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NOTE BY THE EXECUTIVE SECRETARY

ON

ECONOMIC INTEGRATION AND TECHNOLOGICAL

CO-OPERATION

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FOREWORD

At different sessions of the Economic Commission for Latin America, emphasis was laid on the need to study questions of technology, especially in relation to problems of economic development.

The studies carried out by the Commission in five Central American countries, pursuant to the terms of resolution 9 (VI) <sup>1/</sup> referring to economic integration, adopted during the Fourth Session at Mexico, point especially to the growth and existing conditions of technical progress in Central America. The information gathered with regard to each of the five republics throws light on the situation of the area as a whole and on the possibilities of practical action in this field. In view both of the work completed and of the unique prospects offered by economic integration in Central America, the Executive Secretary of the Commission desires to set before the Committee on Economic Co-operation meeting at Tegucigalpa on 23 August 1952, certain preliminary considerations referring to technical co-operation and research which, if they can be carried into practice, would effectively supplement the studies of economic integration already begun.

/1. General Considerations

## 1. General Considerations

Economic development is a complex process in which many factors of a diverse nature are involved. The application of capital to human labour with a view to rendering it more productive is one of the essential conditions. However important it may be, it is inseparably associated with scientific training and the application of scientific knowledge to the process of production. Technology, in fact, consists precisely in making use of scientific inventions and of the best methods for the production of goods and services. In essence, development is a process of technological improvement, made possible by the progressive investment of capital in the different forms and stages of production.

The low standard of technological achievement and inadequate application of scientific knowledge in the utilization of natural and human resources are characteristics of under-developed countries. For this reason alone, many possibilities of creating wealth for the benefit of the community as a whole are either ignored or set aside. Mineral and forest resources, raw materials which might be processed, vegetable species which might be adapted to prevailing conditions as well as improved cultural practices, are partially if not entirely unknown for want of technical extension services or scientific research. In working the land and in processing of manufactured goods, out-of-date or inadequate methods are used, involving waste and even total destruction of available factors. The fact that in the workshops, or in the fields, labour lacks the most elementary training, taken together with the shortage of experts and administrators in management, contributes to the survival of uneconomic practices in the operation and management of enterprises.

All this is conducive to a low level of productivity. This is due, in part, to the employment of available human resources in traditional activities rather than in those where its yield might be higher, and in part to the perpetuation of backward methods and procedures. Whilst this low level of productivity prevails, the community will be condemned to lower standards of living which can be steadily raised only to the extent that improvements are made in productivity.

## /2. Technology and

## 2. Technology and the Under-developed Economies

Scientific discoveries and the general principles of technology are now international property. Once they have been established and widely diffused they form part of the wealth common to all mankind. This, however, does not hold true of technological practices, since the conditions for applying these principles to natural resources and human labour differ from one region to another according to the characteristics of the resources and to the habits and needs of the community. Hence, in each country or in each region undergoing a process of development, it is necessary to establish and foster institutions for technological research and experiment which may enable existing knowledge and progress to be adapted to prevailing conditions and which, in turn, can further the research and experiments essential to the characteristics of a particular region or country.

A few examples suffice to illustrate this point. Soil surveys, the prospecting of mineral or organic potentialities in the sub-soil, studies directed to the utilization of sources of energy, the suitability of the climate for certain crops and breeds of livestock are all vital for economic development. They call for permanent, continuous effort by professional men and specialized agencies, to be carried out in the very area where the results of these studies are to be applied. Similarly, local human resources should also be studied with a view to deriving the utmost advantage therefrom. In many under-developed countries, improvements may be made in the methods and productivity of artisan labour or in that of small cottage industries, both in the rural and urban areas, thus raising the level of income and of the standard of living in large centres of population. This type of work is of considerable importance, even in such highly developed countries as Czechoslovakia, Switzerland and Japan. During the past few years, many Asiatic countries have fostered campaigns for the improvement of productivity in the artisan classes.<sup>1/</sup> Research can and should be carried out regarding methods and processes whereby productivity might be raised in the manufacturing

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<sup>1/</sup> Regarding the work done in this connexion in India, Pakistan, China, Burma and Indo-China, see Agrarian Reform, Defects in the Agrarian Structure as Obstacles to Economic Development, United Nations 1951, II, B.3; Handicrafts and Small Scale Industries in Asiatic Countries, International Labour Office, Geneva, 1951; Cottage and Small Scale Industries, Economic Commission for Asia and the Far East. Document E/CN.11/1 of T/30.

industry, by studying management and the technical aspects of systems adopted in local factories, by comparative studies which refer to countries having similar characteristics or, alternatively, by training centres and campaigns designed to achieve this goal.<sup>1/</sup>

Another important aspect which stresses the need for regional technological research is the adaptation of industrial and agricultural technology to economic conditions in the under-developed countries as they apply to capital and labour availabilities. Gradual technological improvements in the industrialized countries have progressively made a flow of savings available which is sufficient for these new investments and at the same time provides employment in novel activities for that part of the population affected by technological unemployment. The existence of a continuously expanding capital goods industry is essential to absorb increments in the supply of labour.

Technological progress in the industrialized countries, broadly speaking, has been featured by the increase of capital investments per gainfully employed person and has led to an improvement in labour productivity, without simultaneously causing structural technological unemployment. Such conditions do not exist at present in the under-developed countries. The rate of growth of the population in the first case, the need to transfer many low-salaried sectors of the population at present engaged in elementary technical operations into more productive activities in the second, and lastly the low rate of savings together with the necessity for using these as efficiently as possible in the economy as a whole, lead countries in a process of development to seek technological systems designed to save capital rather than labour and to maximize capital productivity and employment of the semi-employed or displaced population created by technical progress. This field of technology will have to be carefully studied by those countries interested in achieving a balanced development of their economies since little practical assistance can be derived from the progress made in this sector by other countries with a higher industrial level.<sup>2/</sup>

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1/ See Economic Development of Under-developed Countries, Methods to Increase World Productivity, United Nations Secretariat (document E/2265, 24 June 1952).

2/ For a more detailed analysis, see Economic Commission for Latin America, Theoretical and Practical Problems of Economic Growth (document E/CN.12/221, 18 May 1951, Chapter III).

### 3. Advantages and Possibilities of Technological Co-operation in Central America

Technological research and experiments are costly and require the co-operation of highly qualified scientists. Hence the difficulties encountered by small countries with scanty financial resources, desirous of carrying out such programmes. In the case of Central America, this problem might be solved by the joint effort of the five republics, with a view to sharing the financing of a programme of such tremendous importance for their future development. There are, furthermore, certain unique circumstances which make such co-operation advisable. The similarity of conditions, of natural resources, of agricultural, artisan and industrial production and of working methods in the area, the possibility of applying the knowledge of adequate methods and equipment in any of the countries of the Isthmus, all increase the economic advantage to be gained from centralizing technical research and experimental work. This does not imply that in cases where the best results can be obtained from complementing this research by further local studies, such a method should not be adopted. The co-operation required for this kind of undertaking on the part of international agencies and foreign scientific institutions, would be more feasible and practicable were it carried out by organizations in which the five republics are represented, wherein the material and scientific resources available would provide greater advantages from such collaboration. Lastly, since it is the intention of the Central American republics to proceed with their economic development along lines tending at the same time toward their economic integration, technological enterprises carried out jointly, further to constituting a step of the utmost importance in achieving that goal, would enable all concerned to share equally the benefits thus obtained and would employ the experts being trained in each of the republics.

The same considerations are applicable to joint action by the Central American republics in the field of technical training and of industrial and agricultural experts and also in the extension of new and improved methods to the widest possible sector of the working population. The urgent necessity of meeting these requirements is self-evident, as may be seen from the praiseworthy efforts being made in the agricultural sector during the past few years by the all Central American governments and by private individuals, and also from the demand for industrial education on the part of private economic organizations.<sup>1/</sup>

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<sup>1/</sup> See the resolutions of the First Central American Convention of Chambers of Commerce and Industry, San Salvador, September 1951.

4. Practical Prospects for Technological Co-operation in Central America  
(a) Institute of Industrial Technological Research

The reasons set forth above stress the advantages which the Central American republics would procure from the creation of a single institute for technological industrial research for the whole of Central America, based on the co-operative efforts of all the republics in the Isthmus, insofar as its installation and operation are concerned. The following basic objectives might be established for such an institute:

- (i) To carry out methodical research of the natural resources in the region and to study their utilization with a view to the development of industry, mining, the supply of energy and other forms of production.
- (ii) To carry out studies of Central American industries and to suggest technical improvements designed to improve methods of production, to raise productivity, to make use of waste, to establish quality controls, etc. To offer solutions for enquiries made by private enterprise, and in co-operation with the latter, as well as with labour associations and government organizations; to foster campaigns for improving working methods and raising the level of productivity.
- (iii) To examine and suggest the most adequate technological methods for the industrial development of the region, taking into account the scantiness of capital availabilities and the advisability of its optimum utilization. To consider the possibility of providing remunerative employment, under the best possible income conditions for the excess population and under-employed labour.
- (iv) To act as an advisory organization to the Central American governments in technical matters connected with industrial projects, as regards the choice of foreign experts and other similar problems.

/(v) To train

(v) To train Central American research workers and technicians in each and every field of activity developed by the institute.

(vi) To foster by all possible methods the extension of technical knowledge and to stress the need for industrial technological research.

Previous experience might be drawn upon in the establishment of this institute. For the past few years, the Mexican Institute of Technological Research has been in operation in that country, under the auspices of the Bank of Mexico and of the "Nacional Financiera". The Institute, now directed by Mexican experts, is adequately endowed and its practical results have already led to innovations such as those introduced in the industrial uses of maize and in the improvement of certain industrial processes, among which figure the manufacture of tanning extracts, of candelilla wax and of other products, the coking of low grade coal for the manufacture of briquettes to replace charcoal, the retting of kenaf, improvements in a decorticating machine and the utilization of chick peas. Discoveries have also been made as regards the extraction of oil from various domestic seeds, in some of which unknown properties have been found (among others, a possible substitute for tung oil). At present, numerous studies are being made in different industries, further to the enquiry and advisory services rendered by the Institute to private industries and to the government, and the training of Mexican experts. During the first five years of its activities, the Institute's annual expenditure has averaged about 140,000 dollars, including costs of installation, a building worth 50,000 dollars and scholarships for several experts sent to study abroad. It should be pointed out that after a certain period these institutes become largely self-sufficient as a result of the income accruing from the services they render.<sup>1/</sup>

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<sup>1/</sup> Another precedent in Central America, is the Preliminary Technological Study for the Industrial Development of El Salvador, drawn up by the International Division of the Armour Research Foundation. This report recommends founding "a laboratory for industrial research and development on a small but modern scale", in that Republic, with a view to the subsequent establishment of a larger organization. In this connexion, see "Revista de Economía de El Salvador", t.I. Nos. 1-4, January-December 1950, pages 373 et seq.



(b) Coordination of agricultural research

Co-ordination of agricultural research and experiments, as well as agricultural extension services, have been strongly encouraged in Central America in the course of the past few years. All the countries in this area, on a greater or smaller scale, have established some form of research and extension. The government, private enterprise, international agencies, and friendly governments have co-operated in attaining the present standard.

At the same time, it should be acknowledged that actual conditions for agricultural research, on a national scale, could be improved by co-ordinated measures, designed to eliminate useless duplications, systemize the exchange of knowledge, and achieve a common regional directive for programmes of research, training and extension, and lastly, with a view to furthering the economic integration of Central America. The Inter-American Institute of Agricultural Sciences at Turrialba would be of assistance in obtaining practical results from such co-ordination throughout Central America.

In view of the foregoing considerations, it might be advisable to co-ordinate agricultural research in Central America in the formulation of programmes, the inter-relation of the work being done in each country and above all, in fostering those studies considered most urgent or necessary for crop and livestock production in Central America with a view to the economic integration and development of this area. In the initial phase, it might be preferable to accord priority to programmes from which valuable practical results may be expected over the short or medium period rather than to those involving purely scientific research.

(c) Technical training in the industrial field

Without impairing the general culture and scholarly instruction which have thus far been the guiding principles of education in Latin America, it is acknowledged that special attention must be given to technical training on all educational levels. In the particular instance of Central America, it would seem advisable to effect co-ordinated action as between the different countries, so that, with the co-operation of competent international agencies, a total revision of the structure and teaching methods may be carried out, taking into account both the improvements required in general education and educational needs themselves, with a view to the development of the economies. However,

/this revision

this revision might involve a period of time which cannot and should not be wasted. On the contrary, whatever step is taken toward improving technical education will provide both a basis and valuable experience for future planning. It should be remembered that the first convention of the Central American Chambers of Commerce and Industry proposed that in each capital, and in the large cities, technical and industrial centres should be set up to train average and highly-skilled labour for industry. In this same sphere, it might be possible to study the advisability of establishing a Central American Higher School of Industrial Engineering for the training of highly qualified experts. Such a school might operate in conjunction with the Institute of Technological Research, mentioned under (a), making as much use as possible of the latter's facilities and scientists in its educational activities, and supplying the Institute with researchers, as well as providing experts and directors for public and private enterprise. The training of this type of professional men in the zone in which they will later work and in contact with the natural and human problems of the ambient is an undisputed advantage, justifying the effort and costs inherent in such a task.

(d) Technical training in crop and livestock production

Certain advantages may be derived from a revision and co-ordination of the agricultural training plans at present being carried out on a national scale. At first glance, it would seem advisable to improve and extend the system of technical functional rural primary schools for the children of agricultural labourers, as well as the development of vocational schools and special practical courses in agriculture for farm managers, tractor drivers, etc. On a national scale, practical education should also be made available for training agricultural experts, selected among the youths leaving the primary schools. These courses should last four or five years, and resemble those at present being held in Guatemala at the National Agricultural School of that country. As regards higher education, it would seem preferable that, instead of national organizations, the efforts and resources of the individual countries should be concentrated in a school of economic engineering and of zootechnology and veterinarians, with highly qualified professors, good equipment, and a high level of instruction, taking into account the facilities offered by research institutes already in existence.

/(e) Technical training

(e) Technical training for management

The training of administrators and managers is a more difficult task. "The training of business managers is of the highest importance. In many industries, in many countries, output could be increased very substantially with the same equipment and the same labour force if only more efficient managers were available". <sup>1/</sup>

The instruction ordinarily afforded is not in itself adequate for training good managers. These must possess a number of innate qualifications as well as direct personal experience. On the other hand, the establishment of educational facilities, in a branch which is steadily expanding, assists naturally talented individuals to develop according to their aptitudes and, at the same time, enables those already experienced to improve their knowledge. At the moment, it seems advisable to stress the necessity for working out these problems, to undertake studies with a view to their ideal solution and to establishing an industrial and commercial school with an average level of instruction. Similarly, the possibility must also be considered for offering higher courses of business management, as well as economic courses and courses in industrial engineering and agronomics, which may also be attended by men engaged in public and private administration.

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<sup>1/</sup> See United Nations Measures for the Economic Development of Under-developed Countries (United Nations, E/1986, May 1951), page 33.