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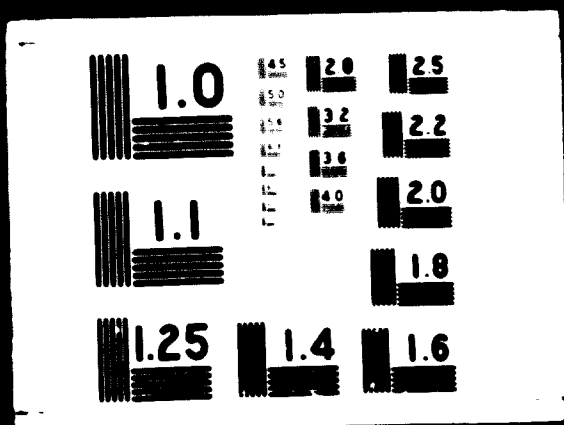
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**INDUSTRIES PROCESSING AGRICULTURAL COMMODITIES OTHER THAN FOOD**

Prepared for the Symposium

Presented by the Food and Agriculture Organization

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.

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#### SUMMARY

(1) Before deciding to invest in processing of agricultural raw materials, a developing country should study carefully the present and future domestic and export situation for the products it intends to manufacture and the comparative costs of manufacturing them. The present paper is intended to provide a background framework for such decisions. It touches upon the various problems which have to be faced by developing countries planning to establish industries based on the processing of non-food commodities.

(2) It is not possible within the space limits to examine the factors affecting the processing of all agricultural raw materials, nor is it feasible to discuss in detail all the practical measures needed to set up processing industries. For a wider coverage of this subject, FAO can provide on application an expanded version of the present paper.

(3) To identify specific commodity projects in individual countries, it will be necessary to go beyond the generalization of this paper. In many instances, it may be advisable to establish pilot projects for the initial assessment of feasibility and for the training of local personnel in management and processing methods, and for practical demonstration to potential entrepreneurs and national development agencies.

(4) No universal blueprint for the development of agricultural (non-food) processing industries is advocated. The paper, however, clearly points out the benefits which may be obtained by developing countries which progressively establish the various stages of processing needed to convert the raw material to a final end-product. Such processing industries constitute an important base for the sound over-all industrial and economic advancement of the developing countries.

#### INTRODUCTION

1. Agricultural commodities other than food (and excluding forestry and fishery products) include for the purpose of this paper the raw materials and beverages used in various industries manufacturing a wide range of industrial and consumer goods. The commodities can be roughly divided into six main groups, viz.:

- I. Natural Fibres, vegetable as well as animal fibres;
- II. Hides and Skins, including also inedible animal by-products and certain vegetable tannin extracts;
- III. Saps and Secretions, such as rubber, lac, resins, etc.;
- IV. Stimulants, Beverages, Flavouring and Condiments, such as tea, coffee, cocoa, tobacco and spices;
- V. Technical and Essential Oils, including drying oils;
- VI. Various Commodities, for use in the manufacture of industrial starches, insecticides, medicaments and dyestuffs.

2. A very high percentage of the world output of most of these raw materials comes from the developing countries. The larger-scale farmers and estate owners in these countries consume little of the produce in its raw state, but sell most of it. There are relatively few industries in developing regions for the processing, and especially for the more advanced and sophisticated processing, of agricultural raw materials; consequently, the farmers' produce as dealt with in this paper is mainly exported to developed, and to a lesser extent, centrally-planned economies for manufacture into end-products.

3. But demand for the end-products in developing countries has also been growing relatively rapidly in the recent past, and will probably continue to expand as local entrepreneurship grows and economic development leads to higher incomes and higher standards of living. With the material at hand, consideration is increasingly being given to the promotion of local manufacture in these areas, both to meet local demand, and perhaps also to replace the export of raw materials with exports of progressively further processed materials and, eventually, with finished products.

4. There are many advantages for a developing country if it can successfully process and market its own raw materials. Generally speaking, the processing of a raw material gives it more value. This "value added" is received when the finished product is sold and the proceeds distributed as wages and profits. The expansion of processing thus raises a country's national income, and promotes economic growth. If a developing country can substitute its own processed products for products previously imported it saves foreign exchange equal to the amount of the value added in processing. Similarly, if it exports a processed product instead of the raw

material, it will earn additional foreign exchange equivalent to the value added. In general, therefore, the expansion of raw materials manufacturing in developing countries promotes economic development, and improves the balance of payments. Other benefits include fuller employment of labour and the stimulation of ancillary and related industries.

These benefits will, however, only accrue to a country processing its own raw material if it can compete successfully in the end-product market. In many cases, developing countries have the advantages of apparently cheap labour resources and proximity of the raw material. On the other hand, they are often at a disadvantage in competing with processed agricultural products from developed countries because of one or several of the following factors: distance from major markets, which are often to be found in higher-income developed countries; trade barriers in developed countries which discriminate against imports of processed goods; lack of locally-produced machinery, so that foreign exchange must be spent to obtain imported machinery; lack of managerial and technical skills to run complex processing machinery; small available markets for processed goods which prevent the construction of large plants, which have low unit costs when worked at or near full capacity.

6. Producers of agricultural materials (but not yet experienced in food products), whether in raw or processed form, and whether located in developing or developed countries, have to face increasing competition from man-made substitutes. These substitutes are mainly produced in developed countries, although they are consumed also in developing countries, and many of the latter are now also starting to produce their own synthetic materials. In many cases synthetic materials have the advantage that they can be "tailored" to a specific end-use, that their quality can be closely controlled, and that their prices are relatively stable.

## I. COTTON MANUFACTURES

### (a) Process outline

7. The seed hairs of cotton form the raw material for a large proportion of the world's textiles while the seed itself gives rise to various human and animal foods. After harvesting the seed cotton from the boll - in many countries still undertaken by labour intensive hand picking - the process outlined may be summarized as:



(1) Ginning: This process, initially involving cleaning, extraction and hull separation, essentially comprises the removal of the cotton fibres from the cotton seeds and trash. Two main types of gin are used - roller and saw; the former is of particular application for long staple cotton. The resultant lint is baled for commerce.

(2) Seed processing and elaboration of derivatives: The content of seed in seed cotton is roughly two-thirds by weight and the average oil content of the whole seed is about 20 per cent by weight. Dependent on the type of cottonseed, the process sequence may include removal of the residual coating of short fibres - known as linters - which represent a particularly important source of cellulose used for the manufacture of chemical cotton. After removal of the hulls, oil is expressed from the prepared cottonseed meats by hydraulic or solvent extraction; the resultant products, edible oil, cake, meal and their derivatives, all have important uses for human and animal feed.

(3) Spinning is essentially a mechanical operation of drawing and twisting together the carded and possible combed cotton fibres to produce a yarn or thread. This requires capital intensive facilities including plant, equipment, buildings and air-conditioning. For economic performance, a round-the-clock production schedule should be followed. The multiplicity of finishes and end applications of modern fabrics demands the use of a range of cotton yarns (and yarns of cotton mixtures) which no one spinning facility could economically and technologically produce.

(4) Other processes: These comprise weaving and knitting; finishing; dyeing, etc.: make-up into end-products like garments. These processes, especially for make-up, are labour intensive. Due to the wide variety of yarn grades, qualities and properties used in weaving and knitting, these processes are becoming increasingly specialized.

8. The different processing activities involved in cotton manufactures provide a variety of opportunities for exploitation in the developing countries. In this paper, two main stages in the production process are distinguished: (a) Ginning (production of "raw" cotton); and (b) Manufacture (spinning, weaving, finishing).

(b) Present production and trade

Ginned cotton

9. The developing countries grow and gin about 40 per cent of the world cotton crop (estimated at rather more than 11 million metric tons in 1965). The main producers in 1965 were India, Mexico, the United Arab Republic, Brazil and Pakistan. Between them, these countries accounted for two-thirds of total production from developing countries.

10. Only about one-third of the world cotton crop (or 3.7 million metric tons) is exported after ginning. Although the United States of America together with Western Europe and the centrally-planned countries grow and gin about 60 per cent of the world's cotton (7.0 million tons), they account for only about one-third (or 1.2 million tons) of total exports of ginned cotton. The developing countries, on the other hand, export about 57 per cent of their cotton crop in the form of ginned or "raw" cotton. The principal exporting countries are Mexico, the United Arab Republic, Brazil, Sudan, Pakistan and, of lesser significance, Syria, Peru, Nicaragua and Uganda.

11. The main importing areas are Western Europe, taking 40 per cent of world exports, Japan with 28 per cent and the centrally-planned countries which import a further 25 per cent. Together, these countries import about 3 million tons of ginned cotton. India is the largest importer among developing countries with 150,000 tons annually, followed by Hong Kong with 130,000 tons.

12. International trade in ginned cotton is thus characterized by a relatively large number of widely dispersed exporting countries which supply the pre-manufactured product to relatively concentrated groups of importing countries.

Cotton manufactures

13. As shown above, developed and centrally-planned countries, either by producing it themselves (6.9 million tons) or by net importation (1.2 million tons), dispose of about 8 million tons of ginned cotton for further manufacture. The rest of the world cotton output, about 3 million tons, is processed into semi-manufactures or manufactures in developing countries.

14. This situation shows considerable development from that immediately following the Second World War, when there were few developing countries with significant cotton manufacturing capacities, except for India. By the mid-1950's several new important producers had emerged, particularly in South-East Asia. These included Pakistan, Hong Kong, China (Taiwan) and Korea.

15. The primary motive for this shift in the location of the world's cotton textile industries from high-income to low-income countries was import savings, but several developing countries have also become net exporters of cotton textiles. In 1961-1963, although developing countries as a whole still remained large net importers, India, Pakistan, Hong Kong, China (Taiwan), Korea and the United Arab Republic were net exporters of about 250,000 tons (raw cotton equivalent) of cotton manufactures.

16. Grey cotton is still the most important fabric exported from developing to developed countries, but whereas in 1955, 65 per cent of European imports were re-exported to developing countries after further manufacture, this trade has declined considerably due to the growth of textile industries in these countries or direct imports from other developing nations, and the bulk of the imports is now consumed in Europe. In addition, the developed countries are now importing substantial amounts of certain types of finished goods, particularly shirts, nightwear and knitwear.

(c) General outlook for cotton manufacture

17. Since 1951, world cotton production has only increased at 2.2 per cent per annum, and the share of cotton in total world textile fibre output has fallen from 74 to 63 per cent. The major part of the total fibre increase has been due to the growth in man-made fibre production which has increased over the same period at an annual rate of about 9.5 per cent.

18. In the period to 1975, it is expected that total world demand for textile fibres will grow at an annual rate of between 2.2 and 2.7 per cent, as population and average incomes rise. The demand for cotton will depend largely on the competition between it and man-made fibres, particularly in apparel fibres. As incomes rise, much of the future increase in per capita demand for such fibres is

expected to take place in developing countries. As competition from man-made fibres is less intense in these countries and will probably remain less intense, at least until 1975, the increased consumption of cotton in these markets may be sufficient to offset its declining share of developed country markets, and so maintain its present share of total world consumption. Under the most favourable conditions, therefore, cotton may have a growth rate similar to that for textiles as a whole.

19. On the other hand, technological progress in the manufacture of man-made fibres, changes in consumer tastes, and movements in relative prices in favour of man-made fibres may considerably reduce the rate of growth of demand for cotton. Cotton supply, also, may not expand as rapidly as in the past, because of the discouraging influence of lower United States of America support and export prices on production in other countries, and the need in some areas to produce more food on available land. Under these circumstances, the cotton growth rate may be no more than 1.8 per cent per year.

20. By 1975, therefore, world cotton consumption is expected to be between 12.5 and 14 million tons, and about one-third of this will be consumed in developing countries. In view of their expanding domestic markets, developing countries will probably continue to establish cotton manufacturing facilities. The over-all volume of international trade in raw cotton may therefore contract, but developing regions as a whole may well become net exporters of cotton manufactures, as well as of raw cotton as at present.

(d) Prospects for cotton manufacture in developing countries

Cotton ginning

21. The suitability of raw cotton for further manufacturing, and hence its price, will depend greatly on the efficiency of the ginning operation. In some developing countries, much of the ginning industry is on a small scale, using obsolete equipment, often with inadequate pre-cleaning facilities. The lint produced is sold to the spinning mills for a low price because of poor quality and damaged fibres. In recognition of the need for high quality ginned cotton, many developing countries are now investing in modern large-scale equipment.

22. The economics of the primary processing of cotton could also be improved in many cases if producing countries made more use of by-products processing, and particularly the derivation of oil and cake from the cottonseed.

Cotton manufacture

23. For most of the developed countries the establishment of a textile industry based on cotton was the starting point for their industrialization. In general, textile manufacturing would seem to offer good prospects for economic growth in developing countries: several developing countries have already successfully established textile industries, and in the general projections, production of cotton goods by developing regions as a whole is expected to continue to increase. But to a large extent, future prospects for cotton manufacture will depend on the particular circumstances in individual developing countries.

24. In the recent past, the relative importance of different factors of production in total costs has tended to favour developing countries. The most important item, particularly in the spinning process, is the cost of the raw cotton. In Hong Kong, for instance, raw cotton represented 80 per cent of the cost of yarn. In Latin America about half the production costs of a spinning and weaving mill were attributable to the raw material. It is probable, therefore, that a country with its own supply of raw cotton will enjoy competitive cost advantages.

25. It should be noted, however, that the growing and ginning of cotton in a particular country is not necessarily a justification for the local elaboration, by spinning and weaving, of that same cotton. In many cotton producing countries, locally-grown cotton may be exported while imports of cotton and/or yarn may service the requirements of local textile industries.

26. Another important cost item in cotton manufacture is labour. In the case of the Latin America spinning and weaving mills it was calculated that direct and indirect labour costs amounted to about a quarter of total costs. Developing countries with a large surplus labour force would thus appear to be in a favourable position. Much will depend, however, on the productivity of labour. In 1961, for instance, Japan, a developed country, had substantially lower labour costs per unit of output than India.

27. The costs of capital equipment often represent a difficulty for developing countries, particularly as the equipment usually has to be imported from abroad, thus increasing the project's foreign exchange costs. Among developing countries, India has been manufacturing her own textile machinery since 1958 and Pakistan plans to do so also. In many cases, cotton industries in developing countries have been established by foreign investment.

28. In the past, the share of capital in total production costs has tended to be small, but cotton textile manufacturing is increasingly becoming a capital-intensive industry with investments of up to \$US20,000 per workplace. The minimum economic size of unit has grown, and for Europe is estimated at 10,000 spindles in the spinning sector, and 144 conventional automatic looms and 98 multiple-frame looms in the weaving sector. Total investment cost for an integrated mill producing 50 million square yards of fabric a year are about \$13 million. The share of capital in total production costs has increased correspondingly: in Latin America from about 22 per cent in 1950 to almost 30 per cent for an integrated mill established in 1965.
29. It would, of course, be difficult for developing countries fully to adopt these techniques, due to scarcity of capital and skilled labour, and lack of technical knowledge. Their competitive position could still be maintained, however, by applying the capital allocated for the development of the cotton industry to the levels of technology which they can feasibly adopt and thereby make sufficient use of their abundant unskilled labour.
30. The comparative cost advantages of a particular developing country must also be viewed in the light of marketing possibilities. As has been seen, the total world market for cotton goods may not increase as rapidly as in the past, due to competition from man-made fibres. The potential markets for goods from developing countries are further reduced by high tariff barriers in developed countries and other developing countries seeking self-sufficiency. Within the limited world market, the individual country is likely to face increasing competition from other well-established developing countries' cotton industries, and also from a modernized capital-intensive industry in the developed countries. In these circumstances, the establishment of a cotton manufacturing industry will almost certainly depend on the availability of a substantial domestic market which can be given tariff protection. Other government aid may be required, at least initially. The possibilities of some form of regional integration should also be explored if a wider market for cotton goods is sought.

## II. LEATHER INDUSTRY

### (a) Process outline

31. The value of the final leather product depends on the pre-slaughter conditions of the livestock as well as the degree of efficiency in preserving the required characteristics throughout the stages of primary processing, transformation and utilization. The generic variation of hide and skin substance and structure within any species is of minor importance compared with differences caused by environmental and management factors, such as disease, malnutrition and physical damage due to mishandling. In the present context, three process activity levels are outlined:

- (1) Primary processing: After ripping the carcass, flaying is carried out; this comprises the separation of the hide or skin from the sub-cutaneous layer of connective tissue. The use of pneumatically operated knives can significantly minimize faulty cuts which occur with traditional procedures. The resultant hides and skins may then be air-dried, salted or semi-tanned.
- (2) Tanning and leather manufacture initially requires the soaking back of the cured stock as obtained from the primary processing operations followed by liming, tanning, and finishing. Three main types of tanning process may be recognized: vegetable; mineral; oil. Post-tannage operations consist of treatment aimed at improving the quality and appearance of the stock. In the developing countries considerable scope occurs for progressive introduction of refinements in process technology of tanning and leather production; however, in general, the techniques are such that given the requisite expertise they are capable of fairly ready application where local circumstances - especially as to throughput - so justify.
- (3) Manufacture of leather goods: The essential process components for leather goods manufacture are analogous to those in the garment trades, namely cutting, stitching, and making up/assembly. Product design plays a very important role, while cutting of the leather demands special care so as to achieve its optimum utilization. Although leather mass-produced footwear manufacture now involves a complex of highly mechanized operations, labour-intensive processes carried out by craftsmen still occupy an important role in the manufacture of leather travelware, specialities like Moroccan leather articles and other fancy items.

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(b) Present production and trade

Primary processing

32. Developed countries, the main producers of meat, dairy produce and wool, account for about 45 per cent of the world output of hides and skins. Centrally-planned economies contribute another quarter of the total world output. The remaining 30 per cent is produced in developing countries, India being the largest producer of goat skins, while Argentina and Brazil are major producers of cattle hides, and Argentina and Uruguay of sheep skins.

33. Hides and skins entering international trade have undergone some degree of processing before export. Exports from developing countries are usually in dry-salted condition, although suspension dried hides are also marketed, particularly from some African countries.

34. Over half of the world trade in hides and skins takes place between developed countries. Exports from developing countries are, however, important, both in world trade and in the trade balances of the exporting countries. For all developing countries, exports of hides and skins averaged \$US260 million per year in 1959-1961. Although most of these exports went to developed countries, centrally-planned countries imported about \$US15 million worth and this trade is increasing.

35. For many developing countries the export of hides and skins in primary processed form constitutes an important source of foreign exchange earnings. For countries like Argentina and Uruguay hides and skins comprise over 5 per cent of the total value of their exports, and for India, Pakistan, East African countries and Nigeria more than 2 per cent. The export value varies considerably from year to year, however, due to large fluctuations in the price of hides and skins in consuming countries.

Tanning

36. Tanning and leather manufacture is an important industry in many developing countries; most tanneries are small village units processing poor quality raw material with primitive equipment. It is increasingly difficult for most developing countries to find foreign markets for poor quality leather. Moreover, developed countries have sufficient tanning capacity to satisfy more of their domestic requirements. Developing countries' exports of leather are thus less than a third of the value of the hides and skins they export.



Leather goods manufacture

27. The main end-use of leather is footwear production. This outlet accounts for between 60 and 80 per cent of total leather use in most developed countries, and "footwear consciousness" is increasing rapidly in developing countries. In some developing countries, such as India, Pakistan and Hong Kong there is a large output of leather footwear, mainly from small cottage industries. Exports of footwear (including rubber footwear from Hong Kong) from these countries were less than \$US21 million in 1960, while imports were four times this amount. Trade in other leather goods is less significant; however, developing countries imported eight times more than they exported. The developing countries' trade deficit in footwear and leather goods is largely due to the shortage of good quality local leather.

(c) Outlook for leather

38. The demand for footwear is expected to increase as population and real incomes grow at a rate of 4 to 4.5 per cent per annum to 1970 in Western Europe, and at about 3 per cent in the United States. Demand in developing countries is expected to grow at an even more rapid rate than in developed countries, but the latter will still constitute the main footwear market in the 1970's. The demand for other products which have traditionally been made from leather, such as fancy and travel goods and gloves, is also likely to increase.

39. Synthetic substitutes have been developed for many leather end-uses. The most important area of substitution has been in shoe soles. In the United States, where substitution against leather first began on a commercial scale during the Second World War, the proportion of footwear with leather soles had fallen to 26 per cent by 1962. In most developed countries, the proportion of synthetic soles is greatest for women's and children's footwear. As soles are mainly produced from heavy leather, the demand for heavy hides has been particularly affected.

40. For other consumer goods, such as travel goods and upholstery materials, the trend away from leather has been almost as pronounced as for soles. One exception has been the use of lighter leathers for footwear uppers. In the last few years, however, a new synthetic material has been introduced into North American and European markets which, although more expensive than leather, has various technical advantages. If this material proves a commercial success, competition will become as severe in this market as in the other major traditional leather markets.

41. It seems probable that the share of leather in most of its traditional end-uses will continue to decline, but the fall in the share of natural leather may be offset by the expected rapid increase in total demand for leather and leather substitutes (see above), especially if some end-uses can be substantially expanded, such as the promising market for leather clothing. Prices, however, will probably continue to decline as supplies increase. As well as leather substitutes, there is likely to be an increasing availability of hides and skins as the world supply of cattle, especially in developed countries, is increased to meet the large projected demand for meat.

(d) Prospects for leather manufacture in developing countries

Primary processing

42. If exports from developing countries are to be maintained, and if tanning and further processing for domestic markets is to be developed, the quality of the hides and skins will have to be improved at all stages from cattle rearing to the export of the processed product. Moreover, improvement may be expected as central meat plants and abattoirs are established in response to rapid urban development, and bulk handling leads to greater by-product use and better flaying techniques. FAO has at present a fairly widespread programme in developing countries for improving hides' and skins' quality; this includes training and demonstration institutes for flaying, curing, tanning, etc. in Kenya, Nigeria, Iran, Somalia and other countries and a tanning research project in Sudan.

The tanning industry

43. In developing countries with a large cattle population, many of the preconditions are favourable for the establishment of a modern tanning industry; labour costs are usually low, and other raw materials such as vegetable tannins are often abundant. Moreover, the demand for footwear and other leather goods is increasing rapidly in many developing countries.

44. In many countries there is already a large number of small rural tanneries. Even where such tanneries are operated efficiently, there is usually an advantage in establishing semi-mechanized tanneries to produce a more uniform product in greater quantity. Moreover, the various types of leather required for modern footwear can only be produced in a mechanized tannery.

45. Most of the output will probably have to be absorbed by the domestic market. Developed countries' imports of leather at present are relatively small and may grow still smaller as they become more self-sufficient in raw material production (either hides and skins, or synthetics). Moreover, trade barriers, distance, and production costs make it difficult for developing countries to compete in these markets. Duties on imports of finished leather into developed countries vary up to 20 per cent ad val. Moreover, fully mechanized tanning requires expensive facilities and developing countries may have difficulty in matching the low costs derived from scale economies of production in developed countries. Finally, developing countries have difficulty not only in maintaining the uniform quality of their output, but in matching the rapidly changing fashion demands of the leather goods industries in Europe and the United States of America. The establishment and/or reorganization of the tanning industry in developing countries must therefore be aimed primarily at more adequately supplying the domestic market and possibly markets in other developing countries whilst pickling and pre-tanning for export must be given serious consideration.

#### Leather goods industry

46. For many developing countries the establishment of a leather goods industry is a logical extension of the improvement of the primary processing and tanning industries referred to above. A leather goods industry based on a large regular domestic output of good quality leather will enable the country to reduce imports of leather goods, particularly footwear, and save foreign exchange. Moreover, the leather goods industry is generally less capital-intensive and more labour-intensive than tanning and so more suitable for small industry organization.

47. Finally, the value added may be greater than for tanning. In Pakistan, for instance, it would appear that the value added in footwear production was 42 per cent of the total value of production, compared with 19 per cent in tanning.

48. In considering the establishment of leather industries, all the stages from cattle rearing to the manufacture of leather articles must be considered. Potential foreign exchange savings from the reduced import of finished goods must be compared with the import content of all processes. In addition, the total costs of producing leather goods may make their price higher than the competing imports; tariff protection for domestic production may therefore be necessary.

### III. RUBBER PROCESSING INDUSTRY

#### (a) Process outline

49. Two essentially distinct aspects of rubber processing may be distinguished:
- (1) Primary processing: This usually takes place on the estate or small-holding and can be done with simple inexpensive equipment. The tapped liquid rubber latex is coagulated; the resultant slabs are then milled through rollers to form sheets which, after washing, are dried.
  - (2) Manufacture of rubber goods: A large variety of articles is manufactured from primary processed rubber; however, the greater part of total elastomer output (natural and synthetic rubbers) is transformed into tires and tire products. The sheet rubber is first softened and broken down by mastification in mills; it is then compounded with other ingredients like reclaimed rubber, vulcanizing agents, antioxidants, softeners, stiffeners, fillers, pigments and odorants. The prepared rubber is then formed by frictioning; the resulting product may then be assembled - as for tires - and further processed by vulcanization.

#### (b) Present production and trade

##### Initially processed rubber

50. Total world production of natural rubber was about 2.3 million tons in 1965. Production takes place entirely in developing countries, 92 per cent of it in South-East Asia, and the primary processing as described above is also carried out in these countries. Since 1955, world production of natural rubber has only increased by just over 15 per cent. Production in several of the South-East Asian countries has been hampered by political events, although the largest producer, Malaysia, has increased its output in the same period by about 25 per cent to reach a total of over 900,000 tons in 1965.

51. Most of the rubber produced is exported after primary processing. About two-thirds of these exports goes to developed countries, a quarter to centrally-planned economies, and the remainder, just over 10 per cent, goes to other developing countries for further processing.

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### Rubber manufactures

52. World factory consumption of natural and synthetic rubber was about 5.3 million tons, 57 per cent of this being synthetic rubber. Factory consumption is greatest in developed countries which take about 80 per cent of the world total. The centrally-planned countries, more dependent on natural rubber supplies, consume about 10 per cent, and the developing countries, which consume almost as much synthetic rubber as natural rubber, account for the remaining 10 per cent. The share of developing countries in total factory consumption has increased from about 4 per cent in 1955.

53. The processing facilities in developing countries usually consist of several small rubber footwear manufacturing establishments, often locally owned, a few tire retread factories, and tire manufacturing plants wholly or partly foreign owned. Developing countries are still net importers of rubber manufactures from developed countries. It has been estimated that, in 1959-1961, developing countries as a whole spent about 30 per cent of the total foreign exchange earned from exporting crude rubber in importing manufactures made from the same product (or from synthetic substitutes). In the last few years, however, the number and capacity of tire plants in developing countries has risen substantially.

#### (c) General outlook for rubber

54. The prospects both for primary and for final processing of natural rubber in developing countries are strongly influenced by current trends in the world rubber situation. World demand for rubber has increased rapidly in the recent past and is expected to continue to grow in the future, so that by 1975 it may be almost double the present level of consumption.

55. The development of synthetic substitutes for rubber has proceeded further than for other agricultural raw materials. The initial impetus came from the inability of natural rubber to meet demand during and immediately following the Second World War. Now, however, synthetic rubber, largely because of its technical qualities, has displaced, or is displacing, natural rubber in several important end-uses, especially passenger-car tire treads, high-pressure hoses, special purpose belting, and cellular and foam products. It is expected that this trend in substitution for natural rubber will continue, especially as new special purpose synthetic rubbers are developed.

56. This does not imply any decline in the consumption of natural rubber, as the fall in its share is offset by the rapid rise in total demand. Demand for natural rubber is expected to grow from 2.3 million tons in 1965 to about 3 million tons by 1975.

(d) Prospects for rubber processing in developing countries

Primary processing

57. To maintain the price advantage of natural against synthetic rubbers, and to offset the effects of lower prices on their profits, natural rubber producers are trying to cut their costs and improve and standardize the quality of their output. Primary processing of tapped rubber (along with packaging and dispatch) represents about 13 per cent of total production costs of Malaysian estates. Efforts to reduce this important cost item and to improve the marketability of their product are being made in all rubber producing countries.

58. New techniques and products, for instance, are being developed, such as the mechanico-chemical crumbling process producing Heaveacrum, which increases the suitability of the product for further processing, after shipment, by reducing its mastification time. Experiments are being conducted with oil extended natural rubber, with a view to reducing end-product prices while maintaining their desirable properties. New uses are being found for natural rubber, especially in the engineering field. Better standards of rubber grading are being devised and some of the Malaysian production is already being processed to meet the technical specifications for the recently introduced standard Malaysian rubber (ESEMAR).

59. These, and related efforts in the field of rubber growing (such as use of high-yielding clones intercropping, crop diversification, and improved tapping methods) have been taken into account in assuming that rubber producing countries will be able to produce and sell by 1975 at least 25 per cent more natural rubber than at present. But whether the increase in sales will lead to a net increase in export earnings will depend on the future course of natural rubber prices.

Rubber manufactures

60. The manufacture of rubber beyond the primary processing stage is capital-intensive: the rubber manufacturing industry in developed countries uses complex technical methods to produce a wide variety of industrial components and consumer goods. Moreover, a considerable sum of money is expended on research and development into the improvement of equipment, techniques, formulations and process operations for the manufacture of high-quality rubber products.

61. It may not be necessary, however, for developing countries at this stage to adopt similar methods, as they are less industrialized and their domestic demand for rubber goods is less diversified. The main products consumed in developing countries are tires for motor vehicles and bicycles and rubber footwear. Nevertheless, even tire manufacture is fairly capital-intensive, and labour costs account for less than 2 per cent of total tire costs in a country like India. Rubber footwear manufacture is somewhat less capital-intensive, but competition from non-rubber synthetic formulations is increasing, especially in developed countries.

62. The more capital-intensive the processing operation, the greater are the economies of large-scale production. The feasibility of establishing a rubber manufacturing plant will thus depend greatly on the size of the market for its output. But even if costs are competitive it may be difficult for developing countries to export rubber goods to the main world markets.

63. The world rubber manufacturing industry is characterized by a high degree of concentration of capital and ownership. The large integrated manufacturers of tires and other rubber goods have their own substantial resources of both natural and synthetic rubber. Moreover, most of the recent expansion of manufacturing capacity in developing countries has been undertaken by these international companies with the aim of supplying local or limited regional markets. They are not anxious that these new factories should compete with their other installations which are already supplying the international market.

64. For developing countries, entry into the world market is also made difficult by the differential tariff rates on imports of processed rubber products into developed countries. For instance, although raw rubber enters these markets duty-free, tires and tubes pay a nominal tariff of 19 per cent in the United States of America,

20 per cent in the European Economic Commission and 27 per cent in the United Kingdom. It is only where developing countries produce cheap, less capital-intensive products and/or where they enjoy tariff concessions that they can hope to export to these markets.

65. There remain, of course, possibilities for trade in rubber products within developing regions. But the establishment of manufacturing facilities in one country must be based on a realistic assessment of such export possibilities. In South-East Asia, for instance, several countries, including India and Ceylon, set up large tire factories to take advantage of scale economies, under the assumption that they could make substantial exports to neighbouring countries, only to find that these countries had in the meantime also established tire manufacturing plants with sufficient capacity to cover their domestic requirements. In such a situation, a decision to establish rubber processing facilities must depend greatly on the size of the domestic market alone. This market can be, and usually is, protected by high tariff barriers.

66. Another large cost component, in addition to capital, is the raw material content. For tire manufacture the raw material content is about 80 per cent, of which the largest items are rubber (both natural and synthetic) and rayon cord. For other products also, the rubber content of total cost is high. For non-rubber producing countries, therefore, and for countries whose indigenous rubber supply only covers part of their requirements (such as India), the import content of the finished product will be high, and net foreign exchange savings will in many cases be negligible.

67. It may be possible, of course, for some countries to replace imported natural raw materials with domestically produced synthetic materials, as India is doing. But this is expensive and the establishment of a petro-chemical complex involves policy and planning issues which go beyond the rubber industry itself.

68. To sum up, it appears likely that the establishment of a domestic rubber manufacturing industry in developing countries will initially result in a dearer product than could be obtained from importing rubber goods from developed countries due to lack of skills, capital and infra-structure facilities. The disadvantage of higher price may, however, be (a) limited in extent if a market can be found large enough to exploit fully the economies of scale and (b) offset by foreign exchange savings. For practical and long-term purposes it seems likely that the market



available to most developing countries will be limited to their own domestic one. Moreover, foreign exchange savings are only likely to be substantial if the rubber manufacturing country has its own supply of raw materials, including especially crude rubber.

69. The prospects for the establishment of rubber industries in developing countries are therefore greatest in those countries having a rapidly expanding market for rubber goods: the fact that raw rubber is locally produced would constitute an additional incentive to manufacture.

#### IV. CONCLUSIONS

70. The primary processing of agricultural raw materials usually involves some sort of separation or extraction and almost invariably takes place in the country of origin. The processing facilities are often located near the area where the commodity is grown because the weight loss in processing makes the transport of the unprocessed raw material uneconomic, and because of spoilage factors, such as stem hardening (jute), putrefaction (hides and skins and rubber). The industries based on such activities offer many advantages to developing countries: they transform raw materials into transportable, and therefore marketable, commodities, thus creating income both for producers and primary processors; sale of the joint- and by-products also provides income. The location of these industries in rural areas provides a major source of employment for rural populations and can therefore be very important in reducing migration to urban centres.

71. In many cases, processing methods are somewhat primitive, and the resulting products are sometimes of poor quality. Incomes of producers and processors could be greatly improved by the adoption of more modern techniques, improved management practices and better quality standards.

72. For developing countries as a whole, the economic advantages to be gained from technological improvements in the primary processing industries for agricultural raw materials are likely to be somewhat limited (even if perhaps rather more certain) compared with those from the phased progressive manufacture of the same commodities. Further manufacture for instance offers the possibility of obtaining the additional value added from the later processing stages, and increased foreign exchange if the manufactured product is exported, or was previously imported.

73. Moreover, the prospects for a widespread expansion of primary processing in developing countries for some commodities are often limited by the lack of a wholly suitable raw material base.

74. This applies, for instance, to the production of some commodities such as jute and allied fibres, cocoa, and rubber, but the production of cotton and hides and skins is more widely dispersed throughout developing countries. Large-scale expansion of primary processing of commodities in the developing countries can only take place if the agricultural raw material output to be processed is also increased, and in many cases this is difficult because of lack of suitable soil or climate for these particular commodities, and because of other factors which make their planting uneconomic. On the other hand, later manufacture is not confined to countries with a raw material base, and several developing countries, such as Hong Kong, have successfully established intermediate or final goods processing on the basis of the importation of initially processed raw materials. Nevertheless, for later manufacture as well as for primary processing, the availability of a cheap locally produced raw material is a great advantage.

75. Developing countries contemplating the establishment of further manufacture - particularly as relating to the more sophisticated end products - must consider the likely costs of production compared with those of already established manufacturers, which for most non-food products are located in developed and centrally planned economies. The two main comparative advantages developing countries are likely to have are in the costs of the raw material and in the labour rates. Much depends on labour's productivity and how efficiently it can be used: difficulties in introducing multiple shift working may, for instance, raise labour costs for some agricultural processing industries to uneconomic levels. Whether low raw material and labour costs give developing countries an over-all cost advantage over manufacturers in other countries will depend on the importance of these two items in total production costs. Cost structure figures derived from particular manufacturing plants for specific locations are notoriously misleading when taken as representative for countries and regions.

76. Capital progressively features as a highly important cost item as the extent of process sophistication and specialization increases. The greater the share of capital in total costs, the less significant will be raw material and labour costs. Although some developing countries enjoy comparative advantages in the latter items, few have abundant, cheap capital resources. Most processing equipment must be imported into developing countries, so that as well as large absolute costs, there

is a large import content in total costs which must be paid from scarce foreign exchange reserves. A second aspect of capital intensive industries is that they usually involve economies of scale, such that unit costs fall as output increases: a high level of turnover may therefore be necessary before the manufacturing unit can break even. Large plants are therefore more economic than small ones, provided they can be used to capacity, often on a shift basis. This in turn depends on the market being large enough to absorb the output at a price which covers costs. For many developing countries, the processing of commodities with marked scale economies may be difficult, not only because of the substantial initial investment for large plants, but also because of the difficulty of finding a market for their output. Much will depend on the present and projected demand situation for the commodity in question.

77. The growth in demand for both food and other agricultural raw materials depends basically on the concomitant trends in population and income, although to some extent the demand for non-food products such as rubber tyres and belting, and ropes will also depend on the degree of industrialization. The demand for agricultural raw materials differs from that for food, in that man-made substitutes are replacing the natural commodities in many traditional end-uses. The degree of competition from synthetics differs greatly; rubber and cotton were the first to be affected, when man-made substitutes were developed during the Second World War, and these substitutes now account for about 55 per cent of the total elastomer market and over a quarter of the apparel fibre market (synthetics 8 per cent, rayon 18 per cent). In most developed countries the proportion of footwear with leather soles has fallen significantly and substitution by synthetics has caused similar trends in other major leather end-uses. Compared with these commodities, the competition of man-made substitutes with jute (and with hard fibres) is in the initial stages. Jute end-uses are also affected by the trend towards bulk-handling and competition from paper and synthetics.

78. Where competition from man-made materials has only developed recently, it is as yet uncertain how severe competition will prove in the future, and what effect it will have on the demand, and supply of natural raw materials. In some end-uses, such as heavy-duty tyres, the natural product so far has technical advantages which have not yet been reproduced in the man-made product; in others, such as some rubber

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and apparel articles, a blend of natural and synthetic materials has been found to be the most satisfactory. In addition, some of the producers of these natural materials which were first affected have met the competition by improving their product, and increasing their sales services: notable examples can be found in rubber (and in wool). However, taking account of the expected total end-use demand, and the future share of synthetics, it is projected that by 1975, world demand for natural rubber and for cocoa will be about 50 per cent above present levels, whereas for cotton and jute it will be between 10 and 30 per cent.

79. Not all of the world market for natural processed raw materials is accessible to the industries of developing countries. Unlike trade in primary processed raw materials, most of which is only lightly affected by trade barriers, trade in the intermediate and final goods is at present subject to a wide variety of obstacles. Although population and incomes are expected to rise in developing countries, the main markets for the products under discussion continue to be in the developed and centrally planned countries. Developed countries discriminate in their tariff and quota import policies against the more highly processed goods and in favour of the primary processed product. Many of these barriers are, of course, not absolute. Some developing countries can produce at sufficiently low cost to surmount tariff barriers and compete effectively in developed country markets; others have established an export trade with centrally planned economies in processed commodities which these countries have not been able to produce in sufficient quantities to satisfy local demand. There is also the possibility that developed and centrally planned countries will in future be more liberal in their trade relations with the developing group.

80. Even if surveys show that some developing countries can manufacture certain goods at lower cost, it is not necessarily possible for them to rely on exporting a substantial proportion of their output. The same considerations apply in reverse, however, for developing countries and commodities where the comparative costs of production are unfavourable; the domestic market can be reserved for locally processed products by import restrictions and production subsidies. This can be, and often is, justified by the expected "non-measurable" benefits accruing to the country. In addition to any import savings on processed goods, local processing facilities may create additional employment, and stimulate ancillary industries.

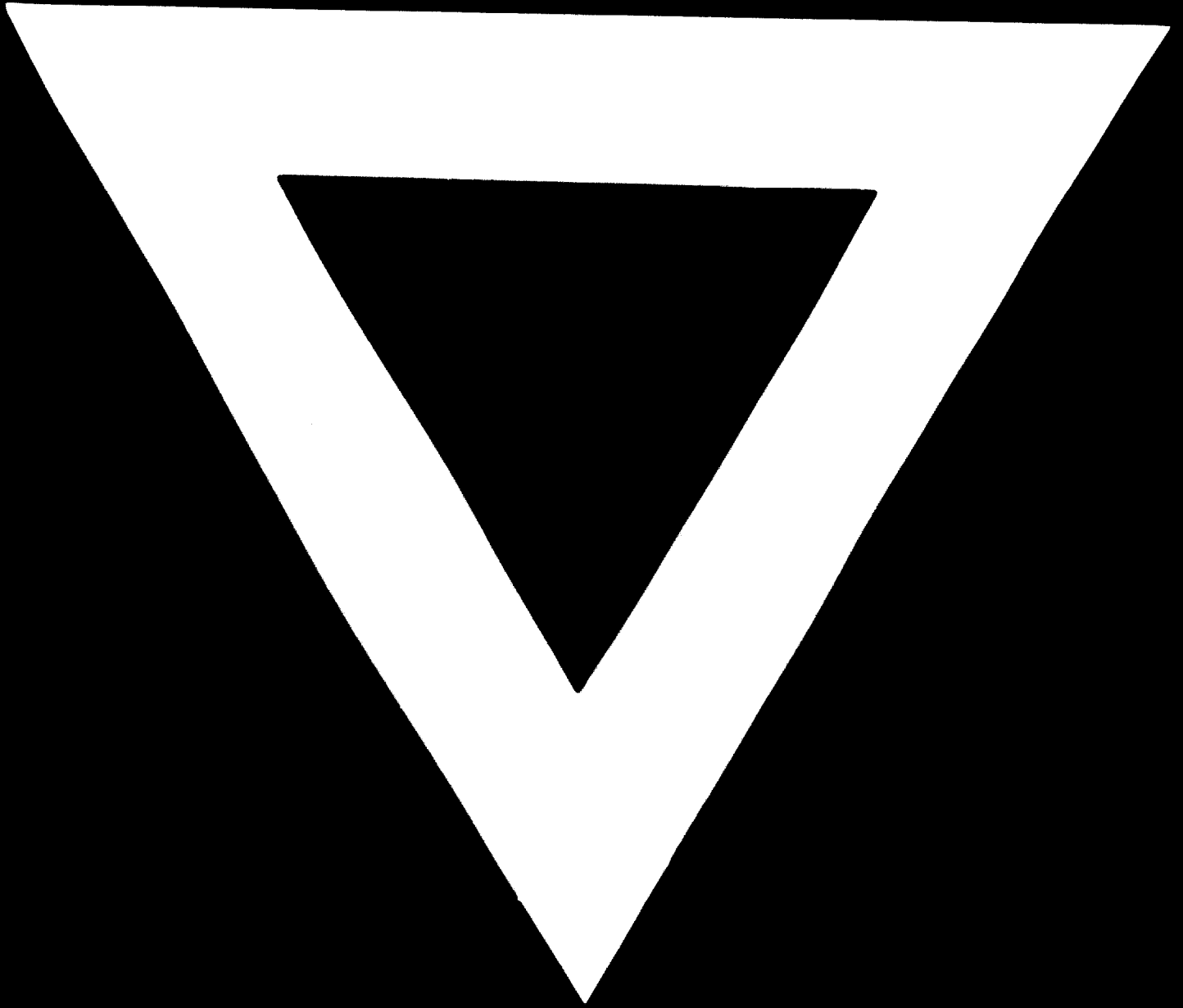
81. As well as competition from imports, it is also possible for governments to control competition from locally produced synthetic products. Demand for synthetic products is not expected to increase as rapidly in developing countries, due mainly to lack of raw materials and considerations of scale of manufacturing operations. In some developing countries, however, synthetic materials are being produced which compete directly with the locally produced natural product. In such cases, a policy decision is clearly required as to how far such competition should be encouraged, taking into account the effects on the local economy.

82. How far the local market for the natural processed commodity should be protected will depend in part on its size and on the extent of scale economies in the processing operation. Where economies of scale are large but the local market is small and other outlets negligible, the costs of protection may be prohibitive. For such commodities, a more feasible solution may be specialization on a regional scale, so that large plants can be fully utilized in supplying the wider regional market.

83. FAO in its regular programme, and as executing agency for the United Nations Development Programme is already undertaking pre-investment projects in the field of processing of non-food agricultural commodities; it confidently expects that scope for this work will increase as more and more developing countries begin to appreciate the close link between agriculture and industry, and the key importance of agricultural processing industries as a basis for sound industrial development.

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