distinct areas in the broad field of oils and fats and associate industries where close collaboration among groups of countries in the ECAFE region could substantially contribute to improvements in techniques and application of modern technology, thereby bringing increased prosperity to the region as a whole. There is also scope for collaboration in evolving a uniform pattern of domestic trade and also international trade, particularly in copra and oil palm and the oilcake/meals.

The most important and pressing issue is the inadequate supply of protein in the region. It is paradoxical that while the region abounds in the production of oilseed and copra, which are good sources of protein, they have not been fully exploited for manufacture of protein concentrate and processed foods on a commercial scale. The oilseeds which are available in abundance are cottonseed, soybean and groundnut. Coconut by itself is also a vast source of protein. While there has been considerable advancement in the technology of utilization of oilseed/protein concentrate in some countries in the ECAFE region, it seems to be necessary to establish close collaboration among the research laboratories to develop technique suitable for adoption in the region. This is a challenge to the food processing industry to develop processed food products based on oilseed proteins which would be acceptable to the people and could be sold at economic prices.

The coconut industry is also of great importance to the countries in the southeast region. The modernization of coconut processing, by-product utilization such as shell and coir, improving the oil extraction and processing techniques — and also further conversion of oil into fatty acids, and alcohols, should receive closer attention. Equally important is the development of edible flour or better utilization of the copra cake as a source of protein in the diets of the people, as far as possible, instead of the almost exclusive use of the cake/meal as a food stuff for livestock, as at present. In recent years some attention has been paid to the wet processing of coconuts, with the particular object of promoting the utilization of protein for human consumption. Organization of internal price stabilization boards (commodity boards) and arrival at agreements for a common export policy of coconut products are other matters which lend themselves to close collaboration among the important coconut producing countries.

Oil palm cultivation, now largely confined to Indonesia and Malaysia, could be extended to a number of other countries in ECAFE region such as India, Thailand, and Ceylon where soil and climatic conditions are suitable. Oil palm cultivation and extraction of palm oil is a highly specialized plantation industry. The prospective producers of palm oil could greatly benefit by the experience of Indonesia and Malaysia, where it is a well established industry. It has also been shown that the return per acre from oil palm cultivation is higher than other plantation crops, such as coconuts and rubber.

There is a vast potential for development of a non-traditional source of oil, viz. rice bran oil in almost all the Asian countries. There are many problems impeding its development. In fact like the coconut industry, the rice and rice processing industries should receive close attention for development from a number of points of view. Agriculturally, there is great scope for increasing yield per acre and thereby the total production of rice can be increased. The techniques employed by the rice milling industry are outdated in most countries of the region; modernization of the rice mills will have manifold advantages. The yield of the grain will increase by 5-8 per cent and the by-product bran will be recovered in a higher state of purity, making the extraction of oil more economical. There are problems in the extraction of oil, due to the physical nature of the bran which is fluffy, unlike other oilseeds. The techniques of oil refining, and the separation of wax and non-fatty ingredients also require process developments; Considerable advances have been made in a few countries in the region. This is another area where close collaboration between countries could contribute towards increasing the oil wealth of the region.