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National Paper*

of

The Arab Republic of Egypt

(Final Draft)

* This document has been prepared by the Academy of Scientific Research and Technology, Cairo, with contributions received from several ministries and specialized institutions.

CONTENTS

INTRODUCTION

1. The contents of this Paper are organized according to the UNCSTD Agenda items and subitems, which imposed some limitations on the methodology of treatment. The Egyptian Government reserves the right to submit a modified version at a later date.

2. This document expresses the views of the Egyptian Government regarding the issues of UNCSTD, with emphasis on the existing negative aspects and their diagnosis, and the measures recommended for action at the national and regional levels, and co-operatively among developing countries, in order to reduce technological dependency and approach self-reliance. Views have also been expressed with regard to the role which should be played by the developed countries and by the UN system.

3. Since this Paper used the horizontal approach of the Agenda, the treatment of the subject areas was made accordingly throughout the exposition. Essentially, these subject areas are:

(a) Vertical and horizontal development of agriculture, including all food sources;

(b) Development of arid areas, including water resources;

(c) Rural and urban technologies, including transport and communication;

(d) Health, human settlement, and environment;

(e) Natural resources and energy and their rational utilization, and industrialization including production of capital goods.

4. The Egyptian stand is based on the following convictions:

(a) That social peace and international peace - viewed in historical perspective and taking into account the immense current and future capabilities of science and technology (S & T) - can be accomplished only through political stability and securing justice among society strata and among countries;

(b) That the absence of peace for more than 30 years in the Middle East, and the Israeli occupation of Arab territories, have seriously affected the developmental process in Egypt and in other countries in the region. Moreover, the considerable increase in expenditure on armament in the developed countries has contributed to shrinking the expenditure of these countries on R & D for development issues of interest to all humanity, and also to reducing the size of assistance provided to the developing countries;

(c) That the unfair practices of several industrialized countries and their international corporations - manifested in transactions involving transfer of technology to developing countries - have been a major factor contributing to the widening of the gap among countries. Hence, there is the call for establishing an international system for assisting and protecting the developing countries (cf. treatment of Agenda Item 3);

(d) That the preservation of the ethical values and cultural identity characteristics of all countries are matters which should be given utmost attention in future action, in view of the serious threats which may be involved in some S & T applications. It may be mentioned in this regard that Egypt has adopted the symbol "Science and Faith" to signify the basis for its socio-economic development activities;

(e) That education is fundamental to socio-economic development at the citizen and national levels, and that the appreciation of S & T in all society sectors is the key to their optimal utilization;

(f) That the world natural resources - particularly the non-renewable ones - represent a national wealth for the present and the future generations, and hence should be utilized most rationally and wisely, while actively searching for substitutes;

(g) That there is a world crisis in food sources, which aggravates with population increase. Hence, there is a vital need for mobilization of world efforts - particularly through S & T - to find the necessary solutions;

(h) That science - with its present and future potentials - is capable of solving many mankind's problems, particularly in the developing countries in the fields of food, health, energy, production, services, etc. While this is true, the developed countries - because they alone and until now have reaped most of the benefits of S & T, and because the principle of international integration requires that the fruits of S & T be shared by all countries on equal footing - have historical and moral responsibilities in redressing the existing imbalance in development levels in the world, which increasingly threatens life and its quality;

(i) That the present situation and the events of the future all necessitate that the world agree rapidly on new and fair patterns for relations and transactions between developed and developing countries for the welfare of all mankind.

These should be established within the framework of the New International Economic Order and the Code of Conduct on Transfer of Technology;

(j) That the UN system should be developed, in its structure and functioning and in the range of its services, to be capable of providing more viable programmes which decisively benefit the developing countries (cf. treatment of Agenda Item 3).

CIRCUMSTANCES OF THE SOCIO-ECONOMIC DEVELOPMENT IN EGYPT

5. Agriculture plays an important role in the national economy, despite the fact that only approximately 6 million feddans (1 feddan = 4200 sq.m.) are cultivated, corresponding to approximately 2.5% of the total area of the country (approximately 1 million sq.km). The population (approximately 38 millions) is essentially concentrated in an area of not more than 36,000 km. Approximately one half of the labour force is engaged in agriculture, although agricultural production represents approximately 30% of the GNP, and exported agricultural products account for approximately 75% of the total value of exports. Industry has developed considerably since 1955, particularly in the fields of textiles, transformation industries, agro-industries, petroleum, and construction, and, in all, this sector represents approximately 30% of the GNP. The remaining 40% of the GNP is generated by commerce, tourism, transportation, and other service industries. The process of socio-economic development in Egypt has passed through unfavourable circumstances, which still prevail and may be attributed to the following external and internal factors:

(a) Instability as a result of the wars which extended over the past 30 years;
(b) Rapid increase in population;
(c) Incompatibility of manpower planning with ideal patterns.

NATIONAL STRATEGY FOR SOCIO-ECONOMIC DEVELOPMENT

6. After the triumph of the October War, the main features of the general strategy for the socio-economic development of Egypt until the year 2000 were delineated in the "October Paper" - approved by the people in a national plebiscite (1974) - to highlight action lines for the future as follows:

(a) Preparation for the year 2000 to provide the foundation of progress for future generations;
(b) Acceleration of development rates;

(c) Support and rationalization of the public sector to continue to play a leading role in development;

(d) Support of private sector to participate effectively in development;

(e) Adoption of a policy of open-door economy, which - through encouragement of Arab and foreign capital - would attract the needed investments and result in transfer of modern technologies;

(f) The citizen, being the means to, and objective of, development, is the main target in the comprehensive strategy of development. Hence, the latter will have to have social dimensions as well as economic ones;

(g) Review of the concepts and systems of education and culture of all disciplines and at all levels; from eradication of illiteracy to public technical and university education, and to scientific and technological research;

(h) Acceleration of the rates of progress based on science, technology and faith;

(i) Assurance of the open society which enjoys freedom and security;

(j) Preparation of a new map for Egypt, showing its population no longer confined to the Nile Valley and the Delta, and creating opportunities for expansion in the utilization of natural resources and establishment of new communities and production centres.

7. In the light of this long-range strategy, a comprehensive socio-economic development plan has been drawn up which comprises a series of 5-year plans starting with the 1979-1983 plan, now underway and having the following objectives:

(a) Increasing the rates of development to reach an average of not less than 9-10% annually;

(b) Correcting the economic process through treatment of the problems of replacement and renewal in the units of production and the services, particularly in the vital utilities;

(c) Optimal utilization of material and human resources in all three sectors of the national economy (public, private and co-operative), while providing opportunities, security and encouragement for Arab and foreign investment in an open-door economy policy which will result in the transfer of capital and technologies to complement local efforts and capabilities;

(d) Assuring the importance of Arab and African economic co-operation which should assume positive and effective dimensions to realize high development rates in all Arab and African countries.

ITEM I: SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

A. The choice and transfer of technology for development; and

B. Elimination of obstacles to the better utilization of knowledge and capabilities in science and technology for the development of all countries, particularly for their use in the developing countries.

Technological dependency:

8. Several studies, concerned with the role of S & T in the process of socio-economic development in the developing countries, have dealt with several issues of transfer and utilization of scientific and technological knowledge, as well as the obstacles experienced hitherto in this regard. Taking into account these considerations as a whole, we find that some of them are local (such as inadequacies in systems and policies of the developing countries), while others are external (such as the attitudes of some developed countries and their institutions). However, these considerations are directly responsible for the present state of technological dependency, in its various forms, from which the developing countries suffer and which create a serious world imbalance in the distribution of S & T resources, human resources and natural resources.

Internal factors of technological dependency:

9. It is a fact that developing countries pay dearly as a result of technological dependency, which partly could have been saved had these countries had adequate qualified manpower operating in institutions of adequate capabilities. However, the governments in several developing countries opt to import turnkey projects while utilizing experts from the developed countries in order to reduce the risks involved. This attitude suppresses the germs of national S & T capabilities, which already suffer from neglect and inadequate financing, and leads to their isolation from current development events. Such unnatural divorce between science and technology has been largely responsible for the indulgence of the science

community in issues of academic interest (even if they are of limited value) and contributed to the continued technological dependency of the country.

External factors of technological dependency:

10. It is universally acknowledged that the behaviours of the production institutions in the developed countries and of the multinational corporations constitute a serious causative factor in the problem of technological dependency. This arises principally from the unfair practices of the technology monopolies during the negotiation processes in which they take advantage of the technical weakness of the developing country in some situations. The world community, in attempts to redress these imbalances, agreed on the necessity of establishing the New International Economic Order and abiding by the Charter of Economic Rights and Duties of States as adopted by the UN General Assembly, and on the need to develop a Code of Conduct on Transfer of Technology which will assure more equitable transactions between developing and developed countries, and between importers and suppliers of technology.

Some manifestations of technological dependency as experienced in Egypt:

11. Experience in transfer of some technologies to Egypt has revealed the following negative aspects, which resulted from the unequal positions of the negotiating sides, particularly where the supplier represented a world monopolistic power:

(a) Difficulty of assessing the proper price of the imported technology;

(b) Uncertainty that the technology is the best available, due to inadequacy of information on alternatives available in the world market;

(c) High direct costs of the right to use patents, licenses, process know-how, trade marks and technical services;

(d) Inclusion of restrictive clauses in transfer contracts such as:

(i) Limitation (and sometimes prohibition) of export of manufactured products to certain markets;

(ii) Stipulating a unilateral flow of technical improvements from the licensee's technology without reciprocal obligation on the part of the licensor;

(iii) Using quality control or product standards by the licensor as an indirect means of introducing unwarranted requirements on the licensee;

(iv) Restricting the licensee's right to obtain a complementary technology from other sources;

(v) Restricting the licensee's activities with regard to volume, scope, and range of production;

(vi) Requiring payment of royalties (excessive in many cases) during the entire period of manufacture of the licensed products and application of the licensor's process;

(vii) Imposing restrictions on the use of production raw materials and limiting their supply to the technology supplier;

(e) Transfer of obsolete or inappropriate technology, and imposing complementary contracts with unfair conditions;

(f) Excessive use of the licensor's personnel;

(g) Over-pricing of the inputs which the licensor provides in the transfer;

(h) Obliging the licensee to enter into exclusive sales.

12. Being aware of the dimensions of the international situation and of the framework and effectiveness of the necessary action at the national level, the Egyptian Government calls for the attainment of the following:

(a) Generation of the political will to bring about the needed change: This happens through the firm belief of the national policy-and decision-makers that S & T and their application are the real means available to accelerate socio-economic development, and that the increased contributions of local S & T capabilities are a guarantee for the stability and continuity of this development and a means to approach technological and economic self-reliance;

(b) Delineation of national S & T policies. The objective being to approach technological self-reliance, such policies should be linked to all national socio-economic development plans, which necessitates a close co-operation between the central S & T planning institution (Academy of Scientific Research and Technology) and the Ministry of Planning. This also necessitates the development of the former institution to be capable, through the executive S & T infrastructure, of rendering advice in all matters related to transfer of technology;

(c) Acquiring better positions in situations of transfer and utilization of technology: this becomes assured by the availability of local capabilities

proficient in matter of vertical and horizontal transfer of technology. Moreover, the transactions of transfer of technology should lead to a genuine growth and development of the local capabilities and to raising the standards of living, without merely copying the consumption patterns of developed countries. The Egyptian experience reflects the importance which the Government attaches to the Code of Conduct on Transfer of Technology, and offers the following recommendations for action:

(i) The State should conceptualize realistically its needs of foreign technologies which must be imported;

(ii) Information should be collected on the new and latest innovations and inventions in the world for the development of production. This is instrumental in enhancing the national negotiating position by making available facts on alternative technologies and their sources;

(iii) Agreement should be reached on an optimal contracting model for transfer of technology transactions, which provides for adequate mobility for the negotiator from the developing country and at the same time alerts him to the pitfalls and to the unfair conditions which may be involved;

(iv) The contracts should stipulate the participation of local institutions in the provision of a substantial proportion of the production needs and raw materials, in the utilization of by-products, and also in the installation processes through maximal use of local manpower. They should also stipulate the participation of the supplier of technology in the establishment of training institutions which provide the technical manpower that would - within a time frame - replace the foreign experts involved in the project;

(v) In the cost-benefit analytical studies on transfer of technology transactions, due consideration should be given to the real costs (explicit and hidden) borne by the recipient as well as the real returns (direct and indirect);

(vi) An effective mechanism should be devised for the follow-up of the transferred technologies, with the object of assessing the problems which appear as a result thereof, monitoring the fulfilment of the supplier's commitments, and benefiting from such experiences in future transactions;

(vii) There is a world need to revise industrial property legislation inasmuch as they affect licensing for the utilization of patents, to be more effective in benefiting developing countries through transfer of technology;

(viii) Egypt finds that it has the potential to utilize the current trend of locating some commodity production centres in developing countries, where material and manpower resources are available and reasonably priced;

(ix) Developing countries should benefit from each others experiences, particularly with regard to those technologies which proved to be inappropriate or whose transfer conditions were unfair. Hence, there is need for establishing regional centres for the compilation of all such information, as well as data on the technologies appropriate for the development of the region;

(x) The realization of (or coming close to) economic integration among Arab and African countries could very well be an inducement for technology suppliers to invest in these countries with better terms, because of the marketing potentialities at the level of groups of these countries.

Obstacles to the better utilization of S & T:

13. The following obstacles have been identified in the Egyptian situation, although their acuteness diminishes with time:

(a) Deficiency in S & T executive systems. This is manifest in their size, quality, objectives and programmes, and also in the national policies for their establishment, co-ordinating their activities and providing stability for their structures (cf. Agenda Item 2);

(b) Deficiency in S & T information systems. This has been traced to inadequacy of appropriate expertise, modern facilities and managerial procedures needed to provide scientists and technologists with latest S & T information (cf. Agenda Item 2);

(c) Weakness of the links between scientific research institutions and application establishments, which affects the attitudes of scientists and production authorities toward each other. A contributing factor in this regard is the involvement of many scientists in activities which are not directly related to production problems and aiming at self promotion;

(d) Brain drain to developed and other developing countries (for material reward and/or social satisfaction) and, internally, to other sectors of the national economy;

(e) Inadequacy of national expenditure on R & D. This, being a most contrasting manifestation between developing and developed countries, should be corrected in Egypt and other developing countries by raising the expenditure to approach the corresponding level in developed countries (approximately 3% of the national product);

(f) Shortage in S & T manpower. Although it is the largest in the Arab World, this manpower in Egypt is inadequate and shows an imbalance in the ratio of researchers to their assistants. It is necessary, therefore, to increase the size of R & D manpower (currently 500/million population) to reach 1000/million population through treatment of the brain drain problem, encouraging university graduates to work in R & D fields, and increasing the ranks of technical assistants and auxiliary R & D force;

(g) Lack of appreciation of S & T. This is manifest in the inadequacy of the vehicles for popularization of S & T (in the masses and schools) which is reflected in the public attitudes toward scientists and modern S & T practices. It is necessary in this regard to highlight the role of science museums and science programs in the media, and to infuse interest in handicrafts and science models while making their supplies inexpensively available to as wide a sector the population as possible.

Measures to eliminate the obstacles:

14. The following is an enumeration of the measures which should be taken:

(a) Delineation of the long-term areas of vital importance to socio-economic development where S & T could play an effective role;

(b) Adoption of modern methodologies for forecasting and planning of S & T activities to assure the optimal mobilization of available resources and favourable conditions necessary for the full participation of the R & D community in the national development;

(c) Design of concentrated R & D programmes which effectively contribute to advancement of S & T in a manner which integrates with the overall national developmental planning and assures co-ordination between all sectors;

(d) Reinforcement and consolidation of the existing S & T infrastructure, while providing adequate balance at both the horizontal and vertical levels;

(e) Reinforcement of the national S & T policy system through the appropriate legislations which provide stability, centralization of R & D planning, and contractual implementation of the projects;

(f) Co-ordination of all technology importation and adaptation activities through the central S & T system under a definite legislative arrangement;

(g) Technological self-reliance should be a national target, particularly the technologies related to rural development and handicraft industries, and those of national importance e.g. cotton, food, drug, power, metal, tool, building, transport, and capital goods industries;

(h) Efficient training of S & T personnel of all categories, with special emphasis on those involved in the applied sectors, as well as the youthful and female elements;

(i) Realistic treatment of the problem of brain drain, through institution of new systems for employment and reward, and social and health care, in order to create a favourable balance between the pull and push forces;

(j) Paying special attention to the S & T services, such as information and documentation, maintenance of equipment, invention and innovation promotion, data banks, standardization and metrology, and product quality control;

(k) Bilateral co-operation with other countries should be so designed that optimal utilization be made of the opportunities available and created through the open-door-economy policy, and of the technical aid programmes provided by regional and international groups or organizations;

(l) Appropriate schemes should be developed for the co-ordination of S & T activities at the African and Arab World levels to maximize the benefits reaped by all parties involved;

(m) Egypt should collaborate with developing countries in the implementation of a number of R & D projects - in which the developed countries could participate - such as the utilization of marine resources, production of non-conventional energy, horizontal agricultural expansion, and exploitation of arid and semi-arid zones;

(n) International development agencies, established by the developed countries, should increase their technical and financial assistance and loans with fair terms and without imposing political conditions;

(o) Regional and sub-regional organizations (governmental or otherwise) should be alert of the rapid progress in S & T, and consequently be aware of their responsibilities at present and in the future.

C. Methods of integrating science and technology in economic and social development; and

D. New science and technology for overcoming obstacles to development.

The general strategy of scientific and technological research:

15. The national Five-Year Plan includes (as do the other plan envisaged until the year 2000) projects which are based on the application of S & T for development. As a result, a parallel plan is being prepared for S & T action, which is founded on a conceptualization of the strategy of scientific research in the next period formulated by the Academy of Scientific Research and Technology. The latter emphasizes the following approaches for integrating S & T in socio-economic development:

(a) Realism in S & T research activities. The strategy calls for the orientation of research conducted in the professional institutions (with participation of universities) toward practical goals which benefit the Egyptian community at large. It also involves a call for the encouragement of adaptive research which aims at generating the necessary technical knowledge for production as a substitute for importing the products;

(b) Pervasion of the spirit of commitment in the local S & T community. With the realization that publication-oriented research is not the optimal quality needed to support the developmental process in a direct manner, nor is it the kind of output necessary for evaluation of scientists involved in mission-oriented research, two approaches have been considered:

(i) Institution of the system of conducting research by contract;

(ii) Passing a legislation which assures R & D personnel (employed in non-university institutions) of a satisfying remuneration that does not take academic accomplishment exclusively into consideration;

(c) Strengthening the links between S & T research and production institutions. It is generally recognized that the existing weakness of these links represents a serious obstacle. The efforts made to overcome the problem, which is common in many developing countries, include the establishment of intermediate institutions such as the following two examples:

(i) Engineering and Industrial Design Development Centre, which is affiliated to the Ministry of Industry and primarily concerned with industry-related problems of production, such as prototype design and development, and planning of industrial production units;

(ii) Invention and Innovation Development Service, which is affiliated to the Academy of Scientific Research and Technology, and intended to provide the development services following laboratory experimentation level;

(d) Strengthening the extension services rendered by the R & D community. The strategy calls for maximizing the benefits which can be drawn from freely available S & T knowledge, through adaptive research. This involves the provision to the local productive sectors with information on foreign techniques and knowhows after adapting them to local conditions while preserving their special merits;

(e) Maintaining a balanced relationship and integration between basic sciences and their applications, humanities, and social sciences. The strategy calls for concentration on applied research without neglecting basic research and asserts the fundamental role of the humanities and social sciences in the socio-economic development of Egypt, chiefly in view of the social, behavioural and environmental repercussions of modern technologies.

16. Role of basic sciences. Until recently, basic sciences have had a large share of research activities in Egyptian universities and professional research institutions, including the National Research Centre. However, it must be emphasized that the applied agricultural researches have, during several generations, made prominent contributions, particularly in regard to cotton and its breeding which was the cause of the world reputation which this national crop enjoys. The importance which the Government attaches to agriculture is reflected in the establishment of a chain of specialized agriculture and irrigation research institutions. Generally, it is considered no longer acceptable, in the present circumstances, to permit basic research to exceed a certain proportion of the total activities in the national R & D institutions (also including those of higher education). In fact, the change is beginning to take place resolutely and rapidly, and, for example, in the National Research Centre an equilibrium between basic research (20%) and applied research (80%) is expected to be attained by 1980.

17. Role of human and social sciences. Because of the far-reaching effects of modern technologies on societies of ancient civilizations, such as the Egyptian society, sociologists are deeply concerned about the behavioural, cultural and spiritual aspects of these effects. There is general agreement on the necessity of exhaustive researches on the effects of modern technologies on the various strata of the society, to provide recommendations for protective and corrective action. As an example, the patterns of life in the Egyptian rural

society - which have remained largely unchanged for thousands of years - are currently undergoing profound changes, as a result of electrification and mechanization.

18. Increased utilization of new science and technology. It is generally agreed that many of the material problems of humanity can be solved through application of the already existing S & T knowledge and that which will be generated as a result of the future breakthroughs in basic sciences and technological applications. Efforts being made in Egypt in this regard include the utilization of the technologies of remote sensing, management of water resources and their protection from pollution, and non-conventional energy sources, particularly solar energy. In the treatment of subitem b of Agenda item 2, an enumeration is given of some of the areas in which new science and technology can effectively promote development in Egypt, through national efforts and collaboration with developed countries and international organizations.

ITEM II: INSTITUTIONAL ARRANGEMENTS AND NEW FORMS OF INTERNATIONAL CO-OPERATION IN THE APPLICATION OF SCIENCE AND TECHNOLOGY

A. The building up and expansion of institutional systems in developing countries for science and technology.

Infrastructure:

19. As a result of practical experience and evolution, the following conceptualization of the S & T institutional systems necessary for the national socio-economic development has been reached:

(a) The necessity of existence of a central S & T planning institution which operates integrally with the national planning machinery, particularly in medium - and long - range programmes, according to a national S & T policy. This institution, in Egypt, is represented by the Academy of Scientific Research and Technology which attained its present structure and function after numerous changes. The Academy has a governing council which includes leaderships of educational and scientific institutions as well as of ministries, and several

experts. The national S & T community is represented in the membership of its 17 specialized councils. Basically, the Academy is responsible for the formulation of science policy and implementation of research projects (approved by the specialized councils) contractually at the national level. It is also responsible for co-ordinating the activities of the various research institutions, encouragement of basic research (in an appropriate balance with applied research), S & T information (specialized and popularized), provision of incentives and rewards to scientists, S & T publishing, supporting scientific societies and national committees (corresponding to international unions), and promotion of scientific relationships with foreign countries and international organizations;

(b) The necessity of existence of a network of S & T executive institutions, which includes those concerned with higher education, and training of the researchers and technicians supplied to a suitable group of research centres which are involved in development-related R & D activities. The universities, of which there are 12 in Egypt, are the backbone of this network, and include traditional colleges as well as a number of specialized centres. The infrastructure also includes several specialized and technical institutes which are affiliated to ministries. In all, the national S & T infrastructure in Egypt is composed of about 80 establishments which include the Academy-affiliated research institutes (of which the most important are the National Research Centre, and research centres for oceanography and fisheries, observatories and geophysics, standardization and metrology, petroleum, endemic diseases, and for metallurgy, in addition to service institutions for information and documentation, scientific instruments, and a patent office);

(c) The necessity of supporting industrial and production units through a network of centres for technical studies and technological research related to problems of productivity, quality of products, cost, and labour, and also for comparison of local and similar foreign products to help in developing competitiveness both in the local and foreign markets.

S & T manpower and available financial resources:

20. The personnel employed in teaching and research in the universities and in institutions of higher education exceed 8000 (exclusive of demonstrators). With the recent increase in the numbers of such institutions and the increase of capabilities of several of them to train the required personnel, the Government is currently limiting the sending of education missions overseas to the areas of modern sciences and where local training is inadequate.

Manpower involved in R & D in Egypt is estimated to exceed 20,000 of individuals qualified with master and doctor degrees. In this community, females represent approximately 16%; those trained in Egyptian universities approximately 60%; those employed by the ministries and production units approximately 30%; and by the Academy-affiliated institutions approximately 10%; specialists in applied sciences represent approximately 64%; in basic sciences approximately 18%; and in social sciences and the humanities approximately 18%.

The financing available for R & D activities represents approximately 0.83% of the GNP (UNESCO report for 1976). Estimates (a report submitted to UNESCO in 1978) for 1976, as an example, show that the total national expenditure on R & D is approximately US$ 85.4 million (capital and current) distributed between the production sector (4%), high education sector (26%), and the services sector (70%); that the current expenditure on basic research accounts for 18%, on applied research 50%, and on developmental research 32%; that the total expenditure from government resources represents 82%, and from foreign resources 18%; that the share of the scientist/engineer in this expenditure is approximately US$ 144, and that this corresponds to approximately US$ 2.4 per capita. These figures show that the average expenditure as related to national income, though lower than that in the developed countries, is among the high averages in the developing countries. It is also noteworthy that the share of the scientist/engineer is considerably low, which represents a serious obstacle to R & D productivity.

Functional objectives of the S & T institutions:

21. Based on the Egyptian experience, these objectives, arranged in an ascending order to be attained progressively with time, may be envisaged as follows:

(a) To be the nation's means to follow up and appraise modern S & T accomplishments and to assess national needs therefrom. This attitude, in the initial phases, is passive though it involves self-development;

(b) To be the national pool from which local and foreign companies involved in transfer of technology draw technical personnel increasingly;

(c) To act in an advisory capacity to assist authorities and technical decision-makers in matters of transfer of technology;

(d) To participate in the formulation of national socio-economic development plans, using scientific procedures in the choice between alternatives and in decision-making;

(e) To perform experimental research supportive of national projects involving transfer of technologies, to assure their appropriateness, and environmental and labour compatibility, to investigate possibilities of utilization of local raw and intermediate materials, and of production by-products, and to examine their effects on other national activities;

(f) To be capable of delivering the performance which helps in approaching national technological self-reliance, through indigenous development of technologies and services, starting with simple and basic types (using duplicative approaches), and progressing to more sophisticated ones (contributing by innovation and invention);

(g) To upgrade the quality of their performance to the point where output is measured essentially by practical value-related criteria;

(h) To be clar to all concerned, that the desired development in the function and performance of these institutions is a goal which should be attained within a forseeable time-frame, and hence the necessity for appropriate action to enable the S & T community to operate in a sphere which comes progressively closer to that of developed countries.

B. Research and development in the industrialized countries in regard to problems of importance to developing countries.

22. The following problems represent serious obstacles to national socio-economic development, and, because of their importance and present and future dimensions, their confrontation therefore is a matter of vital importance:

(a) Shortage in food resources;

(b) Shortage in human settlement expansion requirements;

(c) Shortage in requirements for raising standards of living to those common in the developed world;

(d) Rapid increase in population (as a factor contributing to the previous problems).

23. Consequently, Egypt considers that the involvement of the industrialized countries in basic and applied research activities related to these major problems is a matter which deserves serious attention. The following are examples of such activities:

(a) Shortage in food resources. This being a problem of the developing world in general, special and concentrated efforts should be made to develop agricultural and livestock productivity, and rural life, including:

(i) Confrontation of the problems of desertification;

(ii) Treatment of agricultural soil problems;

(iii) Modern technologies for rationalized usage of irrigation water;

(iv) Optimization of usage of traditional fertilizers and development of new types;

(v) Development of superior strains of agricultural crops (with regard to yield, and resistance to diseases and pests), particularly the starch, protein and oil grains;

(vi) Survey and acclimatization of suitable wild plants for food and industrial products, particularly those which can be adopted to desert and semi-arid areas;

(vii) Development of new and more effective methods for combating plant diseases and pests, particularly those which affect food plants;

(viii) Development of new and more effective methods for combating cotton plant pests;

(ix) Desalinization, and use of brakish water for irrigation;

(x) Development of appropriate agricultural equipment for pre- and post-harvest operations, which are distinctive in simplified design, adequate performance, and low price;

(xi) Development of the transportation and storage technologies to minimize the losses in pre- and post-harvest operations, with special regard to combating loss-causing pests;

(xii) Development of the technologies of processing grains and other crops to maximize utilization of all products;

(xiii) Optimized utilization of agricultural and animal wastes;

(xiv) Development of new and superior strains of poultry and livestock;

(xv) Study of non-traditional animals and birds for potential food sources;

(xvi) Concentration of efforts for combating common farm animal diseases;

(xvii) Formulation of special feeds for poultry and livestock; utilizing local agricultural and industrial wastes, and their fortification by additives to increase productivity of meat, milk and eggs;

(xviii) Investigation of intermediate (and appropriate) technologies for development of life and diversification of production in rural areas, such as: housing, small-scale production units, limited processing/industrialization of agricultural products, and utilization of wastes of all kinds;

(xix) Development of the fishing industry and utilization of marine products, in all available coastal and inland waters;

(b) Shortage in human settlement expansion requirements. The treatment of this problem, common in many developing countries though particularly acute in Egypt, requires R & D approaches such as:

(i) Development of new types of building materials, utilizing the abundant sources (e.g., sand, lime and clay materials) for production of bricks by novel techniques which are distinctive in simplicity, low-cost, and non-dependence on centralized production systems;

(ii) Development of new modalities for rapid and inexpensive construction of housing units;

(iii) Development of appropriate standardization which allows rapid housing construction and provision of complementary supplies;

(iv) Development of new binding materials and alternatives which depend on local raw materials;

(c) Shortage in requirements for raising the standards of living to those common in the developed world. By and large, health considerations are at the top of these requirements. However, the problem of bilharziasis stands out as the most serious health problem in Egypt, since it affects productive life expectancy, and national productivity in general. Researches in Egypt and in the developed countries have not yet arrived at a decisive solution, nor is there an indication that the solution is imminent. The solution might reside in a radically effective molluscicidal agent, anti-bilharzial drug, or an immunizing agent, the latter being an approach in which no worthwhile accomplishments have been attained as yet;

(d) Rapid increase in population. Needless to say, the implications of this problem - which affects the developing countries, and probably the whole world - include aggravating the food and housing situations in the country. In this regard, Egypt can only emphasize the importance of the efforts needed to develop family planning methods which are effective, safe, ethical, inexpensive and easy to apply. The ultimate goal is to attain a solution to the problem which threatens life and its quality on this planet.

C. Mechanisms for the exchange of scientific and technological information and experiences significant to development.

Present situation of S & T information in Egypt:

24. These activities started in Egypt as a result of sporadic and non-co-ordinated efforts. In 1954 the National Research Centre, still in its early stages, established a department for S & T information and documentation which operated nationally and internationally, and later developed into the National Information and Documentation Centre (NIDOC), which plays today a prominent role locally and in the Arab World.

25. In addition to traditional functions, this Centre is responsible for publishing a series of specialized national periodicals (edited by the scientific societies), in addition to an Arab scientific abstract periodical (in co-operation with UNESCO and some Arab organizations), several specialized bibliographical and abstracting periodicals, reviews, conference transactions, and current-information periodicals (which started with the field of pharmaceutical sciences as a service provided in Egypt, the Sudan and Saudi Arabia, in co-operation with UNESCO). The Centre also serves regionally through arranging seminars on bibliographical and documentation activities, and exchange of periodicals. Other specialized R & D institutions in the country (such as the National Research Centre, Agricultural Research Centre, Irrigation Research Centre, Engineering and Industrial Design Development Centre, National Social and Criminological Research Centre, and other institutions of higher education and affiliated to the ministries) also issue periodicals on their research and extension service activities.

26. Efforts are currently being made (with local and foreign contributions) to develop the NIDOC - through providing it with new premises and with modern equipment and facilities - into an institution which will be able to render its services regionally. This process requires:

(a) Increased financing, particularly in foreign exchange;
(b) Development of information services and making them known and available to the local S & T community;
(c) Introduction of modern information and documentation service technologies;
(d) Development of the service delivery efficiency through training programmes;
(e) Establishment of a national S & T information network involving local universities and R & D institutions, and linking them to the Centre;
(f) Linking the Centre to the international S & T information network to enable both local and regional services;
(g) Development of the Centre's science editing, publishing and printing capabilities;
(h) Integration of the Centre's activities with patent service activities.

D. The strengthening of international co-operation among all countries and the design of concrete new forms of international co-operation in the fields of science and technology for development; and

E. The promotion of co-operation among developing countries and the role of developed countries in such co-operation.

Relations between Egypt and groups of developing and developed countries:

27. Historically, Egypt has had a cultural role which affected all developing countries in the region and, likewise, has been affected by the surrounding cultures. This mutual effect was most pronounced during the twentieth century in educational and public culture, and was particularly pronounced in the neighbouring African and Arab countries, and also in some Islamic countries. This role became diversified during the last 50 years to include Egyptian co-operation in many fields (such as education, public health, agriculture, construction, etc.). During the last 30 years, which witnessed a flourish in some Arab and Islamic countries following oil discoveries, a rapid rise occurred in the needs of these countries for assistance, which Egypt provided in most areas of socio-economic development. This required the orientation of large numbers of specialists in these areas (where services outweigh production) to work in the countries which asked for their services, to the extent that some aspects of development in Egypt were affected.

28. On the other hand, the opening of Egypt to industrialized Europe started in the early years of the nineteenth century in the form of sending educational missions, receiving experts, and establishment of a chain of educational, scientific and production institutions. All this was the foundation of a flourish in industry, agriculture and management nationwide. These efforts were impeded during the same century and the first half of the twentieth century by a number of set-backs (with some movements for social reform) as a result of administration factors and foreign intervention, which culminated in the occupation, the effects of which lasted until the middle of the present century. After independence, new patterns of relations with most countries were established, which embodied opportunities for development through bilateral and regional ties. The establishment of the UN system and its organizations also provided numerous opportunities.

Review of S & T transactions between Egypt and the developing countries:

29. An analysis of the Egyptian experience in co-operation with the Third World reveals several negative aspects in form and performance, which may be attributed to an inadequacy in delineating the objectives, implementation efforts within a given country, and co-ordination efforts within a group of countries.

30. The many schemes of co-operation among the countries of the Arab and African regions in which Egypt participates, and to which the Arab League and the Organization of African Unity systems contributed through planning and sponsoring, comprise several positive as well as negative experiences. These are useful in indicating the areas in which regional co-operation can be most effective, and in which Egypt expresses its willingness to participate, as follows:

(a) Training of personnel in fields of R & D. As a prerequisite, a comprehensive visualization of the needs of the entire region from these capabilities, and an evaluation of the existing educational and training institutions and their programmes should be made, followed by the establishment of specialized centres of excellence through strengthening some of the existing institutions. The countries of the region may also wish to consider the notion of creating one or more top-level universities with integrated structure and capabilities, to handle issues of the future for the benefit of the entire region. These countries may also consider establishing programmes to exchange students of certain specializations to complete their studies or receive specialized training on R & D procedures which are available in institutions other than their own;

(b) Exchange of scientists, university professors, technology application experts and technicians. This important type of exchange should be performed within carefully designed programmes to be the source of benefit to all parties, rather than a drain of manpower for one party. As for Egypt, for instance, considerable numbers of individuals, encouraged by the better salaries offered, have been employed in the development projects of neighbouring and friendly countries. Although the majority return eventually to Egypt, their absence causes shortages which are particularly noticeable in universities and in the professions, and, moreover, only a small proportion of their earnings is repatriated. The problem may effectively be handled by two possible measures:

(i) Regulation of emigration, which occurs outside governmental arrangements, by controlling the process sectorally;

(ii) Formulation of bilateral arrangements with governments of beneficiary countries to contribute financially to the strengthening of the educational and training systems in the country, in a manner which is commensurate with the size of the benefits;

(c) Training of technical assistants and technicians, through centralized regional programmes which induced the establishment of specialized training centres to be distributed geographically according to the availability of facilities and skills;

(d) Strengthening of the ties between the scientists and specialists in the region, through unions and professional associations in various specializations to realize integration in their activities. This may also be supplemented by convening conference and seminars, and publishing scientific and informational periodicals on topics of importance to the development of the region. It is Egypt's view that these ties should also be strengthened between the Arab and African regions, and with other groups of developing countries;

(e) Establishment of centralized regional S & T information systems, to support regional development programmes, which are optimally linked to national and international networks;

(f) Implementation of regional development programmes through joint research projects, which stem from the common development needs expressed at the regional or subregional levels. In both of the African and Arab regions, there are at present several such projects which are executed mostly through bilateral arrangements and much less through collective group efforts. The following areas, as examples, however, deserve examination on the part of the entire African and Arab regions:

(i) Settlement in desert areas;

(ii) Desertification;

(iii) Optimal utilization of fresh water resources;

(iv) Protection of environment and pollution control;

(v) Development of the industry of building and construction (materials and patterns);

(vi) Survey of natural resources;

(vii) Development of agricultural methods and procedures;

(viii) Development of energy resources (conventional and non-conventional);

(ix) Optimal utilization of marine resources;

(x) Meteorological observations.

There are also many examples of projects (which could be implemented co-operatively in the region), aiming at the adaptation and development of advanced technologies for increasing national and regional productivity, such as those which are concerned with the natural resources abundant in the region or a sub-region (e.g. forests, ores, energy, agro-industries, fisheries, etc.). Among the most effective means which could be used collectively in this regard, is the establishment of specialized and adequately equipped S & T institutions, such as those concerned with remote sensing, plant breeding, animal breeding, electronics, etc.

Review of S & T transactions between Egypt and the developed countries:

31. An analytical review of these transactions (of different types, sizes and objectives) indicates the following shortcomings:

(a) Inadequacy of planning of these transactions, which frequently results in duplication and overlapping on one hand, and the futility of some of the projects on the other. This reason lies behind the observation that several such agreements have never been implemented;

(b) Some of the projects implemented inter-institutionally are scientific luxuries, and are not compatible with the real needs and priorities of the country. They are accepted only because the counterpart institutions in the developed country have preference for this type of research which is related to their own activities;

(c) Limited effectiveness of several educational and training programmes offered to Egyptians in developed countries, essentially because of their non-relevance directly to developmental issues in Egypt, or in developing countries in general, which causes an isolation of these individuals from local realities;

(d) Slowness in implementation of the agreed-on projects, which both sides may be responsible for;

(e) The experts dispatched by the developed countries may not be of the scientific and expertise calibre compatible with their assignments. Their excessively high salaries, sometimes, consume large proportions of the funds allocated for the projects;

32. Based on past and present experiences, and an assessment of their results, the Egyptian Government presents below a viewpoint in regard to co-ordination of national action, the new forms of co-operation with industrialized countries, and the types of S & T activities to be implemented co-operatively through bilateral arrangements or to be performed specifically in the developed countries:

(a) Central and sectoral systems in Egypt, responsible for co-operation with foreign countries in S & T areas, should have adequate surveys on the existing potentials of, and areas of distinction in, these countries, particularly in regard to academic schools, specialized research centres, training institutions, R & D institutions, and models of practical and field application in all areas related to national development projects;

(b) The needs of the various sectors in the country should be matched with the opportunities available through potential co-operation with the developed countries. Such observations should then be taken into account in concluding agreements, in order to maximize their objectivity and effectiveness, and to make them instruments of attaining certain goals, and satisfying certain needs, in certain sectors, and under certain circumstances;

(c) A national formulation should be found to co-ordinate and integrate the actual needs of the various sectors (in education, research and production) in Egypt, which necessitate co-operation with the developed countries. This can be realized by establishing a central system which has information about the development plans projected for implementation within a time-frame to accomplish the results envisioned by the central development planning machinery;

(d) Counterparts in collaborating R & D institutions in Egypt and in the developed countries should be selective in their activities, giving preference to those projects which are directly relevant to the socio-economic development

process in Egypt over those of academic, or only marginal, importance. A positive attitude has been shown in recent years by some developed countries, by conducting feasibility studies before implementation of technical assistance programmes related to development needs in Egypt;

(e) The utility of the training programmes in the developed countries increases if these countries take the following into consideration:

(i) Involvement of Egyptian scientists in the recipient country's own R & D projects related to application in agriculture and industry, or those tackling problems of the developing countries in general, or particularly related to the Egyptian situation, including projects on intermediate technology, and technologies appropriate to conditions in the developing countries;

(ii) Opening opportunities for Egyptian trainees to work directly in fields of agricultural and industrial production, and permitting them to be informed about the latest methodologies of management, and techniques of production. These individuals would be relied upon to train others upon return home;

(f) Since the efficiency of management and planning procedures in R & D and production institutions is crucial for their successful performance, the assistance that can be rendered in this area by the developed countries to Egypt and other developing countries would be rated highly among forms of international co-operation in the next period;

(g) Careful consideration should be given to the rewarding potentialities of implementing multi-disciplinary projects in which several participants, from one or more developed countries, collaborate with maximized integration to assure the benefits of their implementation;

(h) The Egyptian cultural and technical embassy bureaus in the developed countries should have the function of following up S & T accomplishments in these countries, and report their observations to the appropriate institutions at home. The latter institutions should be adequately organized and equipped so as to optimally utilize the received information.

ITEM III: UTILIZATION OF THE EXISTING UNITED NATIONS SYSTEM AND OTHER INTERNATIONAL ORGANIZATIONS

33. The UN system performs its world-serving functions through agencies which increased in number, variety, and size over the years. This increase happened as a result of the growing need to utilize the international machinery and its capabilities to maximize the output for peace and for the socio-economic development of all countries, particularly the developing countries, and to reduce the gap between developed and developing countries. Practical experience during the last years has shown that much has been accomplished, and also that more can, and should, be accomplished, which necessitates urging the international machinery for action.

34. Past experience also reveals the need for an examination of the infra-structure, functions, performance and interrelationships of the agencies involved in economic and social activities, with the purpose of making them better equipped for facing the demands and challenges of the next period. Efforts are currently being made for restructuring the UN system in accordance with resolutions of the General Assembly and the Economic and Social Council.

35. Egypt considers that the existing UN system and other international organizations have a crucial role in the establishment of the New International Economic Order, implementation of the Code of Conduct on Transfer of Technology, implementation of the declarations and recommendations of the UN Conference on issues of socio-economic development worldwide during the Second UN Development Decade, and in organizing a world conference for reaching agreement on the mechanisms needed for implementing the afore-mentioned declarations and recommendations. It should be ascertained that the role of the UN system becomes decisively effective after the appropriate restructuring has been attained, which would enable it to perform the following essential functions:

(a) Provision of practical assistance to developing countries in matters related to transfer of technology through establishment of a world centre, with affiliated technological information-expertise banks, which would participate in the negotiation process and in the subsequent follow-up and evaluation of

projects. This machinery may represent the minimum of assistance to be rendered by the UN system, since the ideal arrangement would have the said machinery acting as an international fund for the transfer of technology, with the capability of acquiring the technologies needed by the developing countries and making them available at fair costs and conditions, along with the necessary consultancies before implementation and expertise during application;

(b) Establishment of an effective world technological information network to enhance the productive capabilities of the developing countries, including a revision of the existing practices and legislations of industrial property and licensing. This also involves the establishment of national and regional centres for the acquisition and processing of patents produced in the developed countries and also locally and regionally;

(c) Exerting an international effort for approaching a state of unified standards and measures;

(d) Adoption of world integrated programmes for dealing with the fundamental problems of the Third World which, in particular, include shortage of food (grains and animal protein) and energy, inadequacy of building materials and patterns, public health (notably endemic diseases), the deterioration of environment and population increase, through utilization of existing knowledge and aggressive basic research;

(e) Adoption of world integrated programmes for the development of appropriate appropriate and intermediate technologies to improve the quality of life in the developing societies(particularly in rural areas) and their productive capabilities. It is practical, in this regard, to organize commissioned R & D programmes in both the developed and developing countries;

(f) Establishment of a world system for rewarding and honouring the scientists whose contributions provide practical solutions to the major problems of humanity (particularly those indicated above);

(g) Organization of intensive training programmes and establishment of regional training centres which are concerned with the fundamental development issues, including advanced vocational production training to produce different levels of graduates and trainers, and strengthening of existing training institutions;

(h) Revision of existing procedures for the implementation and follow-up of the recommendations of international conference and appraisal of their effectiveness;

(i) Overall assessment of the output of the UN developmental projects which have so far been implemented in developing countries in order to benefit from the results in scheming new projects;

(j) Overall assessment of the criteria used in the selection of international experts, in regard to their capabilities, suitability for their commissions and their remuneration. Due consideration should be given to increasing dependence on experts of the region for service in projects of their own region;

(k) Active cultural endeavour to acquaint developed societies with the civilizations and heritages of the developing societies, and the potentials of their contribution to humanity as a result of development;

(l) Developing a world mechanism for monitoring advanced science achievements, with the purpose of preventing their use in threatening world peace, humanity and civilization anywhere in the world;

(m) Harmonization of the UN system science and technology policies and activities and their co-ordination with those of other international and regional organizations to realize the afore-mentioned objectives, as a possible alternative to establishing new institutions. It is also important to harmonize the activities of these agencies to assure integration and complementarity of all contributions (in lieu of competition, or work in isolation) for the implementation of a given project;

(n) Establishing of an arrangement for the continued dialogue and consultation between developed and developing countries in regard to the above issues in general, and questions of transfer, adaptation and development of technology in particular, in accordance with the recommendations of the Lima Declaration.
