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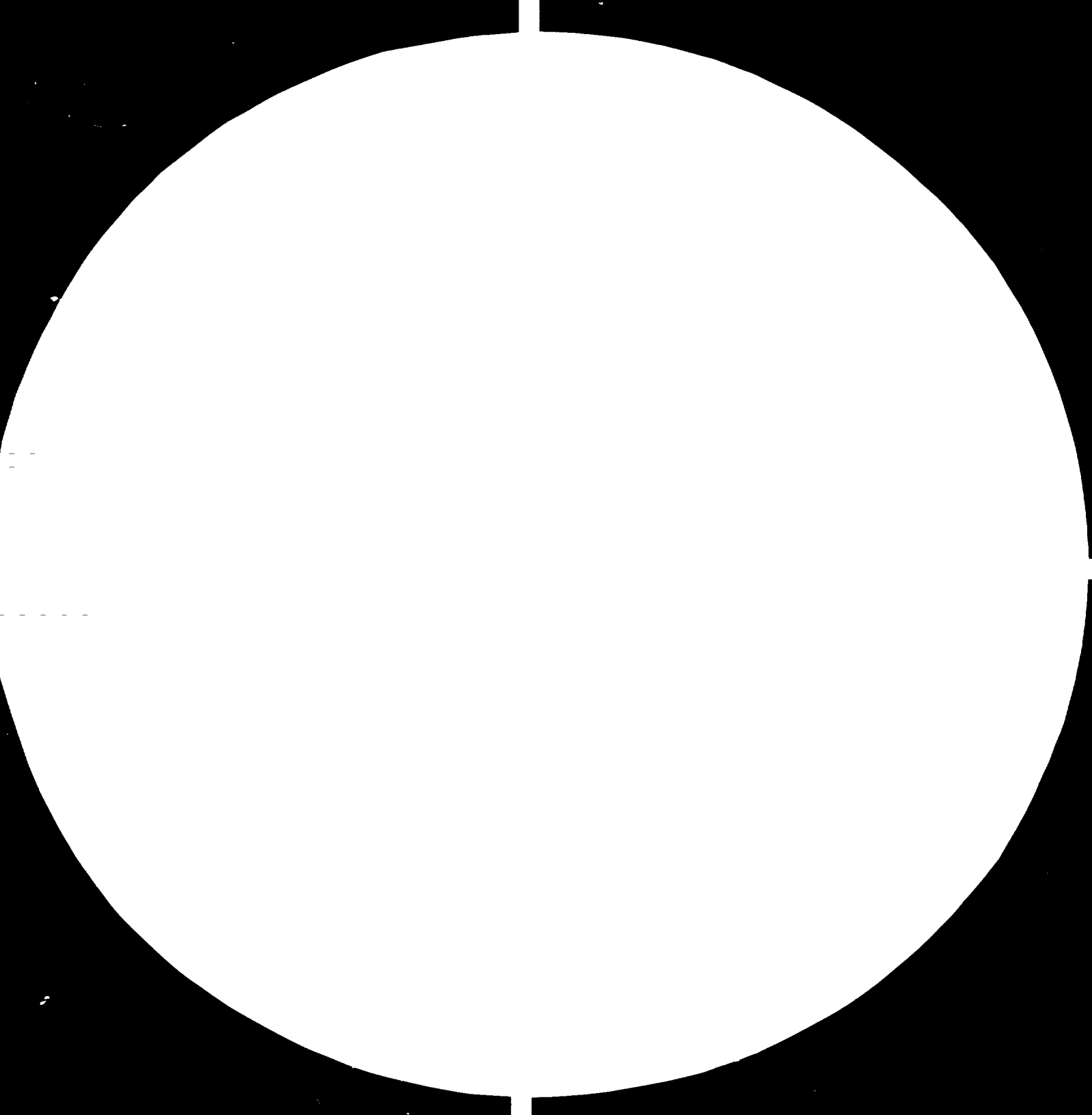

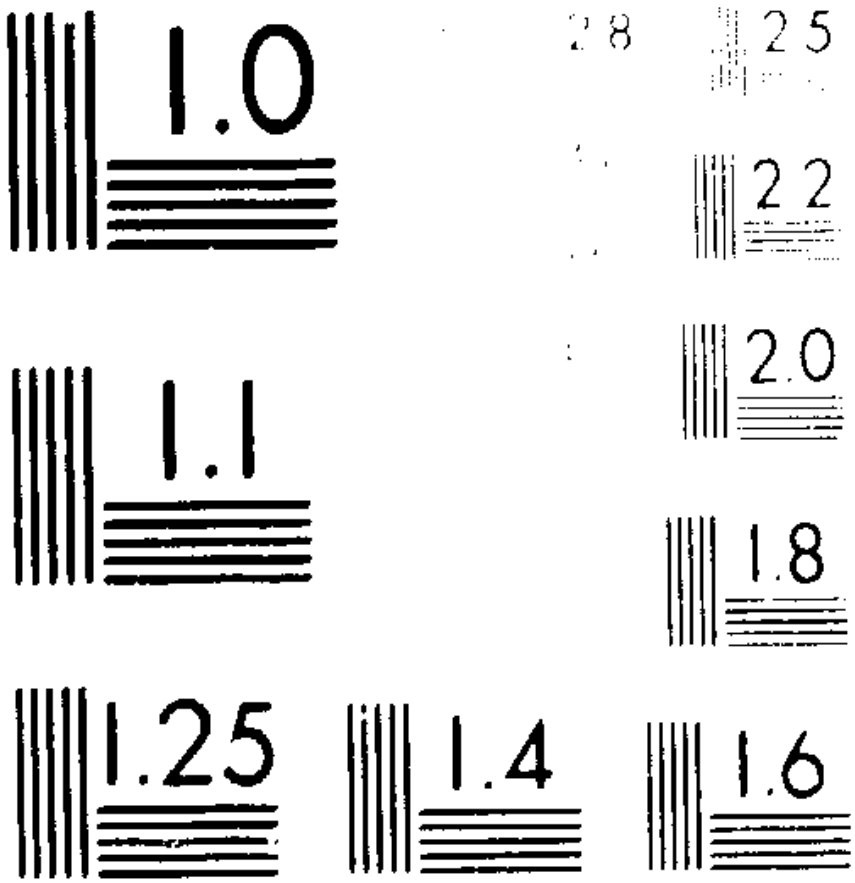
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Distr.
LIMITED
UNIDO/IS.197
15 December 1980
ENGLISH
Original:FRENCH

UNITED NATIONS INDUSTRIAL
DEVELOPMENT ORGANIZATION

REPORT OF THE NATIONAL SEMINAR

ON

THE TRANSFER OF TECHNOLOGIES*

YAOUNDE - CAMEROUN

7-12 July 1980

PREPARED BY

THE NATIONAL COMMITTEE ON THE TRANSFER OF TECHNOLOGY

(COMITE NATIONAL DE TRANSFERT DE TECHNOLOGIE)

GENERAL REPRESENTATION FOR SCIENTIFIC
AND TECHNICAL RESEARCH

(DELEGATION GENERAL A LA RECHERCHE
SCIENTIFIQUE ET TECHNIQUE - DGRST)

*This document has been translated from an unedited original.

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C O N T E N T S

GENERAL CONSIDERATIONS

Technology has been the subject of extensive discussions over the last decade in those international assemblies which are especially concerned with studying tne transfer of technology, the selection of an appropriate technology, the adaptation of inappropriate imported technology and the development of new technologies.

It was felt to be necessary to define certain terms so as to facilitate the understanding of the subjects raised during the Seminar.

The word science describes the deliberate attempts on the part of man to discover, by the objective study of empirical phenomena, how things function as causal systems. Since the aim of science is to deduce empirically the relationships between the phenomena and the events in our world, and not simply to extract practical applications from the relationships deduced in this way, it may be said that science seeks to understand (to know why) and not to invent (to know how).

Technology is a combination of equipment and knowledge. The study and practice of the concrete applications of scientific discoveries for the production and improvement of goods or services are described by the word technology. Practitioners of technology utilize techniques to satisfy the concrete needs of humanity. They do this by retaining and developing new models of equipment, machines or installations which considerably amplify the efforts of man, improve the efficiency of his activities and refine the products of his work. The task of technology would seem therefore to be to invent rather than to understand.

When one chooses a technology it is necessary to acquire either the whole of this technology or its component parts. If it is not available locally it is possible either to develop it locally or to import it and adapt it to local conditions, or again to transfer it directly from abroad and to apply it as it is used in the country of origin.

The transfer, adaptation and development of techniques

This transfer of technology can take various forms. It can take place within the framework of turnkey projects, product availability arrangements, associations by shareholding, licensing agreements, direct purchase by national investors or direct foreign investment. Each of these forms corresponds to a different grouping of costs and social and economic efforts. They involve not only direct costs (such as the purchase of the machines and technical knowledge, the payment of royalties and the cost of management agreements) but also the indirect costs of transfer such as, for example, the visible costs represented by the excessively high price of imports of machines and of intermediate production factors within the framework of the price of the transfer, together with other costs, which are difficult to measure, and which can result in certain cases from the restrictive commercial practices which form part of the arrangements for the transfer of technology. Another indirect cost, which is also difficult to estimate in practice, is the loss of opportunities to profit from the development of technologies within the country.

The freedom to choose or to adapt freely foreign technology is limited both by the initial choice of the mode and also the source of the transfer. These are mainly long-term effects, not always seen very clearly at the moment of choosing, and these need to be analysed very carefully. It is therefore important to envisage the possibility of various sources and various modes of transfer, together with the possibility of breaking down the technology into its various components.

In order to select from the existing armoury of technologies that technology which is most suitable, and to utilize it effectively, it is therefore necessary to possess technological capabilities which are more or less similar to those needed for the creation of a new technology. To negotiate with the sellers of machines and to choose the equipment which is most economic and most advantageous, to purchase technology for a manufacturing process under equitable conditions, to examine tenders concerning development projects, to sign various licensing agreements, to evaluate the proposals concerning projects linked to a given technology, to negotiate effectively with foreign investors or to become familiar with the various aspects of patents - these are some of the complex activities

which are involved in the choice between various processes, activities which require a detailed national technological capability which generally only exists in the developing countries.

We understand by development the joint process of growth and change which is designed to improve the conditions of life and work of populations. Growth is simply the expansion of existing goods and services: it is therefore a quantitative metamorphosis. By contrast change assumes the adoption of methods of examination and analysis and is, therefore, a qualitative metamorphosis.

Significance of the term "Research and Development" (R & D)

Research is used to describe the quest for new knowledge. By contrast Development is the systematic use of the results of research and existing empirical knowledge with a view to the introduction of new materials, products, processes and methods, or the improvement of existing ones, including the development of prototypes and pilot plants. Development includes those studies which have to be carried out to determine technical and socio-economic feasibility, together with the utility, acceptability and profitability of innovations.

In the field of research and development it is customary to distinguish three categories of activities:

Fundamental research may be defined as all activity which is systematically creative and intended to increase scientific and technical knowledge or to lead to the discovery of new fields of investigation without an immediate practical objective.

Applied research may be defined as all activity which is systematically creative and is directed towards the increase of scientific and technical knowledge, but having as its aim a particular practical objective. Applied research is undertaken in order to exploit the results of fundamental research with a view to their practical application, or to determine new methods or new means of achieving a previously defined and specific practical aim.

In general it may be said that applied research transforms theories into operational form. Its results generally have an influence on a limited field of science and technology and are of a specialized character in the sense that they are intended to be exploited in given situations or to solve specific problems, and are not presented as having general and universal value, unlike the results of fundamental research.

Experimental development may be defined as all activity which is systematically creative and exploits the results of fundamental and applied research and empirical knowledge with a view to introducing new materials, products, devices, processes and methods or to improve substantially those which already exist, including the development of prototypes and pilot installations. Broadly speaking experimental development is intended to introduce new applications.

The activities linked to the adaptation of imported technology, and those which are intended to improve effectively existing technology, must in general be expressly designated as experimental development work.

INTRODUCTION

Preliminary note

1) Taking into account its desire to integrate technological development into the process of national development the Government created, by Presidential Decree No. 78/109 of 1 April 1978, the Comité National de Transfert des Technologies (CNTT), an organization for coordination, consideration and information in regard to the Transfer of Technologies.

2) The Comité National de Transfert des Technologies is responsible, amongst other activities, for:

- listing national requirements in regard to science, techniques and industry;
- studying of the modes of transfer, adaptation, and development of techniques;
- selecting foreign technologies capable of effectively contributing to the development of our country and its economic and social progress:

3) The Comité National de Transfert des Technologies consists of representatives of the technical Ministries, University Institutions and Chambers of Commerce and Agriculture, together with individuals recognized for their special competence. Because of its multi-disciplinary nature the Comité National de Transfert des Technologies is able to integrate experiences in various sectors of the economy so as to favour both the harmonious development of industry based on the judicious adaptation and choice of foreign technologies and also the promotion and development of local technologies.

4) In order to assist this organization in its work the Government has requested the assistance of UNIDO in order to familiarize and increase the awareness of its executives concerning questions raised by the transfer of technologies, and to formulate a national plan of action in this field.

5) The assistance offered by UNIDO and accepted by the Government consists of three parts:

Part 1: A study trip by the President and the Secretary of the Comité National de Transfert des Technologies, during which they visited UNIDO Headquarters and a number of developing countries to obtain information

on the experience of organizations in the field of development, acquisition, adaptation, transfer and dissemination of appropriate technologies, to obtain information on the national policies for the transfer of technologies and on the institutional framework implemented for this purpose.

Part 2: Sending a study mission of UNIDO experts to Cameroun for the purpose of assisting the Comité in drawing up a programme of national action.

Part 3: Organizing a national seminar for the interested departments and organizations, a seminar which should give rise to a synthesis of the actions to be undertaken in this field.

OPENING OF THE NATIONAL SEMINAR ON THE TRANSFER OF TECHNOLOGIES

6) The National Seminar on the Transfer of Technologies was held from 7 to 12 July 1980 in the premises of the Chamber of Commerce, Industry and Mining of Yaoundé under the joint auspices of the Cameroun Government and the United Nations Industrial Development Organization (UNIDO).

The Seminar was opened by Monsieur VROUMSIA TCHINAYE, General Representative for Scientific and Technical Research, in the presence of Monsieur G.S. GOURI, Deputy Director of UNIDO.

7) Referring to the assistance, and in the name of the Resident Representative for the United Nations Development Programme (UNDP), Mr B. COPPENS recalled in detail the technical assistance granted by the UNDP to the Comité National de Transfert des Technologies with the support of UNIDO. He explained that the assistance of the UNDP was intended to familiarize the CNTT executives with the questions of development and transfer of technologies, and also to assist the CNTT in accomplishing its own mission as effectively as possible. He promised the active cooperation of the UNDP in locating financing for the projects retained as the results of the recommendations arising from the work of the Seminar.

8) He was followed by Mr G.S. GOURI, Deputy Director of UNIDO, who first of all expressed his gratitude to the Government and the people of Cameroun for the hospitality which they had extended to himself and to the UNIDO experts. He then recalled the important role played by UNIDO in assisting the developing countries in acquiring and reinforcing their technological potentiality so as to realize their autonomy in regard to technologies. The assistance of UNIDO in Cameroun, which had been modest in the initial years, had developed rapidly in volume and would continue to grow because of the role and importance of industry in the process of socio-economic development of the country.

The attention of the Cameroun Government has been drawn to the recent creation of a United Nations Interim Fund for Science and Technology for Development (IFSTD) which offers a new source of financing for projects for programmes in the field of development and the transfer of technologies. Mr GOURI concluded by assuring the Government of the desire and availability of UNIDO in collaborating and in assisting both in the implementation of the recommendations of the Seminar and also in other fields contributing to industrial development.

9) He was followed by the General Representative for Scientific and Technical Research who thanked UNIDO for the assistance which it had given in the organization of the Seminar and for the assistance given to the Comité National de Transfert des Technologies so as to assist it in starting its work.

After having emphasized the role played by science and technology in the socio-economic development of nations he underlined the complexity of the problems involved in the choice of techniques, and also the difficulties encountered in the transfer of technologies, having regard to the many economic implications and the imbalances which they could cause in the social structure, without overlooking the damaging effects on the environment which could result.

The essential objective of the seminar was therefore to promote an exchange of views on the various problems posed by the acquisition, adaptation and development of technologies and, at the same time, to make the national executives conscious of the need for the integration of technological planning into the process of national development.

Whilst expressing the wish that the seminar would take place in a serene atmosphere and would achieve total success the General Representative hoped that the work would result in concrete and realistic proposals with a view to drawing up a national plan for the development and transfer of technologies.

PARTICIPANTS

10) Representatives of the Technical Ministries and of the following public and private organizations participated in the seminar:

- Departments of the Prime Minister, Ministries of Economic Affairs and Planning, Agriculture, National Education, Posts and Telecommunications, Transport, Livestock Industries, Mines and Power, Information and Culture, Equipment and Housing, Public Health and Finance; the General Representation for Scientific and Technical Research, University Institutions and Chamber of Agriculture. To these should be added representatives of ALUCAM, CELLUCAM, of the Cereals Office, CAPME, ASCATTEECH and the General Representative for Tourism.

Representatives of the International Organizations resident at Yaoundé, namely the FAO, ILO, MULPOC, AIPO, WIPO, UNDP and the United Nations Information Service and the UNIDO experts also took part in the seminar.

The complete list of participants is given in the annex.

ORGANIZATION OF THE SEMINAR

11) Election of the officers

The following persons were unanimously elected:

- Messrs.	NYA NGATCHOU	President
	ENONGENE METUGE	Vice-President
	TAYOU SIMO	Reporter
	MAIMO ANTHONY	Reporter

12) Adoption of the Agenda for the Seminar

The following agenda was unanimously adopted:

1 - Opening of the Seminar
2 - Election of the officers
3 - Formation of the working groups
4 - Reinforcement of the technological capabilities of the developing countries: defining a framework for national action
5 - Development of the Cameroun economy
6 - Training of technical labour
7 - Development and marketing of local technologies
8 - Importing, promoting and acquisition of foreign technologies
9 - Strategies and recommendations for a National Programme for Development and the Transfer of Technologies
10 - Discussions in working groups
11 - Adoption of the report and closing of the Seminar.

13) Formation of the working groups

Three working groups, within which discussions were to take place, were formed. These are:

Group I - Rural Development, Agro-Industry, Energy and Environment,
Group II - Electronics and Telecommunications,
Group III - Industrial Machinery and basic materials.

SUMMARY OF THE DISCUSSIONS

Reinforcement of the technological capabilities of the developing countries: defining a framework for national action

It can be seen that, at the present time, the application of industrial technology to development is characterized by the fact that practically all the industrial techniques used in the developing countries have been transferred from the developed countries, an operation in which the developing countries are present in a situation of inferiority. Generally speaking the developed countries not only possess those techniques which are lacking in the developing countries but still maintain their technological advantage, partly due to their research and development efforts and to their access to financial and human resources, and partly as a result of the lack of precision in the rules applied for the transfer of techniques and the operation of the international patent system. The developing countries themselves suffer, from their very nature, from an unfavourable negotiating position, aggravated by inadequate knowledge and the necessary skills needed when choosing, acquiring, adapting and absorbing foreign technologies or developing their own technologies.

Reinforcement of the technological potential should have, as its object, to promote technological self-sufficiency, to profit from the advantages of modern technique and science for all the population, and to permit the development of certain sectors of the economy such as industry and agriculture, transport, energy, telecommunications, etc.

I - THE PRESENT SITUATION

Developing countries encounter difficulties in the aspects of choice, acquisition, adaptation, assimilation and development of techniques.

A. Choice of techniques

When choosing techniques it is necessary to possess the necessary information and to evaluate it. To possess the technical information is of practical interest when taking decisions, and so it is necessary to

have skilled personnel who have access to information throughout the entire world. Those concerned could be information specialists with a technico-economic training. Furthermore in the developing countries the evaluation of projects from the economic and technological point of view comes up against not only a lack of information but also the absence of the necessary skills, and the fact that the criteria to be applied in this matter have not been defined.

B. Acquisition of the techniques

As far as the actual acquisition of the techniques is concerned it is essential to have the necessary skills to define the technological services required or to appreciate the modes and conditions of contracts. Now governmental legislation relating to the importance of the techniques which constitute an institutional base for the reinforcement of technological capabilities is lacking in most developing countries.

It is also found to be necessary to give more attention than perhaps has been done up to the present time to the technological results of the policies followed in regard to foreign investments.

C. Adaptation of the techniques

In order to be able to adapt the techniques to local conditions, markets and raw materials it is necessary to have skilled personnel with several years of experience in the field of production. Adaptation of techniques can also be carried out by:

a) engineers and technicians in a company when the latter judges that it is necessary to adapt the techniques which it employs, either because this is advisable or when advised to do so for economic reasons,
b) Institutes of Industrial Research, and
c) consultant engineers.

D. Assimilation of the techniques

The question of assimilation of techniques is linked, in the strict sense, to that of the conditions governing the assimilation of a given

technique, whether imported or local. In this respect the technical skills and experience of the labour force play an important role. Transferring a foreign technique into a completely different social environment often poses problems of assimilation, and requires special efforts both on the part of the supplier and also on the receiver of the process. Assimilation will be considerably facilitated if the technology contract indicates precisely the number of persons to be trained and the nature of the training to be given by the supplier. Assimilation and, in a general way, technical growth, depend above all on skilled engineers and research workers, technicians of all levels and skilled labour.

E. Development of techniques

To develop techniques is the wish of developing countries. However there are very few countries where industrial establishments have their own research and development laboratories and, even in such cases, they only have very modest achievements to their credit. As a general rule the research work carried out in the developing countries is mainly financed by the State and carried out in research institutes or universities. The often modest credits are often devoted to fundamental research rather than to applied research. The difficulties experienced by research institutes are of two categories, internal and external.

The internal difficulties include:

a) errors too often committed at the start, such as:

i) - too ambitious a concept, and the choice of directors and executives who do not have the required training,

ii) - building a laboratory and recruiting its personnel in the absence of a prior evaluation of the needs of the nation and of the industry in regard to research and development.

b) errors in operation, such as:

i) - inept management,

ii) - absence of any commercial orientation,

iii) - personnel who do not correspond to the needs,

iv) - inadequate remuneration of the technical personnel,

v) - lack of mobility of the personnel,

vi) - absence of research based on priorities,

vii) - absence of marketing effort,

viii) - inability to offer grouped services to industry,

ix) - lack of guarantee in regard to the techniques which have been developed,

x) - absence of a constraining provision to carry out research on contract.

Amongst the external difficulties are difficult coordination and relationships with industry and the public authorities, inadequate financing and a lack of discrimination in importing techniques.

II - THE FOUNDATIONS OF A COHERENT STRATEGY

From the above summary it can be seen that the factors and components to be taken into consideration when reinforcing the technological potential of a nation are so numerous and so varied that the measures taken by the Government are generally fragmentary and poorly coordinated. At all events it is advisable not only to try to train specialized and skilled labour in the country but also to see that this is distributed suitably, not losing sight of the fundamental question of the development of local techniques. If a coherent strategy is to succeed it is necessary:

- to fix the objectives in regard to development,
- to utilize the human resources,
- to make a judicious choice of those sectors playing a motive role (modernisation of agriculture, transport, telecommunications, energy, etc.),
- to draw up a technological plan.

III - FACTORS IN THE GENERAL FRAMEWORK FOR ACTION AT NATIONAL LEVEL

The framework to be established must rest on three essential factors: the policies, the programmes and the institutions. In themselves the policies can only act as safety valves, opening or closing the flow of resources and national energies. The creation of these resources and energies must be the result of specific programmes for action, the direction of these being given by the policies. The institutions are the instruments for implementation, and their efficiency depends on that of the policies and the programmes which support them. It is necessary to try to avoid any excessive attachment to one of these three factors at the expense of the other two.

The general framework of national action should include the four following aspects, the importance of which is obvious:

a) the establishment of the desired measure of appropriate techniques and the structure of national technical capabilities;

b) the evaluation of the present state of technological potential and the determination of gaps and deficiencies;

c) the formulation of a strategy covering policies, programmes and institutions, and the determination of the financial and human resources necessary for the application of this strategy;

d) the implementation of provisions with a view to the coordination, harmonization and control of execution.

x

x x

Cameroun must draw up a programme to reinforce national technological capabilities, making it possible to develop and use industrial techniques adapted to the various sectors of the economy. To do this it is necessary to draw up a national technological plan. Such a plan should facilitate the evaluation and perfecting of local technologies and the acquisition, assimilation and adaptation of foreign techniques, together with the development of innovatory techniques and processes. Improvement of the technical capabilities should form an integral part of this plan, and should be written into the teaching and training programmes.

A plan of this type should make special provision for:

a) an inventory of the technological needs in the key and priority sectors of the economy;

b) the implementation of an effective system for collecting and disseminating technical information so as to make it possible to determine and evaluate technological variations and to be aware of innovations and adaptations;

c) the creation of a national technical department concerned with technical studies, testing prototypes, quality control, metrology, etc.;

d) the creation of appropriate mechanisms to control, select, follow-up and adapt foreign techniques;

e) the carrying out of industrial research and development activities at the level of institutions and companies, and the reinforcement of the functional links between research centres and teaching establishments on the one hand and the distribution sector and the service industries on the other;

f) the evaluation of techniques so as to determine their effect on the environment and working conditions.

THE DEVELOPMENT OF THE CAMEROUN ECONOMY

(Sectoral Development and Technological needs)

From the summary which has been given on this point it may be seen that the philosophy of the Cameroun Government in regard to development has, as its foundations:

- planned liberalism,
- self-centred development,
- social justice and equilibrium.

- planned liberalism reflects the deep conviction of the Government that on the one hand private initiative remains the best motive force behind development and, on the other, that it is the responsibility of the State to mobilize, coordinate and orientate all these initiatives towards the progress of the national community.

- Self-centred development - implies the development of the people, by the people and for the people, since the only authentic development is that which depends above all on the productive and creative effort of the people themselves.

- A policy of social justice reflects the conviction that the improvement of the standard of living of the people, and the equitable redistribution of the fruits of growth between the various social categories, is the final aim of our development and the basis of social peace.

From this point of view our efforts must tend towards the constant search for equilibrium between the various sectors of activities, between the regions, between the town and the country and between the generations. In this way the natural, historical or social inequalities will be reduced and the fruits of development will be better distributed throughout the population.

This philosophical basis of our development implies, at a technological level:

- re-establishing the spirit of creativity of the Cameroun people;
- giving free rein to the creative imagination of the Cameroun people;
- freedom for invention and innovation at both individual and collective levels;
- implementing institutional mechanisms for technological development;
- disseminating know-how;
- establishing a data bank on the technological wealth of the country;
- utilizing the results of research for the social well-being of the population.

I - SOME MACRO-ECONOMIC PROBLEMS REQUIRING TECHNOLOGICAL SOLUTIONS

have been identified in the Cameroun economy; these include:

- the need for changes in the mode of life as expressed by the youth of Cameroun, those under 20 years of age representing 55.6% of the total population;
- the phenomena of urbanization: the urban population is increasing at an annual rate of about 7%, a level which reflects the phenomenon of economic and social change, attracting rural populations towards the towns;
- problems of food: the prospect of an inadequate supply of agricultural products in relation to the forecast demand is closely linked to the phenomenon of the rural exodus;
- problems of employment: it can be seen that the capacity for the absorption of labour is limited in the industrial sector, and the elasticity of the supply of workers in regard to the increase in the activities of the various sectors falls below a level of 1;
- problems of the mastery of imported technologies: importing these technologies must be controlled, regulated and integrated into a technological development plan;
- an inventory of national resources is seen to be the point of departure for better technological planning.

II - SECTORAL DEVELOPMENT AND TECHNOLOGICAL NEEDS

2.1. - The lack of performance of agriculture in Cameroun, and particularly of stock-raising

This is due:

- to the ageing of the rural population, the average age for active persons in the rural areas being between 40 and 60;

- to the rudimentary production tools used;
- to the non-utilization, in most cases, of fertilizers;
- to the non-availability of selected vegetable materials.

The raising of agricultural production to a quantity sufficient for a rural population which is slowing down, so as to support the food needs of the whole of the population, must involve a profound change in the mode of production:

- research into and utilization of higher-performance agricultural tools. This research must take into account the diversity of our ecological zones;
- the production of fertilizers from our local raw materials;
- at a non-prohibitative cost;
- the development by the research structures of high-yield varieties and their multiplication and distribution by the appropriate departments.

2.2. - <u>The satisfaction of the needs of the population in animal proteins requires that solutions be found to the following problems</u>.

<u>In the field of fishing</u>:

- a knowledge of our ocean resources and their mode of reproduction;
- the mastery of open-sea fishing techniques;
- the development of aquaculture;
- the mastery of techniques for preserving catches;
- the implementation of a low cost fish transport and preserving infrastructure.

<u>In the field of stock-raising it involves</u>:

- eradicating harmful insects such as the tsetse fly;
- overcoming the shortage of animal feeding stuffs;
- creating new grazing areas for stock;
- finding animal species capable of resisting the dangers of the environment;

- promoting small stock-raising by the production of day-old chicks and piglets.

2.3. - In the forestry field

The problem is presented in terms:

- of an inventory of forest resources;
- of the collection of rare and essential oils;
- of deforestation;
- of reafforestation by developing appropriate varieties;
- of preservation of timber.

2.4. - In the energy field

Despite the potentialities of the country in this respect there is an inadequacy of energy production compared with the needs of households and the development of other sectors. Electrical energy of thermal and hydraulic origin covers:

- scarcely 16% of the needs in the urban areas;
- 3% of the needs in the rural areas.

High investment costs necessitate further construction of hydro-electric dams, and the prohibitive cost of transport of this energy limits its use over the whole of the country and operates in favour of the development of other sources of energy.

2.5. - Problems of the location and establishment of industries for building materials and building, integrated into the national economy.

Despite the implementation of appropriate structures for the promotion of a social habitat in the urban and rural areas the prohibitative cost of building materials is of such a nature as to strangle the policy of the Government. This is why it is necessary to design appropriate technologies for the utilization of our local resources, (stone, sand, timber, clay, limestone, iron, etc.) and to develop national capabilities in this respect so as to establish companies with national capital, technologies and directors.

2.6. - The basic engineering and metallurgical industries

The needs of the country for equipment goods and for intermediate goods and the presence in our soil of certain raw materials (iron and bauxite) favour the implementation of the basic metallurgical industry, onto which can be grafted an engineering industry.

The establishment and complete mastery of such an industry necessitates the initial development of national capabilities in regard to prospection, extraction, metallurgy, engineering, the control of standards and quality and the repair and maintenance of equipment.

However the establishment of these already complex units may be preceded by the realization of assembly units for imported equipment goods (transport equipment, etc.) of such a nature as to facilitate the adaptation and assimilation of know-how.

2.7. - The chemical industries

The needs of our agriculture for fertilizers and plant protection products and the needs of other industries for chemical products and of the population for pharmaceutical products, together with the existence on the national territory of materials such as agricultural products (flora, mineral substances, etc.), require that this industry should be developed so that it can be integrated into the national industrial fabric.

2.8. - Transport and communications

The most preoccupying problem in this sector, in addition to the cost in currency of equipment and imported engineering services, lies in the ever-increasing cost of investment and maintenance of the oligarchy exercised by foreign companies.

Our desire is to see this sector totally integrated into the national economy, both in the field of the production of goods and those services which are necessary for the realization of basic infrastructures which, in the field of production of goods and services, are necessary for the development of transport and communications services. National capabilities must therefore be developed for a true mastery of this sector.

2.9. - Health

In this field, and in addition to measures of a preventive order which need to be taken so as to ensure good health for man (supply of drinkable water, sanitation, food preparation, etc.), it is important that the goods and services required by curative medicine should as far as possible be produced locally. National capabilities must be developed so that local industries can benefit from an assistance which would allow them to design hospital and laboratory equipment and to manufacture these from local materials.

2.10. - Problems raised by the integration of women into the merchant economy circuit

Cameroun women are increasingly concerned with lucrative activities and/or working outside their own household. As it is absolutely essential to reconcile their role as mother and wife with that of an economic agent they wish to see traditional household equipment improved so as to reduce the working time spent on household tasks. The design of an appropriate technology in the service of Cameroun women would allow them to contribute more effectively to the growth of the Gross Domestic Product of the country, the more so since women account for 51% of the total population.

THE TRAINING OF TECHNICAL LABOUR

Technological development depends on human resources, the utilization of which is an essential task falling largely outside the framework of education in the conventional sense of the word. Firstly, by training of technical labour it is necessary to understand the technical and supplementary training of a wide range of workers and not simply the establishment of a group of specialized technical departments. Secondly, where the collectivity is concerned, it is necessary to consider technical capabilities not only as a production factor but also as a component in the infrastructure or as an external economy which must advance ahead of the demand.

In Cameroun the training of senior level scientific and technical personnel is carried out at the University of Yaoundé and in the University Centres. However higher technical training (civil engineers, electrical engineers, electronics engineers, agronomists, doctors, etc.) is given in the major colleges amongst which are the Ecole Nationale Supérieure Polytechnique, l'Ecole Nationale Supérieure Agronomique and the Centre Universitaire des Sciences de la Santé.

The utilization of human resources requires a series of fundamental measures. In particular it is necessary, in addition to those efforts already made, to train a large number of artisans, to improve traditional trades and techniques, to favour independent work, to give a professional orientation to school programmes and a rural orientation to technical and higher studies, to encourage research institutes to examine the problems concerning traditional techniques in the rural zones, etc., and in general to place special emphasis on the training of technicians and intermediate executives and on the revaluation of their status, since the transfer of technologies depends to a large extent on them.

In fact it is found that progress in the field of teaching and training for the application of science and technique to development are held back by several obstacles such as:

a) inadequate human, financial and material resources in relation to the needs;

b) an incomplete inventory of the available labour, and the ineffective distribution and under-utilization of this labour;

c) the failure to adapt programmes to the situations and the special needs of the country, shown by the fact that scientific and technical teaching is not integrated into general teaching;

d) a lack of technicians and engineers.

THE DEVELOPMENT AND MARKETING OF LOCAL TECHNOLOGIES

Despite the laudable efforts already made by the public authorities much remains to be done in order to identify, to study in detail and to develop local and traditional technologies so as to integrate them effectively into self-centred development.

One can see:

- the absence of an operational structure for dissemination which would favour the possible exploitation of studies on feasibility, opportuneness, possibility, etc.;
- the absence of an Institute of Technological and Industrial Research;
- the lack of any link between imported technology and local technology;
- the necessity to adapt local techniques to the conditions of rural regions and to activities such as the converting of agricultural products, the manufacture of building materials and building. These techniques must be systematically evaluated from the point of view of their improvement resulting from the application of modern techniques and science;
- that the General Representation for Scientific and Technical Research should play its role of encouragement, coordination and control of scientific and technical activity more fully (CENEEMA, ENSP, etc.)

THE IMPORTING, PROMOTION AND ACQUISITION OF FOREIGN TECHNOLOGIES

The failure of domestic technological capabilities is shown by the importing of very many foreign techniques, the use of which has several effects. Firstly it often happens that account is taken neither of domestic production factors nor of those resources which are available locally.

In the same way the exporting of products manufactured using imported techniques is seriously limited by the conditions under which the technology is made available to the user country. It has been found that the mode of transfer of technology which has been practised in Cameroun, as in most of the developing countries, is imitative transfer, since it still involves the importing of technologies which exist in the developed countries, sometimes without any modification or adaptation to local conditions. One notes the absence of fixed and scientific criteria for the examination of agreement files, together with the lack of those competent executives who are needed for the evaluation of the technological aspects of the projects. In general it is rather considerations of a fiscal order which encourage the promoters to address themselves to the administration. It should be noted, however, that efforts are made by nationals within small and medium sized companies.

From the above it can be seen that it is necessary to:

- implement a national policy in regard to the importation, regulation, acquisition and promotion of technologies;
- to create a structure for Scientific and Technical Information and Documentation;
- to promote research and development capabilities in local industrial complexes;
- to implement a service of local consultants;
- to carry out studies with a view to using those techniques which have now fallen into the public domain.

III. CONCLUSIONS AND RECOMMENDATIONS OF THE SEMINAR

After having considered in detail the various aspects of the development and transfer of technologies the Seminar has adopted those conclusions and recommendations which take into account national realities and experience in other developing countries.

These conclusions and recommendations are concerned not solely with serving as a working basis for the country but also for reinforcing actions already undertaken to develop the national technological potentialities, with a view to developing and favouring the acquisition, adaptation, transfer and assimilation of technology as a motive force which would make it possible to attain the economic, social and cultural development objectives of the nation. To this end the participants at the Seminar felt it to be necessary to enlarge the subject, going beyond the more restrictive concept of the transfer of technology, and have extended it by considering the entire range of actions which are required from the point of view of the development and application of local technologies, the acquisition and revalorization or adaptation of technologies, both endogenous and exogenous, and the transfer and assimilation of technology in collectivities so as to obtain the maximum multiplying effects for the country.

1. The Government has already taken a certain number of measures to encourage the increasingly widespread utilization of science and technology within the framework of the economic development of Cameroun. This is why a series of actions, the most important of which has been the establishment of the present General Representation for Scientific and Technical Research, has been undertaken by placing special emphasis on scientific and technical teaching, together with applied research at the University and the other University Institutions. Parallel to these measures, which are intended to increase the technological potentialities of the nation, other actions have been envisaged, essentially by way of mixed enterprises and foreign investments, so as to facilitate the entry of foreign technology into the country as provided for in the Investment Code of Cameroun.

However, and despite these measures, the situation in the country is not very different from that which prevails in most of the developing countries which do not have a clear policy in regard to technology and in particular a pertinent legislation on:

a) the development and application of local and traditional technologies;

b) the acquisition, adaptation and transfer of exogenous technologies;

c) legislation on the entry of exogenous technologies into the country:

In this respect it is also necessary to emphasize the need to make provision for the horizontal transfer of exogenous technologies in the country, inasfar as such a transfer would allow the improvement of existing technologies, particularly the traditional technologies:

d) the development and training of technical labour and the utilization of specialized capabilities;

e) the financing of technical activities, especially with a view to distributing and making utilizable the results of local research.

Taking the above into account the participants in the Seminar recommend that an exhaustive study should be carried out by the Comité National de Transfert des Technologies and the General Representation for Technical and Scientific Research with a view to evaluating in detail the situation in Cameroun and to formulate, for the attention of the Government, concrete proposals on the legislation and policy to be followed in regard to technology. This study should call, as far as possible, on national experts working in the various Ministries and Organizations, together with those persons who are actively interested in the development, acquisition, transfer and, particularly, the utilization of technology.

2. Cameroun has drawn up and applied, more or less successfully, four five-year development plans. The fifth is now being drawn up.

Examination of the difficulties encountered during the realization of the first three plans shows that, amongst other problems, there is an absence of a clearly defined plan, especially in regard to the needs in technology and in human resources necessary for the implementation of the plan. As in most developing countries the macro-economy has been given priority at the time of preparation of the plan, and it is only recently that attention has begun to be given to the sectoral and sub-sectoral planning. It is even more recently that consideration has been given to the programming and planning of the technology which requires special capabilities to coordinate the preparation and realization of these plans and programmes. It is as a result of the plan or programme of technology, prepared on the basis of a clear policy in the subject and relating in particular to the design and dissemination of industrial technology, that it is possible to achieve the desired result and to obtain the wished contributions from the point of view of effective utilization of technology of development. It is only by means of a well prepared plan or programme for technology that it is possible to take into account inter-sectoral linkages such as the integration of industry and agriculture, transport and communications, rural development, etc.

In the light of the above the participants in the Seminar recommend that measures should be taken, including the allocation of sufficient funds, with a view to drawing up a national technology plan or programme, within the framework of the next five-year development plan. The Comité National de Transfert de Technologie and the General Representation for Scientific and Technical Research should, in collaboration with the Planning Directorate, identify the needs in regard to technology or those relating to it, with a view to the realization of the national development plan, and should formulate concrete proposals which should be included in the technology plan or programme. Special emphasis should be placed on the training of Cameroun nationals in the following capabilities:

a) the development and marketing of local technologies, in particular those which are capable of contributing as efficaciously as possible to rural development;

b) the evaluation, selection, negotiation for acquisition, adaptation, absorption and improvement of foreign technologies;

c) the development and training of technical personnel, in particular technologists, technicians and middle management.

Special emphasis should also be placed on the operation of the national technological institutions, their financial needs and their working programmes.

In this way the final objective would be to draw up a plan which would consist of a list of programmes, sub-programmes, projects and activities in which each of the constituent components would define the problem or problems to be solved, the direction and volume of work to be carried out, the results expected and the time required for achieving these. Apart from this qualitative aspect of the task the quantitative needs should be defined in the form of the necessary funds, the implications for external trade and the utilization of labour (cf higher and middle skills, etc.). In the overall plan a reasonable equilibrium should be sought between human resources and expenditure. The plan should also make provision for a mechanism for the continued evaluation of performance, and should draw up control methods on responsibilities by the higher authority charged with planning in respect of technology.

3. If industrial technology is to contribute effectively to development, and in this way to allow Cameroun to develop, acquire, absorb or to make more widely used these technologies, skilled personnel are needed and these, at the present time, are insufficient not only from a quantitative point of view but also from the point of view of the diversity and level of their capabilities. This shortage of specialized personnel constitutes a major brake on development. There is a shortage of personnel having at the same time capabilities in agriculture, engineering and management; there is a shortage of industrial designers, production and manufacturing engineers, design engineers, technicians for the food industries, personnel with capabilities in regard to quality control and accountant-managers, to cite only a few. Amongst the executives available at the present time

imbalances exist between the percentages of technicians, middle management and higher management; there is generally no correlation between the needs for technicians and the training which is given. These shortages and imbalances have been identified, and the country has already taken laudable initiatives both at the political and practical levels with a view to a positive solution.

Despite these initiatives however the programmes for training personnel engaged in technical activities remain largely inadequate, both in quantity and also in variety, if the various needs of the country are to be met. The present teaching system does not permit the appropriate training of technicians. In respect of higher management, for example, the training programmes for engineers at the University are always of the traditional type intended for the training of civil, mechanical and electrical engineers. It is necessary that the University should take practical measures to diversify its teaching, taking into account the real needs of the economy (chemical engineers, town planners, petrochemists, etc.). On the subject of the training of technicians Cameroun does not have training establishments of sufficient quality. This explains the shortage of technical personnel such as fitters, machinists, welders, electricians, carpenters and model-makers who are particularly essential for industrial production, quality control and the installation, operation and harmonious maintenance of industrial machinery and equipment.

Taking into account the situation which prevails at the present time, and to which the Government is allocating a substantial part of its educational and training budget, it is necessary to seek means which will make it possible to extract the best advantage from the utilization of these resources so as to produce the type of specialized personnel which are needed by the national economy. To this end the Government should take measures to allow industry to participate actively in all forms of training and in the solution of the problems of shortages and imbalances in labour. Furthermore the process of technical training should be seen from a wider angle. The actions necessary for the training of personnel appropriate to industrial technology must be initiated from the base. Industrial and commercial companies should, from the start, be made aware of the problems of

industrial development. Intensive action must be undertaken with a view to the reform of training programmes in technical teaching establishments at pre-university, university and post-university level so as to interest pupils, from an early age, in mechanical matters, and to develop their ability to adjust and, in a word, to appreciate technology. To this end it is necessary to consider the reorientation of the programmes of industrial training institutions and others which already exist, together with the creation of special training establishments on a multi-sectoral or single-sectoral basis. In addition to the official training programmes which should be designed to meet specific needs it is important to have a systematic approach to training on the job.

It is not possible to dissociate the programme for training national personnel intended for these activities from the necessity to re-evaluate the social status and to improve the professional status of scientists, technologists and technicians.

The participants in the Seminar recommend, as a result of this, that a national plan for the training of technical personnel should be drawn up and emphasized in the national technological and economic development plans. This plan should present an overall programme in the long term for the development of resources and competence at a human technical level, and should provide not only for the creation of appropriate teaching establishments and the reform of programmes but also the professional training of specialized executives, technicians, scientists and managers, together with special training with a view to the selection, adaptation and development of technology. These programmes should also give special attention to the needs of the industrial sector and the need to engage women for technological tasks, particularly in the rural environment.

The participants furthermore recommended the establishment of a multi-disciplinary unit composed of technicians, specialized in the field of natural resources which are of importance for the country, namely natural gas, oil, bauxite, iron ore, timber, coffee, cocoa and palm oil products. These technicians should be sent out into the world to acquire experience on the site by all means so that, when they return to the country, they could form a "staff college" on the many usages of the resources, arising from their competence; could follow

up the developments which are involved in their various fields; could provide for the country the technological elements which are necessary at the time of negotiation for the acquisition of foreign technologies, and could serve as executives in the development of local technologies.

4. More than 95% of world research is carried out in the developed countries. With a few rare exceptions the results of this research are primarily of interest to the developed countries, and for this reason are of only limited interest for Cameroun. Furthermore the few research activities carried out in Cameroun suffer from their own inadequacies. For example most of the results of the research which are obtained in Cameroun are not applied, for many reasons. The capability for adapting and improving existing technologies and for developing local technologies meeting the national conditions constitutes an important stage with a view to reducing technological dependence; it should, for this reason, be developed as a matter of priority. If the strategy to this end is followed as it should be it would favour the expansion of the innovatory capabilities in the country and should, in particular, be to the profit of the rural economy.

The first action to be undertaken, since it is lacking in the country, is the identification and systematic improvement of the technologies already being applied. Particular attention should be given to measures intended to reorientate the existing research in the country, to encourage the widespread use and exploitation of the results of research, and the participation of industrial and commercial countries. It is advisable to develop capabilities with regard to engineering and design. Certainly several reasons explain why private countries are not interested in research and development; nevertheless measures should be taken to encourage them to participate increasingly in local research activities.

These measures call for a series of decisions and texts on the part of the Government; examination of the existing policy should, as a consequence, be the object of national action.

All too frequently local traditional technologies are abandoned without reason. The application of modern technology and science to revalorize most local technologies could be an important factor in the improvement in the conditions of life in the rural environment. Local decision-makers and technologists should change their outlook so as to allow a reorientation towards satisfying of national needs of the programmes for development and industrial research and techniques, together with the methods for drawing them up. It is necessary to proceed towards the collecting and dissemination of information on the available technologies in the country and to encourage innovatory capabilities.

In the case of existing technology institutions measures should be taken, where necessary with the assistance of international organizations, to revise their structures, programmes and modes of operation so as to adapt them to the real needs of the country and, when they exist, to the policies, planning and programme of the country in regard to technology. This examination would also make it possible to formulate recommendations on the appropriate means for financing and management of the technology establishments and to recruit or retain competent personnel.

In this respect it is necessary to emphasize in particular the necessity for developing mechanisms which are suitable for financing the marketing of locally developed technologies with success, and/or to finance the absorption and dissemination of exogenous technologies. Although Cameroun has implemented measures for practical arrangement there is still much to be done on this subject. In fact this is a field where national and international action is absolutely essential because of the importance of the implications which it has for the development of industrial technology in the country.

The creation of an effective mechanism in regard to technological and industrial research and carrying out the tasks of development, selection and adaptation of foreign technologies is a not unimportant aspect of the process of development of industrial technologies. This mechanism should provide appropriate institutional provisions for the development of local technologies within private or public organizations, including the university, and without overlooking the research and

development departments in industry. If necessary an Institute for Technological and Industrial Research should be created within the framework of this mechanism.

Taking account of the above the participants recommend:

a) The creation of a National Institute for Technological and Industrial Research. The Comité National de Transfert de Technologie and the General Representation for Technical and Scientific Research should undertake a study of the work in hand, together with the available research equipment in the country, particularly in the University, the Ecole Polytechnique, CENEEMA and CAPME, with a view to identifying the best means for harmonizing or integrating the activities which would fall within the competence of the Institute, the creation of which is proposed; this would make it possible to avoid useless wastage and to maximize the use of technicians and the laboratory apparatus which is so expensive.

b) A study by the General Representation for Scientific and Technical Research of the institutions for promotion and the arrangements for financing local research and the utilization of their results. This study should contain concrete proposals on other systems or approaches for examination by the Government.

5. The Government has adopted a certain number of measures for the promotion of foreign technology and to negotiate its entry into the country. Amongst these measures are the investment codes, the fiscal provisions, the system for granting import licences and fiscal encouragements. However there is no clear policy or legislation with regard to the importing of technology, in particular by the private sector; nor is there any legislation on the dissemination of this technology. Now there may be divergence of views between the private and public sector on the acquisition of a technology. The Government must therefore have a policy in regard to the acquisition of technologies and put in hand legislation - or, where necessary, guide-lines - which would define the conditions and sectors in which the entry of a technology would be advantageous for both the acquiror and the seller.

Consequently it would be advisable to create a national system and an appropriate institution for the acquisition and legislation of technology. This institution should, by its vocation, be able to work in close collaboration with the national technology institutions and to remain an entity independent of the private sector, so that it would be able to negotiate a means for acquisition of foreign technologies and to promote and facilitate their entry and their utilization. A national plan of action in regard to technology should include the development and capabilities, a mechanism and an institutional framework relating to the various aspects of acquisition of foreign technologies, in particular the sources of the available technologies and their alternatives, their comparison with local technologies where relevant, the activities of technological research and development in the country which are necessary for the dissemination and updating of imported technologies; comparable information on the economic, financial, legal and technological conditions of the agreements covering the transfer of technology, information on foreign companies granting technologies, the multinationals in particular, and finally information on recent developments in international law in regard to licences, patents and trade marks, together with the obligatory authorization of licences.

With the increase and diversification of manufacturing activities in the developing countries one must expect that the entry of foreign technologies will increase rather than diminish, at least in the short term, with a progressive trend towards the more sophisticated technologies. The acquisition of exogenous technology calls, as a consequence, for practical and urgent measures. The principal objective to be sought in this field must be to reinforce the power of negotiation of the country, so as to allow it to choose the technology which is appropriate under equitable conditions, and to lead its partner to fulfil its obligations. Here again the problem is one of making decision-makers aware, both at company level and at Government level, and to give them all the tools for training necessary to negotiate and draw up contracts in regard to technology. At company level it is necessary to define directives for the acquisition of

technologies and to assist owners by providing them with model contracts and information on sources of technology. The evaluation of contracts on this subject should be carried out as a function of the existing conditions in the country.

Taking the above into account the participants in the Seminar recommended that the Government should have a policy and national legislation in regard to the acquisition of technology and that it should create a national institutional mechanism with clear responsibilities: it could involve reinforcing the Comité National de Transfert des Technologies so that it can carry out studies on the promotion and on legislation for foreign technologies in the country.

6. Whilst Cameroun has defined its programmes and its economic needs in the national development plans its efforts in the field of science and technology have remained sporadic and isolated from the economic plans, and this has not made it possible to attain the development objectives. Certainly research is a subject of a not unimportant amount of attention, but little effort has been directed towards establishing the framework of the institutions and services with the personnel required for the intensive application of the knowledge acquired in the practical parts of production. The Government has already created a number of institutions such as the University, the Ecole Polytechnique and various other research institutes, particularly in the field of agriculture. These efforts must, however, be consolidated. In drawing up a plan for technology the emphasis should be placed on the efficient organization of an effective contribution of science and technology in the process of political and economic decision-making by the Government.

It is necessary to associate experts in science and technology in the actions of the Government, as is at the present time the case with the economic planning agents and the financial advisers.

The General Representation for Scientific and Technical Research, as responsible for planning and policy in technological matters, of supervision and control of performance on the one hand and of research on the other, should also establish a system or a network of links, that is to say institutions or service organizations working on the

development, experimentation with prototypes, pilot plants, departments for the promotion of agriculture and industry, quality control (food products, consumer products, raw materials), standards, information, patents, technological studies, control of the evaluation and planning of projects, negotiations in regard to technology, repair and maintenance of equipment, and the management of development, together with teaching and technical training. Officially certain of these institutions and departments already exist in the country, although there are considerable gaps and they operate in isolation. For example the research institutions do not have any structures for development, experimentation on prototypes and pilot plants. They have very little contact with those who are actually working in production.

Cameroun should also establish a technical department responsible for acting as an industrial consultant and able to identify, prepare and evaluate projects; to carry out feasibility studies, to draw up a balance sheet of costs of a factory and to carry out detailed technical studies, to construct buildings and to install machines, to order factories and make them operate. It is necessary to give the rural world, the sector of traditional technology, the attention which it merits. The national technology plan should as a consequence contain concrete proposals intended to fill in these gaps and to establish those links which are essential if one wishes the transfer, acquisition and development of technology to be closely integrated with production, with a view to ensuring economic progress.

In order to fulfil efficiently these functions and responsibilities, and to carry out successfully the planning and supervisory functions, it is necessary that the General Representation for Scientific and Technical Research should be able to call on skilled technical and scientific personnel. The quantity of this personnel is of lesser importance. What is primarily necessary is personnel of a very high level who should be given support from all sectors of the economy as a result of its working methods, rather than by forming a large bureaucratic team.

The effective utilization of science and technology in the service of development necessitates the collection and processing of scientific and technical data emanating from various sources and their combination

in order to obtain the desired technical factors with a view to carrying out the national industrial and economic development plans. At the present time Cameroun does not have a suitable executive class able to operate as a national documentation and technological information network. Whilst valuable efforts have been deployed in creating libraries and documentation services to meet the wishes of the scientific personnel technological information still remains embryonic and is not effectively used.

Generally speaking information, data and technological and industrial statistics are lacking. Without them the planning of sectoral and national objectives of development is impossible. One also finds a lack of information necessary for the on-going analysis of market trends and of technology, for the identification of new possibilities resulting from the revision of national or sectoral plans, for the evaluation of short or long term industrial and economic trends in the country, and without overlooking changes in needs.

The problem is particularly acute in regard to knowledge and information on sources of changes of technology and other solutions for existing technologies in various fields. Often there is no knowledge or information on the alternatives to transfer, their methods as compared with the various other solutions, or on the consequences which the importing of a given technology present. At a national level there is practically no information on resources and technological potentialities.

This inadequacy of the information systems at the level of research, acquisition, processing and rapid dissemination of information relating to various aspects of technology, is even more aggravated by the difficulties of transfer of technology within the country. The lack of adaptation of the information obtained from sources external to the local situation presents a problem; most frequently the information is presented in a form which is relatively inaccessible to the user who is therefore obliged to have recourse to the services of a "decoding" agent. Even in cases where the information is easily understandable it may concern the production of articles which are either often too complex for the local market or call on technological processes which are outside the scope of the local investor. The means available for the exchange of information in Cameroun seem also unsuitable, inasfar

as anyone who wishes to use them must acquire new capabilities or accept high charges, as is the case for most of the electronic systems. Finally there is a serious shortage of personnel having the training required to work in these institutions.

In the light of the above the participants in the Seminar recommend that the scientific and technological structure which the country has at the present time should be the subject of a study by the Comité National de Technologie and the General Representation for Scientific and Technical Research. This study should contain concrete proposals on the routes and means for reinforcing the existing structure, in particular by the creation of new institutions such as the Institute for Technological and Industrial Research mentioned above, the establishment of a National Documentation and Scientific and Technical Information Centre, and a network for scientific and technical information, the opening of a National Consultancy Agency and a National Office for the promotion and regulation of exogenous technologies in the country.

7. General

As was indicated at the beginning of these Conclusions and Recommendations of the Seminar a general consensus emerged for enlarging the concept of transfer by considering in turn the development, selection, acquisition, adaptation, transfer, absorption and dissemination of technology.

The participants in the Seminar therefore recommend that the possibility of transforming the "Comité National de Transfert de Technologie" into a "Comité National de Développement Technologique" should be examined.

In the light of the success of this Seminar, and the valuable and constructive ideas which emerged during the discussions, the participants recommend that a follow-up should be entrusted to the Comité National de Transfert des Technologies, to the General Representation for Scientific and Technical Research and to the other Ministries, companies and competent institutes with the assistance of the UNDP, UNIDO and other competent international organizations. The follow-up action should

comprise the calling of similar seminars, not only on the general aspects of development, acquisition and transfer of technology but also on specific and specialized subjects such as the techniques for negotiating contracts in regard to technological matters, the management of research institutes, the identification of projects, and the preparation of the results of local research.

REPORT OF COMMITTEE NO. 1:

- RURAL DEVELOPMENT AND AGRO-INDUSTRY
- ENERGY AND ENVIRONMENT

The concepts of rural development, agro-industry, energy and environment are interdependent. Any socio-economic development strategy should be designed to improve the conditions of life of the rural population, which represents 78% of the total population, and should meet as far as possible the needs of this population by utilizing local resources to the maximum whilst taking into account the character of the environment. In this case it is necessary to develop and to disseminate inexpensive technology, and adapt it to the environment, such as the adjustable motor-cultivator which could be used in all regions of Cameroun despite variations in the depth of the arable soil.

Rural development

One of the problems encountered in this sector is that of the rural exodus of young persons towards the urban zones:

Economic cause:

- the search for more remunerative employment.

Social and cultural cause:

- the search for leisure activities.

The Committee recommends:

- that the public powers should study appropriate measures for making life more attractive in the rural environment (remuneration for livestock products, road infrastructures, leisure activities, etc.),
- making the populations aware of the role which the rural zones need to play in national development,
- developing and marketing artisan products,
- that studies should be undertaken with a view to improving the rural habitat and the utilization of local materials (timber, clay, etc.).

Agro-industry

We may use, as a definition of agro-industry, everything involved in the production, conversion and preservation of processed food products. In this context food self-sufficiency constitutes one of the principal priorities.

The introduction of techniques for post-harvesting processing in the agricultural sector form part of the field of agro-industry.

Irrespective of the efforts which have been made a number of gaps have been identified:

- the absence of any general methodology for valorizing agricultural products;
- difficulties in applying the results of research, when these exist.

The object to be attained is to develop techniques for processing and preserving perishable food products, particularly at village community level. In order to do this the small industries seem to be the best form in which to promote and attain the objective of food self-sufficiency.

The Committee recommends:

- that studies of agro-industrial valorization and industrial production, together with the various by-products, be accentuated;
- a sociological study of its effects on local employment;
- a macro-economic study of the encouraging effects, upstream and downstream;
- a study of the various technological routes and of development and research into supplementary adaptation to make these routes applicable to local conditions;
- the implementation, within an Institute of Technological and Industrial Research which is to be created, of a unit for studies and technological research with a view to promoting small rural agro-industries.

Environment

Technology cannot develop without some effects on the environment. The fundamental concept to be aimed at is that of ecodevelopment, which may be described in the following manner: to achieve the "internal limits of man" without transgressing the "external limits" or, again, to satisfy the fundamental material and non-material needs of man without at the same time destroying, but possibly even improving, the natural economic equilibrium.

Taking into account the fact that technology:

1) leads to a degradation of the environment, which is shown simultaneously by the exhaustion of resources and by pollution and also by the destruction of the homeostatic mechanisms, whether natural or created by man,

2) is a pathogenic factor which plays a role in the entire range of mental illnesses,

3) is a pathogenic factor which plays a role in the entire range of sematic disorders:

the Committee recommends:

- that preliminary studies should be systematically carried out before the transfer of any technology, with a view to avoiding pollution (by waste treatment) and the degradation of the receiving environment, etc.
- that populations are made aware of the dangers due to pollution, dirt, etc.
- the creation of a specialized structure for the treatment of waste products, both industrial and household (very important).

Energy

As far as the energy field is concerned the Committee feels that it is necessary to accentuate research and studies with a view to the utilization of non-conventional energies such as solar energy, biomass energy and wind energy in the rural environment.

The national energy policy must take into account the important role which the utilization of solar energy could play, together with the potential support which it could give to the solution of the problem of water in the semi-arid zones of the northern province so as to meet the needs of the population, stock-raising and agriculture.

REPORT OF COMMITTEE NO. 2

ELECTRONICS AND TELECOMMUNICATIONS

This Committee met on 11 July 1980 within the framework of the Seminar on the Transfer of Technologies organized by the General Representation for Scientific and Technical Research with the assistance of UNIDO, the United Nations Industrial Development Organization, at the Chamber of Commerce, Yaoundé, from 7 to 12 July 1980.

Considering the immense range of the field of electronics and telecommunications, which includes inter alia:

- telephones, telex and telegraphy;
- data processing by computers and calculators;
- domestic electrical appliances including refrigerators, hi-fi systems, transistors, etc.;
- information and education including radio and television;

Considering the very wide application of electronics and telecommunications in all fields of life, both in regard to individuals, groups and the entire nation;

Given, as a consequence, the impossibility of considering seriously in so short a time all the problems in all the fields of electronics and telecommunications under the aspect of the transfer of technologies;

Noting that there exist problems in certain nerve sectors which necessitate more urgent attention because of the economic, social and cultural impact of these sectors and the vital character of their role in National Development;

It was felt to be necessary to concentrate interest and efforts and to make recommendations on three points:

- As far as Telecommunications are concerned: Telephones;
- In regard to General Electronics: Radio and Television.

I - TELEPHONES

On the subject of telephones, and in the field of telecommunications;

Considering that Cameroun has vast infrastructures of telecommunications

which have been constantly growing for more than 20 years, and that these have changed, in regard to telephones, from manual to automatic and are now on the point of taking a step forward into electronics;

Considering that Cameroun has a good position within the emerging countries, and in Africa in particular, in regard to telecommunications technicians, both at the quantitative level and also in terms of skills and competence at all levels;

Noting, however, with telephone users the many problems and difficulties encountered in the acquisition and utilization of this instrument which is so essential for our economic development;

Considering that the problem of transfer of technologies in the field of telephones in particular hinges around two points, namely the complete mastery of techniques already utilized at the present time and also an adequate policy for the future in regard to investment, selection of equipment, markets, forecasts and planning;

After having identified the principal problems confronting our country in regard to telephones, namely:

- the problem of after-sales service, that is to say in particular that of spares which are sometimes unobtainable on the market. This is due to the fact that techniques in regard to telephones in particular, and electronics in general, evolve at a very rapid rate; this means that equipment which is sold to us is found to be obsolete only a few years later;

- the heteroclitic and heterogeneous character of our equipment, arising from the fact that telephones use advanced techniques which we are unable to produce, either in the present or in the near future, and which are not within the scope of our own financial capacities. The necessity to call on sources of foreign and multiple sources of financing, together with the system of linked loans, explains the rest;

- the recourse to, and confidence in, foreign counsellors and the fact that the national technicians are either not or only slightly involved in the decisions, together with the drawing up and carrying out of the contracts: studies, choice of equipment, adaptation at factory level to new techniques, installation of equipment;

Asking if there is not, on the part of our technicians, some lack of zeal, of a spirit of initiative and of effort in order to master and control quality together with the performance of equipment so as to maximize their efficiency;

The Committee on Electronics and Telecommunications asks:

- that more confidence should be placed in national technicians;

- that they should be given sufficient resources to carry out their tasks;

- that measures for motivation should be taken in favour of telecommunications technicians at all levels so as to encourage them to fulfil their mission with more zeal in the field and not to seek more lucrative administrative functions, as at the present time;

- that a hierarchy should be established within the various ranks of telecommunications technicians with the granting of technical titles as a function of their capabilities and the tasks which they carry out, and in relation to the advantages which they are granted;

- that the principal of "the right man in the right place" should be given priority over considerations of a political or other order, and that seniority and experience should be respected;

- that our technicians should be increasingly trained at all levels in the Ecoles Nationales so that they are more aware of local realities;

- that material and technical resources, together with the necessary administrative facilities, should be given to our Ecoles Techniques so that they can carry out the more practical training of our technicians;

- that a better structuring of the telephone service should be introduced, in particular at the technical level, with a view to defining and carrying out a rational and accurate distribution of the tasks as a function of capabilities;

- that national technicians should be increasingly associated with decisions, forecasting, planning and with contracts: studies, choice of equipment, mastery of the techniques adopted, installation of the equipment, so as to be able to maintain the equipment more effectively;

- that a clause should be included in specifications for contracts which would guarantee after-sales service, that is to say in particular the supply of spares for at least a certain number of years;

- that studies on forecasts and on serious and detailed planning should be carried out in association with our technicians before the installation of new telephone exchanges or the extension of existing exchanges, so as to avoid the too-rapid saturation of the telephone network and the deterioration of equipment because of their inadequacy for the local environment.

II - GENERAL ELECTRONICS

1. Radio

- Considering the very high national consumption of radio receivers;

- Considering the economic, political, social and cultural range of the radio and its importance in information and training of the masses;

- Considering the immense profits which the companies which exploit this field draw from us, and the anarchy which appears to reign on the market for radio receivers;

The Committee on Electronics and Telecommunications proposes:

- that particular attention be given by the authorities to this sector, including the control and organization of the market;

- that the start of local production should be envisaged at the level of assembly and mounting, with compulsory financial assistance from the companies concerned, placing the emphasis on the utilization of national capabilities and labour;

- that measures should be provided for the protection of this local production and for the optimum utilization of national raw materials, in particular for finishing;

- that, parallel to this assembly line, there should be organized a market for electronic components covering all the sectors of conventional and professional electronics, with a view to solving maintenance problems.

2. Television

In regard to television:

Considering the preoccupation of the Government to ensure that the National Television Service, now in the project stage, should cover the rural zones with a view to their emancipation and to the balanced development of the Nation;

- Considering the future impact of this means of information and training of the masses, together with its influence of its start-up and development at an economic, social and cultural level and on National Unity;

- Considering the need to avoid, in this field, those difficulties encountered in regard to telecommunications in general and of the telephone in particular;

The Committee on Electronics and Telecommunications asks:

- that particular attention should be given, at the time of realization of this project, to the problems of electrification and the maintenance of energy sources in rural zones, together with the problem of interconnection between the various sources of electrical energy so as to ensure good image quality;

- that the emphasis should be placed on the coherence if not the uniformity of the systems of equipment which are adopted;

- that experience in regard to telecommunications in the field of contracts, in which the need for the training and rational and optimal utilization of national technicians, in the field of after-sales service, and of forecasting and planning, should be taken into consideration.

REPORT OF COMMITTEE No. 3:
INDUSTRIAL MACHINES AND BASIC MATERIALS

It was rather difficult for us to circumscribe the object of our discussions, particularly because of the fact that the first committee had a subject which was more or less similar. We will therefore examine the agro-industries.

Our discussions finally led us to believe that basic materials included everything which is concerned with agriculture on the one hand and with minerals on the other, and in any case everything which is termed a raw material.

The following problems have been identified:

- The technological deficit because of the importing of patents, licences, turnkey factories and machines, whereas machines exist which can be produced by Cameroun nationals without having recourse to the Western nations;

- A shortage of certain capabilities, particularly in the field of maintenance and industrial design;

- The absence of collaboration between the research institutions from the point of view of overlapping in their activities, because they evolve in a closed system.

These problems, the list of which is by no means exhaustive, have resulted in the following recommendations:

RESOLUTIONS

1 - On the valorization of the agricultural potential

The development of Cameroun being particularly dependent on agriculture the public authorities should organize the agricultural sector in such a way as to promote maximum production per unit of surface area. In order to do this it would be desirable to carry out a serious examination of agrarian problems with a view to creating systems capable of favourably influencing productivity, whilst meeting the essential needs of utilization of labour, products of prime necessity, etc.

2 - On applied research

Institutions and Research Centres should orientate their work towards those technologies which can be put into practice in Cameroun. To do this it is desirable that resources should be made available to them, making it possible to express the results of their research in concrete form. Furthermore better collaboration should exist between the various research institutions, and between these and companies of all sizes.

3 - On the promotion of small and medium-sized companies

The creation of production units of a semi-industrial character for machines of interest to small and medium-sized companies (in the fields of stock-raising, preservation, timber converting, etc.) with the use of local materials and the production of intermediate articles, and reinforcing institutions such as CENEEMA and CAPME operating in the same direction.

Extensive information on the field of endogenous technologies and national products by exhibitions, fairs, promotional campaigns, international meetings, etc.

4 - On exploiting patents

The promotion of the exploitation of patents which have fallen into the public domain and which meet our specific needs. In order to do this to request the OAPI to inform us of all patents relating to our priority sectors as a function of national objectives. This should be easy because of the existence of the Treaty of Cooperation in regard to patents.

5 - On the nature of the machines to be used

Machines corresponding to the specific needs of the country, and hence simple, robust and inexpensive and easy to maintain (maintenance and spares produced by national workshops). This would result in arriving at a healthy restructuring of present economies with the aim of making material the aspirations of our country in regard to self-sustained growth and economic independence.

6 - <u>On training:</u> To place the emphasis on the industrial and technical training of middle management:

- Maintenance foremen,

- Industrial designers and those designers who could, in collaboration with the research institutions, extract our industry from the consumer state into which it has entered, and to innovate.

The existence of industrial and technical capabilities should promote the creation, and encouragement by the public powers of this creation, of engineering offices.

CLOSURE OF THE SEMINAR

The closing ceremony of the Seminar took place at 11.00 hours on 12 July 1980. This was presided over by Monsieur NYA NGATCHOU, Director of the Programmes for the General Representation for Scientific and Technical Research, and who represented the General Representative who was unable to attend.

After having thanked UNIDO for its active participation in the organization of the Seminar the Director of Programmes congratulated all present on the success of the Seminar, and expressed a wish to see the propositions and recommendations studied by the Comité National de Transfert des Technologies. This organization should then submit to the Government a programme for action intended to establish an operational structure responsible for the implementation of the concrete proposals which resulted from the work.

The President of the Seminar

Mr. NYA NGATCHOU

Vice-President

Mr. METUGE ENONGENE

Reporters

Messrs. TAYOU SIMO

MAIMO ANTHONY

ANNEX

NATIONAL SEMINAR FOR THE DISCUSSION
OF TRANSFER OF TECHNOLOGIES

Yaoundé - United Republic of Cameroun:
7 - 12 July 1980

Place: Chamber of Commerce, Industry and Mines

LIST OF PARTICIPANTS

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- AMBASSA-KIKI L. Raphael, Agricultural Machinery Engineer, MINAGRI
- AMBELLIE Louis, Chairman - ASCATTECK
- ARHINI BYLL, Engineer in Charge of Studies - S.E.D.A.
- ASONGWE N. Nicholas, Educational Adviser, Technical Division - Posts and Telephones (Ecole Supérieure des P et T)
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- BAKALA Joseph, Research worker (IBA-DGRST)
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- BARA AZOA, Head of Special Secretariat - DGRST
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- MBOME Lapé Israël, Doctor of Biochemistry
- MBON Ruben, Director of the Cereals Office
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