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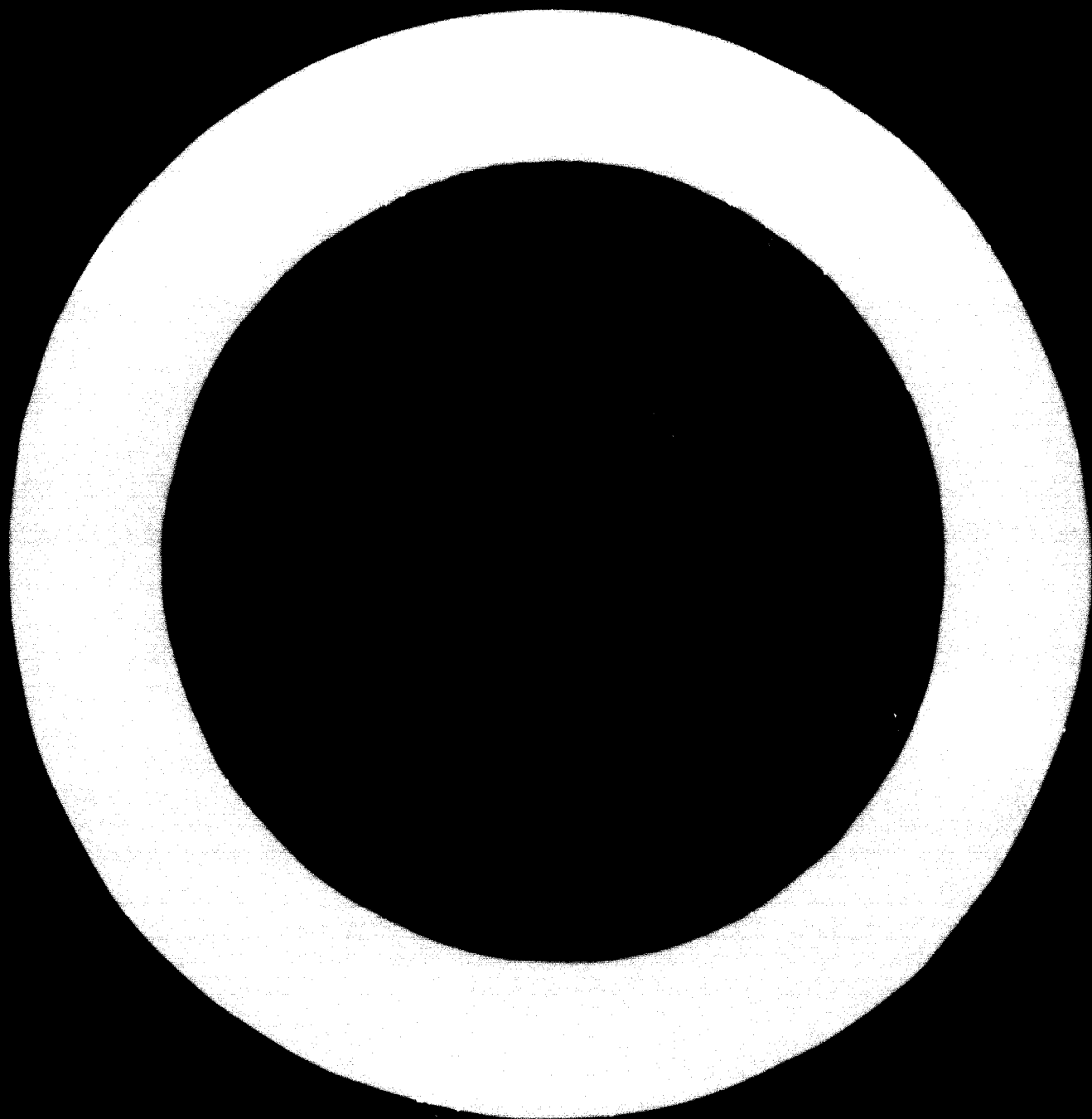
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TEXTILE INDUSTRIES IN DEVELOPING COUNTRIES

Recommendations and Summary Report of the United Nations
Inter-Regional Workshop on Textile Industries in Developing
Countries, Lodz, Poland: 6 - 27 September 1965

For: Regional Symposia on Industrial Development, 1965 and 1966

By: Centre for Industrial Development, United Nations



RECOMMENDATIONS AND SUMMARY REPORT OF THE INTERNATIONAL
INTER-REGIONAL WORKSHOP ON TEXTILE INDUSTRIES
IN DEVELOPING COUNTRIES

Lanz, Iceland: 6 - 27 September 1965

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I. ORGANIZATION AND ATTENDANCE

1. The United Nations Inter-Regional Workshop on Textile Industries in Developing Countries was held in Lodz, Poland from 6 - 27 September 1969.
 2. The workshop was organized by the Centre for Industrial Development in co-operation with the Bureau of Technical Assistance Operations of the Department of Economic and Social Affairs of the United Nations, and the Government of Poland.
 3. The workshop was attended by:
 - (a) Participants invited from the following developing countries: Argentina, Brazil, Colombia, Hong-Kong, India, Iran, Israel, Mexico, Poland and the United Arab Republic.
 - (b) Experts from Industry, Universities and Research Institutes from the following countries: Czechoslovakia, France, Japan, Switzerland and the United Kingdom.
 - (c) A representative of the Economic Commission for Latin America (ECLA).
 - (d) Observers from the International School Secretariat.
 - (e) Observers from Textile Research Institutes and Textile Mills in Poland.
- A list of participants, experts, officers of the workshop and observers is included in Annex I of this summary report.
4. The workshop was opened with an address by Dr. I. H. Abdel-Rahman, United Nations Commissioner for Industrial Development. A message was read from Mr. Victor Hoo, United Nations Commissioner for Technical Assistance.
 5. Welcome addresses were given by Mr. K. Olszewski, Minister, Head of the Committee for Cooperation with Foreign Countries, Government of Poland, Mr. Z. Wojtkowski, Deputy Minister of Light Industries and Mr. E. Kazmierczak, Mayor of the City of Lodz.
 6. Addresses were also given by Dr. T. Jedryka, Chairman of the workshop, and by the Director of the workshop, Dr. N. Beredjick.
 7. Dr. T. Jedryka (Poland) and Dr. J. L. Juvet (Switzerland) were unanimously elected Chairman and General Rapporteur respectively. Dr. N. Beredjick and Mr. V. Saxi served as Director and Technical Consultant of the workshop.

8. The workshop had before it a working paper entitled "The Textile Industry in Developing Countries" by Mr. V. Saxl, and 33 background documents in the field of textiles prepared by or for the Centre for Industrial Development. A list of the papers is included in Annex II.

9. The workshop prepared a set of recommendations and a report on the Textile Industries in Developing Countries. The recommendations and report were unanimously adopted at the concluding session of the workshop. This document will be published by the United Nations in 1966.

10. As part of the workshop Programme, the participants took part in field trips to textile mills and textile machinery plants in the vicinity of Lodz, Bialsko-Biala, Krakow, Warsaw and to the Bast Fiber Research Institute in Poznan.

II. RECOMMENDATIONS OF THE WORKSHOP

11. The following recommendations were adopted by the workshop:

(a) The workshop recommends taking into consideration the great utility for determining appropriate policies in the textile industry of the studies made by United Nations bodies in certain developing regions, that the Governments of developing countries in cooperation with the national associations of textile manufacturers request from the Centre for Industrial Development and the Regional Economic Commissions the extension of such studies to their respective countries and regions with a view of assisting them in determining the economic and technological aspects of an optimum policy for their textile industries.

(b) The Workshop, having noted the firm desires of the developing countries to create or to expand their textile industry as an essential part of their industrialization process, considered that the high costs of the modern machinery may accentuate the balance of payments difficulties of these countries and therefore recommends that, in such cases where outside financing is necessary, it be given in such a way that it is to the advantage of the developing country and avoids possible practices in the export of textile goods which are not in conformity with the rules of international trade.

(c) The workshop having considered the increasing variety of textile machinery offered by manufacturers to developing countries, and having taken note of some of the difficulties of making adequate selection of appropriate equipment for the expansion or modernization of the textile industry in developing countries recommends that the United Nations Centre for Industrial Development convene a group of textile machinery experts with a view of formulating a set of guidelines on textile machinery selection.

The Workshop having noted with satisfaction that the Centre for Industrial Development will convene a Group of Experts to consider the problems of utilization of second-hand machinery in all industrial sectors in developing countries, further recommends that the group of Textile Experts consider in collaboration with the above body, the problems of utilizing second-hand textile machinery in the textile industry of developing countries.

(d) The Workshop recommends that Governments of developing countries take full advantage of the assistance which the United Nations, through its Centre for Industrial Development, Regional Economic Commissions, the Expanded and Regular Programme for Technical Assistance and the Special Fund may render.

Such assistance should not be limited to basic surveys of the textile industry in these countries, but include follow-up assistance for the solution of specific problems in the industry adequately identified and pin-pointed through such or other surveys and studies.

The Workshop further recommends that such assistance includes both economic and technical aspects of the textile industry, and be designed according to the nature of the problems of the respective countries, ranging from short-term missions of individual experts, to collaboration in the establishment of local institutions which may serve the textile industry for longer range assistance through missions of groups of experts and personnel from counterpart institutions.

(e) The Workshop recommends that developing countries consider the creation of a body to deal specifically with the problems of production and trade of textiles in these countries, with a view to:

- i) rationalize their production and assist in determining any possible lines of specialization for individual countries or sub-regions or regions;
- ii) to liberalize to a further extent, trade in textiles among the developing countries.

To this effect the Workshop recommends that the Committee for Industrial Development consider the establishment of a special sub-committee to formulate the terms of reference of the above mentioned body.

(f) The Workshop recommends, that taking into account the valuable experience gained and the fruitful exchange of views among the participants at The First United Nations Inter-Regional Workshop on Textile Industries in Developing Countries, the appropriate organs of the United Nations make all necessary provisions for the convening at periodic intervals of two or three years Workshops or Seminars of similar nature in the field of textiles.

Arrangements should be made to hold these meetings in different regions in countries willing to extend invitations to provide host facilities.

(g) The workshop having considered the importance of productivity for textile industries in developing countries recommends to the United Nations and its Specialized Agencies to undertake all necessary steps, to assist in the formation of regional or national Centres of productivity where such do not exist, with a view of improving the efficiency of textile industry management, dissemination of new techniques of organization and management, new or improved methods of training of personnel at all levels and carry out productivity measurements and inter-firm comparisons. The workshop further recommends that the United Nations and its Specialized Agencies call on developing countries with established experience in this field to provide experts, scholarships and training facilities for the implementation of this recommendations.

(h) The workshop having considered the background documentation submitted to it by the Centre for Industrial Development recommends the utilization of this material together with any additional information to be collected by the United Nations with a view of preparing a General Survey of Trends and Prospects for the Textile Industry in Developing Countries, and further recommends that this survey be submitted for consideration to the International Symposium for Industrialization to be held in 1967.

(i) The workshop having considered the acute shortage of skilled manpower for the efficient operation of the textile industry in developing countries, and having elaborated for this purpose a draft programme for group in-plant training of engineers and technicians from textile plants in developing countries, recommends that the United Nations Centre for Industrial Development take all necessary steps for the early implementation of the group in-plant training programme in textiles and to this purpose initiate as soon as possible negotiations with governments of countries willing and able to provide the necessary training facilities and personnel, and having a viable textile industry.

(j) The workshop recommends that the Centre for Industrial Development and the Regional Economic Commissions of the United Nations initiate or continue studies on the basic and general problems of economies of scale and plant size, and formulate general principles of policy in this connexion.

The workshop further recommends that these studies should cover insofar as possible all textile processes including spinning, weaving, finishing and others. In addition these studies should aim to include as many fundamental factors as possible in order to define in a better way the concept of economies of scale, taking into account not only the technical factors

such as equipment and labour requirements, but also such elements as the quality of raw materials and final products, the prevailing levels of factor costs in the various countries, and overhead costs including administrative and marketing.

The workshop further recommends that in order to define a policy on textile industry, developing countries take into account the findings of the above recommended studies and use them as a basis, introducing the additional modifications and adjustments required by the particular conditions of each developing country.

(k) The workshop recommends that in order to facilitate the advance and modernization of the textile industry in developing countries the United Nations bring to the attention of the Governments of respective member countries, the necessity to adopt adequate measures aiming at a more liberalized access for the developing countries to modern technological processes and know-how at reasonable rates of fee and royalty compensation.

(l) The workshop recommends that the United Nations through the Centre for Industrial Development and its regional Economic Commissions initiate or continue studies in developing countries at the national and regional level in order to establish adequate standards of productivity for the textile industry for these countries and regions. The studies should include such aspects as labour productivity, technical productivity, work loads and work assignments within the mills of each country, and should insofar as possible include comparisons with the standards of developed countries.

(m) The workshop, having considered the problems of transfer of textile technology and know-how to developing countries, recommends that the United Nations Centre for Industrial Development take all appropriate steps to enlist the collaboration of Textile Research and Development Centres or Institutes in industrialized countries in cooperative projects with similar institutions in developing countries with a view of improving their technical facilities and skills of their personnel.

12. The Report of the workshop deals with the main substantive items that follow below in a summary form.

III. THE INTERNATIONAL SETTING

13. The textile industry, catering for basic needs, is one of the first to take root in developing countries. Developed countries, possessing superior knowledge of manufacture and a capacity to supply plant and machinery, could be of considerable assistance to developing countries about to begin establishing or in the process of modernizing their own textile industry. Reference was made during the discussions of the workshop to some bilateral agreements

... of the textile industry in developing countries, which is not only a matter of economic growth, but also a matter of technical progress.

15. The present capital intensity of the textile industry has required a substantial amount of plans for the rapid establishment and expansion of the textile industry in developing countries. It was pointed out in this connection that at present, all over the world, return on capital investment in the textile industry is rather low.

15. Governments of many developing countries have undertaken planned development based on certain priorities and national objectives. As a result concrete plans have to be drawn up for installing or expanding textile industries in these countries. The extremely rapid technical progress has progressively altered the traditional structure of the sector, changing the textile industry from a labour intensive to a capital intensive industry.

16. The distribution of textile equipment in the world has changed showing a higher percentage of total world installed capacity in developing regions than in past years. Between 1958 and 1963, active cotton spindles, expressed as a percentage of world total, in Africa, South America, Asia and Oceania, and Japan increased approximately by 100%, 25%, 23% and 29% respectively. In the same period active cotton looms, expressed as a percentage of world total, in Africa, Asia and Japan, increased approximately by 100%, 60% and 17% respectively.

IV. ASSESSMENT OF NEEDS

17. World demand for textiles is increasing at a rate which is slow and markedly different from one region to another. For example in Latin America it was only 2% higher in 1960 than in 1950, in Africa it increased by about 20%, and in the Far East (not including Japan) by 25%. Among the developing regions only the Middle East showed a substantial growth which amounted to over 70% during the decade 1950-1960. Thus, with the exception of the Middle East, the growth of "per capita" consumption in developing regions was less than that of the world as a whole, and in consequence the gap between the developed and developing countries as regards consumption of textiles is apparently widening.

18. It was considered necessary for assessing the need of the textile industry to make separate evaluations for each country of the inter-relationship between absolute levels of income and the level of textile consumption, the growth of incomes and the growth of textile consumption, as well as the level of prices of textiles and the consequent effect upon demand. Consumption of textiles is expressed in terms of weight for lack of other indicators, however, the increasing use of synthetic fibres and of higher counts of yarn tend to

make the product lighter. The influence of synthetics in developing countries is still very small, although the most rapid consumption growth rate occurs with synthetic fibres. Cotton consumption represents two-thirds, and wool represents one-tenth of total world consumption.

19. The assessment of needs requires a joint effort at the national and at the mill level. It was recommended that a special study should be made on the relationship between prices and demand. The need for collecting data on production, installed capacity, degree of equipment obsolescence, output per machine, labour productivity and tentative cost calculations was emphasized. The surveys prepared by ECLA were discussed as examples and their effect as a stimulus for action to correct the problems identified was noted.

V. FORMULATION OF POLICIES

20. Problems in developing countries where a significant textile industry exists were considered separately from countries which are just beginning to industrialize and are planning to set up a textile industry.

(a) Definition of Problems

21. The problems of the former type are over equipment, obsolescence of machinery, and in some instances lack of administrative and technical personnel. The latter type countries are mostly primary goods producers with little experience in industrialization. These countries need to initiate a well-planned and well-coordinated industry. The main policy criteria are as follows:

- (i) Promotion of the industry should be undertaken with a view to satisfying specific domestic, regional and international markets. Careful consideration should be given to the planning of production. In this connexion, participants pointed out the merits of various plans adopted in their countries or regions.
- (ii) Financing difficulties may arise such as decapitalization of the mills, devaluation of national currencies, and the high rates of capital interest. Fiscal incentives and exchange insurance schemes were discussed as possible remedies. The availability of long-term credits from various sources was discussed as a means of facilitating financing.

22. Although no single structure of the industry can be recommended for consideration by all developing countries, it was noted that the quickest rotation of capital and the most intensive production line were basic elements of an adequate structure. Several other technical, administrative and commercial guiding rules were discussed. These included investigation of the minimum economic size, application of modern production control methods, and locating and developing markets for the best use of products.

(b) General Policies for Promoting Efficient Operation

23. In developing countries with an existing textile industry operational deficiencies may be due to insufficient management skills. Such would be corrected by acquainting the mill administrators with modern methods. In countries where a textile industry is being set up, promotion is normally included in the national economic development programme. However, the training of the necessary staff for the future should be given early consideration.

(c) Measures and Institutions to Ensure Higher Levels of Productivity

23. Programming should be the basis of obtaining higher levels of productivity. The two main objectives are the reduction of production costs and the improvement of quality. Institutions for productivity promotion should be established, and every textile mill should have a quality control laboratory.

(d) Price Policies and Markets

24. It was agreed that the textile industry in a developing country should consider the basic clothing needs of the mass consumer its first and main market, selling at low prices, in large quantities, and with rapid returns.

VI. COUNTRY STATEMENTS

25. During the deliberations of the workshop participants made statements on the status-quo of the textile industry in their respective countries. A brief summary of these is given hereafter:

Argentina

26. The textile industry in Argentina is second in importance only to the mechanical engineering and automobile industry. The textile mills follow targets laid down by the National Council for Development (CONADE). The textile industry obtains long-term credits from national financial agencies. There are good facilities in operation for the technical education and training of labour in the country.

Brazil

27. In Brazil an internal programme has been set up which includes incentives for the modernization of the industry itself, the improvement of the textile machinery industry and also the amelioration of the cotton national production.

Studies were conducted with regard to the North-East region and as a result official agencies were created to supervise credit, organize intensive training courses, provide incentives for the modernization of the industry, raise the standards of labour productivity, and improve the national cotton production.

Colombia

28. The textile industry encompasses about 20% of all gross manufactured output. Cotton predominates textile production which is destined to satisfying the local market. The Association of Textile Manufactures has carried out a survey of production, demand, equipment, employment, capital invested, availability of raw materials and forecasts. The Government influences the industry's progress by controlling imports. The country has the highest productivity of labour in Latin America, and highly qualified management methods.

Czechoslovakia

29. After World War II, the textile industry was nationalized and organized into large units. Spinning machinery has been re-conditioned and most looms were modernized. Improvement, although slow, has made the industry an important factor in the economy. Incentives are available for the mills. Extensive modernization continues.

Hong Kong

30. Textiles are the country's major industry and account for 52% of the value of domestic exports. Spinning, weaving, knitting, dyeing, printing and finishing, and tailoring are all undertaken by the industry. With the exception of the dyeing, printing and finishing branches, development has been very rapid. The most recent development is the spinning, weaving and finishing of mixed yarns such as cotton/polyester. Extensive diversification has taken place within the textile industry.

Iran

31. Iran is self sufficient in cotton products and produces a surplus for export. The cotton textile industry is 75% owned by the private sector, the rest is Government owned. At present production meets the domestic market requirements.

Iran

32. Long-term loans and financial support for personnel training are provided by the Government whose policy is guided by social as well as economic considerations. Several technological and commercial institutions render services to the local industry on technological innovations, scientific research, labour productivity, market research and market development.

Japan

33. In order to rationalize the textile industry government permission is required, by law, before any spinning frames can be installed. This law also adopts a system of freezing surplus spindles for a number of years and allows expansion of capacity to meet increased demand at the cost of scrapping frozen equipment in double the amount of capacity to be expanded. An "Export Inspection Law" helps in maintaining reputable export practices.

Mexico

34. Mexico is faced with the problem of surplus cotton, wool, and henequen (hard fibre of the sisal family) production capacity, and a considerable quantity of obsolete equipment. Various measures were adopted to solve these problems. These include forced scrapping of obsolete machinery, prohibiting the purchase of second-hand equipment, the local construction of textile machinery, Government nationalization of the henequen industry, and the setting up of a Textile Programming Committee.

Poland

35. Poland imports raw materials but has a well established tradition of textile operations including machinery construction. Over half of the textile mill capacity existing before World War II was destroyed or made inoperative. The industry was faced also with problems of shortage of skilled labour and absenteeism. Intensive personnel training and introduction of multi-shift work were introduced.

The country's central plan is used to progressively solve the basic needs and problems of the industry such as, investment priorities, modernization and the proper use of raw materials.

United Arab Republic

36. In the 50's the textile industry in the UAR was able to meet domestic requirements and also have a surplus for export. However, because of protection, the industry neglected modern techniques and as a result difficulties were subsequently faced with exports. The Government as a consequence set up

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a permanent committee to promote better marketing, impose standard specifications, plan a policy for applied research, and conduct economic studies. The Ministry of Industry laid the foundation of a concrete policy for the modernization and development of the industry, and a General Egyptian Textile Organization was set up to plan and execute the technical, scientific and commercial development of the industry.

37. By 1964 machinery, production capacities and the value of cotton textiles exported increased very considerably and extensive training programmes were successfully organized to raise labour skills and productivity. Future development of the textile industry in the UAR is geared to meet the expected growth in domestic consumption and potential export outlets.

VII. RELATIVE IMPORTANCE OF DOMESTIC MANUFACTURERS VERSUS IMPORTS

38. The workshop considered the need for the general industrial development of the developing countries as a basic element for their progress. It was recalled in this connexion that the Centre for Industrial Development of the United Nations has organized seminars on various aspects of industrialization and renders technical assistance to governments in the solution of problems in this field.

39. The following advantages accruing from a policy of industrialization in developing countries were pointed out:

(a) Transferring economic activity from primary to secondary sectors increases the value added to production and permits a better utilization of natural resources thereby raising the population's standard of living.

(b) Rapid population growths and increasing number of displaced agricultural labour necessitate the creation of new employment.

(c) Chronic balance of payments deficits, caused by the ever increasing demand for manufactured goods in developing countries and the insufficiency of foreign exchange earned by slowly increasing exports of primary goods, compel governments to substitute imports by local industrialization.

40. Some participants felt that in order to promote industrialization in developing countries some measures of industry protection may be necessary.

41. The workshop noted that a substantial proportion of personal income is spent on textiles and that most regions of the world are nearly self-sufficient in textiles. North America imported in 1960, 2.2% of the total quantity of textiles consumed during that year, the figures for Western Europe, Oceania, Latin America, the Near East, the Far East, and Africa are 12.6%, 53.2%, 9%, 14.3%, 7.2% and 80.2% respectively.

42. The Workshop recommended that the United Nations assist governments in the rational establishment of their textile industry, which could be carried out in stages with a gradual process of vertical integration.

43. The Workshop also examined the question of the high prices of textile products of an industry protected by high tariffs, and the gradual reduction of these tariffs to promote more efficient production. It was generally agreed that it would not be viable to defer the establishment of textile mills in developing countries for purely economic reasons. However, the Workshop stressed the need for general surveys in every country on production, raw materials and marketing before establishing any textile industry.

VIII. RAW MATERIALS INCLUDING PROBLEMS OF AVAILABILITY AND CRITERIA FOR SELECTION

44. In 1960 world production of natural textile fibres was 16.1 million tonnes, by 1970 this figure is expected to increase by about 27%. Cotton is expected to show the highest rate of increase. Bast fibres world production in 1964 was 3.23 million tonnes.

45. The production and consumption of wool has increased by about 50% over the past 15 years. At present, wool production is expected to remain almost constant at 1.5 million tonnes per year. Wool will continue to be a product of extensive international trade as the principal producers are not the major consumers. Blends have become of increasing importance in the wool industry. It was stated that the use of synthetic fibres in the woollen industry has prevented the occurrence of world wool shortage. The Workshop also reviewed progress in the use of raw materials and blends in woollen and worsted processing.

46. It was brought to the attention of the Workshop that the International Wool Secretariat undertake fundamental and applied research to assist manufacturers in a number of countries with advice on such items as appropriate technological processes for a specific product, labour development, machinery and textile fashion trends.

47. In 1960 world production of man-made fibres was 3.3 million tonnes, by 1970 this figure is expected to increase by 106%. Synthetic fibres are becoming increasingly important as raw materials for the textile industry. In fact, the share of natural fibres is expected to drop from 83% in 1960 to 75% by 1970 of the total textile production. The rate of growth of the staple variety of man-made fibres is now higher than that of filaments, however, this is expected to change in future. (USA, Japan, U.K., USSR, Italy and France are the largest producers of man-made fibres and there is a definite tendency towards the concentration of production in these countries).

48. In 1950 of the total man-made fibres 60% was cellulosic fibres, in 1964 however this proportion fell to about 66%.
49. The correct use of textile fibres depends on the weaving conditions for the final products, fibre properties, economic factors of end-use, availability of fibres, and of necessary processing equipment, and the standard of living of prospective customers.
50. The appreciable difference in price of the various fibres and in the cost of their processing, along with the end-use, are the main considerations governing the application and blending of fibres.
51. The workshop noted that some countries tend to use their available raw materials uneconomically, such as using high quality fibres to produce lower grade goods. This can be remedied either by trade or by producing high quality goods. The workshop recommended the most economic use of locally produced fibres.
52. The problems of man-made fibres stem from the existing excess production, capacity installed in the world, the large capital needed to start production, and the very high costs of erecting new plants in developing countries. Developing countries should consider the production of mixed fibres, using some amounts of man-mades from the very beginning.
53. The prices of finished textile goods can differ greatly from one country to another because of different national policies for raw material prices. It was recommended that access to raw materials markets be liberalized.
54. The workshop felt that extensive research and market studies are necessary before deciding upon the feasibility and advisability of the production of man-made fibres in developing countries. It was also recommended that the consuming countries study carefully the market situation of natural and synthetic fibres, which could be mutually substituted, in order to avoid serious disturbances in prices or availability.

IX. THE MILL LEVEL, METHODS OF ASSESSMENT OF NEED, AND FORMULATION OF OPTIMUM POLICIES

55. In developing countries government planning often greatly influences the policies at the mill level. The workshop dealt with specific policies on the mill level. The following were considered:

(a) Planning of a New Textile Plant

Before establishing a primary textile plant in a developing country, the availability of the following factors must be ascertained: sufficient capital

(a) Planning of a New Textile Plant - (cont'd)

for fixed assets and for current operations, ample labour supply, availability of local or imported raw materials at reasonable prices, adequate duty protection, a distinct need for a product, a clear possibility of producing at suitable prices for the market aimed at, and well trained management. A survey should then be undertaken to study the extent of the market, type of plant and its location, type of fabrics to be produced, as well as type of machinery to be purchased.

(b) Modernizing an Existing Plant

This may entail replacing individual machines within a group of machines or within a department, replacing a complete production line, or modernizing one or more departments of the mill. The Workshop agreed that modernization would not be complete without improvements of operations in general, such as supervision, quality control, and proper labour training.

(c) Expanding an Existing Plant

The Workshop considered that such is generally a simpler task as the aims are more clearly defined. It was noted that the trend at present is the construction of unit plants which facilitate expansion. In older mills, care must be taken so that the addition of new equipment does not cause any obstructions.

(d) Improving Operations at Mill Level

Various circumstances and conditions, sometimes beyond the control of management, may prevent a mill from operating successfully. Some of the basic problems encountered by a spinning mill in Latin America and solutions to these problems were discussed. The problems were as follows:

- (i) Convincing labour and technicians of the necessity for change.
- (ii) The problem of improving blends, reducing yarn counts and determining end-products.
- (iii) maintenance of uniform quality of production. For this purpose a mill control laboratory with strict quality control was installed.
- (iv) Problems of redistribution of labour. Such were reduced by a better selection of staff and the re-training of workers.

56. It was agreed that, in developing countries, mills should have a certain degree of flexibility in the types of fabrics which can be produced in order to be less vulnerable to changes in market requirements. The Workshop also considered the duties of top management, the sales and costing departments, the technical and quality control departments.

X. TEXTILE PROCESSES

57. The Workshop noted that two-thirds of the installed spindles are cotton spindles. New developments in this field include high drafts, large packages and high speed spinning. Considerable improvement was also noted in the worsted spinning system, where high speed gills using automatic levelling devices are being employed. No basic change was noted in the woollen system. The semi-worsted system, which was recently introduced, employs a card producing sliver which is gilled usually in two or three operations. The tow top system uses converters which convert continuous tow into staple form either by breaking or cutting. Processes have also been developed whereby a change in appearance and texture or an increase in the bulk or stretch characteristics of continuous filament yarns can be obtained by putting a permanent crimp, loop, coil or curl into normal continuous filaments. This texturized yarn offers one of the most promising areas for the future of synthetic filaments, which are more suitable for texturizing as they can be heat-set. Core-spun yarns can be produced on any conventional spinning frame.

58. Methods are being developed for modifying the texture of cotton yarns by using either conventional machinery to produce a highly twisted yarn which is treated with a cross-linking agent and then partly untwisted, or by treating conventionally produced plied yarns and then passing them through a false twisting machine.

XI. TYPES OF TEXTILE PRODUCTS

59. The Workshop took note of the following main fabric categories:

(a) Woven fabrics made of wool, cotton, or synthetic spun yarns and filament yarns. These have preserved their market importance and increased in variety. New types, such as stretch wovens are growing in importance. A significant trend is the increasing use of wider looms, which results in reduced costs.

(b) Knitted fabrics are becoming more important because woven fabrics are expensive and their capital turnover is slow. These fabrics give

elasticity and ease of care in care treatments. The techniques used for their production are:

- (i) Straight bar and flat knitting which is most closely related to the original knitting techniques. The straight bar machine produces greater type fabrics. Flat bed machines are said to give greater patterning scope.
- (ii) Circular knitting, particularly double jersey production which has increased, and is being used for ladies dresses, suits and swimwear.
- (iii) Warp knitting developed closely with the development of man-made filaments.
- (c) Fabrics produced by stitch knitting and stitch bonding represent only a small part of the industry. Warp and weft threads are employed, and the fabric is secured by stitching.
- (d) Stretch fabrics which were in little use a decade ago, are at present being used as direct substitutes for natural rubber yarns. For cotton stretch fabrics, three basic principles are presently emphasized: slack mercerization, using crosslinking agents to set crimp, and crimping and heat setting thermoplastic cotton.
- (e) Non-wovens fabrics are made primarily of textile fibres held together by a bonding agent, or by the use of self-contained thermoplastic fibres, and are not processed on conventional spindles, looms or knitting machines.
- (f) Flocked fabrics are also manufactured by unconventional methods. Present emphasis is based on a development whereby an overall fabric can be flocked by means of an electrostatic process instead of mechanical flocking which has many limitations.
- (g) Tufted fabrics are essentially pile fabrics in which the tuft pile fibres are inserted into a base fabric in a manner which is essentially a stitching action. Tufting is a more efficient process than weaving and therefore cheaper fabrics are produced. New, finer gauge and more sophisticated machines are broadening the range of tufted fabrics.
- (h) Multicomponent textile structures are fabrics with an invisible adhesive, and can be of fibre, flock, foam, sheet and fabric in numerous combinations of weight and style. These structures are replacing traditional fabrics and also opening new markets. With the appearance of polyurethane foam as a thermal insulator, designers have started to engineer a variety of multi-component fabrics.

III. DYING AND FINISHING METHODS

60. The workshop noted that at present textile market requires well dyed and appropriately finished fabrics. It was also noted that many new techniques have been developed recently. For example a new group of dyestuffs namely reactive dyes which do not act by absorption but by chemical molecular union, have found rapid acceptance.

III. OPTIMAL TEXTILE PLANT SIZE AND ECONOMIES OF SCALE

61. Technical and labour balance alone do not necessarily ensure maximum productivity. As capital is difficult to obtain, it is important to outline a methodology for assessing the minimum economical mill size. ECLA submitted such a methodology, whereby the capital cost of raw material and labour are assessed for alternative balanced production units.

62. It became clear, during the discussion, that an economical size of spinning plant for a mill not integrated with weaving is about 10,000 spindles, whereas for an integrated mill it is about 30,000 spindles. It was also thought that there was an upper limit for economic size determined by operational, commercial and administrative consideration rather than economical consideration. At a certain level management becomes complicated, capital requirements increase, and additional qualified labour may be difficult to find.

63. The workshop noted that beginning at about 7,000 spindles and increasing up to around 25,000 spindles, investment and production costs per unit of output become progressively smaller, but the difference tends to be relatively small. At present, a unit of 25,000 spindles, costing about 2.5 million dollars for machinery only, may be regarded as the optimum size being economical as to capital investments, working capital required, management ability, requirement of skilled workers, economic production and return on capital. However, smaller mills, when these are of particular interest to developing countries, may be installed with future expansion adequately provided for. The workshop also stressed that very small installations (say less than 4,000 spindles) would give rise to a disproportionate increase in costs.

64. Suggestions were made that growth of a textile mill may be gradual and by steps, each step being reached after careful study. Attention should be given to the kind of product (counts, grey or fancy), and to the structure of the mill (integrated or not).

65. Much attention was given to the question of the economic size of finishing plants. It was felt that the installation of complete modern finishing equipment for one weaving mill with a small number of looms should be avoided. It was also mentioned that some countries are planning to establish finishing plants on a cooperative basis, similar to the example of some plants in India.

XIV. IMPORTANCE OF MILL BALANCE - INTEGRATED AND NON-INTEGRATED MILLS

Importance of Mill Balance

66. A balance of production should exist not only within but also between the various mill departments. Within a department, unbalance may be detrimental both to the quality of the product and to machine performance. Between departments it is the weaving department that should operate fully. The extent of unbalance between the weaving and spinning departments should be minimized.

Affect of Integration

67. The advisability of integration was deliberated and the following advantages were considered possible as regards vertical integration:

(a) The introduction or the improvement of quality control using modern statistical techniques.

(b) Reduction of production costs.

(c) The possibility of creating conditions for the better training of personnel.

(d) The possibility of reducing the magnitude of the fluctuations in demand.

68. In certain countries integration is encouraged by the tax structure, and in some countries a form of vertical integration is achieved by employing existing local skills.

69. It was strongly stressed that vertical integration presupposes the existence of highly qualified senior staff, as well as suitable transport and communications.

70. For economical reasons it was suggested that integration between departments in an enterprise should not cover more than the production stages, leaving the marketing to an appropriate body which should have close liaison with production. Vertical integration of production, however, is economically possible only if a certain degree of horizontal integration exists.

71. The workshop made it clear that the problem of economic size of a group is not to be approached only from the technical viewpoint, but also from a more general standpoint, giving due attention to economic and financial conditions. It was suggested that the United Nations and the Regional Economic Commissions should undertake the study of this problem in different regions of the world.

XV. TENTILE MILL CONTROLS

72. Effective mill controls are important in developing countries, and the establishment of correct standards, based on optimum performance goals, understood and applied at each mill, is imperative.

73. The workshop reviewed progress achieved in the textile industry in some industrialized countries during the past decade, and noted that methods have evolved for product quality control, process efficiency improvements, manufacturing cost reduction and the improvement in the per worker yield.

Mill Control Programme

74. The workshop also noted that an efficient mill control programme includes the following points:

- (a) Controls and tests applied at all stages of production to eliminate deficiencies.
- (b) Establishment of optimum production levels which combine maximum speed and efficiencies with satisfactory product quality and practice standards indicating the acceptable tolerances.
- (c) Controlling waste by establishing standards for its quality and quantity.
- (d) Establishment of a machinery maintenance programme. The need for a preventive maintenance programme, a proper spare-parts ordering system was emphasized by the workshop.

75. The setting up of a special mill control laboratory for the purpose of correctly assessing product quality and promptly reporting findings to management was considered necessary.

Quality Control Programme

76. The workshop agreed that such a programme should be introduced carefully in order to avoid additional production difficulties and frictions among departments.

77. In establishing a programme to be conducted by the Control Laboratory, management should consider the following:

- (a) scope and methods of tests to be conducted, and materials to be tested;
- (b) frequency and number of tests to be carried out, in accordance with the appropriate statistical techniques.

78. Successful mill controls achieve better and uniform product quality, and reduce costs and wastage.

XVI. PRODUCTIVITY

79. The workshop agreed that the objective of increased productivity is to increase living standards by improving the relationship between output and input of factors of production. Thus the concept of productivity should be considered in the light of a sustained effort toward the better utilization of men, equipment and materials. These objectives should be carefully examined by management when taking decisions for investment and when directing plant operation. In this context, it was pointed out that it is desirable to increase productivity with proper care not to create conditions liable to cause unemployment and labour difficulties in developing countries.

80. Productivity measurements have been one of the most important instruments to indicate when and where decisions to improve the operations have to be taken. It is necessary to be clear on the objectives for making measurements and thus make it possible to select the best methods. These measurements are considered only an accessory to promote action in the field of productivity and are not by themselves an objective. Productivity measurements can be examined from two main points of view:

(a) The factory level: In one of the first systematic studies in the textile industry at the factory level, labour productivity was selected as the main index to show operation efficiency in the plant by comparing the actual man output to three standards:

- (i) expected productivity, which is the best possible man output with the same machinery layout and plant conditions;
- (ii) improved productivity, which is the possible man output with the same machinery and improvements made;
- (iii) optimum productivity, which is the possible output with the best machinery available for the specific mill.

(b) It was pointed out that the level of productivity itself measured in "hours worked by operatives per 100 kg"/HOK/ will not reflect properly the different positions of mills in that the requirements are the relationship between:

- (i) the present HOK to the expected one
/organizational index/
- (ii) the present HOK to the improved one
/operational index/

(iii) the improved HOK to the optimum on
/obsolescence index/

81. This methodology was followed in Europe in the 1950's and was recently also adopted by the Argentine Productivity Centre. In eastern European countries the measurements now cover more than 500 mills.
82. There are other systems of inter-firm comparisons and the method chosen must consider the receptivity of mill management, the cost of the survey and the way it is to be financed. The participants made it clear that it was not possible to apply any of the available methods without a substantial study taking into account the particular condition of each area, and the exact purposes envisaged by the study.
83. At the country level the measurements have the objective of providing guide lines for the policy to be adopted for the industrial development of the country.
84. It was agreed by the Workshop that there are four basic areas of attack to obtain a better performance in the textile industry: management qualification, standardization and quality control of production, job description as well as job rationalization, and adequate maintenance.
85. The Workshop also took notice with interest of the institutions being created in some countries for promoting and spreading technical and industrial knowledge as a means to increase productivity in the enterprises.
86. The Workshop recommended that all countries consider the establishment of institutes for the development of productivity and stressed the need for such institutes to establish and maintain close cooperation in order to share their experiences and acquired knowledge.
87. The dissemination of information was considered to be of paramount importance to productivity. This aspect is closely related to the compilation and distribution of documents, scientific and technical literature, and other informative materials. The Workshop recommended that, in view of the need to have access to such information, all material and information of common interest throughout the world be made available without undue limitations.
88. During the discussions it was pointed out that the work of ECLA in this field is in line with the plans for modernization and rationalization upon which Latin America's textile industry is just embarking, and in recognition of the fact that existing conditions in this industry are liable to bring it to a standstill unless drastic measures are taken to remedy the situation.

... well-... The trends of operating conditions in Latin America seem to be similar to those described in the Latin country studies, with particular reference to cotton and wool spinning and weaving mills. The first relates to a well-balanced situation with a high degree of up-to-dateness side by side with a high level of operating efficiency, as reflected in the productivity levels concerned. Few countries present this ideal situation. The second category includes those situations where a high degree of up-to-dateness of equipment is not accompanied by a parallel efficiency, i.e., as manifested in an adequate use of capital. The third category is represented by countries which maintain an intermediate level of up-to-dateness and operating efficiency. These countries require both organizational changes and re-equipment on a moderately intensive scale. The fourth and largest category covers situations where little of the equipment is up-to-date and operating efficiency is low.

90. The main indicators relating to operating conditions in a number of countries studied by ECLA were outlined both from the standpoint of the fibres processed (cotton and wool) and of the process used (spinning and weaving). These data cover:

(a) Up-to-dateness

The definition of an up-to-date machine takes into account its age, the degree of automation, production capacity and other technical criteria such as size of spindles and speed of loom.

(b) Utilization of Equipment

The standard adopted was three daily shifts (two eight-hour shifts and one six-hour night shift) in 300 working days a year, i.e. a total of 6,600 machine/hours per year.

(c) Labour Productivity

This is defined as the physical output of one operator in one hour and, to facilitate comparison between mills or between countries, the nominal values noted are converted to, or weighted in terms of an equivalent product.

As a point of reference, a so-called "standard for Latin America" has been established, which is considered to be a feasible level under prevailing Latin American conditions of manpower training, conventional up-to-date machinery and available raw materials.

(d) Unit Output

This is defined as the ratio between the physical volume of output and the number of machine hours required to achieve it. It also relates to a standard for Latin America consisting of the production capacity of equipment regarded as modern.

XVII. TRAINING

91. During the extensive discussions on training, it was agreed that on-the-job training is the most urgently needed type of training, especially at the level of supervision and medium-level direction of the mills. The training within industry methods was considered the most suitable for this purpose.

92. In nearly all the developing countries there is a necessity for intensive training of technicians who can fill the gap between the engineering personnel and the skilled workers. At the engineering level, there is a universal need to implement methods to bring colleges in closer contact with the industry.

93. The Workshop agreed that in-plant training is useful in bridging the gap between practical industrial application and fundamentals taught at universities, in emphasizing the trainee's engineering and technical abilities, and in underlining the suitability of individual trainees for specific occupations. Group in-plant training programmes in industry are amenable to promotion of training projects at the country level and can be systematically planned in advance. In-plant practical training and familiarization with actual problems and practices should be the predominant feature of such a training course.

94. The Workshop elaborated a group in-plant training programme for engineers and technicians from developing countries in the textile industry. Trainees for this programme should be graduates with an academic degree in Textile Engineering Technology, or graduates of pre-college level with work experience of not less than 4-5 years in the textile industry; or practitioners in textile engineering with at least five years practical experience in the textile industry.

95. Although traditional textile and garments may predominate in the textile industry, the workshop examined the present developments in the textile industry which are finding increasing application in developing countries. Several factors are noted: the increasing rate of progress in textile technology; the trend to a:

- (a) the introduction of man-made fibres in great varieties of numerous products and the possibility of their blending with natural fibres;
- (b) the dynamics of technical developments; and
- (c) the new techniques in textile processing.

XIX. NEW PRODUCTION TECHNIQUES AND PRODUCTS

96. The use of many new production methods has increased the versatility of the industry and has produced an assortment of products better suited to demand and end-uses. A new product, such as non-woven goods, is produced directly from loose fibres eliminating the traditional techniques of spinning, weaving or knitting. Techniques, particularly adapted to the processing of chemical fibres are being developed. These include the conversion of tow and the texturizing of yarn. The converter technique makes use of the natural way the fibres are formed by chemical plants. It may be used for the production of 100% synthetic fibre yarns or the converted tow may be blended with natural fibres of tow.

97. The workshop noted that the new products, such as texturized continuous filament fibres, are coming into increasing use. Texturizing gives properties similar to those of yarns spun of staple fibres as well as good wearing durability. The production of texture yarns should therefore not be overlooked by any developing industry.

98. The workshop also took note with interest of developments in the field of non-woven goods. One type of non-woven fabric is replacing articles made of cotton and of artificial leather. Some non-woven fabrics are made by the shrinking of web containing thermoplastic fibres and may be resistant to heat, fire, and chemical and biological effects.

99. The workshop noted that finishing operations must not only aim at a higher commercial value of the processed material but must also enhance the physical properties with respect to the end-use, such as resistance to creasing and shrinkage, "wash and wear" properties, and water proofing, a finishing operation which is finding increasing application.

100. Foamstacked woven and knitted fabrics are noted to have good wrinkle retaining properties due to the polyurethane foam. This diminishes the share of textile fibres used for such fabrics. Foamstacking techniques are simple and require very few special equipments, and may therefore be of considerable economic importance to some countries.

101. The workshop noted major achievements with regard to the aggregation of separate machines to form continuous automated finishing plants. These include:

- (a) continuous bleaching of rope and full width fabrics of cotton, flax or their blends with man-mades. Newly developed bleaching agents make speeds of 600 kilos of material per hour possible;
- (b) continuous aggregates for the processing of loose stock, which are able to dye almost any kind of fibre in top or in tow form. The output of these aggregates amounts to 12⁵-200 kg/h;
- (c) aggregates for dyeing piecegoods, woven and knitted, operate by soaking, setting and finally rinsing;
- (d) production lines for complete finishing of woven and knitted goods which comprise a section for primary cleaning of fabrics, and a section for dyeing.

102. It is expected that continuous processing lines for complete finishing will develop at an increased rate. The use of such techniques is possible provided that there is a specialization of finishing plants and a standardization of assortment groups to be finished.

XA. EQUIPMENT AND MACHINERY FOR TEXTILE INDUSTRIES IN DEVELOPING COUNTRIES

103. Traditional techniques of producing yarn have been modified and developed, and completely new methods of producing fabrics and other textile products have been introduced. The production rates of individual machines have increased considerably, e.g. the production rate of cotton card has increased by a factor of four, the draw frame by a factor of eight, and certain types of looms by a factor of three.

Limits to the Production Rate of Textile Machinery

104. In many cases the performance of a machine is limited by the properties of the material being processed and by the inevitable interference and

interaction between process elements.^{1/}

105. Production at 100% efficiency: can be increased by increasing the value of any or all the three factors mentioned below:

- (a) the linear speed of the machine;
- (b) the weight per unit length;
- (c) the number of production units per machine.

Efficiency

106. The workshop took note that machine efficiency determines the actual production and is affected by the following factors:

- (a) Whether the machine falls in class A or class B.

If the machine falls in class A category, e.g. the ring frame, then the size of the individual machine is determined by limits imposed by the machine maker and considerations of layout. If in class B, e.g. the speed frame, the size of the individual machines will largely be determined from considerations of machine interference.

- (b) Size of creel package and time element to creel.

In recent years package sizes, particularly can sizes, have been considerably increased to such an extent that often a machine need only be creeled once per shift. Clearly under these circumstances very marginal improvements are achieved if the size is further increased.

- (c) Size of produced package and time element to doff.

The output package of one machine becomes the input package of the next and the space available in the creel of the subsequent machine must be a consideration, thus the can sizes for a cotton card are appreciably greater than those for a draw frame feeding a speed frame.

^{1/} The production of a textile machine operating at 100% efficiency is obtained by multiplying the linear speed at the output by the weight per unit length of the delivered material multiplied by the number of production units per machine. The actual production is the product of this quantity and the machine efficiency.

(d) Down-time for clearing, maintenance, or inactivity in the case of poorly organized labour.

It must be recognized that down-time is essential for preventive maintenance and a proper schedule should be laid out for this work.

107. The argument developed above shows that the law of diminishing returns affects machine design and influences the development of machines. Thus the workshop considered that a greater gain may be obtained by a reduction in the price of machines than in further reduction of the HOK which at the present time are already extremely low, in absolute terms, with conventional modern machinery.

108. In countries where a textile industry is being created, the provision of new jobs must be taken into consideration. It was therefore generally considered that the new industry should be of a modern type adapted to the existing operating conditions, and capable of being supplemented with automatic devices as and when required.

109. For countries with an existing textile industry, it was stressed that their essential problem was modernization of the existing plants and possibly the setting up of new firms. The situation for such countries is rather complicated because the modernization often means a reduction of employment.

110. Some participants stated that developing countries should take into account the prevailing level of wages when planning a modernization programme.

111. The workshop took note of the analysis undertaken by the Economic Commission for Latin America in its study on the textile industry of Brazil, where different hypotheses of technology were considered and their effects on production costs assessed. It was pointed out that this type of analysis was a useful tool from the point of view of economic policy and industrial development policy in general, and could provide an overall framework for the determination of investment policy for the textile industry as a whole.

112. By means of these hypotheses it has been possible to make a thorough assessment of the situation of the industry in Latin America in giving a precise picture of the degree of obsolescence of the industry. Moreover, this study made it possible to estimate the value of applying the different solutions envisaged in the above mentioned hypotheses taking into account investments and amortization costs, employment, final costs of the products, etc.

XXV. DEGREE OF LEVEL OF SPECIALIZATION

113. The degree of machinery specialization required is determined by a number of technical and economic factors. Among the technical factors are:

- a) the characteristics of the raw material, e.g. whether short or long fibres will be processed;
- b) the characteristics of the final product, in particular whether the process is designed for mass consumer products or fashion products.

114. Among the economic factors is the question of mill balance, which can be upset, causing an increase in cost of production if technically viable changes are introduced without due consideration.

115. The workshop noted that it is necessary to have a clear idea of the present and future requirements of a particular plant since this influenced the number and flexibility of the machines to be installed.

XXVI. UTILIZATION OF NEW VERSUS SECOND-HAND MACHINERY

116. It was considered that machinery should be scrapped whenever a process becomes obsolete or if the performance of a new machine has become greatly improved. The issue therefore is one of judicious judgment as to which machines should be completely replaced by new machines and which could be rebuilt to extend their utility and usefulness.

117. The question arose as to what extent second-hand machinery could be utilized in the textile industry in the developing countries. It was felt that while there is the danger of importing uneconomic used machinery, there is also some substance in the proposal to evaluate second-hand equipment and permit restricted imports as and when there is promise of economic usefulness. This may be the case with equipment which is replaced by highly modern machinery in developed countries, such surplus useful machinery may be successfully employed in developing countries. It was therefore pointed out that extreme care should be taken to evaluate such plant and machinery before they are recommended for use in a developing country.

118. In this context it was recommended that an international group of experts could be of great assistance in studying the requirements in developing countries and advise on the usefulness of any such machinery.

119. A proposed system of inspection and certification, which is to be carried out before purchase is authorized. This is not, and certainly, is not done generally at present.

120. The workshop noted with satisfaction that a meeting of experts is under consideration by the United Nations, to consider the problems of second-hand machinery in a number of industrial sectors.

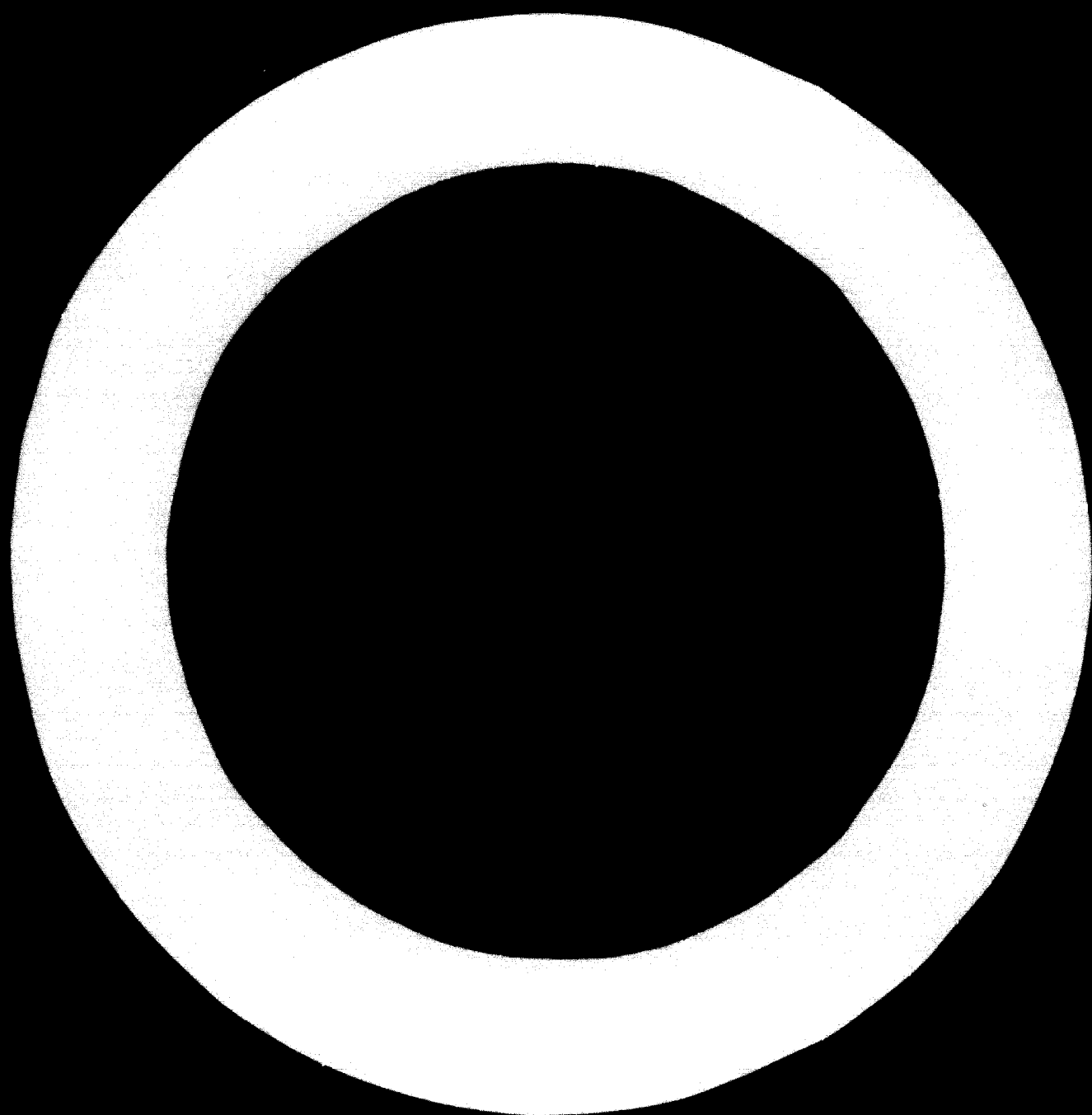
XXIII. AUTOMATION IN THE TEXTILE INDUSTRY AND PROBLEMS CONNECTED WITH IT

121. The workshop took note that it is convenient to differentiate between automatic machinery or devices and true automation. Automatic devices are designed to achieve either a reduction in labour, such as automatic lap doffing on the scutcher, or an improvement in the final product such as automatic levelling devices. The workshop concluded that each automatic device should be carefully considered for possible useful application in developing countries. On the other hand, automation implies manufacturing with the minimum of human contribution. An automation system should also be automatically controlled including automatic fault correction. Revolutionary approaches to techniques for producing yarn, fabric and other final products have been and are being examined. Automatic doffing and conning and also creeling equipment is being developed. More than 12 systems already exist for processing cotton from bales to ring frames in an automatic or semi-automatic manner.

122. One of the basic problems when machines are linked together is machine interference, thus the efficiency of the whole line approximates to the product of the efficiencies of the component machines.

123. The workshop considered that automation systems such as those presently proposed for the cotton spinning sector are probably not well suited for installation in developing countries since the unnecessary and small advantages of reduced labour can be completely offset by the higher cost involved in introducing, running and maintaining the system.

124. The workshop, however, agreed that in the case of a continuous flow, tension controlled finishing plant automation may be advocated for bulk production, in developing countries.



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ANNEX I

LIST OF PARTICIPANTS

(a) Participants nominated by Governments

<u>Country</u>	<u>Name</u>	<u>Affiliation</u>
Argentina	Prof. Eng. Gerardo Lasalle	formerly Director Argentine Productivity Centre, Buenos Aires
Brazil	Mr. Alberto Tangari	Executive Secretary Executive Group for Heavy Mechanical Industry
Colombia	Mr. Gabriel Poveda	Chief of Technical Department The National Association of Industries (ANDI)
Hong Kong	Mr. Elmer Jing Sung Tau	Secretary Nanyang Cotton Mill Ltd. and Island Dyeing and Printing Co., Ltd.
India	Mr. Anil Chandra Chaudhuri	Director Office of the Textile Commissioner Government of India
Iran	Mr. Mohamed Bagher Kia	Member of the Board of Directors of Iran Fac- tories Company, and Director of the Textile Industries Section of the Government of Iran
Israel	Mr. Shlomo Geor-Arie	Director of Textile and Leather Industries Ministry of Commerce and Industry

(a) Participants nominated by Governments (cont'd)

<u>Country</u>	<u>Name</u>	<u>Affiliation</u>
Mexico	Mr. Jaime Martinez Benitez	Official of Nacional Financiera
Poland	Dr. T. Jedryka	Director Textile Research Institute
United Arab Republic	Mr. Mohamed Merzban	Egyptian Public Organisation for Spinning and Weaving

(b) Experts

<u>Country</u>	<u>Name</u>	<u>Affiliation</u>
Czechoslovakia	Mr. J. Holecek	Commercial Director KOVVO (Foreign Trade Corporation for Import and Export of Precision Engineering Products)
France	Mr. R. Haour	Manager Compagnie d'Engineering et de Planification Industrielle Economique et Commerciale
Japan	Dr. T. Murayama	Managing Director Japan Spinners Association
Switzerland	Dr. J. L. Juvet	Professor University of Neuchatel Switzerland
United Kingdom	Mr. F. Greenwood	Development Director Prince, Smith and Stells Ltd.

(c) United Nations Staff

Dr. N. Beredjick Project Director
 Centre for Industrial Development

Mr. V. Saxl Technical Consultant

Mr. M. Pollner Economic Commission for Latin America

(d) Observers

(i) International Wool Secretariat

<u>Country</u>	<u>Name</u>	<u>Affiliation</u>
Belgium	Mr. O. Ransart	Director Market Development
Netherlands	Mr. A. J. Pleumeekers	Director of the Technical Department
UK	Mr. J. Matthews	Director Manufacturing Services Section
UK	Mr. A. Z. Sliwerski	Industrial Officer Manufacturing Services Section

(ii) Poland

<u>Name</u>	<u>Affiliation</u>
Eng. Henryk Cichowski	Textile Research Institute, Lodz
Eng. Kazimierz Uranowicz	East Fibres Research Institute, Poznan

(ii) Poland (cont'd)

<u>Name</u>	<u>Affiliation</u>
Mrs. Lanuta Mordaka	Manager Department for Cooperation with Foreign Countries Textile Research Institute
Mr. B. Stasica	Technical Manager Textile Machinery Metal Export
Mr. Andrzej M. Witkowski	Assistant to Director General CETESE
Eng. Wlodzimierz Kilanowski	East Fibres Research Institute, Poznan

ANNEX 2

LIST OF PAPERS

WORKING PAPER

1. Textile Industries in Developing Countries

United Nations
Centre for Industrial
Development by
Mr. V. Saxl, UN Technical
Consultant

BACKGROUND PAPERS

1. Manufacturing Controls for Textile Mills
2. New Finishes Giving Additional Advantages to Wool Products
3. Modifications of Textile Products by Chemical or Physical Treatment
4. Modern Finishing Methods for Cotton Textiles, Including the Production of Stretch Fabrics by Using Special Spinning, Twisting or Weaving Methods
5. The Textile Fibre: Raw Materials, Their Availability and Application Criteria
6. Recent Technological Achievements and Possibilities of Their Application in Developing Countries

Werner Textile Consultants

A. Pleumeeckers
International Wool Secretariat

Carroll L. Hoffpauir and
B. M. Kopacz, Agricultural
Research Service

Carroll L. Hoffpauir and
B. M. Kopacz, Agricultural
Research Service

Instytut Włokiennictwa, Lodz

Instytut Włokiennictwa, Lodz

BACKGROUND PAPERS (cont'd)

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|-----|--|--|
| 7. | <u>The Systemated Mill</u> | <u>Textile Industries</u>
February 1965 |
| 8. | <u>Modern Cotton Industry</u>
<u>A Capital Intensive Industry</u> | Report by the Special
Committee for Textiles
(OECD) |
| 9. | <u>Textile Outlook for the Sixties</u> | Study by the US Department
of Commerce |
| 10. | <u>The Textile Industry in Latin</u>
<u>America II. Brazil</u> | United Nations Publication
E/CH.12/623 |
| 11. | <u>The American Textile Industry</u>
<u>Competition, Structure, Facilities,</u>
<u>Costs</u> | L. D. Howell
Economic Research Service |
| 12. | <u>International Cotton Industry</u>
<u>Statistics of 1963</u> | International Federation of
Cotton and Allied Textile
Industries |
| 13. | <u>Surface Styling of Textiles</u>
<u>by Flocking</u> | Farbenfabriken Bayer AG |
| 14. | <u>The Production of Synthetic Fibres</u>
<u>on a Petrochemical Basis in Develop-</u>
<u>ing Countries</u> | P. Seifert, Inventa AG |
| 15. | <u>From Crude Oil to Synthetic Fibres</u>
<u>with Special Consideration of</u>
<u>Sequence for Polyester Type Fibres</u> | D. Katus, Lurgi Gesellschaft
für Mineraloltechnik m.b.H. |
| 16. | <u>Polyester Synthetic Fibre Materials</u>
<u>for Developing Countries</u> | David Brown
Halcar International Inc. |
| 17. | <u>Development of a Synthetic Fibre</u>
<u>Industry, As For Example Nylon-6,</u>
<u>in Developing Countries</u> | D. Thormann, Hoechst-Linde,
International GmbH |

BACKGROUND PAPERS (cont'd)

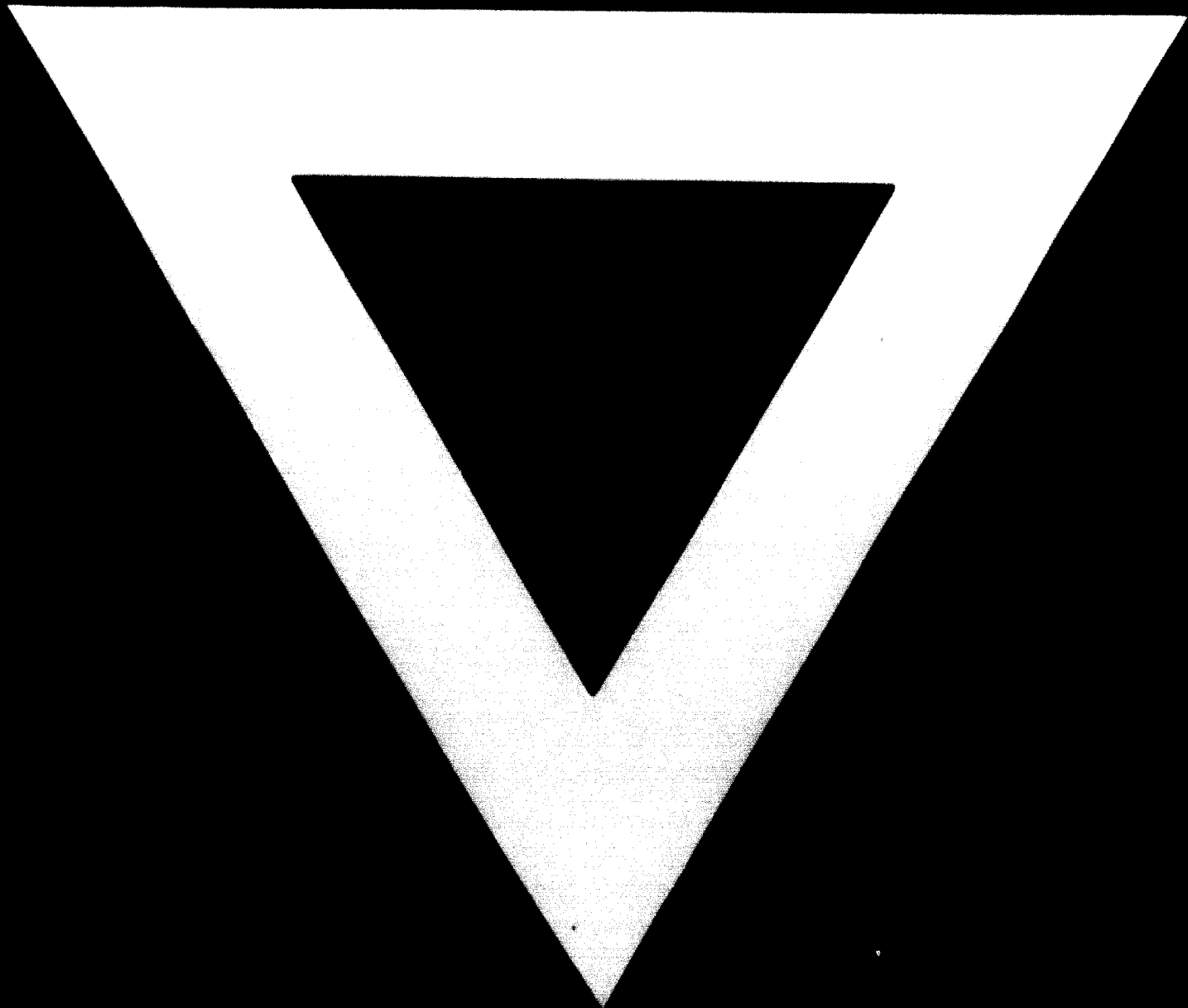
18. Economics of Scale in the Cotton Spinning Industry
(E/CN.12/L.7) Economic Commission for Latin America
19. Problems and Prospects of the Textile Industry in Latin America
(E/CN.12/L.6) Economic Commission for Latin America
20. Some Aspects of the International Setting for Textile Industries in Developing Countries J. L. Juvet, Professor
University of Neuchatel
21. Policies Regarding the Development and Operation of Textile Industries in Developing Countries R. Haour
Copico
22. Synthetic Fibres of Polyamides J. Laub
Hans J. Zimmer AG
23. Acrylic Fibres E. Tsunoda
Asahi Chemical Industry Co. Ltd.
24. Selection of Wools in Relation to End-Uses J. Matthews
International Wool Secretariat
25. Competitive Operation of Wollen and Worsted Plants J. Matthews
International Wool Secretariat
26. Modern Weaving Techniques, Styling, Designing and Fabrication of Wool Fabrics A. Z. Sliwerski
International Wool Secretariat
27. Textile Fibres and Their Properties Burlington Industries, Inc.

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BACKGROUND PAPERS (cont'd)

- 28. Productivity and Labor-Unit
Requirements in the Cotton
Textile Industry
A. Nicol
Productivity Measurement
Advisory Service
- 29. Manufacturing Costs in the
Textile Industry
Sigar Schlesinger
United Merchants and
Manufacturers, Inc.
- 30. Recent Innovations in Textile
Finishing
Ralph Kalenbaugh
- 31. Establishing of Textile Industries
in Developing Countries:
Comparative Study of Weaving Costs
RUTI Machinery
Works, Ltd.
- 32. Modern Methods of Ballroom Design
International Wool Secretariat
- 33. A Guide to Fibres
L. I. Du Pont
La Marse and Company, Inc.





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