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ECA TRAINING PROGRAMME FOR RESEARCH WORKERS AND TECHNICAL  
PERSONNEL IN THE FIELD OF SOLAR ENERGY IN AFRICA

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### 1. Introduction

Manpower is crucial in the economic, social, cultural, political and technological development of any nation. This is because trained manpower embodies knowledge, skills, technical know-how and inventiveness, all of which exercise fundamental influence on the development process. Capital, natural resources, technology, foreign trade and foreign aid are all very critical as resource inputs in development, but none is as precious and as crucial as trained manpower. To fully utilize all the other input factors man's brains and skills have to be applied in their employment.

Africa's relative economic and technological backwardness as compared to other regions of the world, can be attributed partly to unfavourable natural environment and partly to the underdevelopment of its human resources. This is because Africa is abundantly blessed with natural resources; but the region lacks the capability to exploit its vast natural resources for the benefit and material improvement of its people. This lack of capability to exploit its natural resources and transform its economies results primarily from inadequate resources of trained manpower, especially scientific, technical and managerial manpower at the middle and higher levels. According to UNESCO information source Africa's resources of scientists, engineers and technicians per million inhabitants by 1970, was only between one-half and one-third of those of Asia and one-thirtieth of those of Europe.

Today every African country suffers from a paradoxical problem of growing unemployment among school leavers co-existing with growing shortages of middle and higher-level trained personnel. As economic development gained in momentum manpower shortages, particularly managerial and technical manpower, have become the real constraint to national development effort. Many factors are responsible for this unfortunate situation. Existing educational institutions are not turning out enough of, or even preparing the skills required, while too many of the wrong type of educated persons are annually coming out of our schools, colleges and universities. The quality of education has been far from satisfactory: too much of memory work; too little of vocational skills; and not enough attention devoted to developing attitudes that foster self-confidence and performance. Existing educational curricula tend to alienate Africans from their socio-economic milieu.

Secular education in most African countries is hardly more than three generations old. Consequently, only a very small proportion of the population that should benefit from modern education have in fact so benefitted or are enrolled in any form of formal education. As a consequence adult literacy rate in Africa by 1970 averaged 74 per cent. <sup>1/</sup> Formal education by 1975 achieved an enrolment ratio of 59.1 per cent of the relevant age-group for the primary level, 13.7 per cent for the second level and 1.8 per cent for the third or university level. <sup>2/</sup> In higher education the number of students

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<sup>1/</sup> UNESCO Statistical Yearbook, 1972.

<sup>2/</sup> UNESCO document ED-76/MINEDAF/3, page 9.

enrolled per 10,000 inhabitants by 1970 was only 12 as compared to 48 in Asia; 57 in Latin America, 135 in Europe and 402 in North America.<sup>1/</sup>

If Africa's economic underdevelopment can be attributed partly to the inadequate development of its human assets, then a higher level of socio-economic development can be achieved and the transformation of African economies can be accelerated through education and training that is relevant and appropriately oriented to the challenges and opportunities of development. Hence, the faith in training as one of the major means African countries must take in order to raise the standard of living of the masses of the people. We must train to prosper.

## 2. ECA role in manpower and training

The secretariat of the Economic Commission for Africa has been involved in personnel training ever since its inception. At the Commission's first session in January 1959 training was one of the priority areas the secretariat was requested to pay attention to. The work programme approved for its first year, provided for on-the-job training for Africans at the Commission's secretariat and for a survey, in collaboration with UNESCO, of training facilities in economics, statistics and related fields. By October 1962 the secretariat had established a Training Section to promote and co-ordinate training policies and training activities. Other substantive divisions of the secretariat planned and executed seminars, training workshops and courses in their respective sectors. Several statistical training institutions were established and the African Institute for Economic Development and Planning was also established to train planners. At every session of the Commission resolutions have been adopted in general and specific training areas, thus obliging the secretariat to intensify its manpower development effort. Today all the substantive divisions of the secretariat have continued to provide training in their respective sectors while a separate unit, the Public Administration, Management and Manpower Division, concentrates on all aspects of manpower development and utilization and on public management. The Division has for its primary task assisting member States in management improvement, in personnel training and in training institutions building and strengthening.

ECA's human resources development programme constitutes a major component of the secretariat's work programme and a priority area in Africa's development strategy as outlined in the Revised Framework of Principles for the attainment of a New International Economic Order in Africa (document E/CN.14/ECO/90/Rev.3). The programme's overall objective is to assist member States in the reform and development of their education and training systems in relation to economic and social development needs; foster the coordination, harmonization and development of training policies and programmes at national level; and promote co-operation at the multinational, subregional and regional

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<sup>1/</sup> Extract from UNESCO Statistical Reports and Studies - Higher Education International Tendencies 1960-1970, Annex I.

levels in developing and utilizing institutional facilities for the training of Africans in priority fields of manpower requirement.

### 3. The Expanded Training and Fellowship Programme for Africa

While the main objective of ECA training programme is to assist member States in developing institutional and administrative capability to undertake training locally as well as encourage the training of Africans in particular skill areas, it was necessary all along for the secretariat to supplement national training efforts. This has been done as already noted in the preceding section through the organization of seminars, training workshops and courses and the establishment of training institutions. In addition, the secretariat has endeavoured to encourage the training of Africans in response to various resolutions of the General Assembly, the OAU and of the various legislative organs of the Commission itself by establishing a fellowship programme.<sup>1/</sup> The first step to be taken in this direction was the establishment in 1965 of an ECA Co-ordinated Bilateral Fellowship Programme. Under that programme ECA received offers of fellowships for training in various fields from co-operating bilateral donor countries and organizations. The offers were virtually all from outside Africa and consequently training was undertaken abroad. In further developing the programme the secretariat tried to encourage member States to utilize offers for training their nationals in skill areas that were crucial to their economic and social development programmes and to induce donors to make offers in fields that ECA considers of more immediate priority. Between 1965 and 1978 a total of 1140 Africans were trained or received awards under the programme.

Following the directive of resolution 318(XIII), adopted by the ECA Conference of Ministers meeting in Kinshasa (Zaire) in March 1977 which called upon the Executive Secretary, *inter alia*, to "initiate appropriate studies and follow-up action for the mobilization of resources for the operation of a Training and Fellowship Programme for Africa, which should accord priority to the critical manpower requirements of member States, especially, those of the least developed, land-locked, island and other disadvantaged African countries" the secretariat proposed an Expanded Training and Fellowship Programme for Africa and a Training Fund for its implementation. The proposal was considered by the eighteenth meeting of the ECA Executive Committee which was held in Khartoum (Sudan) in May 1978 and unanimously approved it for immediate implementation.

This new programme is the first comprehensive five-year training programme, 1978-1982, to be initiated by the secretariat. It aims at fostering intra-African co-operation in utilizing available national and multinational training facilities for the training of Africans in fields considered strategic to Africa's economic transformation. It is structured and is being operated on the principle of co-operation and collective self-reliance. External training facilities in specialized fields are equally required and will be utilized in

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<sup>1/</sup> Commission resolutions 77(V), 123(VII), 125(VII), 195(IX) and 318(XIII); General Assembly resolutions 2083(XX), 3201(S-VI) and 3202(S-VI); ECOSOC resolutions 1090(XXXIX) and 1274(XLIII); African Declaration on Co-operation, Development and Economic Independence of May 1973; UNCTAD resolution 87(IV).

areas of need since for a long time to come Africa will not be self-sufficient in training facilities, particularly in managerial and technological disciplines. The target of the programme is to train 8,000 Africans in five years, of which at least 3,600 are to be training in African institutions. Training under the programme will provide for both specialized undergraduate and post-graduate courses in universities, technical courses in polytechnics and teacher training institutions as well as short-term practice oriented and inplant training programmes tailored to the needs of the individual.

For the moment the programme is giving priority to training in the following fields:

- (a) Manpower training for the basic industries, other industrial projects and for agriculture;
- (b) Graduate training in specialized disciplines with priority to specific manpower training areas listed in Schedule A of the Programme;
- (c) Training in science, engineering and technology;
- (d) Training of teachers and instructors in technical, management, accounting and other critical fields;
- (e) Group training for African science, technical and managerial executives and policy makers with focus on technology and experience transfer;
- (f) Subregional and national training courses in budget and financial management and tax administration;
- (g) In-plant training in the management of enterprises and development projects for nationals of LDCs and newly independent African States;
- (h) Training of managerial and higher technical staff responsible for State Farms and integrated rural development projects;
- (i) Training in solar energy;
- (j) Other specialized fields of post-graduate and post-experience training not adequately provided for by the other sub-programmes.

The secretariat has during the second half of 1978 established an appropriate machinery - Training Programme Operations Unit - to develop and administer the new programme. The Unit has two professional staff, one Training Programme Assistant and two secretaries. It is intended to strengthen its staff resources as more funds become available for programme development.

Member States have been invited to support the programme both as users and as donors. A few positive responses have already been received. Non African Governments, donor organizations and foundations have also been invited to support this African programme aimed at collective self-reliance.

in manpower training. Progress in initiating and operating the programme will be reported to the forthcoming ECA Conference of Ministers to be held in Rabat (Morocco) in March 1979 in the hope that the Conference will urge member States as well as non-African organizations to support the programme generously with both cash grants and offer of fellowships.

#### 4. Training in Solar Energy

Non-conventional sources of energy constitute one very rich energy potential in Africa that can be exploited to meet the energy needs of the masses of the African population, especially in respect of energy for heating, lighting, cooking, irrigation and power generation in rural areas, including rural industries. The potential of the energy of the sun is particularly great since it is in Africa that the landmass on both sides of the equator constituting the torrid zone is greatest in the world. Until lately African countries never gave any attention to exploiting this vast natural resource simply because knowledge of the science and technology for doing so was not available. The position today is now different, thanks to the pioneering efforts of a few African scientists who have attempted to harness the energy of the sun for domestic, agricultural and industrial uses and have been trying with every conceivable difficulty to develop a local technology for the development and utilization of solar energy.

Solar energy technology is one area where African scientists, technologists and entrepreneurs are trying to be self-reliant although they are still far from attaining this goal. Since the early 1960s we know that some African countries and institutions have been conducting fundamental and applied research designed to harness and use solar energy. They have developed prototype solar apparatuses for various operations such as water pumps for irrigation, water heaters, solar dryers, solar distillers etc. In this regard considerable research experimentation and on-the-job training of personnel are being carried out in solar research stations, especially at the Institut de Physique Météorologique of the University of Dakar (Senegal); the Solar Energy Laboratory in Bamako (Mali); the Office de l'Energie Solaire (ONERSOL) in Niamey (Niger); the Ecole Inter-Etats d'Ingénieurs de l'équipement rural in Ouagadougou (Upper Volta); and the Institute of Solar Energy and Related Environmental Research of the University of Khartoum. In addition, several African Universities are engaged in research on the practical uses of solar energy. Among these institutions may be mentioned the Universities of Lagos, Nigeria, Ibadan and Zaria in Nigeria; the University of Science and Technology at Kumasi in Ghana; the University of Freetown in Sierra Leone; the University of Cameroon at Yaoundé; the University of Zomba in Malawi; the University of Zambia, Lusaka and the University of Butare in Rwanda.<sup>1/</sup>

The impression derived from the preceding paragraph is that a growing number of African countries and research institutions are now devoting increasing resources to research, experimentation and development of apparatuses for the exploitation of solar energy. On the other hand, work in this field in some countries is still very modest, while in a good many other African States

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<sup>1/</sup> Project on the Promotion of the use of Solar Energy in Africa for the period 1978-1983 (ECA mimeographed document).

hardly any attention has been given to exploiting the energy of the sun. There are two main constraints to the development of solar technology in African countries, and these apply to countries where some work is already being done as well as to others that are yet to make a start. These are: the shortage of funds and of scientists and technicians. It is with the aim of alleviating the manpower constraints as well as fostering African self-reliance in solar energy technology that ECA secretariat has found it necessary to include training in solar energy as one of the priority fields for the operation of the newly established Expanded Training and Fellowship Programme for Africa.

The association of African economies with the commerce and industries of Western Europe and North Africa, especially since the second half of the 19th century and more intensely over the past seven decades, has resulted in the annihilation and virtual extermination of indigenous technologies that for centuries had sustained traditional economies. Some of the lost and decayed technologies include iron smelting, steel making, and related manufacturing of tools, implements, utensils, etc; textile manufacturing; brewing; wood-work; and a variety of domestic handicrafts.

The result of this loss and failure to sustain, develop and apply indigenous technologies is that African countries have become extensively and intensively dependent on the importation and use of foreign technologies. This over-dependence has constituted one vast area of foreign exchange drain through the high cost paid for overpriced patents, blueprints and technical know-how. It has also caused Africans a loss of self-confidence in themselves. Even when talented Africans invented new technology and appliances that were relevant to their countries' economic and social situation, they were too often obliged, for lack of funds for the necessary development and registration, to sell their inventions to foreign investors for a pittance. Invariably African Governments and entrepreneurs subsequently turned to the same foreign investors to hire the very technology, which initially originated from an African soil but at very handsome prices and with restrictions on the adaptation and further development of the same technology. Because the terms and conditions for the transfer of technology to developing countries are very restrictive, African countries also find it difficult to develop local technological capability such as can be acquired on the job in the process of adapting and improving imported technology.

Solar energy technology is one field where tropical countries have a natural advantage. They can achieve technological self-reliance in this field, provided they seize the opportunity to apply themselves to conduct the necessary research, develop solar apparatuses and associated manufactures, using existing solar energy research laboratories and workshops. This requires adequate government financial and legislative backing. Such support must be forthcoming and no room should be left for African countries to allow foreign technologies to pre-empt the market. In short, the exploitation of the solar energy resources should not be allowed to become another lucrative field of technological dependence on the industrialized economies. The anxiety, however, is whether African countries can hold their own in this field, more so when it is realized that even the industrialized countries are already stepping up their solar energy research and related manufacturers and would not hesitate to add

this new technology to their already vast monopoly of modern technology in all fields. ECA's training and fellowship sub-programme in the solar energy field is designed to enhance African capability to hold its own in the development and application of solar energy technology.

Training in solar energy aims at training the following categories of personnel concerned with the development and utilization of solar energy:

(a) Administrators and engineers in countries that wish to establish a national solar energy programme and would like to formulate appropriate policies and establish administrative machinery for doing so. Such personnel would need training to sensitize them to the vast potentials of solar energy resources and to expose them to the concrete results that are being achieved in other African and non-African countries, particularly in the practical uses of solar energy. Such training would normally be of 1 to 3 months in duration and for this advantage could be taken of the facilities and experience of existing solar energy research stations and laboratories in African countries.

(b) Research scientists and engineers interested in advancing their knowledge and technological skills and familiarizing themselves with the "state of the art" in the development and application of solar energy technology in other countries. The programme would emphasize the development of technology adaptation and technology improvement capabilities. Training period could range from 3 to 9 months, depending upon the experience and requirements of the programme participants. Training is to be undertaken in either African countries or abroad, preferably a combination of both, whereby training abroad is coupled with a short study tour to relate acquired experience to African situation and existing knowledge and technical know-how.

(c) Training of middle-level technicians and skilled craftsmen in the skill for manufacturing, assembling, maintaining and repairing solar energy apparatuses and equipment. The training of this group should also include techniques in training personnel at the lower level so as to enable them to transfer their skills to a much larger group of technicians and skilled operatives needed in the manufacturing process and for the servicing of equipment in rural areas.

At this stage when the sub-programme is only being initiated and adequate resources for its implementation are still being sought it is not realistic to talk about a training target. However, as an indication of the minimum effort that the secretariat would like to apply to the training of Africans in the field of solar energy technology, it is planned to provide over the 1978-1983 period, resources permitting, 25-30 fellowships for policy makers and administrators; 100 research scientists and engineers and 200-250 fellowships for the training of technicians and skilled craftsmen.

The secretariat has already initiated action to get a training programme well underway. To this end it has concluded a bilateral technical co-operation arrangement with the French Government which will provide funds for training a limited number of Africans working in the solar energy field. The training



will be conducted partly in French research laboratories and solar equipment manufacturing plants and partly in existing solar research stations in Africa. Possibility of similar arrangements with other donor organizations and countries is also being pursued. Since it is more desirable that as much of the required training should be conducted in Africa, ECA secretariat will continue to search for funds and co-operate with other agencies to enable it to place most of the fellows to be trained in African institutions and research stations. In this regard it is hoped that African Governments would respond more favourably to the Executive Secretary's plea for full support in the form of cash grants and fellowship offers to the Expanded Training and Fellowship Programme for Africa.