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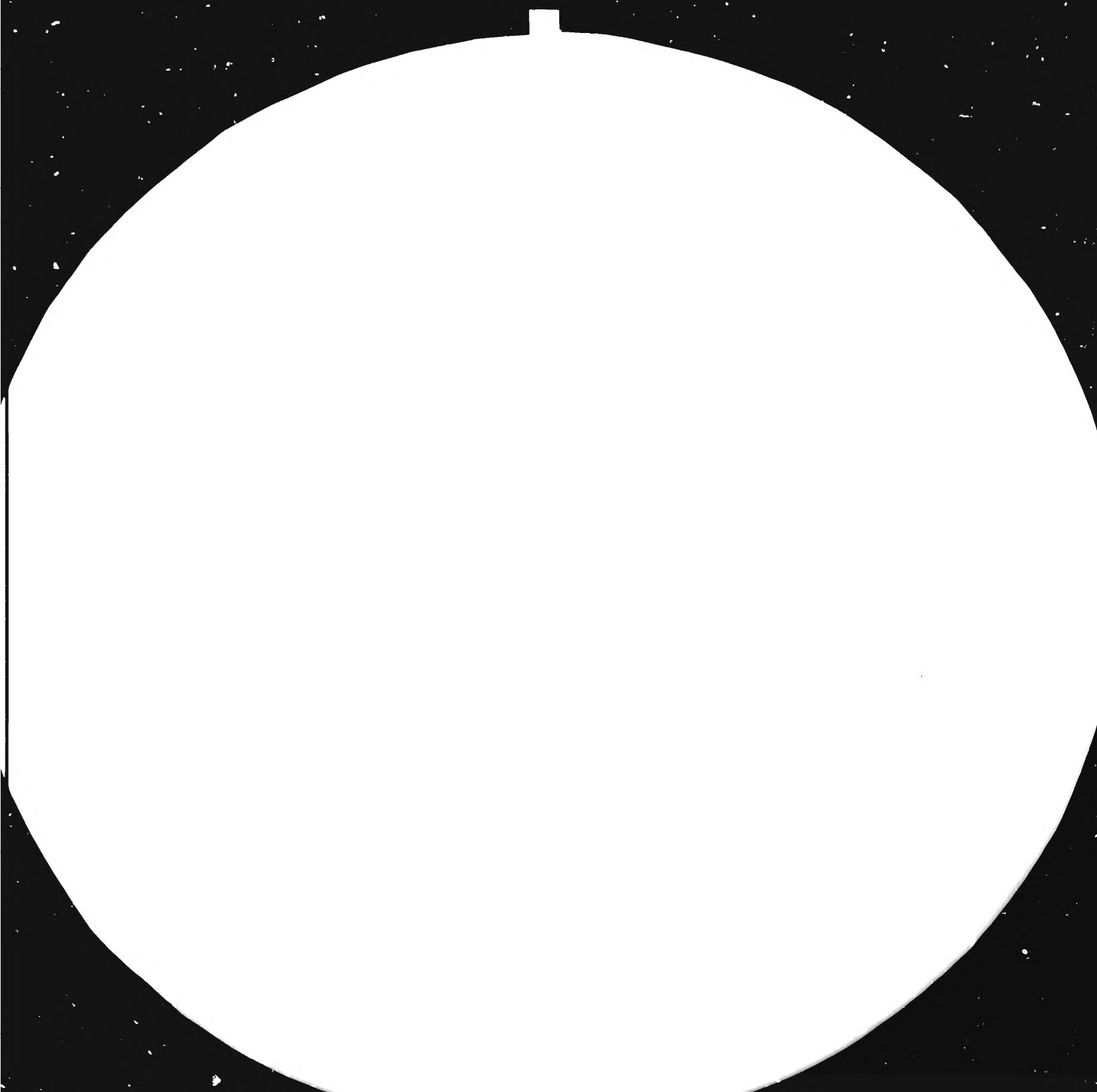

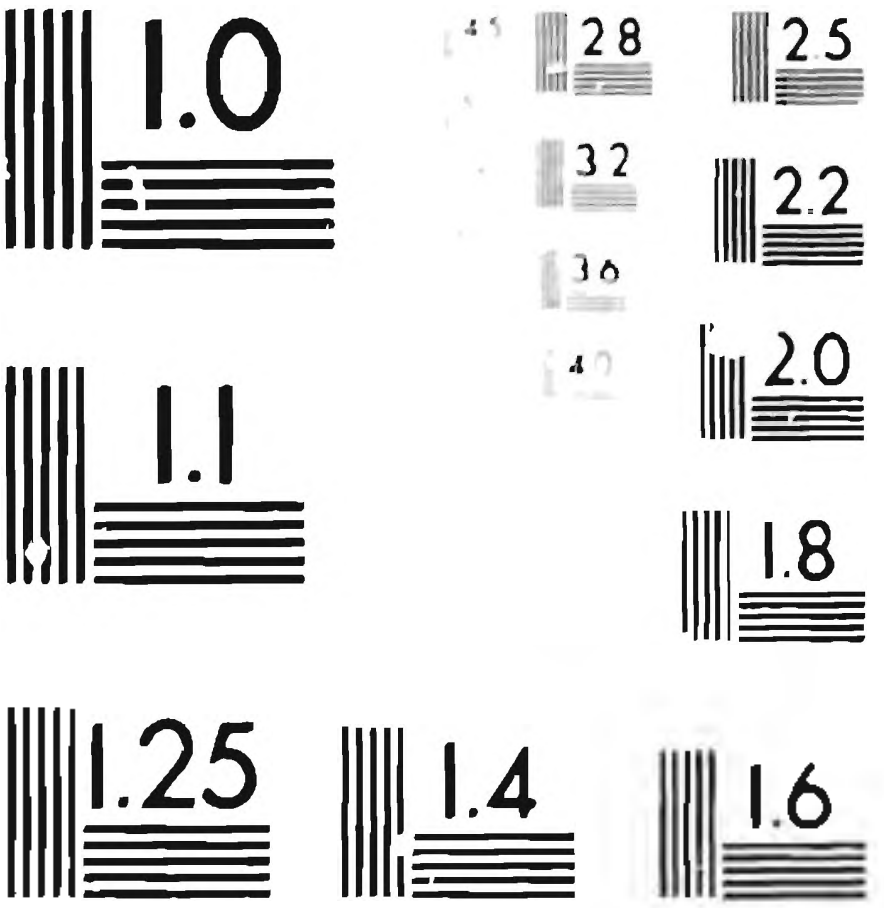

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DEVELOPMENT AND TRANSFER OF TECHNOLOGY

INCLUDING THE INDUSTRIAL AND TECHNOLOGICAL INFORMATION BANK INTIB.

Report by the Executive Director

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Summary

Analyses the activities undertaken by the secretariat during 1983 in the field of development and transfer of technology (including the role of the Industrial and Technological Information Bank) against the general thematic background of industrial technology for the 1980s. Considerations relating to integration of technological advances with ongoing industrial and technology development efforts of developing countries are highlighted. Supplements information contained in the Annual Report of the Executive Director, 1983 (ID/B/320) by reviewing activities implemented towards the end of the year.

Introduction

1. The Industrial Development Board at its seventeenth session considered a report of the Executive Director on "Development and transfer of technology including the Industrial and Technological Information Bank" (ID/B/296) and in conclusion 1983/5[1/] requested the Executive Director to submit to its eighteenth session a report on the work by the secretariat in this field.

2. Detailed information on the activities of the Technology Programme in 1983, including information on the work of the Industrial and Technological Information Bank (INTIB), is contained in the Annual Report of the Executive Director, 1983 (ID/B/320, chap. V, paras. 68-117). The present report continues the analysis undertaken in the reports (ID/B/281 and ID/B/296), submitted to the previous two sessions of the Board, of UNIDO activities against the general background of industrial technology for the 1980s; in addition, aspects not covered in the 1983 Annual Report as well as activities that were implemented towards the end of 1983 are described. Since the overall question of industrial technology in the 1980s is discussed at some length in the background document (ID/CONF.5/6) to be submitted to the Fourth General Conference of UNIDO, the present report is somewhat briefer than those submitted to the Board in the past.

I. DIMENSIONS OF THE IMPACT OF TECHNOLOGICAL ADVANCES

3. Activities undertaken in 1983 led to a closer understanding of the several dimensions of technological advances in relation to their implications and potential for developing countries. The International Forum on Technological Advances and Development held in Tbilisi (USSR) in April 1983 as well as the expert meetings, both preceding and following the Forum, contributed substantially in this respect. As a result, the need to place technological advances in the total context of industrial and technological development in developing countries has been clearly underlined. It has also been recognized that even the most sophisticated technological advances contain certain features which make them relevant to developing countries; thus, in addition to avoiding inappropriate imports of new technologies, a conscious and concerted effort should be made to harness these technologies for the benefit of those countries.

4. Discussions in the Forum also revealed that technological advances are acting simultaneously on several industrial sectors of interest to developing countries. While microelectronics and information technology, for example, have implications for productivity over the entire range of industrial sectors, particularly in relation to engineering industries, biotechnology has a significant impact on the agro- and food-processing, chemical and pharmaceutical, and energy industries. An interaction among the technological advances themselves has led to their mutual acceleration. A trend is also emerging towards the changing alignments of international technology markets. The market for information technology, for example, is controlled by semiconductor firms and telecommunications and computer transnationals. In the biotechnology field, chemical,[2/] pharmaceutical, petroleum and food-processing transnationals have shown a marked interest through participation in equity of small biotechnology firms and through funding research. Thus, the international technology markets over a broad range of industrial sectors would appear to be undergoing a change. The trends in biotechnology markets also have implications for agricultural[3/] and energy development.

5. The foregoing considerations underline the need for systematic monitoring of the impacts of technological advances on the various industrial sectors. This could be achieved through the building-up of sectoral dossiers for those industrial sectors already covered by INTIB. Attempts to review technology market trends for the benefit of developing countries would be particularly useful in the present context, and a schematic outline for such a review was prepared at a meeting of selected heads of technology transfer registries in July 1983. The eighth meeting of heads of technology transfer registries, held in Caracas (Venezuela) in October 1983 under the auspices of the Technical Information Exchange System (TIES), commended UNIDO efforts in this respect. Efforts to resolve the special problems of acquisition and contracting of new technologies have been initiated by TIES through the licensing of computer software. The Caracas meeting requested the secretariat to prepare studies on that subject as well as on the evaluation of engineering and consultancy fees with particular emphasis on selected sectors and specific types of agreements.

6. During 1983, technological advances in the field of materials and related technologies were given particular attention by UNIDO. Until now, materials have failed to receive explicit and systematic attention in the industrial and technological policies of most developing countries. Policy formulation in this field is a complex and difficult task in view of the wide range of activities, both as regards inputs and outputs, related to materials. It is, however, necessary to recognize the implications of the development and use of new materials in terms of energy, comparative advantage and cost effectiveness. Greater attention will need to be given to this field in the coming years. The subject of materials was broached by the Tbilisi Forum in 1983. A study was completed of nine selected composites which may be of particular interest to developing countries. A review of the developments achieved in high temperature ceramics was initiated, and at the request of the Government of Mexico an expert on this subject visited Mexico and made suggestions for consideration by the Government. A quarterly information bulletin "Advances in materials technology: Monitor" was launched, with the first issue covering high-strength, low-alloy steels. Each issue of the bulletin is expected to cover a specific group of materials and contain a review of the state of the art by eminent experts on the subject as well as other relevant information of interest to developing countries. Developments in carbon fibre technology were reviewed in an international workshop organized as part of a project in Brazil, funded by the United Nations Financing System for Science and Technology for Development and backstopped by the Division of Industrial Operations.

7. The developments in technology related to solar photovoltaic cells deserve attention both from the energy point of view and in relation to semiconductors and materials. The Forum considered this subject in some detail. It was suggested that while developing countries were waiting for a reduction in the costs of solar cells in line with alternative energy costs, they might usefully strengthen their research, development and application capabilities, including the local design and construction of the systems in which the solar cells would be incorporated. Solar cells can also be fabricated on a laboratory scale in most of the developing countries, giving them an essential understanding of the techniques of design and fabrication. Efforts by developing countries in this field during the 1980s - particularly in the next few years - are thus considered of crucial importance.

II. ACTIONS AT THE NATIONAL LEVEL

8. While the Forum and other activities of the secretariat have helped in sensitizing policy makers, scientists and technologists in developing countries as to the implications and potential of technological advances, the secretariat is hopeful that such sensitization will stimulate concrete national actions. In the course of 1983, there was increasing evidence of such efforts at the national level. UNIDO has encouraged the formulation of technology policies by assisting developing countries to organize national workshops for policy and decision makers. Experience gained from the workshops held in Malaysia and Trinidad and Tobago in 1983 confirmed that future workshops on that subject will have to consider increasingly the implications of technological advances. Such workshops should enable countries to adopt selective and differentiated approaches to respond to the technological advances according to their level of development.

9. In the field of genetic engineering and biotechnology, the secretariat's efforts in promoting the setting up of the International Centre for Genetic Engineering and Biotechnology encouraged developing countries to initiate national efforts in this field. Several developing countries have established, or decided to establish, national centres or core-groups to deal with the subject. A similar trend can be observed with regard to microelectronics. In Mexico the setting up of a microelectronics application centre is under consideration and the Government of Venezuela has requested UNIDO to upgrade a national institution to serve as a regional centre for Latin America. In Africa, initial studies were prepared on the potentialities of applications of microelectronics, genetic engineering and biotechnology suited to local conditions. These studies will be submitted to the forthcoming Congress of African Scientists for consideration. Initial studies in the region of the Economic Commission for Western Asia have revealed that assistance will be required in setting up regional facilities for computer maintenance and the use of Arabic letters in computers.

10. The work undertaken by UNIDO has revealed that developing countries should give careful consideration to the manner of integrating technological advances in their industrial and technological development, and that, for this purpose guidelines may have to be evolved. The Workshop on Institutional and Structural Responses of Developing Countries to Technological Advances held in Dubrovnik (Yugoslavia), May/June 1983, dealt with this problem in depth. The report of this Workshop was issued as document ID/WG.401/7.

11. An important task is the integration of industrial and technological policies. Several industrialized countries have recognized the need for technological policies to form part of a larger set of structural policies, which will enable a country to acquire a significant place in the international economy with regard to a cluster of interlinked industries. There is also recognition that technological policy should be seen as a leading component of industrial policies the other components of which have lost their cutting edge. Traditionally, in developing countries, industrial policies regulate or approve the establishment of industries, provide incentives for such establishment and build up the infrastructure necessary for industrial development. In some countries there are, in addition, explicit policies governing foreign investments and the import of technology. The developing countries may, however, be obliged to

make increasing use of an approach whereby trends in technology will set the pattern for industrialization, as in the case of export-oriented industries where technology plays a vital role in ensuring international competitivity. Such considerations will also be relevant where production is basically for the internal market since there cost-effectiveness and resource and energy saving techniques are likewise important. The options available for industrialization purely from the present and prospective technology point of view have therefore to be viewed along with both internal and external demand and considerations on national resource availability in formulating industrial strategies and policies and in attempting industrial restructuring. Once technologies of specific relevance have been identified, policy support should be given to strengthening capabilities in those fields. Public procurement policies could also be an instrument for the introduction of technological advances.

12. Industrial policy should also take into account specific aspects of technological advances on the basis of which industrial activities could be promoted in developing countries. The secretariat studied two of these aspects in 1983. First, a concept was elaborated for the development of software as an industry in developing countries incorporating both the technical and policy requirements for its promotion (UNIDO/IS.383). (Two further studies on this subject will be forthcoming.) Secondly, a concept for the full utilization of agricultural crops from leaf to root was formulated following research on the utilization of biomass as a resource for the manufacture of several industrial products, and a study on the utilization of paddy is nearing completion. In this way modern technology could contribute to decentralized industrialization efforts. The secretariat's efforts in integrating traditional and emerging technologies are in line with its earlier work in the field of appropriate technology.

13. The integration of technological advances in the industrial structure requires active involvement at the industry and enterprise levels. At the industry level, government departments and chambers of commerce and industry could conduct awareness campaigns. Large industrial enterprises could form advisory groups to identify optimum ways and means to benefit from technological advances. Long-term industry plans and the consolidation and rationalization of the industrial structure would also be advantageous. At the enterprise level, managerial involvement, long-term corporate plans, adequate information, R + D capabilities and the formation of inter-disciplinary task forces play a significant role. Another aspect, examined in some detail by the Dubrovnik Workshop, was associated labour problems in terms of skill requirements, retraining, training institutions, etc.

14. The integration of technological advances into the ongoing technology development efforts of a developing country would entail a number of measures including the identification of national priority projects, the formation of interdisciplinary task forces, transsectoral and transorganizational interactions, mobility of personnel between education, research and production, emphasis on development aspects of R + D and the creation, where necessary, of new institutions. Depending on the prevailing conditions of a country and its aspirations, UNIDO assistance to technological institution-building in the country might include: the creation of new types of institutions suitable to specific technological advances; where resources do not permit, the establishment of interdisciplinary core-groups rather than institutions; and generating awareness and an interdisciplinary capability on the part of existing institutions to assimilate the technological advances relevant to their fields of work.

15. The upgrading and re-orientation of education at the school and university levels is a basic prerequisite for the development of human resources. New approaches to the process of teaching and the promotion of interdisciplinary curricula are other desirable goals. In view of the inevitably long lead time, actions must be initiated by the developing countries without delay. There are, however, areas such as computer programming, where short-term training of existing personnel will yield dividends. Reversal of the "brain-drain" and the utilization of the services of expatriate nationals also assume a new relevance in the context of technological advances.

III. TECHNOLOGY ADAPTATION AND DEVELOPMENT

16. The task of integrating technological advances in the industrial and technological structure of developing countries also involves appropriate policies and strategies for innovation in developing countries. Full measure of attention has to be given to this aspect. The secretariat is co-operating with the International Institute for Applied Systems Analysis in the latter's detailed study on innovative management in electro-technology in order to study its relevance to developing countries' efforts in this field and how such efforts could be placed on a better footing. The mechanisms and modalities of commercialization of endogenously developed technologies are being examined in response to a request from the National Research Council of Sudan.

17. Developing countries also need assistance in their efforts to export technologies. The results of studies commissioned by UNIDO on this aspect were assessed, and an expert group meeting was held in December 1983 to draw up a programme of promotional activities to be undertaken by UNIDO. Attitudinal barriers on the part of recipient countries and the lack of systematic flow of information on commercially available technologies from developing countries were identified as some of the handicaps. It has been proposed that - building up on the earlier efforts of the secretariat - an information system on commercialiy available industrial technologies in developing countries be set up with designated national focal points. INTIB was requested to undertake this task.

18. The question of selective applications of microelectronics for developing countries continues to be examined as a means of harnessing technological advances for development. A meeting is being convened in March 1984 to better co-ordinate the efforts of the various institutions and organizations engaged in this field.

IV. TECHNOLOGICAL INFORMATION

19. The nature and quality of technological information is becoming increasingly important in view of the dynamic changes in technology. The need for information on technology selection and acquisition, and technology policy and planning has acquired greater significance and urgency than before, at a time when INTIB is suffering from a lack of resources.

20. The flow of inquiries to INTIB followed the same broad pattern as that in 1982. Inquiries were received from 113 countries including 15 developed countries. Countries from which 25 or more inquiries were received were: Brazil, Colombia, Costa Rica, Ghana, India, Mexico, Nigeria, Peru, Sri Lanka, Turkey and United Republic of Tanzania. Six of these countries (Colombia, Costa Rica, India, Peru, Turkey and United Republic of Tanzania) also figured on the same list for 1982, whereas Indonesia, Pakistan, Sierra Leone, Togo and Zaire are no longer on the list.

21. UNIDO participation in the Technical Congress held in conjunction with the Third International Fair "Technology for the People" in Manila (Philippines), 23-25 November 1983, demonstrated the usefulness of attendance at such fairs, inter alia, in terms of popularizing INTIB and generating user interest. Nearly 1,100 requests for information were received from visitors to the Fair, most of which related to agricultural machinery and energy for rural needs, topics dealt with by the Technical Congress. Contacts were also established with some 50 potential suppliers and recipients and further requests for information or other assistance are expected.

V. ACTION REQUIRED OF THE INDUSTRIAL DEVELOPMENT BOARD

22. The Industrial Development Board may wish to review the foregoing analysis and take note of the various elements of the approach to industrial technology for the 1980s and the work of the secretariat in this respect. The Board may also wish to reiterate its earlier decisions with regard to the strengthening of institutional arrangements within the secretariat for the development and transfer of technology and the allocation of adequate resources.

Notes

1/ Official Records of the General Assembly, Thirty-eighth Session, Supplement No. 16 (A/38/16) para. 79.

2/ Pat Roy Mooney, "The law of the seed: another development and plant genetic resources", Development Dialogue (Uppsala, Sweden) 1983, Nos. 1-2, table 24, p.99.

3/ Ibid., p.4: "A small number of very large transnationals ... have acquired hundreds of seed companies over the last twelve years and are aggressively moving into the South. Most disturbingly they have an opportunity to combine their leadership in plant breeding with their dominant position in pesticides manufacturing. At stake is the future of agricultural development in the South."