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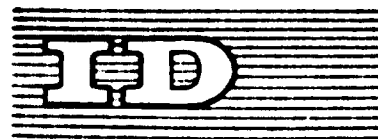
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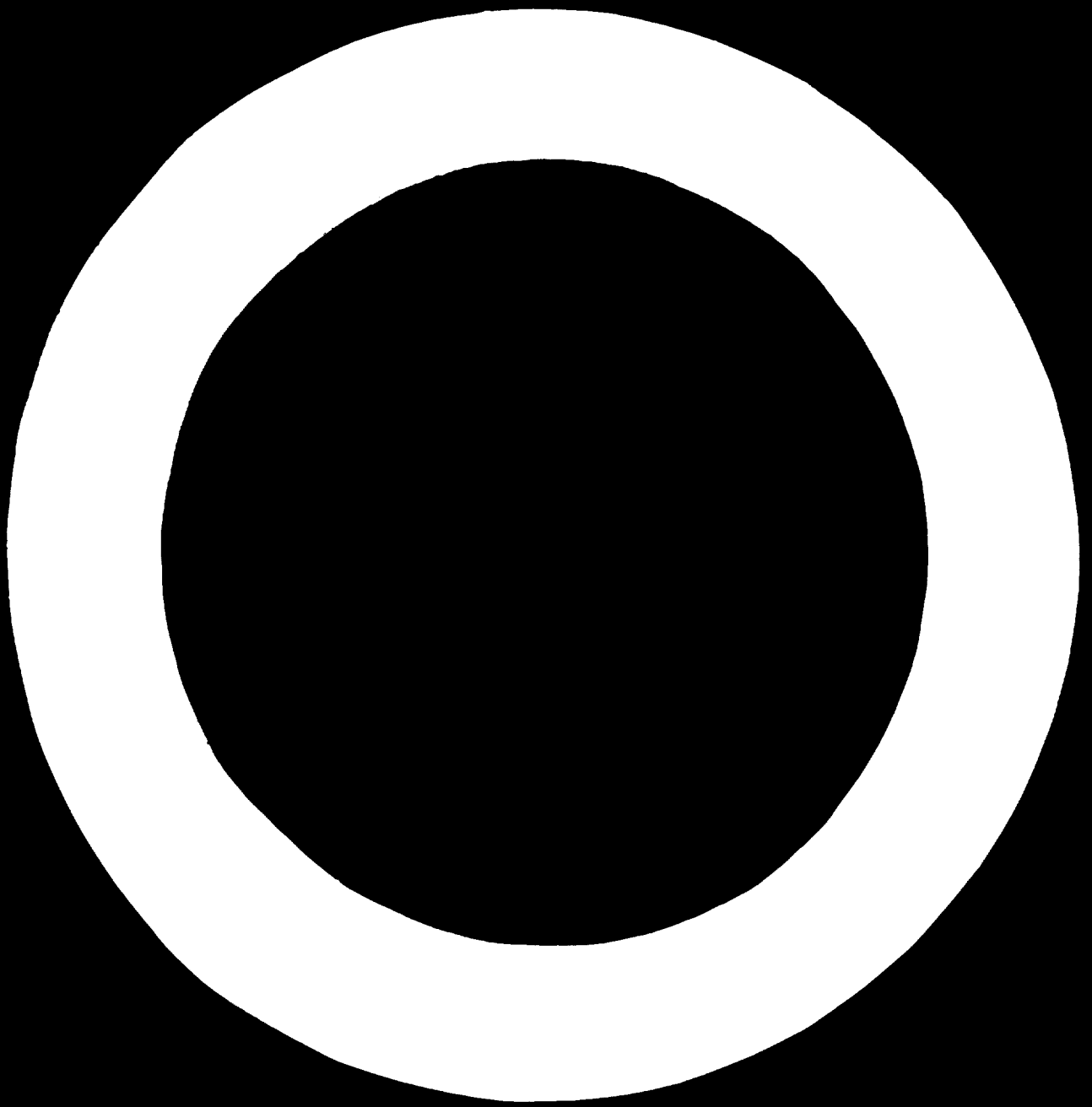
Vienna, Austria, 25 November - 6 December 1968

Summary of Presentation for 10th Session of the  
United Nations Advisory Committee on the Appli-  
cation of Science and Technology to Development

Division of Industrial Technology

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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.



The Industrial Technology Division has as its main task the application and frequently the adaption of industrial technology within the context of our assistance efforts directed at developing countries. This is a very complex task not only because of the manifold activities that make up what is generally understood as "industry" but also because conditions in developing countries as a rule differ from conditions in developed countries where existing industrial technologies are being applied. These differences involve a great variety of conditions such as labour, management, climate and so on, which can be defined with relative ease. However, they also involve such conditions as we normally lump together as the general environment which are much more difficult to define but just the same have a major effect on our attempts to transfer technology and know-how.

In carrying out our functions, we distinguish basically between two major activities: first, we provide the technical backstopping to field activities carried out by UNIDO. To give you an idea of the magnitude of this task, we are at the moment actively involved in close to five hundred assistance projects in varying stages of planning and implementation. Second, we plan and carry out supporting activities consisting of large or small meetings such as symposia, seminars, expert group meetings and so on, on the one hand, and on the other written work such as manuals or monographs provided by our own staff or outside consultants.

By now we have completed drafting our programmes of work for 1969 and 1970 and guidelines to the programme of 1971. These will be presented for consideration to the next session of the Industrial Development Board.

In the following, I will describe for you some specific points of the programmes which we think are of interest to this Committee.

### Engineering Industries

The science of electronics has been advancing with enormous speed due to the efforts of space technology. Because of this rapid development a so-called technology gap appears from time to time even among developed countries, small organizations often cannot keep step with this rapid pace and are forced to merge or to work as subcontractors for large organizations. Engineers have difficulties to follow advances made and even those working full time in their profession feel they should return to the university to be re-educated in the theoretical foundations of new technologies.

The transfer of technologies to the developing countries is particularly difficult under these conditions and it takes time to effect this transfer. In fact, technologies are becoming obsolete even during the time required for the transfer. UNIDO is therefore paying attention to the readiness and capability of the developing countries to receive and absorb advanced technologies and attempting to create the means and the carriers of this transfer.

Another problem in electronics engineering with its large part of pure science is to provide a professional environment. For the electronic engineer this professional environment is the industry. Where industry is not existent or in its beginning other means have to be found to create this professional environment. UNIDO believes that such means include the establishment of design institutes, award of fellowships to industrialized countries, direct technical assistance to upgrade engineering departments of organizations and professional conferences with the co-operation of national and international associations of the profession.

UNIDO plans to carry out or is currently implementing several projects that should help to create the necessary professional environment. Among these projects are an institute for design of electric and electronic measurement instruments in India under the

sponsorship of Special Fund; and re-organization and expansion of the design institute for electronic devices for process control in Bulgaria, (a team of scientists concluded a six months assignment financed by SIS funds and a substantial Special Fund project has been requested as a result of their work). UNIDO also proposes to hold a conference in 1969 to identify the most suitable technology for the manufacturing of telecommunication equipment in the developing countries and for the building of low cost radio and television receivers.

In such a large field as electronics it is of great importance to establish an order of priorities. Since the complex field of technologies the electronic industry is comprised of cannot be transferred at the same time, priorities will have to be given to those that will have the greatest impact on the industry and the largest lasting effect on the economics of the developing countries. For this reason the highest attention has been directed to industrial electronics, process control and telecommunication technology.

Development in agriculture during recent years has been considerable throughout the world, principally in the developed countries. Agricultural progress is due to the hybrid and high yielding varieties of seeds, much closer and more accurate planting of these seeds, the use of great quantities of fertilizers and chemicals and improved cultural practices. All these have required a whole new group of agricultural implements and machinery. These have largely been developed in the industrialized countries and are now being experimentally used in the developing countries.

UNIDO purposes to assist these developing countries to produce as much modern agricultural equipment as possible. Many developing countries have some existing capabilities that are not being fully utilized and which could produce some agricultural equipment. UNIDO plans to assist in product designs, manufacturing technical know-how

and production necessities such as plant rearrangements or identification of most suitable machine tools. A meeting of experts will be held by UNIDO in 1969 to formulate these objectives.

Practically each developing country is engaged in the development of some sectors of the whole spectrum of branches of the metalworking industry. UNIDO believes that one of the major problems faced by developing countries is the need to increase the amount of manufacturing machinery in their possession, particularly of machine tools. There are many important factors that must be considered in solving this problem. A country could set up its own production of machinery or rely on import of machinery from industrialized countries. However, in any case, attention should be paid to such factors as proper acceptance and installation of machinery obtained; organization of preventive maintenance and repair; and increase in the utilization of machinery.

In 1966, UNIDO conducted a Metalworking Symposium in Moscow, where important issues were discussed and a number of recommendations were made, among which the most prominent are:

"The United Nations should extend its help to promote and organize Research and Development Institutes for the specific local needs of developing countries. These Institutes should begin as small pilot organizations and should gradually be expanded. The most effective locations of such Institutes should be investigated."

"An international multi-language classification system of all metalworking machines should be initiated under the auspices of the United Nations, in order to eliminate existing confusion in terminology and misunderstandings in various countries. Such a classification should be preceded by an international definition of a machine tool. A similar classification should be initiated for materials for metalworking industries."



"Investigations by the United Nations of the possibilities of adapting acceptance tests for new machine tools to present requirements are recommended. These may include the up-dating of the Schlesinger and other accepted tests where required, taking into consideration developments in many countries. Type testing and grading of machine tools with United Nations assistance is likewise recommended for this investigation."

Currently, UNIDO is working on implementing these recommendations; preliminary work on adapting the acceptance tests for new machinery and on a classification system have been completed. The results of this work will provide the initial information to developing countries on important problems such as proper selection and installation of machinery. This is a great necessity as the number of machine tools per capita in developing countries is still going down in comparison to that in advanced countries, an important indication of the growing gap between the developed and developing countries. Rather than an acceleration of industrialization, this seems to indicate a relative slowdown in the standing of development of less industrialized countries.

Productivity presents another problem. For instance, modern cutting tools with throw-away carbide tips, the technique of which has been known in developed countries for more than 20 years, has not yet spread sufficiently in developing countries, and as a result, low speeds and feeds in machining are used, and productivity is very low. Also, such progressive methods of parts production as pressing, stamping, die casting and plastics moulding have not been sufficiently introduced in developing countries because of the shortage of skilled labour, such as designers and makers of tools, dies and jigs. This problem will be discussed at the expert group meeting which will shortly take place under UNIDO programme here in Vienna in early December of this year. Another problem relating to productivity is the use of such sophisticated and new machinery as modern numerical control machines in the developing countries, which will be considered, too, at the Vienna meeting. Mass production technique is another

subject connected with the general problems of low productivity. In any case, saving of highly qualified skilled labour and the achievement of better quality of products are desirable objectives. Off-setting disadvantages are high cost of equipment and the need for a modern organizational structure for maximum utilization.

Another problem is the one of creating capabilities in developing countries to create their own original designs. UNIDO has started work in this important field, and under Special Fund programme a number of design centres are now being established in the developing countries to help in creating original equipment and spare parts, and assist in adapting them to local needs. This is a problem of considerable importance on which the development of the metalworking industry depends, as no product can be produced without engineering design. Developing countries should not only import the new ideas, but should also develop their own. One UNIDO project has become operational this year: an engineering and design centre in the UAR under the Special Fund programme.

In the industrialized countries the maintenance of industrial, agricultural and mobile equipment was developed simultaneously with its production. In the developing countries the use of the equipment preceded its production and, as a result, the technology of maintenance has not been developed and must be transferred separately from the industrialized countries now. In addition, special technologies for maintenance and repair have to be created for conditions that are not existing in many industrialized countries. The so-called maintenance mindedness has to be promoted and firmly established.

UNIDO stepped up its activities in repair and maintenance during 1968 and is now launching a broad programme. Several teams of experts are in the field or will leave for developing countries throughout the world to find the point of greatest leverage. This work will continue in 1969. In 1970 a symposium will consider the work accomplished. Technical assistance projects have been planned in repair and maintenance for Indonesia, Jamaica, Congo and the Cameroon.

### Metallurgical Industries

The activities of UNIDO in the metallurgical field focus on the iron and steel industry (processing of ore, production of coke and auxiliary materials, pig iron, steel, and production of semi-finished products for subsequent processing by the engineering industries); heavy non-ferrous metals industry (zinc, lead, tin, copper and others); and light non-ferrous metals (aluminium, titanium and magnesium), including ore dressing, production of metal and alloys and the production of semi-finished and finished products.

In providing assistance UNIDO is faced by conditions for establishing iron and steel industries in developing countries which vary greatly and to a considerable extent depend on the stage of development encountered. Some countries, such as India, Brazil and Yugoslavia have already achieved considerable success in developing their iron and steel industry. Others, like Pakistan, Jordan and Nigeria, are at present at the beginning of development of their iron and steel industry. A third category of developing countries can only hope to develop their iron and steel industry on the basis of regional co-operation.

The Second Interregional Iron and Steel Symposium recently organized by UNIDO in Moscow covered "The techno-economic prerequisites for establishment and development of the iron and steel industry in developing countries". This problem required the consideration of many scientific and technological factors as well as economic and financial problems. A number of topics of scientific and technological importance to the development of steel industries in developing countries were identified at the Symposium.

Examples of these were:

- (a) The possibility of production of iron by "direct reduction" of iron ores. A number of new methods of direct reduction using the latest equipment and technology may be commercially valuable

- to developing countries under certain conditions. UNIDO is planning to organize a seminar on this topic in conjunction with ECE and any contribution the Committee may wish to make would be welcomed.
- (b) The technology of steelmaking is constantly advancing. At present non-continuous methods such as the LD process are used; still, continuous processes for steelmaking may have a considerable advantage, particularly in developing countries as they should be cheaper and more economic at lower levels of production than the present conventional steelmaking processes. The method, technology and equipment to be used for continuous steelmaking, however, requires further research, examination and study, another subject that the Committee may wish to help UNIDO with.
- (c) The continuous casting of steel is generally recognized to be the best method for casting steel and the technology in this field continues to develop and improve. Some new methods, such as casting of semi-finished products with special configuration, casting with subsequent rolling and other improvements are of great importance to developing countries and UNIDO plans to look into these possibilities in connexion with specific requirements in developing countries.
- (d) Certain developing countries plan to create and develop their iron and steel industry by backward linkage. That is to install steel rolling facilities to process imported semi-finished steel products. Subsequent rolling, steelmaking and ironmaking capacities may be added. Countries which are at present starting to develop their steel industries have found this technique useful. To introduce this method it is necessary, however, to have modern rolling mills producing a wide range of different semi-finished and finished products available. UNIDO is currently studying this approach of backward linkage.

UNIDO's activities in the field of light and heavy non-ferrous metallurgy are mainly concerned with the development of non-ferrous industries in developing countries geared to the utilization of locally arising deposits of non-ferrous ores. The methods of producing traditional heavy non-ferrous metals, such as copper, zinc

and lead and light non-ferrous metals, such as aluminium are fairly well established. UNIDO's main concern in these fields is to increase the degree of self-processing of the metals where this is appropriate. Therefore, UNIDO has been assessing recent scientific and technological developments in the non-ferrous metallurgical field to examine whether they can be utilized by developing countries in processing their non-ferrous metal resources. In this connexion UNIDO held a meeting in 1967 to examine the production of alumina from various ores in developing countries. A second meeting examined the modernization and expansion of plants in the copper industry and new, though largely experimental methods for continuous production of copper were examined. A third meeting will be held in the future to examine the new hydro- and pyrometallurgical methods for producing copper, cobalt and chromium in developing countries. A similar type of a seminar on the new continuous combined method of simultaneously producing lead and zinc is also planned and the participation of the Committee in this endeavour would be welcomed by UNIDO.

Developing countries are sometimes required to pioneer the application of new scientific and technological developments. One example of this may possibly be in the processing of titaniferous ores of which many developing countries have large reserves. These countries, such as UAR, India, Ceylon and Tanzania have requested technical assistance from UNIDO to help them in the development of these minerals. The technology of processing these ores is, however, complicated and not well studied. UNIDO has commissioned two specialist studies on this problem. In addition, an expert group meeting will be organized to discuss this problem and work out recommendations regarding the optimum technological and economic basis for processing these ores in developing countries. Again, assistance by the Committee would be most helpful.

### Construction and Building Materials Industries

In the construction and building materials industries field one of the areas of great importance to developing countries is cement and products manufactured therefrom. The problem is that in many areas the size of plant which can be justified by the market is often too small for economic operations. Also in certain countries there are problems of storage in adverse climatic conditions. In many cases, also, the most suitable raw materials are not available and it is necessary to adapt processes and modify the fuel requirements. There is therefore a pressing need for the design of efficient, flexible, small-scale plants capable of ready expansion as the market grows. UNIDO has undertaken a number of studies in this field and is publishing a paper setting forth the problems, indicating the economic parameters and suggesting certain solutions.

The Committee may wish to consider that even in old established manufacture such as cement there may be new scientific ideas which would allow the technology to be modified to meet the particular problems outlined above.

Allied to the problem described above is the use of cement along with asbestos fibre to make various fibro-cement products such as pipes, tiles and cladding materials. Here the problem in many developing countries is the shortage of asbestos fibre. The Committee might be interested to note that in addition to giving assistance in the development of asbestos plants, UNIDO is planning an expert working group to investigate what alternative fibrous materials can be used, whether there are acceptable alternatives to cement, and how

new types of composites can be manufactured in developing countries.

A somewhat analogous problem to which UNIDO is paying increasing attention is the use of plastics for construction purposes in developing countries. This is an area which in developed countries tends to be highly sophisticated. UNIDO is conducting studies designed to show how plastics can be modified and adapted to the conditions of the developing countries' construction industries and used, along with traditional local building materials, to provide cheap and efficient structures. It is hoped that this work will form the subject of a symposium in a year or two.

The remaining major area of activity by UNIDO in the building materials industries field is the development of clay building materials in developing countries. This was the subject of a seminar held this year in Denmark under the joint auspices of UNIDO and the Danish Board for Technical Co-operation with Developing Countries. Clay building materials are of course already manufactured in many developing countries but often by primitive and traditional methods and the scope for improvement both in efficiency and quality is considerable. This is the first task to be tackled and UNIDO has a number of field activities designed to improve existing installations. It also plans further regional seminars to study the problems applicable to particular regions. In the longer term, however, these industries should be mechanised in developing countries as they have been, to a large extent, in developed countries. The problem of translating the relatively complex techniques and machines used for this purpose in developed countries to the climatic, social and economic conditions of developing countries is one which deserves great attention and the Committee may wish to consider it.

Chemicals, pharmaceuticals and related industries

The UNIDO programme of work recognizes that the industrialization of a developing country depends to a considerable extent on the ready and inexpensive availability of sufficient quantities of various basic chemicals. Balance of payments considerations frequently limit importation by developing countries and economic manufacture within the country is often the answer. The main chemicals considered in this area are salt, sulphuric acid, soda ash and the caustic soda/chlorine complex. Nitric and phosphoric acids are dealt with later in connection with fertilizers.

This is, of course, a well-established area of the chemical industry and it may be wondered what new aspects are deserving of study in relation to developing countries. UNIDO is considering two main aspects (1) the function of adaptation of scale and (2) the manufacture of salt as a basic raw material for other chemical manufactures.

As regards the first problem, UNIDO is making preparations for a seminar probably to be held in the USSR in 1969 or 1970 on basic chemicals and particular attention will be paid to the problems of the adaptation of scale and technology in the developing countries. This is an important consideration since the large plants customary for basic chemicals in the developed countries are frequently unsuited to the needs of developing countries because of the complexity of their operation, the degree of supervisory skill required and the limitations in size of local markets.



The second aspect receiving attention from UNIDO is the manufacture of common salt in developing countries. At present many developing countries obtain salt from the sea using primitive collection methods. The salt obtained is used largely for food seasoning and preservation. However, since salt is a raw material which allows a developing country to make a start in the basic chemical industry, UNIDO is giving assistance in the promotion, modernization and mechanization of the marine salt industries and in the development of chemicals based on salt. In 1968 a UNIDO-sponsored expert working group was held in Rome attended by representatives of both developed and developing countries. This group was able to clarify many of the points requiring attention in the establishment of a salt industry. The techniques of marine salt production vary greatly, depending on climatic, geographical and economic conditions and expert advice on these matters can now be made available. UNIDO plans to follow up this working group by techno-commercial studies of marine salt industries in certain regions. It will also carry out studies showing how a marine salt plant can form the basis of a chemical industry by manufacturing derivatives such as sodium carbonate, sodium hydroxide, potassium salts, bromine and chlorine: equipped with a domestic source of these materials a developing country is well on the way to establishing its own chemical industry.

Another activity of great interest to developing countries is the establishment of a pharmaceutical industry, and in particular development beyond the stage of processing and packaging to the level of manufacture of the basic ingredients, especially from local raw materials. These basic materials may

be either synthetic chemicals requiring special organic preparation methods or they may be natural product derivatives from such sources as botanicals, animal and agricultural products. A working group to study the problems involved is planned for 1969 in Budapest. This will highlight not only the technical problems involved but also other aspects such as quality control, pharmacological testing and the education of people to use locally produced drugs. UNIDO's work on this subject is being carried out in collaboration with WHO.

Several other aspects of the chemical industry are receiving attention from UNIDO including the manufacture of chemicals by fermentation and the production of oil from coal. Both of these need careful techno-commercial consideration since, if there is a flourishing petrochemical industry, these activities are unlikely to be economic. But in many developing countries remote from oil but well equipped with agricultural raw materials or coal, industrial fermentation and oil from coal processes may provide a satisfactory entry into the chemical industry.

Another important activity of UNIDO is the pulp and paper industry where many developing countries lacking the normal resources of suitable timber, nevertheless wish to develop their own pulp and paper industry based on local materials such as bagasse, bamboo, sisal and other vegetable fibres. A great deal of experience has already been gathered in this field and one of UNIDO's tasks will be to co-ordinate this expertise and make it easily available to developing countries as required.

### Fertilizers, Pesticides and Petrochemicals Industries

Science and technology have played an important role in the development of agriculture and agricultural connected industries during recent years. The development and wide spread use of new varieties of seeds, such as Mexican wheat and Phillipine rice, have helped many developing countries in the last year to produce more food for their growing population. Great changes have also taken place in the fertilizer and pesticides industries, the products of which are the inputs needed to increase yields. World production and consumption of fertilizers increased considerably in 1966/1967: consumption grew by 9.6% and production by 7.9%.

In the fertilizer, pesticides and petrochemicals fields UNIDO has tried to assist in adapting modern technology to the needs of the developing countries. The technical assistance and special fund programmes in the field, together with studies and research under the supporting activities, have shown the economies of scale of building large nitrogen and ethylene plants at the source of cheap available raw materials, such as oil and gas. At the same time, the technology of storage and transport of liquid intermediate products have been brought to the notice of developing countries and many of them are taking advantage of this technology and harvesting the benefits for their economies (such as in particular Iran, Saudi Arabia, Kuwait and Algeria). The recent switch to the use of liquid and high analysis fertilizers has been adopted by many developing countries (U.A.R., Indonesia, India). UNIDO continues to assess requirements in this field.

UNIDO's activities in the field of fertilizers started with the publication of a Fertilizer Manual (Sales No. 67.II.B.1). This publication gives the developing countries, especially planners and

engineers connected with the industry, information in one place about type of products, production processes, capital costs and production costs. An interregional seminar on fertilizer production was held in Kiev, U.S.S.R., in 1965 where a large number of participants from developing countries discussed with experts from developed countries the technologies and developments in this field. In 1964 the first interregional conference on the development of petrochemicals was held in Teheran and valuable information was transferred to participants from developing countries. This will be followed up by the second interregional petrochemicals and fertilizer seminars in 1969 and 1971 respectively. There have also been expert group meetings, such as the group for fertilizer production from six gas rich countries, the group from fertilizer deficit countries and the group on plastics industries. Publications under the fertilizer and petrochemical industries series have been made helping in the transfer of technology. Two processes which have been highlighted are worth mentioning: the dual process for the production of fertilizer and soda ash and the new process for the production of phosphoric acid avoiding the use of sulphur.

Although DDT continues to be largely used in developing countries as a pesticide, the production and use of phosphorous based pesticides has been accepted. Under the UNDP Special Fund, UNIDO is assisting in putting up pilot demonstration plants for pyrethrum extraction (Rwanda) and DDT and BHC using locally available raw materials (U.A.R.).

The world shortage and high prices of sulphur have effected the production and economies of many projects in developing countries. UNIDO has investigated many processes which use less sulphur or avoid the use of sulphur entirely, such as for example nitrophosphate processes (India). New sources of sulphur, especially from sour gasses, have been investigated and production has started in many countries (Iran, Saudi Arabia). The use of pyrites and gypsum for

sulphuric acid manufacture has been the subject of extensive studies and processes in this field are being adapted for use in developing countries (Tunisia, India). The process for using by-product gypsum in ammonia sulphate manufacture has already been developed and used (India) and is available to other developing countries. These and other possibilities will continue to be analysed by UNIDO and parallel efforts by the Committee would be welcomed by us.

In recent years wide-spread interest through discussions and technical articles has arisen on multi-purpose projects for the production of atomic energy, desalination of water for irrigation and drinking purposes and for fertilizer and caustic soda and chlorine production. UNIDO has participated in seminars in this field and would welcome advice by the Committee on how to follow up interest in this field by practical endeavours.

Irradiation techniques for the production of plastic materials is drawing attention of many developing countries (Taiwan, Phillipines, India). These techniques are much cheaper than conventional techniques and many developing countries are interested in fabrication of components for house building, etc. using these techniques. Also in these fields, UNIDO would appreciate advice as well as in the field of production of protein from oil and gas. At the present, UNIDO supports two pilot projects (in Libya and Madagascar) to manufacture protein from oil as synthetic cattle feed. The subject of protein from oil will be discussed in UNIDO's second interregional seminar on petrochemicals in 1969. Expert studies on the present status of this industry and their adaption in developing countries are also being undertaken by UNIDO.

### Light Industries

The application of scientific results and technological achievements with the aim of developing food processing in developing countries is of considerable interest to UNIDO in recognition of the fact that only up-to-date food processing plants will be able to face the competition of the industrially advanced countries and to develop at the same time a domestic market for its own production.

As an example of how UNIDO proposes to handle programmes of this type, a seminar on integrated agro-industrial food processing was convened in Yugoslavia this month. At the same time, UNIDO's work programme for 1969 includes two expert group meetings on protein concentrate and protein-enriched materials produced by processing soya and inexpensive fish. Various other professional meetings are being considered by UNIDO for 1970 and 1971 which are to define problems in the field of food processing technology and bring them closer to resolution.

We would like to provide you with some examples of the problems with which UNIDO deals now.

(a) Integrated agro-industrial processing of subtropical and tropical crops and products for animal husbandry.

In this field, the scientific approach and the application of the latest results of agro-industrial research must be adopted.

(b) Selection of technological processes and equipment

Considerable efforts must be made in transferring the latest achievements in the selection and streamlining of technological processes and best suited equipment for food processing in developing countries. This creative transfer of know-how should go hand in hand with scientific efforts, taking into consideration the exigencies of new raw materials, new markets, novel working environments and extreme climatic conditions.

(c) Rice

UNIDO is proposing to make available the advanced results in rice milling techniques achieved in the USA and Japan to countries where rice is the main staple food in order to enable them to achieve better results in extracting whole kernels in addition to rice protein and rice fat.

(d) Millet

Sorghum and millet grains are a staple food in many tropical countries, especially in the dry regions of the Sahara and Asian and Latin American countries. The industrialization of millet milling has to be brought to such a level that a stable flour, replacing the import of wheat flour, can be mechanically produced. The production cost of this flour should correspond to the buying power of the consumer.

(e) Cassava

Many tropical countries should be able to grow cassava in larger quantities. A technique to process cassava to a protein-rich flour for the production of bread and other staple products - which can be distributed under prevailing conditions of those countries - does not exist at the moment. We believe that the application of science and technology and the wide experience accumulated in developed countries in handling other root crops would bring about a quick and successful solution to these problems.

(f) Oil bearing materials

Most subtropical and tropical countries have the possibility of growing oil bearing materials more advantageously than many developed countries in moderate climatic zones. Some of those countries have already reached a leading position in supplying the world market with oil bearing materials.

For instance, Nigeria is the world's largest supplier of palm kernels and peanuts and Ghana is the world's largest supplier of cocoa beans. Some Asian countries are the main suppliers of copra to the world market and East Africa is the main supplier of cashew nuts. Another example is castor beans which are mainly supplied by East Africa and Brazil.

The pre-processing, the storage and the transport of these valuable crops are still very primitive and, therefore, considerable losses are incurred. By application of science and technology, pre-processing, fermentation and drying of those crops could be brought under control. Storage and bulk shipment would save millions of dollars each year. In addition, the most advanced technological achievements, such as for instance detoxication of castor bean cakes for animal feeding purposes and production of artificial fibres from castor oil, could be applied directly in producer countries. A further problem in this field could be solved by making use of the latest technique in fresh coconut processing which would exclude and avoid dehydration of the meat and would make the utilization of the milk and of all other parts of the coconut possible.

(g) Improvement of processing operations

In distributing processed foods, prevailing circumstances in developing countries, such as inadequately developed domestic markets, low buying power, considerable distances between points of production and consumption, severe climatic conditions and many other special situations, must be taken into consideration. When establishing a food processing industry in most developing countries, the technique and operations used in developed countries must, therefore, be adjusted to existing needs and exigencies by applying research and in some instances by developing entirely new processes.



Other problems in the field of processing operations which are currently looked into by UNIDO are:

- Milk cannot be distributed in liquid form and has to be concentrated to an instant powder and reconstituted with water on far-distant markets;
- Meat and many vegetables could be dehydrated and transported to domestic or foreign consumers. However, this is only possible if the most advanced achievements of dehydration technique could be applied for this purpose.

(h) Packaging technique and transport

Developing countries are frequently lacking packaging materials and an understanding of packaging techniques. This problem is aggravated by the fact that packaging materials used in developing countries are too expensive in comparison with the buying power. Newly developed packaging materials based on raw materials produced domestically might be the answer in many instances.

UNIDO is also looking into the application of the latest achievements in sterilization techniques (tetra pack, for instance) for distributing deteriorating liquids, because storage and transport of such sterilized liquids and suspensions can be handled without refrigeration and at far lower transport costs.

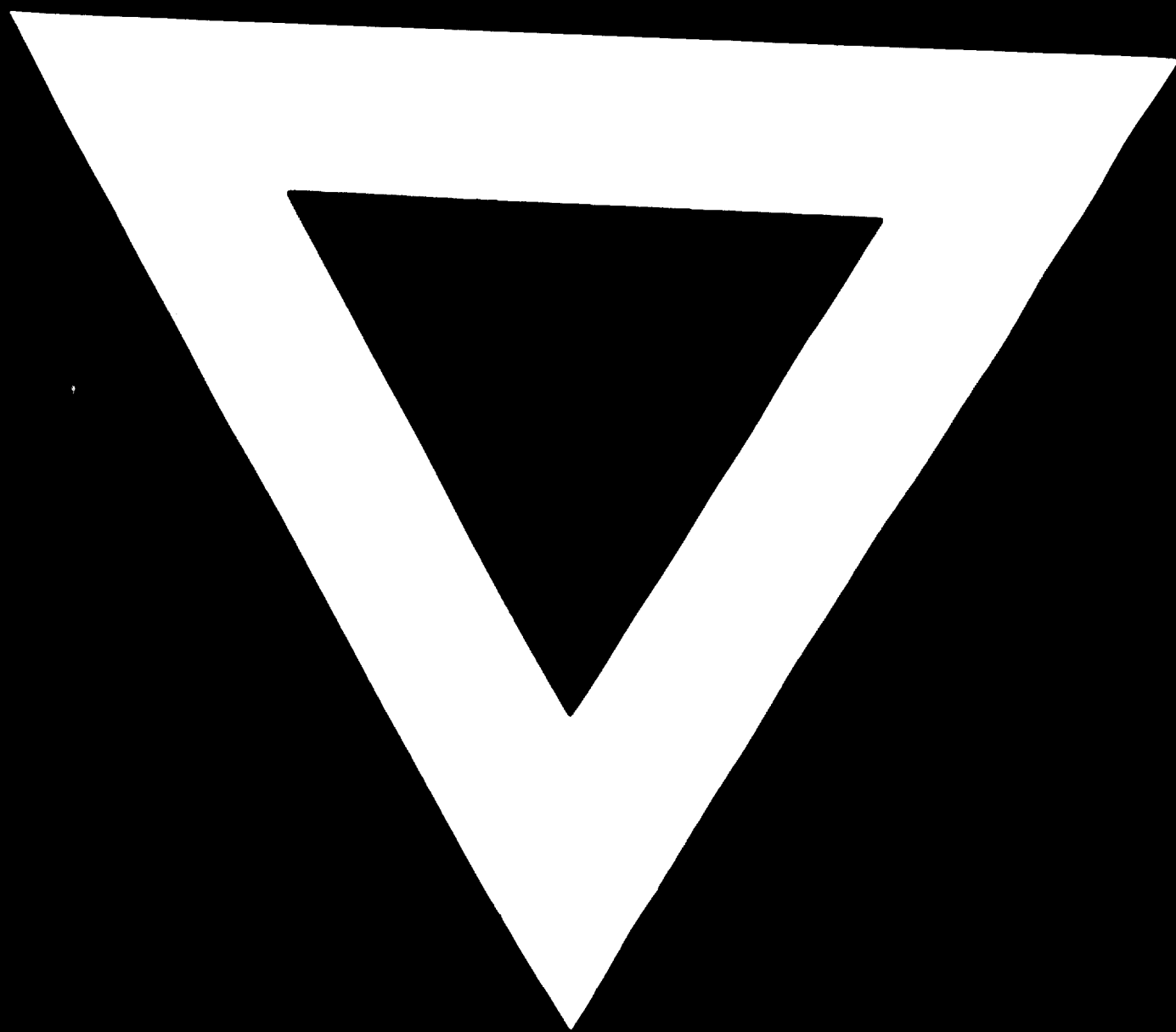
### Continuous Research Projects on Sectoral Developments

Major branch studies prepared by UNIDO cover the development of selected industry branches in the course of an extended period of time (5-10 years). These studies analyse inter alia the impact of introduction and application of new technologies on the development of the industry branch studied. It is one of the objectives of these studies to identify areas where the transfer of technology was unsatisfactory and propose ways and directions for future efforts. Major studies are being carried out presently in steel and non-ferrous metals. Both studies are also connected with the problems of rational utilization of the natural resources available in the developing countries.

As a related exercise, UNIDO also deals with the trends and prospects of the industry branches in the 1970's. In this approach supply and demand considerations as well as the analysis of other economic factors related to the growth of the economies of the developing regions in the 1970's are geared to provide all concerned in UNIDO with guidance in selecting appropriate technologies as well as to initiate or to encourage research according to future needs.

As an additional activity it is planned to extend enquiries into technologies of multi-sectoral impact, such as packaging, containerization, planning, design and servicing of automated processes in the context of experiences gathered in developing countries. In co-operation with the International Atomic Energy Agency the extension of industrial application of radio-isotopes will also be studied. All these are activity areas in which the Committee might be particularly interested and to which it might wish to contribute.





**74.10.17**