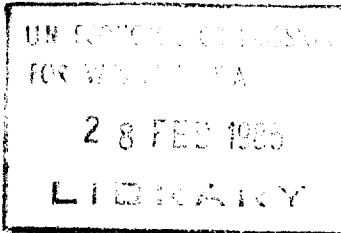




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PROGRESS MADE IN THE IMPLEMENTATION  
OF THE WORK PROGRAMME

Addendum

Executive Summaries

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**REPORT ON AN EXPERT GROUP MEETING ON  
CONSTRAINTS IN AGRICULTURAL PLANNING  
AND RESOURCE MOBILIZATION FOR FOOD  
SECURITY PROGRAMMES IN THE  
ECWA REGION.**

**BAGHDAD, IRAQ  
18-21 December 1983**

1. An Expert Group Meeting on Constraints in Agricultural Planning and Resource Mobilization for Food Security Programmes in ECWA countries was held at Baghdad from 18 to 21 December 1983. The meeting was organized by the joint ECWA/FAO Agriculture Division under its programme elements on agricultural planning and food security. Since the activities of these two programme elements were interrelated, it was decided to pool their resources and jointly organize the Expert Group Meeting.

#### A. Objectives of the Meeting

2. The objectives of the meeting were:

(a) To study, analyse and draw lessons from experience gained with agricultural plan performance and food security problems in selected countries. (An attempt was made to select countries representing diverse experience in development planning).

(b) To study, evaluate and communicate information collected on different planning systems in the region, including information and knowledge of systems, processes, and methods of agricultural planning used in selected ECWA countries and to review them in the light of prevailing economic and social conditions;

(c) To identify major constraints in agricultural development planning and food security issues, to provide practical answers to those issues and to propose options and concrete measures, including specific technical assistance, resource mobilization and a policy mix.

#### B. The deliberations of the Meeting

3. Five case studies were prepared by the Joint ECWA/FAO Agriculture Division and one paper was contributed by ESCAP Division of FAO for the meeting. The following papers which were presented at the meeting formed the basis for discussions, conclusions and recommendations on important policy and planning issues related to the food security problem in the ECWA region:

(a) "Agricultural development and plan analysis of Saudi Arabia" (ECWA);

(b) "Agricultural development planning experience: Arab Republic of Egypt" (FAO);

(c) "Agricultural development planning experience: case study of Iraq" (ECWA);

(d) "Food security issues in Saudi Arabia" (ECWA);

(e) "Constraints in agricultural planning and resources mobilization for a food security programme in Jordan" (ECWA);

(f) "Co-ordinated planning: a basis for joint Arab food security" (ECWA);

4. Five national experts from Egypt, Jordan, Democratic Yemen and Iraq participated, in addition to two delegates from Arab organizations, two from FAO and five consultants and international experts.

5. The deliberations of the Expert Group Meeting revealed the following facts:

(a) The gap between food production and demand in the ECWA region was widening at an alarming rate and posing a serious threat to the food security of the region. That fact called inter alia for an action plan to exploit inter-country complementarities in resource use through interlocking of their diverse resource endowments. However, in view of the constraints caused by the long gestation period inherent in agricultural development, a concurrent action plan to ensure food security based on the availability of food supplies in the international market was an imperative need of the ECWA region;

(b) The current divergence between the level of food production and the rapidly increasing food demand in the ECWA countries, in addition to constraints caused by the nature and magnitude of the natural resource endowment and financial resources, was largely the result of national development programmes which were imbalanced in favour of urban-industrial development. This was mainly caused by (i) the accelerated demand for labour at comparatively higher urban wage rates; and (ii) the push factors conditioned by inadequate agricultural policies (farm prices, incentives, production relations etc.) resulting in mass rural-urban migration. The increased mobility of the tenants, the landless, and the small farmers and the resultant demographic structural changes had the effect of a declining food output in the face of a rising demand for import-based foodstuffs;

(c) Inadequate co-ordination between the planning and implementation ministries/agencies was generally a common problem in the region;

(d) Effective plan preparation and policy analysis for agricultural development was constrained by inadequate data bases in many countries of the region;

(e) Agricultural planning and policy analysis (including all activities related to project analysis and implementation) was further constrained by (i) shortages of trained and experienced technical and managerial manpower; and (ii) the lack of adequately-equipped training and research institutions;

(f) The prevailing system of planning in most countries of the region was characterized by top-down planning without sufficient regional and local level participation;

(g) Public investment in agriculture generally emphasized the development of irrigated agriculture because it enabled better control and was generally exposed to fewer risks. At the same time, the rainfed subsector and range-land which invariably comprised relatively large proportions of resource endowments in the region had largely been neglected, and that, in addition to the loss of potential production, had adversely affected income and employment distribution in the rural sector of the region;

(h) In spite of the fact that in development plans the importance of agriculture was always highlighted, this was often not reflected in the volume of resources allocated to the agriculture sector;

(i) Besides inadequate allocation to the agriculture sector, the rate of implementation was low, owing to, among other factors, the lack of trained manpower and the poor resource management;

(j) In setting priorities for the allocation of investment in agriculture, some countries tended to allocate a substantial proportion to modern agricultural industry such as poultry, which was largely based on imported materials as well as capital technology, to the neglect of agricultural development proper which was basic to achieving food security;

(k) There was a lack of common agreement on what constituted food security at the regional level and as a consequence progress towards the identification and development of joint projects was constrained.

(l) Inter-country collaboration for enhancing food security was generally viewed as an alternative to the direct provision of aid rather than as a joint exercise based on the principle of equitable return to investment. Consequently, it had tended to limit the inter-country flow of resources from capital-surplus countries to capital-scarce countries.

(m) The absence of an effective institutional framework based on appropriate legal and methodological considerations tended to constrain the obtaining of food security objectives

through the exploitation of opportunities offered by the comparative advantage in resource use in the ECWA region.

### C. Recommendations

5. The following recommendations were agreed upon:

(a) In countries with a mixed economy in the ECWA region, agriculture planners should design and develop a planning system which would promote the integration of the development programmes of the public and private sectors with appropriate policy instruments;

(b) Planning must be viewed as a continuous process. Also in view of the gestation period inherent to agricultural development, medium-term planning should be supported by annual development plans. Unless there was a national crisis, annual development plans should not be substituted for medium-term plans.

(c) Technical executing ministries and agencies should be closely involved in the formal process of plan preparation. Similarly, the ministries and agencies responsible for developing programmes and project proposals for plan preparation for the agriculture sector should have formal responsibility for follow-up, monitoring and evaluation;

(d) Recognizing that efficient and comprehensive agricultural planning was dependant on an accurate and reliable data base, all research and data collection agencies generating such data must be supported with the needed personnel and financial resources;

(e) Socio-economic policies related to agricultural and rural development, particularly those policies providing incentives to producers, security of tenure and an equitable return for their labour were essential prerequisites to the agricultural development effort;

(f) There was a definite need for training qualified persons in the area of agricultural plan preparation, project identification, preparation, implementation, management, monitoring and evaluation. However, it was recognized that individual countries could not adequately fulfil that need. It was therefore recommended that regional and international agencies should reinforce their current efforts in that area;

(g) Enough attention in the past had not been given to the rainfed and range lands, which represented a major, permanent agricultural resource of the ECWA region. It was imperative to give special attention to a fuller and more rational use and

development of those areas in order to meet the objectives of food security. It was recommended that ECWA in co-ordination with other relevant regional and international agencies, should focus its planning activities on those areas;

(h) The agricultural sector of the ECWA region was characterized by an extreme imbalance in the distribution of agricultural development resources both natural and financial, among the countries of the region. That overriding characteristic of the sector was seriously hampering national efforts to achieve a reasonable and acceptable level of food security. Thus any serious effort to deal effectively with the ever-growing food problem would necessarily have to be based on appropriate modalities of intra-regional co-operation that were capable of achieving a massive level of interaction of those resources in which the region was abundantly endowed. Yet experience over the past decade had also clearly shown that an effective and sustainable high level of interaction of those resources had to be based on two paramount principles:

(i) Mutuality and equality of benefits and risks in joint ventures;

(ii) The integrated approach to agricultural development within which all types of development projects were planned and implemented within fully integrated programmes. That would require an appropriate institutional framework, based in turn on appropriate legal instruments, capable of co-ordinating, rationalizing and intensifying the efforts of the numerous organizations concerned with the problems of food and agriculture in the region. As things currently stood those organizations were highly specialized and their activities were totally unrelated;

(i) Co-ordination of national agricultural development plans was considered essential for intensifying inter-country co-operation, within which joint efforts could be clearly identified, whether in support of national efforts and objectives or in joint undertakings. Co-ordination of plans would necessarily have to start with co-ordination of the planning methodology.

(j) The ECWA/FAO Agriculture Division should take the initiative to formulate a detailed proposal for co-ordinating national agricultural development planning. Such a proposal would elaborate on objectives, methodology and organizational arrangements. Such a proposal should be discussed with the countries and the concerned regional organizations to ascertain their interest and contribution, and subsequently to work out a detailed project for its implementation.



**STUDIES ON CONSTRAINTS AND EFFICIENCY IN AGRICULTURAL  
PLANNING BASED ON COUNTRY REVIEWS WITH A VIEW TO  
IMPROVING PLAN FORMULATION AND PROGRAMME  
IMPLEMENTATION**

1. An in-depth analysis was made of the national plans of Saudi Arabia, Iraq and the Syrian Arab Republic. Those countries were selected because they represented very diverse experience in agricultural development planning.

#### A. Saudi Arabia

2. In Saudi Arabia availability of water is a more binding constraint than land. The bulk of the water supply for agricultural development is expected to come from the development of ground-water resources. It is estimated that 74 per cent of potential ground water is non-renewable. In such a situation, it seems imperative that this common property resource should be optimally mined over time. The decision-makers or resource managers should determine a time-table for extraction that maximizes the present value of this exhaustible resource. It is recommended that in-depth studies should be made on efficient use and management of the water resources of the Kingdom.

3. Although overall sectoral performance in the last development plan (1975-1980) fell short of expectations, the prospects for achieving developmental targets for the third plan (especially for wheat, dairy and poultry) seem excellent. Under the current plan the Government is spending a total amount of 61.8 billion Saudi Arabian riyals and it is implementing a programme of wheat development, seed improvement, plant protection and improved veterinary care. The government strategy is three pronged: It aims to help small farmers to increase their yield to provide incentives to increase the size of existing farms, and to encourage large-scale commercial development. These policies are already achieving results as wheat production has more than doubled during the first two years of the third plan, and achievement of the development targets is well within reach.

4. According to the area resource survey, 95.2 per cent of the total area surveyed is classified as rangeland. A close evaluation of subsectoral allocation indicates that, in the past, not enough attention was given to rainfed land and to rangeland, both of which represent major and relatively permanent resources of the Saudi Arabian rural economy. There is an urgent need for a sizeable investment to develop proper infrastructure, and to encourage optimum herd size, and conservation and management of vegetation. For production of meat, the study develops scenarios under which different basic system options can be considered to develop rangelands.

5. The manpower shortage has been an overriding constraint on agricultural development in Saudi Arabia. The major problem is the shortage of trained and skilled professionals at both the

regional and the national level. The present staffing pattern of the Ministry of Agriculture and Water has three prominent features: First, a high proportion of foreign personnel which constitute 36 per cent of the overall staff strength; second, a number of vacant posts, which at present represents 22 per cent of the total; and third, a very narrow ratio of professionals to technical assistants which, at the operational level, is 1:1.18 against the minimum ratio of 1:5. This implies a shortage of about 1500-2000 persons, largely at the technical assistant level. The country thus faces a monumental task in mobilizing the manpower required to strengthen the Ministry and to equip it with technical expertise so that it can handle and promote development and planning efforts on both the national and the regional level.

6. In order to strengthen the planning process, it is necessary to significantly improve the data base capabilities of the Ministry of Agriculture and Water and the Ministry of Planning. At the micro level, it is important that each Ministry should give a higher priority to completing the task of the census. In addition, efforts should be made to undertake regular farm surveys on area production and yields, input use, costs of production and production intensities.

7. At the macro level, there is a need to improve national accounts. It is suggested that both sectoral and national data information capabilities should be improved. It is important that aggregates should be calculated, to the extent possible, both at current and constant prices, distributed among sectors, and if possible, by subsectors, categorizing resource share and financing by the public and private sector; the main aggregates should be broken down into five planning regions.

8. Efforts are required to improve the efficiency and working procedures of four basic organizational components of the agricultural planning system in order to enable it to play its proper role. These are the (a) Agricultural policy group; (b) the project formulation and evaluation group; (c) a strong marketing section; and (d) a statistics and data analysis section. Of these four the agricultural policy analysis section requires strengthening immediately so that it can address some of key policy issues which are vital to the future development of agriculture.

#### B. Iraq

9. The planning system in Iraq has undergone repeated experimentation. During the period of the 1960's offices of planning and follow-up were established in all ministries, increasing the number of planning persons with different specializations and emphasizing the role of research and evaluation in the total

planning process. The rapid changes in laws, directives and organizational structures created a sense of instability that permeated the entire planning system, which had negative consequences for the planning process as well as the execution of plans.

10. During the period of the 1970s the planning institution was strengthened by creation of the Higher Agricultural Council. This was rationalized by the need to achieve rapid development in agriculture and to create a new order in both production and social relations in the rural sector. Among the factors which prompted the creation of the higher agriculture council was the relative weakness of the Office of Agriculture in the Ministry of Planning and its inability to speed up the development process in the agricultural sector. However, the creation of the Council threatened the controlling authority of the Ministry of Planning council. In addition, it further aggravated the problem of the shortage of qualified personnel since the few candidates who were available were now in demand by both the Office Agriculture in the Ministry of Planning and the Agricultural Council. It is also created the problem of overlapping responsibility and authority between the Council and the Ministry of Planning. These were some of reasons given for the dissolution of the Agricultural Council, the subsequent reduction in tasks and responsibilities of planning bodies and authorities, and the emergence of decentralized planning.

11. The agricultural sector comprises a public sector (State Farms, etc.) in which the Government has direct control and responsibility for planning and implementation and a private sector made up of the overwhelming majority of small farms, which is characterized by the lack of direct government control over its activities, particularly those related to the production process. Given this dichotomy, the study points out that one of the basic contradiction in agricultural planning process in Iraq is the incongruency between the planning method employed and the prevailing modes of production. The methods of planning assumed government control over execution, whereas in actual reality the plan implementation is carried out by the private farm sector through private decision-makers. It is suggested that this is, perhaps, one of the primary reasons behind the inability of plans to achieve targets. Further, the effective plan preparation and policy analysis for agricultural development is constrained by an inadequate data base and the lack of applied research focusing on major economic and social issues. The report identifies eight major problem areas requiring immediate attention.

#### C. Syrian Arab Republic

12. The second plan, 1970-1980, specifies a number of goals for the agricultural sector among which achieving self-sufficiency in basic foodstuffs and agricultural raw material appears to be the most prominent. The sectoral performance indicates that agricultural development targets have generally fallen short of expectations. This performance is attributed to a number of factors including: the vulnerability of a large segment of the sector to frequent droughts; inadequate maintenance of the existing irrigation infrastructure; relatively low cropping intensity; inadequate extension service, and excessive administrative controls in determining cropping patterns.

13. As regards investment expenditures, the study shares the view expressed in a recent World Bank economic report that the heavy public sector commitment to capital-intensive projects without a corresponding increase in government revenues has pre-empted flexibility in resource allocation to other subsectors of the agricultural sector. While it is important to appreciate the need to insure against the negative impact of climatic variation on sectoral output, there seems to have been excessive weight given to expensive irrigation projects with long gestation periods and questionable incremental economic returns.

14. There is no doubt that the Government is making a comprehensive effort to attain self-sufficiency in food production but the task is monumental and requires measures to correct the current stalemate in agricultural production. The study, after reviewing the entire situation, propose strategies for achieving the goal of self-sufficiency. The strategies relate to possible adjustments, removal of major agricultural constraints, introduction of agricultural supporting policies and finally the development of suitable action-oriented programmes.

15. The possible agricultural adjustments relate mainly to better use of the existing cultivated lands, introduction of scientific farming practices, development of steppe and pasture lands, reclamation of new lands, mechanization and modernization of agriculture, introduction of new strains of seeds in food and industrial crops, meeting the credit needs of the farmers and adjustments in the post-harvest technological options.

16. Examples of constraints which hamper the progress of agricultural development are the inadequacy of trained personnel, lack of action research and development facilities, non-application of appropriate technology inadequate involvement of the peasants organizations in the agricultural planning processes, and inadequate price incentives and subsidies for improving the terms of trade in the agricultural sector.

17. There is a need to introduce supporting policies for the agricultural production strategies in the country. Such poli-

cies include manpower planning, improving the agricultural education system and the development of extension services, support to research and development activities, an increase in the number of supply points from which farmers can purchase farming materials improvement in the pricing and marketing systems, support to small development projects and participation of the farmers representatives in working out suitable trade policies, etc.

18. Finally there is an urgent need for introducing a series of action-oriented programmes to boost agricultural production. These programmes can be divided into three categories: short-term programmes, medium-term programmes and long-term programmes. In this context it is pointed out that emphasis has already been placed on the last category.

19. In short, the prospects for agricultural development in both irrigated and non-irrigated areas seem to be substantial, provided a growth strategy is based on (a) a shift in investment priority from large-scale irrigation projects towards the rehabilitation of and upgrading of the existing irrigation infrastructure and development of low cost ground-water sources; (b) increasing the productivity of the agricultural sector through a well-designed programme of extension and applied research; and (c) less reliance on an administratively-determined cropping pattern which is difficult to control, considering the size of the private sector. In such a situation resource allocation should be encouraged based on market signals.

REPORT OF THE EXECUTIVE SECRETARY  
ON  
PROGRESS AND IMPACT OF NATIONAL AND INTERCOUNTRY  
ACTION PROGRAMMES TO COMBAT DESERTIFICATION

## BACKGROUND

1. Desertification involves ecological changes that sap land of its ability to sustain agriculture and human habitation. It is generally incorrect to view this process as an advance of the desert front relentlessly engulfing usable lands and green fields and pastures. Desert encroachment of such a dramatic dimension may be a genuine threat in some areas. In most cases, however, it is human action that pulls the desert frontiers outward. Where desert edges move outward, the process seldom involves the steady influx of a tide of sand along a uniform front. Rather, climatic fluctuations and land-use patterns interact to extend desert-like conditions irregularly over susceptible areas.
2. Dangerous as desert encroachment may be, a far weightier threat to human welfare is the degradation of patches of forests, rangelands and croplands throughout arid and semi-arid zones. Such degradation occurs wherever land is abused regardless of the proximity of true deserts. Where land abuse is severe and prolonged, especially where extended drought intensifies its effect, grasslands and fields can be reduced to stoney, eroded wasteland, or even to heaps of drifting sand. At best the quality of rangeland vegetation declines as the more palatable and productive species are replaced by less desirable plants, and cropland yields gradually fall as soil nutrients are dissipated and the top soil is removed by wind and water.
3. A long-term shift in the rainfall pattern can by itself transform the ecological character of a region, and when deserts appear to be spreading, questioning whether climatic changes might be the real reason is only natural. Our understanding of climatic changes and our knowledge of historical weather trends in most desert regions, however, are too speculative to permit unequivocal conclusions about climate's contribution to desertification today. Nevertheless, available evidence indicates that rainfall levels in the Middle East have remained roughly the same for the last 5000 years.
4. Whether or not a major climatic change is occurring, the experience of the world's drier zones makes it clear that droughts are unavoidable in arid environments. Although not precisely predictable, they should not come as a shock or be perceived as an unexpected natural disaster like earthquakes or hurricanes. Instead, they should be anticipated as harsh fact of life. Agriculture in drylands, therefore, must be shaped to survive the driest years and should not push the land to the



utmost in years of adequate rainfall. Any other approach may lead to grave consequences every time the rains fail for long.

## II. CURRENT STATUS OF DESERTIFICATION

5. Plagued with extremely adverse climatic conditions coupled with long neglect and misuse of the available natural resources, member countries of the Economic Commission for Western Asia (ECWA) have been going through a widespread and very advanced phase of desertification. It is estimated that about 98 per cent of the region's entire surface area of 4.7 million km<sup>2</sup> is under the effect of one process of desertification or another with varying degrees of severity.

6. Desertification in the region is manifested by deterioration and salinization of the soil, silting and salinization of surface waters, degradation of forests and rangelands, decreased productivity of land, water and wind erosion, increased dust storms and sand dune formation, lowering of the ground-water table, etc.

7. As the percentage area affected by desertification in each country of the ECWA region differs, so does the process resulting in that phenomenon and its impacts. Desertification over 65 per cent of all desertified areas in the region is of a severe and very severe nature, while the remaining 35 per cent of desertification is classified as slight or moderate. The most conspicuous physical indicators of desertification in the region are discussed below.

### A. Deterioration of the soil structure

8. This category covers about 187 million ha or 42 per cent of the total area affected by desertification, of which about 30 per cent has severe or very severe cementation and about 12 per cent has gypsum accumulation in the form of powder, crystals or crust. Gypsomorphy is particularly important in Iraq, the Syrian Arab Republic and Democratic Yemen.

### B. Wind erosion

9. This form of desertification covers about 125 million ha or 28 per cent of the total desertified area in the ECWA region. An additional 83 million ha are also somewhat affected by sand movement and accumulation and are classified under other forms of desertification. Wind erosion is widespread in most countries of the region.

C. Water erosion

10. Quite significant in the hilly and mountainous zones and in denuded areas subject to frequent storm flooding, water erosion covers an area of about 108 million ha or 24 per cent of the total desertified area which is mostly severely and very severely eroded. The countries most seriously affected are Saudi Arabia, Egypt, Democratic Yemen, Yemen, Jordan, the Syrian Arab Republic, Lebanon and Iraq.

D. Salinization and alkalinization

11. Occuring in alluvial plains, coastal plains and in some depressions, salinization covers about 24 million ha, with an additional 95 million ha affected by potentially soluble salts. Desertification due to salinization is most evident in Iraq, Saudi Arabia, Egypt and the United Arab Emirates.

III. SOCIO-ECONOMIC AND POLITICAL INFLUENCES ON  
DESERTIFICATION

12. The socio-economic condition of people in the agricultural sector plays an important role in determining whether or not a proper utilization and sound management of agricultural resources can be applied. In the ECWA region, losses of available agricultural resources through human misuse are large. Man-made elements of degradation are several and can cause grave consequences.

A. Destruction of natural forests

13. In the not too distant past, extensive areas in the region were covered with natural forests. Until some decades ago, a greater part of the Syrian Arab Republic and mountain regions of Iraq, Lebanon, and Jordan were covered with natural forests. Excessive cutting of wood for fuel and timber and expansion of cultivated lands in recent years, however, have led to the destruction of vast areas of forests. In Yemen uncontrolled cutting of trees is still going on at an alarming rate since wood is still the most important fuel material for domestic consumption. Such practices have caused enormous losses of soil, water and wood resources.

### B. Overgrazing

14. Overgrazing plays an important role in the deterioration of natural plant cover. It results from several factors that include changes in stocking and congestion, changes in migration routes that result from redistribution of services and marketing opportunities and changes in livestock composition. Excessive grazing causes considerable changes in plant communities in rangelands. It decreases the number and occurrence of plant species of good forage value and increases plants of unpalatable species and of low value. Hence, it gradually replaces the valuable perennials by the shortlived and fragile ephemerals which lowers the carrying capacity of the rangelands and increases the susceptibility of the soil beneath to wind and water erosion.

### C. Landuse and cropping pattern

15. The present landuse over large areas in the ECWA countries leads to significant losses in agricultural resources. Growing of crops and fruit trees is carried out with little regard to land suitability, which certainly affects the continuity, productivity and economic returns. Cultivating field crops on steep slopes, growing citrus fruits on highly saline soils, cultivating wheat over large areas of marginal lands and poor soils instead of hardier barley, sowing half of the rainfed area each year regardless of rainfall conditions, refraining from practicing legume/cereal rotation instead of following and ploughing against contour are some examples.

16. Expanding cereal farming into marginal lands in many countries of the region has destroyed valuable range areas, especially in the steppes. Considering that crops can be harvested economically only once every five years in those marginal lands, many areas are abandoned after stripping the soil of its original vegetation cover and subjecting it to erosion and invasion by unpalatable, xerophytic, and, in some cases, poisonous plants.

### D. Population pressure and urban encroachment

17. The expansion of cities and villages prompted by the population explosion have caused a significant loss of agricultural resources in most countries of the region. Highly fertile and productive arable lands, mainly in the irrigated areas, have been encroached upon as a result of population pressure and lack of land-use planning. It is estimated that about 10 per cent of

the total arable land in Jordan has been lost to urban development, and about 25,000 feddans of fertile land are lost to urbanization in Egypt each year. Similar losses of agricultural lands occur around various cities in the region.

18. Most countries have passed some legislation to control and co-ordinate urban expansion but, in most cases, regulations have been difficult to implement owing to pressure caused by the ever-rising residential land value.

19. Other factors which tend to lower agricultural productivity and increase the hazard of desertification are improper use of irrigation water, inadequacy of farm mechanization, rural migration to urban centres, land fragmentation and absence of land-capability classification.

#### IV. THE DESERTIFICATION TREND

20. In response to the United Nations Conference on Desertification held in Nairobi, Kenya during 1977, and to its resolution concerning the plan of action to combat desertification, a study has just been completed with regard to a regional assessment of desertification in the ECWA region. This study was prepared through co-ordination between the joint ECWA/FAO Agriculture Division and the Desertification Branch of the United Nations Environment Programme (UNEP). This study was based on the assembled data derived from questionnaire forms which were distributed to member governments of the ECWA region, and on other available sources. The desertification trend, based on changes of its different processes and components within the decade 1970-1980, is summarized below.

##### A. Arable land

21. The area of arable land in the region has increased by only 54,000 ha, representing a negligible annual increase of 0.03 per cent. The biggest gainer was Iraq, with an increase of 400,000 ha, or an annual rate of about 0.8 per cent. Other countries which realized smaller gains were Saudi Arabia, Jordan and Democratic Yemen. The largest loss was recorded for the Syrian Arab Republic, with 411,000 ha, or an annual decrease of about 0.7 per cent. Yemen lost 252,000 ha, or an annual decrease of about 1 per cent, and Egypt's arable land shrunk by 28,000 ha.

22. Expansion in arable land, provided it is not accomplished at the expense of land with a permanent vegetation cover and is accompanied with sound land management practices, is definitely

a positive sign in the fight against desertification. Conversely, any loss in arable land due to soil degradation or declined productivity is an indicator of increased desertification.

#### B. Permanent crops

23. The total area covered by permanent crops in all countries of the ECWA region amounts to only 1.273 million ha, or a mere 0.27 per cent of the total land surface of the region. It increased by 342,000 ha in the last decade, or an annual rate of increase of about 3.7 per cent. All the ECWA countries shared this increase, but the largest gains were obtained in the Syrian Arab Republic, Iraq, Egypt, Lebanon and Jordan. It is a positive sign in the fight against desertification.

#### C. Permanent pastures (range lands)

24. The area of permanent pastures in the ECWA region totals about 115 million ha, or about 24 per cent of total regional area. It has remained constant in all countries in the past decade with the exception of the Syrian Arab Republic, which realized an increase of 825,000 ha or an annual rate of about 1.1 per cent. Area increase in Syrian rangelands was partly due to the abandonment of farming activities in marginal arable lands to planting by forage species in other areas.

#### D. Forests and woodlands

25. About 8 million ha or about 1.7 per cent of the total area of the ECWA region is covered by forests and woodlands. A decline of 518,000 has been recorded for the past decade on an average annual rate of 0.62 per cent. Forest area in Iraq has declined by 367,000 ha, or an annual rate of decrease of about 2.0 per cent. A decrease in forest area over the past decade also occurred in Lebanon, Yemen, Democratic Yemen and Saudi Arabia. Forest and woodland areas in other countries have remained unchanged. Degradation of forest resources leads to increased water and wind erosion, flood hazards, silting of canals, rivers and reservoirs and decreased productivity of downstream lands.

#### E. Irrigated lands

26. The total area of irrigated lands in the ECWA region amounted to 6.07 million ha in 1980, with an increase of 0.5 million ha over that in 1970, or an increase of about 0.9 per

cent annually. An increase of 273,000 ha, or about 1.9 per cent annually was realized in the irrigated lands in Iraq. Other, but smaller increases were realized in irrigated areas of Democratic Yemen, Yemen, Saudi Arabia, the Syrian Arab Republic, Jordan and Lebanon.

27. The increases in irrigated lands were due to increased reclamation activities in potentially arable lands and to the expansion in irrigation projects during the period 1970-1980. However, there is no available information about the extent and severity of waterlogging and salinization in the irrigated lands in the region.

28. An increase in irrigated land area with sustainable productivity accompanied by a proper drainage system to lower the water table and reduce waterlogging and salinity is a positive sign against desertification.

#### F. Cereal production

29. The total production of major cereal crops (wheat, rice, barley and maize) in the ECWA region has increased by about 3.5 million tons, from 10.34 million tons in 1970 to 13.86 million tons in 1980. The largest gainer was the Syrian Arab Republic which contributed about 70 per cent of this increase. Egypt, also, had a significant increase of about 1 million tons and Saudi Arabia achieved an increase of 53,000 tons. Other countries, including the traditionally cereal-producing Iraq, had a slight decline in production.

#### G. Livestock

30. An increase in livestock population of about 10.5 million heads was realized in the ECWA region during the period 1970-1980, representing a rise of 2 per cent annually. The Syrian Arab Republic, Saudi Arabia and Yemen had the largest gain, with other countries in the region realizing smaller gains. Only in Iraq and Lebanon has livestock population declined by a small margin.

#### H. Grazing intensity

31. The increase in livestock population in the ECWA region places an additional burden on the over-exploited natural rangelands and worsens the already severe state of desertification in an area of about 115 million ha. The current grazing intensity,

which varies sharply from one country to another, is about 2 heads/ha for the region as a whole. This is three to four times larger than the sustainable carrying capacity of the rangelands. That is why livestock productivity is only 20-30 per cent of that in developed countries.

32. To summarize the desertification trend in the countries of the ECWA region, notwithstanding the inadequacy of yardsticks of desertification rates, most indicators point out to a continuing increase in the extent and severity of the phenomenon. Especially affected and further threatened are the marginal lands in the Fertile Crescent subregion, the irrigated lands of the alluvial plains in the Nile and Tigris-Euphrates valleys, the coastal plains in the peninsula, all rangelands and forests in the region and many areas in rainfed cropland zones. Due to improper drainage of the flow from irrigated lands and over pumping of ground water, many surface water bodies are subject to further salinity and the ground-water aquifers to exhaustion.

33. A problem as awesome as desertification has not gone unnoticed. Every national government in the desert or desertified area, no doubt, has sponsored programmes to combat one or another aspect of desertification. Most such efforts, however, have been too scattered or too weak to reverse widespread degradation.

34. The negative environmental trend called "desertification" is in countries of the ECWA region, widespread, longstanding, and, in many areas, accelerating. The technologies needed for reversing it are for the most part, already available. Too commonly lacking, however, is a political commitment to the reversal of the process commensurate with the size of the challenge. Faced with immediate crises, most Governments find it difficult to channel substantial resources to combatting a seemingly long-term and nearly invisible problem like ecological deterioration. Such Governments, though, may one day be forced by events to see that their deteriorating agricultural resources are reflected in deteriorating economic and social conditions. The ultimate consequences of desertification which are neither distant nor invisible are undernutrition and famine, unemployment and migration, deepening poverty and deprivation.

#### V. MEASURES TAKEN TO COMBAT DESERTIFICATION

35. Only some rather modest actions have been taken in the recent past by the ECWA countries as measures to combat desertification. These are briefly described below.

36. Iraq: The most important direct action to combat desertification (salinization) has been the completion of a huge drain-

age canals which serves as a drainage outlet for the surrounding irrigated lands in central and southern parts of the alluvial Mesopotamian Plain. An extensive network of secondary drainage canals as well as field drains covering large areas have also been completed. A semi-detailed soil survey and classification for the whole country has been completed and a map, which can be a basis for future land-use planning, has been prepared. Scattered afforestation, rangeland rehabilitation, sand dune fixation and soil and water conservation activities have been implemented.

37. Oman: A project, to be sponsored by UNEP, aiming at sand stabilization, rangeland improvement and safeguarding land productivity, has been identified for the Sharqiya region. It is to be completed in a four-year period.

38. Lebanon: The green plan afforestation project for planting of 1,350 km<sup>2</sup> in the Lebanese mountain ranges to the east and west of the Beka'a Valley with forest tree species has been completed.

39. Jordan: Great efforts have been exerted in recent years in the areas of afforestation and range improvement. Millions of seedlings are produced each year in the well-situated and maintained nurseries. The transplants are planted in prepared sites with good success. Natural recharging of the ground water, by constructing check dams and terraces, in some watersheds has been also practiced.

40. Saudi Arabia: Much effort is being exerted, for sometime, toward combat the formidable desertification processes in the country with significant results. The activities include afforestation, shelterbelts, dam construction, ground water investigation, sand stabilization, etc..

41. Syrian Arab Republic: The most ambitious programme to combat desertification in Syria is that involving the two concurrent 15 year development projects in connection with the steppe rangelands and forests. Costing an estimated sum of \$400 million. The two projects are aimed at planning of 12000 ha. With forest tree species and an equal area with perennial forage shrubs each year. These projects, when completed, will definitely improve rangelands and forest conditions, stabilize soil, conserve the rain water and improve the scenic value of the landscape.

42. Yemen: Many activities have been going on in the Yemen Arab Republic concerning establishment of forest and fruit tree nurseries, reforestation, range improvement, rural development, dam construction, agricultural research, etc., in many parts of the country such as Dhamar, Khawlan, Haraz, Ibb, Hudiedah, Taiz, Rahdah, Maarib, and others. Such projects are either sponsored



by the United Nations agencies, or are implemented through bilateral agreements with foreign countries.

43. Democratic Yemen: In 1982 a two-phase project was completed with the assistance of UNDP/FAO; its aim was improvement of crop production, which involved research intensification, crop management, post harvest technology, sand dune fixation and shelterbelt and amenity planting.

#### VI. ECWA'S WORK PROGRAMME

44. The foundations for the secretariat's work in the area of agricultural resource management and desertification were established, in the context of ECWA resolution 71(VI) of 1979, at the Expert Group Meeting on Management, Conservation and Development of Agricultural Resources in the ECWA Region in May 1981. The results of that important meeting were reported to the ninth session (E/ECWA/145).

45. In follow-up to that meeting, seven project proposals dealing with different aspects of desertification control were prepared and presented to a donor for bilateral financing. The secretariat has further pursued the recommendations of that meeting through the United Nations Inter-Agency Working Group on Desertification and has regularly participated in its biannual meetings for the purpose of programme development and for co-ordination and streamlining its activities with those of other United Nations agencies.

46. Other important activities completed by the secretariat during the period 1982-1983 were:

(a) At the request of UNEP, a paper on "Planning for integrated agricultural resource management and development in the ECWA region" was prepared, which was published in UNEP's biannual journal Desertification Control, No.8 (June 1983);

(b) A document on "The status and management of agricultural resources in the ECWA region" was prepared for the UNEP/USSR monograph Desertification: Scientific Fundamentals and Strategies of Control;

(c) A study on "Regional assessment of desertification in the ECWA region" was completed. The study, which was prepared in the context of UNEP's first general assessment of progress in implementation of the Plan of Action to Combat Desertification, examines the current status of desertification in the ECWA region using various physical indicators; assesses the progress in implementation of the plan of action using different socio-economic indicators, delineates the general trend in

desertification in the ECWA region by major land-use types, and identifies measures to combat desertification;

(d) A case study on "Agricultural resource management and desertification control in Iraq" was completed. The study examines the physiographic, climatic and phytogeographic features of Iraq and its water resources potential and in that context it assesses the state of current agricultural resource use and the extent and rate of desertification. The study also identifies constraints confronting agricultural development in Iraq and outlines an action programme for the enhancement of agricultural production and control of desertification;

(e) A study on "pastoral and livestock management systems and strategies in the ECWA region" was completed. The study reviews and synthesizes various approaches and practices applied in range and livestock management in the ECWA region, delineating points of success and failure; examines in depth the problems faced by nomadic and transient livestock breeders; outlines measures for the overall improvement of the range-livestock system of the ECWA region and identifies a number of technical assistance projects;

(f) The ECWA/FAO Agricultural Division participated in an inter-agency technical programming and project formulation mission launched by UNEP to Jordan. This mission, in addition to developing strategic guidelines for rangeland development in the eastern low rainfall areas of Jordan, developed a range rehabilitation project for the Lajjun area in south-eastern Jordan;

(g) An analysis of ECWA programmes having a bearing upon desertification control was carried out for the United Nations compendium of desertification projects and programmes;

(h) Technical assistance was rendered to UNEP towards preparation of a field manual on economic analysis of desertification control projects;

(i) A study on "An integrated development approach for mountain areas of the ECWA region" was initiated and it is expected to be completed by June 1984.

## VII. AN INTEGRATED APPROACH FOR AGRICULTURAL RESOURCE MANAGEMENT AND DESERTIFICATION CONTROL

47. The framework for the identification and formulation of integrated national programmes of resource management to combat desertification should serve as a guideline for an effective regional desertification control programme to ensure the suc-

successful implementation of the Plan of Action to Combat Desertification on a regional basis.

48. Appropriately applied, the strategy outlined below would ensure that the problems of land degradation and desertification peculiar to the region were accurately surveyed and assessed, the causes of desertification accurately identified, and appropriate policies adopted. Effective national action could then evolve, taking advantage of the similar nature of the problem across national boundaries, which would allow nations to share experiences and knowledge for the combating of desertification.

A. Survey and assessment of land water resources and delineation of agro-ecological zones

49. The insufficient amount of basic information on national agricultural resources is a major constraint in rational decision-making, comprehensive planning, and successful implementation of agricultural development programmes. If the degradation of land and water resources is to be avoided, proper resource evaluation surveys based on the identification of agro-ecological zones should precede any development action. In this regard, it is important to adopt a common standardized methodology for the survey and assessment of national agricultural resources and the impact of desertification.

B. Identification of the causes of desertification

50. It is extremely important to correctly identify the causal links between desertification processes and consequences so that the real causes and not the symptoms are dealt with. For example, before launching any land-reclamation programme, it is necessary to know whether soil salinity/alkalinity in a certain area is the result of mismanagement or of unavoidable geological causes.

C. Stocktaking of existing programmes and projects

51. A stocktaking of existing programmes and projects to determine their relevance to and effectiveness in combating desertification is necessary in order to identify gaps and formulate subsequent policies, programmes and projects. This should include the assessment of existing institutions to evaluate whether they are adequate for dealing with desertification problems.

D. Formulation of reorientation of land-use policies

52. In general, agricultural resource management and desertification control is suffering from the lack of coherent integrated land-use policies on a national scale. This has been one

of the major constraints on ecologically-sound resource development. Most of the conservation work in the countries of the region has been implemented sporadically on an occasional basis; overall resource conservation and development strategies have not been developed and no country in the region has yet established an institutional infrastructure capable of formulating and carrying out programmes of the type and magnitude that are required. The development of adequate policies, supported by the necessary services to implement programmes effectively may take considerable effort, time and money. However, this process could be shortened and mistakes avoided by drawing upon the experiences of other countries in the region or elsewhere.

#### E. Development of appropriate legislation

53. It is important to realize that law, in itself, is not an instrument of resource management. Most of the existing relevant legislation has been drafted for specific sectors and not from an integrated environmental perspective. The legislation has been generally negative in its impact, and has usually stressed what should not be done, without providing any guidance on how the problems should be solved. The legislation exists in a policy vacuum and very little of it is applied. Effective legislation must take into account the social and economic reasons lying behind the abuse or misuse of resources. Legislation should then be drafted in the context of a comprehensive and constructive resource-management programme. It should provide workable alternatives to current abuse and misuse of agricultural resources. It is not simply a question of preserving the environment at the expense of the local population. Rather the challenge is to find a way of providing these people with the opportunity to make a decent living without degrading the resource base.

#### F. Creation and strengthening of an institutional framework

54. Past attempts at improved management and development of natural resources have been marked by a high rate of failure, not because of a lack of appropriate technologies but because of institutional inadequacies. The institutional structures created for or entrusted with the responsibility of solving ecological problems either were incorrectly designed or were not given the necessary financial and administrative authority to deal with the complexity of the problems. On a national basis few, if any, of the countries in the region have institutions carrying overall responsibility for the development of natural resources. Although most of these countries have Ministries of Agriculture, the responsibility for developing specific sectors such as agricultural crops, irrigation, soil conservation, range management, animal production and forestry lie within their individual departments or under different ministries, which tend

to pursue their own special programmes without much co-ordination between them.

55. A rather common national response to the United Nations Plan of Action to Combat Desertification has been to look for specific projects to be conceived and implemented in isolation by the existing ministries/departments. Such a response has usually been inadequate considering the characteristics and magnitude of desertification problems. The entire institutional framework for decision-making, planning and co-ordinating with regard to natural resources management needs to be involved and must, therefore, be redesigned to take over this responsibility. However, it may not always be necessary to establish new institutions. It is more important to incorporate the ecological dimension effectively into the existing institutional framework. However, this can be achieved only if ecological problems are approached in an integrated fashion. Ecological problems result from the interaction of many physical, social, economic and even political factors, and can only be dealt with from this perspective.

#### G. Development of research, education and training

56. Once the weakness in existing institutions have been identified and proposals for new institutions formulated, they should promptly be linked with supporting research, education and training institutions. The technical capabilities of these institutions should in turn be strengthened to enable them to cope with their new tasks. It must be emphasized, however, that education and training, in order to be effective, should be oriented towards the development of skills to meet the actual needs of each country. Agricultural research must be conducted with an understanding of the political, economic and social forces within rural communities. Otherwise the implemented programmes are almost certain to have a very limited impact and, indeed, may exacerbate existing problems in rural societies. Without a complete understanding of the options open to the majority of farmers and of the knowledge and skills that farmers possess, agricultural research is likely to reinforce the narrow objective of output maximization through modern production techniques that exploit and destabilize rather than provide sustained and people-oriented development.

#### H. Planning for integrated development

57. Adequate provision must be made in the national development process for the protection of the natural resource base, which has not yet been given adequate priority in national planning processes in the region.

58. In this regard, it is necessary to appreciate that the sectoral or unilateral approaches to overcoming land-use prob-

lems are generally counter-productive and can lead more often than not to further degradation of the natural resources. A number of examples of such approaches in the region can be cited, such as the extension of irrigated crop production on unsuitable soils, leading to waterlogging and salinity problems; extension of rain-fed cultivation to marginal areas where there is a high risk of crop failure and soil erosion, and thus the danger of inducing desertification; increased application of veterinary practices for controlling livestock diseases without concomitant measures for increased feed production; haphazard or unplanned development of watering points for livestock in range-lands, leading to serious overgrazing and depletion of natural vegetation; and unplanned exploitation of forest areas and woodlands, causing deforestation and degradation of watersheds.

59. The central issue is the need to integrate all the factors that have contributed to the the present situation into a comprehensive package of measures to ensure that lasting damage to land resources does not occur. For example, successful soil conservation needs more than just the application of erosion control methods. It needs an overall land-use policy in which, among other things, soil and water conservation is an integral part. Also in this context the complementary nature of the relationship between range and arable land is of vital concern. Effective measures which integrate crop production with animal husbandry would undoubtedly lead to better overall management of the natural resources. Likewise, the complex relationships which exist between forests, ranges and cultivated lands dictate that an integrated solution should be sought if effective management of any watershed is to be achieved. This implies, for instance, the development of multiple land-use systems which preserve the balance between the available land and water resources and their uses. An integrated system of planning for resource use has to be instituted to avoid any gaps or duplication of effort. The integrated development approach deals simultaneously with the three universal basic development objectives which are usually handled separately, namely: (a) increased production; (b) increased and fairly dispersed incomes; and (c) conservation and development of natural resources. This, however, is a difficult task and would require both political will and a multidisciplinary planning approach.

#### I. Participation of the population in the implementation of development strategies

60. The important problem in the field of resource management and development in the ECWA region is not a lack of relevant technology or even of financial resources but the lack of

defined strategies ensuring effective implementation of programmes and projects with full involvement of local populations.

61. Integrated development strategies should take into account the need for an adequate study and understanding of the prevailing socio-economic conditions. A traditional land user cannot be expected to participate in any proposed land-use changes unless he is convinced that such changes will lead to a substantive improvement in his living conditions. This emphasizes the need for an effective dialogue between the planner and the land user before any action to improve the management of the natural resources is designed and implemented. In this context, it is important to appreciate that where implementation strategies are harmonized with traditional systems, they have a better chance of acceptance. Compulsion alone cannot lead to the success of conservation programmes. Such programmes can only be effective where the authorities use demonstration, extension, and education programmes, coupled with appropriate incentives, to promote the understanding, interest, and co-operation of the public in general and the land users in particular. Only through the effective participation of the local population can resource degradation problems be solved.

#### J. Regional and international co-operation

62. Common problems faced by the countries of the ECWA region could be solved more effectively by combining financial, technical and manpower resources available in the region and seeking solutions appropriate to national needs within a regionally co-ordinated programme. Co-operative regional training programmes are needed to support integrated approaches to natural resources assessment and management. Such programmes could be arranged by existing regional training institutions to educate policy-makers, planners, and managers, as well as to develop scientific and technical capabilities. An important objective for regional co-operation should be the strengthening of existing regional institutions and the development of regional desertification centres for the transfer of information and technology.

### VIII. PROPOSALS FOR FUTURE ACTION

63. The secretariat's work in the field of desertification over the past few years indicates that in view of limited resources available under the regular budget, it would be appropriate, to emphasize the secretariat's work in only a few crucial areas and to make concerted efforts to mobilize extrabudgetary resources.

64. The two crucial areas on which the secretariat should concentrate in the future are:

(a) Provision of direct assistance to countries in the formulation of comprehensive national plans of action to combat desertification and in the preparation of specific projects;

(b) Establishment of a network for the exchange and dissemination of information between countries and between regions on desertification control approaches, methodologies and techniques.

65. Of the seven project proposals presented by the secretariat for bilateral financing during 1982, only one relating to a study on pastoral development and range management strategies is in the process of being funded, by the Federal Republic of Germany. The financing of the remaining six project proposals would greatly strengthen the secretariat's programme in this field. These project proposals are:

(a) A feasibility study on the establishment of a Regional Desertification Communication and Development Support Centre (\$ 35,000);

(b) An expert meeting on desert afforestation in the ECWA region, based on the experience of the United Arab Emirates, (\$45,000);

(c) A case study on economic analysis of conservation action or desertification control (\$51,000);

(d) A regional workshop on multiple resource use management systems (\$75,000);

(e) A training course on land use planning in natural resource management (\$116,500);

(f) A study on risk management in arid zone agriculture.



**EXECUTIVE SUMMARY**

**THE ROLE OF AGRICULTURAL PRICE POLICIES IN AGRICULTURAL  
AND RURAL DEVELOPMENT IN THE ECWA REGION**

1. Agricultural price and subsidy policy is one of the key factors affecting agricultural production, as well as rural and national development. recognizing this, the Economic Commission for Western Asia has undertaken two case studies devoted to the pricing of cereals. The problem of cereals was chosen because of the importance of that product in food consumption and in food/security policy. The fact that cereals are not perishable and can be stored is an advantage for the implementation of policies aiming at stabilizing prices. Furthermore, grain production is very often the sole crop production possible on rainfed land and the profitability of cereal farming is the keystone of any policy aiming at developing dryland areas.

2. The two countries selected, Iraq and Jordan, both have considerable agricultural potential, but their situations differs. Iraq has enough financial and land resources to expect self-sufficiency in major cereals, while Jordan faces the problem of the optimal use of relatively scarce financial and land resources for dry farming. The two countries have a different economic orientation: Iraq has a central planning system whereas Jordan has a free market system. In both cases, however, there is an active price and subsidy policy in support of cereal production as well as significant subsidies for consumers. Support prices are entirely financed by government budgets.

3. In the following sections, three aspects of agricultural price policies are discussed: support of farmers' incomes; incentives for increasing production; and rural development.

#### A. Cereal price policy as a support for agricultural income

4. The main objective of a cereal price policy is to secure a certain level of income to farmers. To reach that objective, minimum prices are guaranteed at which the Government buys any quantity of cereal, provided quality requirements are met. When the entire cereal market is controlled by the Government, that price is the effective farm-gate price. In Iraq, the minimum price is announced before the sowing season and may be increased in case of a bad harvest. In Jordan, the minimum price is announced before harvest time and it has two effects: (a) It limits the price fluctuations on the free market especially harvest time when small farmers who lack storage facilities have to sell their produce at low market prices; (b) It sets a lower time to market prices because farmers who have stored their produce will keep it until the next governmental purchasing campaign if the market prices appear to be lower than the official prices.

5. In order for price stabilization to effectively improve the small farmer's income, the minimum price must be set at a fair

level. The absolute minimum level of the support price is easy to define: it is the cost of the equivalent imported commodity delivered at the main distribution centres (CIF price plus handling and transportation charges). In Jordan, the support price of the main cereals is above that level; in Iraq, the ratio support price/adjusted import prices is slightly unfavourable to farmers owing to the exceptional transportation costs generated by the present conflict situation.

6. The relative minimum price level is more difficult to define: the support price must be set at a level to secure at least a constant purchasing power to cereal farmers. The computation of that relative minimum level must take into consideration the profitability of cereal farming (production costs, productivity) and increases in the cost of living. That aspect is very sensitive in the two reference countries, both of which registered a boom in their economy during the past decade leading to a dramatic increase in the purchasing power of their urban populations. The productivity of cereal farming did not increase significantly during the decade in rainfed farms. In order to measure the increase in the cereal farmer's purchasing power farm/gate prices are compared with general consumer price indexes (subsidies on farming materials do not substantially affect the cost structure because of the low rate of fertilizer use). In both countries, the results are unfavourable to cereal farmers. Cereal prices did not increase in line with the increasing imbalance between local supply and demand; the gap was filled by imports. It is thus recognized that increasingly unfavourable terms of trade have sped up rural-urban migration. In order to reverse that situation, cereal prices would have to be increased. Such a policy would involve a heavier financial burden on the government budget if consumer prices for cereal food had to remain low. The solution would be to have farm productivity substantially improved through the use of modern technology. In that context incentive price policies would play an important role in the rationalization of the farming process.

#### B. The effects of price policies on production

7. The results of incentive prices to promote increased production and the use of improved technology have not been unsuccessful. An econometric study has shown that farmers in Iraq are price responsive but that the positive effect of incentive price is hampered by several constraints. Some of these constraints are natural, such as the uncertainty of dry farming under fluctuating weather conditions. But other important constraints are linked to the unfavourable economic environment for cereal farming on dryland.

8. Indeed, dry farming has not received the same attention given to irrigated farming in development plans. The relative lack of interest in dry farmings in Jordan and, to a lesser extent, in Iraq when compared with irrigation projects can be explained by (a) the higher variability of yields in dry farming which leads to higher risks; (b) the better control of irrigation projects, which are more limited in scale than dryland projects; and (c) the difference in types of investments since an irrigation project is similar to an industrial project and can be done on a turn-key basis while dryland development gives less importance to technical aspects but involves an in-depth reorganization of private and administrative services, land consolidation, infrastructure investment, etc.

9. Because of the lack of support for dry farming production technologies have remained more or less traditional, despite an active price and subsidy policy on agricultural materials (no custom duties on imported agricultural materials in Jordan; subsidization of chemicals and machinery in Iraq). The neglect of improved modern technology has affected farm productivity. Thus, cereal yields in dry farming areas did not register a substantial improvement during the 1970s.

10. Incentive prices are not given for commodities grown in rotation with cereals when modern technology is used. An incentive price for these commodities (legumes, forage crops) would promote the replacement of the traditional cereal/fallow rotation for a more incentive rotation which could provide materials for livestock production.

11. In the pricing system, wheat has received the most attention because of its importance in human consumption. Nevertheless, in the long run increasing attention will have to be given to barley production because: (a) fodders crops are essential for the development of livestock production in order to meet the increasing demand for meat and to avoid large importation bills; and (b) in semi-arid zones, or land affected with salinity, barley is the more suitable cereal because it is less affected by adverse conditions. Better pricing for barley would be economically rational (anticipation of future demand) and would improve the situation of farmers working on marginal lands.

#### C. Price policy as a support for rural development

12. In addition to the direct effects of agricultural price policies on agricultural income and production, agricultural prices affect rural development. Projects willing to introduce improved technological packages must be implemented within a favourable financial environment. This is not always the case. In Jordan where studies have been conducted on the economic viability of new technology for rainfed cereal farming, the

actual pricing system leads to the high probability of negative financial returns because of weather fluctuations. Obviously farmers, will be very reluctant to use new technology if the situation is not improved (subsidization of materials and crop insurance schemes). Valuable development projects may be jeopardized by producer prices which do not reflect the true value of agricultural commodities. This is often the case for cereals because the conflict between incentive farm prices and low food prices tends to slow down the increase in prices paid to farmers in order to limit the burden of subsidies on the governmental budget. On the other hand, prices and subsidies used alone are not sufficient to promote the use of modern practices among the population of small farmers and must be linked with strong institutional services (credit, extension services, etc.). Otherwise the new technology will increase the gap between small and large farmers.

13. On a more technical level, cereals are very often advocated in rotation with vegetable or cash crops in irrigation projects because the use of cereals improves soil fertility and disease control. In fact, however this practice is rarely implemented because the cash crop production brings greater financial returns. Special incentive prices or subsidies financed at the project level by land taxation are needed to encourage the use of cereals in rotation with other crops.

14. National development is very often biased towards urban development. The bias against agriculture takes the form of unfavourable terms of trade leading to an income transfer from rural areas to urban ones. Scant attention has been directed to the participation of the rural population in the national economy and to their potential role in the development process. Better agricultural prices would not only lead to greater equity between rural and urban populations but also secure a sound basis for further development.

#### D. Lessons for consideration

15. Agricultural price policy plays a central role in agricultural development. Its role has been recognized by all the countries of the ECWA region, but policy implementation faces several difficulties, such as the conflicting demands for fair prices for farmers and cheap food in cities. In practice, price policies are often formulated on an ad hoc basis. Improvement must, therefore, start with an in-depth evaluation of policy implications, spill-over effects and impact on main development objectives.

16. At the production level, the lack of price incentives greatly affects the rational utilization of agricultural potentialities and holds up the promotion of modern technology.

Price stabilization and better farm-gate prices are more attractive for small farmers than input subsidies. Nevertheless, any improvement of the small farmer's income cannot be secured without effective measures to increase productivity, especially in dry farming. Incentive prices must cover the crops grown in rotation with main products. In that respect, closer attention has to be devoted to fodder production in the light of the need to develop livestock production.

17. General consumer subsidies impose a heavy burden on the public budget. They must be progressively substituted by targeted social programmes.

18. At the institutional level, agricultural price policies must be closely linked to medium and long-term development plans. Extensive price measures must be taken on the basis of in-depth analytical preparation backed by a sound information and data system. In that respect, close attention has to be given to the analysis of the food and agricultural economy and its implications for national development.

19. Financing of subsidies must be carefully selected in order to avoid too large an increase in the monetary supply leading to inflationary pressures. Ideally, support prices and subsidies must be financed by the tax system.

**THE ENVIRONMENTAL IMPLICATIONS OF ENERGY PRODUCTION  
AND USE IN ECWA COUNTRIES: THE OIL SECTOR**

1. This study aims at examining the effect of the oil industry on the environment, particularly in the oil-producing countries of the ECWA region. The oil industry encompasses the process of oil extraction, transportation and further processing into final refined products. In terms of the environmental effects of the oil industry, the study focuses on the current situation in the oil sector of the oil-producing countries of Western Asia. The Gulf States comprise the subregion which is most exposed to environmental problems in general and to pollution in particular. This is not surprising if one considers that the ECWA region contains some 40 per cent of the total proven oil reserves and 13 per cent of the world gas reserves (1980). Oil production has been escalating throughout the past years from 9.8 million barrels per day (b/d) in 1970 to 16.5 million b/d in 1980 and hence there has also been an expansion of backup services such storage, shipping, refining, etc.
2. Since the Gulf region has the highest density and frequency of oil tanker traffic of any regional sea or oceanic area, it also has a high level of marine pollution.
3. The industrial development undertaken along the coastal areas will have some bearing on the quality of the environment. Therefore, an Environment Impact Assessment (EIA) has to be developed prior to any economic development. The EIA should address, inter alia, present environmental status, target environmental status, type and quality of prospective emissions, impact of emissions, emission control, control technology, emission and environmental status monitoring, and economics and cost effectiveness.
4. The main objective of an EIA is to attempt to identify and predict the potential environmental consequences of a development project. It is a very useful tool but needs further adaptation to the characteristics of the region. By generating options and their impacts at early stages of project planning, the quality of the final decision would be in line with the principles of sound development.
5. Such considerations in the decision-making process as outlined in this study can lead to improved source control/management of existing emissions, active treatment of hitherto uncontrolled emissions; control of total environmental impact by application of more rigorous emissions standards in an expansion sector than would apply to a "grassroots" development; examination of the impact of operational scale upon resource demand; recovery and reuse of water, and provision for the environmental impact of any planned future expansion.
6. Owing to the oil discharged into the Arabian Gulf during the transportation of petroleum products, the marine environment of the Gulf has become a major concern. The average amount of



oil discharged during a ballast voyage is estimated to be about 0.35 per cent of the dead weight of the ship.

7. Massive oil spills are also a source of pollution to the marine environment. Thus there is a need for a close interrelation between measures for the improvement of safety at sea and those directed specifically towards pollution prevention.

8. The most apparent danger of offshore oil exploration and exploitation in the marine environment is the ever-present danger of a blow-out and oil spills with the accompanying physical and chemical pollution. The adverse effects of such phenomena on both living and non-living components of the environment are aggravated by the decomposition products of oil which enters the trophic food chain and causes deterioration of marine food quality.

9. The main potential problem in offshore and on-land operation is blow-out. A strict well-controlled programme is essential as a preventive measure for mitigating the problem. A blow-out contingency plan should supplement the usual preventive measures taken.

10. The pollution combat measures taken within the contingency plan for a given site are outlined in this study. Furthermore, methods for dealing with oil spills are reviewed in order to identify the advantage and disadvantage of each method according to the extent of the spill.

11. The study also reviews the current situation in the oil sector with due regard to development and its implications for these operations. The scope is limited to the countries that heavily depend on oil as the major income generator, namely, Bahrain, Iraq, Kuwait, Qatar, Saudi Arabia and the United Arab Emirates. It is hoped that in the future, the study will be expanded to cover other Gulf States.

12. In Bahrain, the energy-intensive and oil-related industries are bound to cause environmental problems. These are aggravated by the fact that Bahrain is an island of a limited small area and it is situated in the middle of the Gulf where the probability of water pollution is very high. Certain measures are being introduced to mitigate the environmental impact of the oil-based industries in the island. Examples include the extinction of gas flares in the oil fields, modernization of the flare system of the refinery, introduction of new systems and the replacement of the turned-out ones in the polluting industries and the monitoring of the potential pollutants within each plant in order to minimize their environmental impact, etc. However, there is still a need for a comprehensive environment protection policy for the whole oil-producing sector.

13. In Iraq, the complexity and diversity of environmental problems have encouraged the Government to give due consideration to environmental matters in their development plans. Research activities are being conducted to determine the nature of environmental pollution encountered in Iraq. The main pollution in the north results from gas flaring since more than 80 per cent of the gas produced in conjunction with oil recovery is flared. The resulting sulphur dioxide, carbon dioxide, etc. are emitted into the atmosphere. Part of the hydrogen sulphide is utilized in the sulphurization plant in Kirkuk. Some sulphur units are also under construction. Unless proper control measures are taken, these units will surely add considerable toxic emissions of sulphur dioxide to the atmosphere. In Baghdad, the major source of pollution is the Daura refinery and the heavy oil burning in the brick plants. It has been noted that large amounts of carbon dioxide and sulphur dioxide are emitted from the heavy oil treatment plant. Furthermore, the annual production of the brick plants which is nearly 900 million pieces requires 200,000 tons of heavy oil leading to an emission of 13,000 tons of carbon dioxide. A reconnaissance survey analysing the effect of lead emissions from vehicles in Baghdad on the inhabitants and on palm trees was conducted in 1981.

14. In Kuwait, a large number of environmental management and pollution control measures have been undertaken and implemented for the petroleum industry. The oil-related industries are principally concentrated in the Shuaiba industrial area. In 1966, for example, the inhabitants of Shuaiba village were seriously affected by two polluting incidents resulting from the thermal operation start-up of the sulphuric acid plant which emits high concentrations of sulphur dioxide. Marine pollution is another environmental problem facing Kuwait. The industrial area of Shuaiba, which stretches some 25 kilometres along the shore south of Kuwait city, is the main source of industrial pollution. The main pollutants emitted into the atmosphere are sulphur dioxide, hydrogen sulphide, carbon dioxide and hydrocarbons. The Government is actively trying to take appropriate measures to avoid any damage to the environment. In the Shuaiba area, a Pollution Control Centre was established in 1968 to fight water and air pollution. The Centre also established, in co-operation with government bodies the so-called "Code of Practice and Environmental Guidelines" that sets up the criteria for control of gaseous particulate emissions. Pollution of territorial marine waters by ships is strictly controlled under the provisions of the law enforced by the Ministry of Communications. In August 1980 law No. 82 on protection of the environment was published in the Kuwait Official Gazette. By this law, an Environment Protection Council was established under the chairmanship of H.E. the Minister of Public Health. The objective of the Council as outlined in the law has to be achieved through establishment of an Environmental Protection Department. Kuwait can thus be viewed as a model example in the

region of a country which is addressing environmental awareness through well-established mechanisms.

15. In Qatar, plans are under way to lessen economic dependency on income generated by oil exports and to build a large industrial base for processing oil and gas. Most of the recently-built plants have instruments to control pollution emissions. But in the absence of rules and regulations on environmental protection, these measures will not provide substantive support to environmental protection at the national level. Many studies concerning industrial pollution are being carried out in Qatar with the co-operation of the Doha-based Gulf Organization for Industrial Consulting. These studies call for the prevention of pollution in its preliminary stages, through implementation of pollution control within industrial plants. This would prove to be efficient and less expensive than cleaning the environment after pollution occurs.

16. In Saudi Arabia, a large part of the oil revenues after 1973 were allocated to the development of the oil sector for expanding the facilities existing then and for building new treatment units, pipelines, ports and petrochemical complexes. Therefore, the oil industry in the Kingdom is presently undergoing large expansions that will have some adverse effect on the environment. But a separate study is also needed to assess the future environmental impact of newly-introduced industries.

17. In Dubai, the development priorities call for the establishment of large-scale industries based on oil and natural gas. The energy-intensive and oil-based industries will impose considerable stress on the environment and will expose a large segment of the population to new environmental hazards if no appropriate measures are taken to control their emissions and wastes. With all these major expansions in the industrial sector, the United Arab Emirates still lack a comprehensive environmental legislation. In 1978, an executive committee for public safety, professional health and protection of the environment was formed. Later in February 1978, a Supreme Committee for the Environment was formed under the chairmanship of H.E. the Minister of Health.

#### Concluding remarks

18. The assessment of potential environmental and social impacts of petroleum projects is receiving increased attention today from the public at large, from various governmental agencies and from other institutions that are unwilling to accept compromises in their efforts to maintain or improve the quality of life. This increased emphasis on social welfare and the negative side-effects of large development projects is the result

of past failures to recognize their importance in the industrialized world. As a result of this failure to identify and plan for the impact of development, many regions and communities have had to suffer long-term financial distress and their quality of life has been seriously degraded.

19. Another result of the environmental failure experienced in developed countries is the attention which has been drawn to the issue of environmental preservation. Existing industries as well as on those in the planning stages are currently being forced to face this issue. This is specially evident in the field of energy and alternative energies, where a powerful struggle persists between private and governmental groups dedicated to the preservation of the environment and those responsible for the growth of the industry. Inasmuch as the sensitization with respect to pollution in the industrialized countries is the result of experiencing its consequences, it becomes beneficial for the ECWA countries which are presently on the path to industrialization to learn from the mistakes of other countries so that the socio-economic and environmental costs can be avoided.

20. An organized effort, extending beyond individual countries should be dedicated to preserving a healthy environment along with the growth of oil-based industries; this would reflect the principle of balance between environmental protection and industrial development.

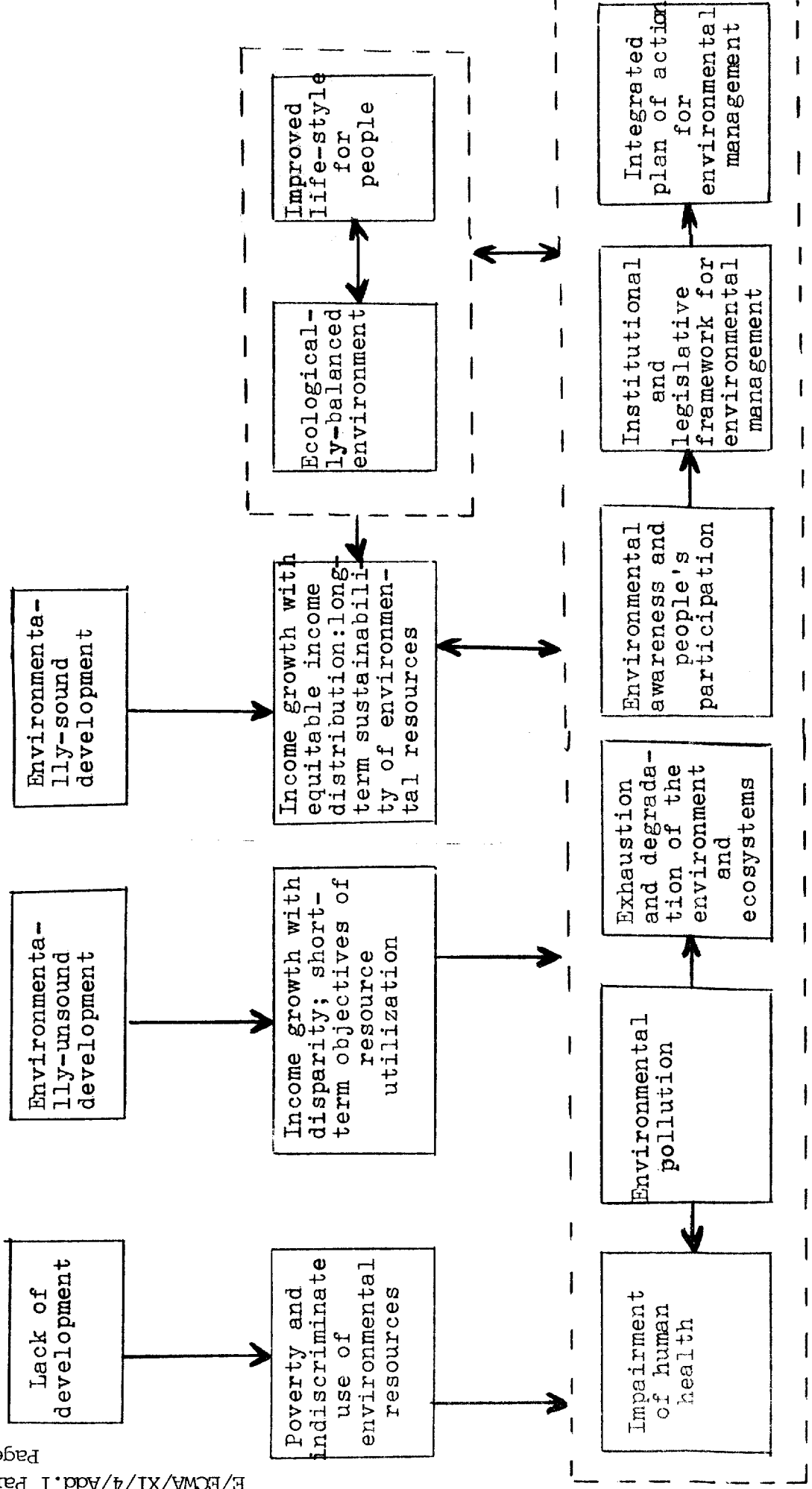
21. The protection of the environment should serve, sooner or later, the aims of any development plan. Development and environmental protection are not incompatible; rather environmental protection is in itself a protection against the negative effects of the process of development. Therefore, in structuring development policies, programmes and plans, immediate and long-term environmental considerations must be taken into consideration.

22. Since the development of the ECWA region is essentially geared to energy and high levels of energy consumption in the various sectors such that the standards of living are measured in per capita energy consumption, the development planning should be modified, not only in terms of economic value added or GNP, but also with respect to ecological considerations. In other words, the quality of life should become the main criterion of development activities, considering that both mental and physical welfare are the ultimate objectives of development.

23. Governments in the ECWA region, especially in the oil-producing countries, are becoming aware of the environmental consequences of their development plans and the importance of prevention and control methods, but they have not yet transformed this awareness into laws or regulations to preserve their

environment. Preliminary efforts at the individual country level are not only desirable but also essential as a first step towards implementing regional measures to control the environmental pollution, which requires much time and effort. Regulations pertaining to the pollutant-emitting industries should be legislated and enforced. Such measures on a national level, would prove useful in the future co-ordination of regional and international anti-pollution control.

Relationship between environment and development



**THE FUNCTIONING AND DEVELOPMENT  
OF SELECTED CONSULTING AND ENGINEERING DESIGN  
ORGANIZATIONS IN THE ECWA REGION**

#### A. Background

1. The role of consulting and engineering design (CED) in the development process is receiving the increased attention of researchers and policy-makers in the member States of the ECWA region. Although it remains a fairly new and not sufficiently explored field of research, its importance for the development performance of developing countries in general and of the ECWA member States in particular has been recognized. This is so despite the fact that consulting and engineering design is a hidden and to some extent abstract development issue which lies behind the realization of development projects which range from infrastructure facilities including buildings, hotels, roads, highways, railways, airports, harbours, power stations, electrical transmission networks, telecommunication projects etc. to urban development schemes, agricultural production units, and industrial plants. CED consists essentially of mental activities needed to optimize investment in all its forms through a set of organizational structures which allow scientific technical and economic knowledge to be integrated and converted into designs and specifications for the construction of projects. However, discussion of this issue is constrained by the small amount of literature available in this field, and the novelty of this research area. Thus, conceptual and measurement problems persist and the need for further empirical research is evident. These factors prompted the undertaking of the study which is summarized below.

2. The case studies discussed herein are about two mature Arab Consulting and Engineering Design Organizations (CEDOs) of different types selected from different countries of the ECWA region. The organizations are not necessarily representative of the functioning and development of CEDOs in the ECWA region in general. Thus, there is a need for further empirical research aimed at generating understanding and knowledge about the establishment, growth and performance of various types of CEDOs operating in the ECWA countries. Until such research is carried out, recommendations in the form of prescriptive policy action cannot realistically be made. However, a wealth of general recommendations has been suggested in the literature about the development of a CED capacity in developing countries. The most important of these have been reviewed in an ECWA study completed in 1982 (E/ECWA/NR/82/3). That study presented a demand-side perspective in that it focused on CED services, at the level of investment projects, which were a response to a certain pattern of demand generated by infrastructure and industrial production facilities. The present study, on the other hand, deals with the supply aspect of CED services, and more specifically, with the functioning of one private independent and one state-owned CEDO. The conclusions which can be drawn here, however, do not have a general validity, because they follow from analyses per-



formed around the two selected CEDOs. The private CEDO (referred to hereunder as X) operates mainly outside the country where it is based, and the state-owned CEDO (referred to hereunder as Y) provides services for domestic investment projects. The similarities and differences in their functioning and development have been identified and are reflected in the conclusions mentioned below:

(a) the environment within which the two CEDOs operate seems to have influenced the pattern of their emergence. While X was established by an independent group of professional engineers and grew in one member State of the ECWA region where the private sector was fairly well developed and played a dominant role in the national economy, Y was established by the Government and developed in a country characterized by its centrally-planned economy;

(b) The initial objectives set for these CEDOs at the time they were established have influenced their pattern of growth. While X was from the beginning intended as a multi-disciplinary CEDO not confined to any specific category of investment project, Y was designed to provide technical services mainly to the oil sector which was characterized by its large public investment programmes. This led to the involvement of X in different types and categories of investment projects and of Y in projects pertaining to oil-field development and transportation and storage, particularly during the first ten years of its functioning;

(c) The organizational structure of these CEDOs seems to be functionally related to their size. Both of the organizations are considered to be large. However, X is much larger than Y and accounts for about five times the total number of personnel employed by the latter. This seems to have led X, more than Y, to adopt a stable and formal organizational structure, acquire an intensive multi-disciplinary character and develop a fairly high degree of built-in standard procedures and mechanisms of work;

(d) The type of clientele seems also to change with the size of the CEDO. In its early stages of growth, X relied more on clients from the private than from the public sector. Those comprised about 60 per cent of its clientele during the first five years of its operation. With the growth of the CEDO, however, state enterprises became its main clients, amounting in 1982 to more than 95 per cent of its total clientele. As regards Y, the type of clientele has continued to be the public sector and more specifically, various ministries, public authorities and state-owned enterprises.

(e) Although X has started to operate in fairly diversified fields of activity (infrastructure, industry, agriculture), its initial performance centred around certain types of infrastructure, mainly architectural, like houses, office buildings and touristic complexes. It has subsequently moved into more complex projects like irrigation works, highways, bridges and dams. It has further widened its fields of specialization by handling large urban development schemes. It has also participated in providing services to industrial production facilities scattered among various sectors. However the limited number of industrial projects and their fairly wide sectoral distribution allow only for certain tentative conclusions to be drawn regarding the involvement of X in industrial activities. This involvement seems to follow the pattern and stage of industrial growth of the countries where X has been operating. These countries have limited experience in industry which is still at its early stage of development. However, one can safely say that the performance of X seems to conform with the generally recognized pattern of CEDO development, i.e. from a predominately civil and architectural engineering type to a more complex type encompassing civil engineering work, diversification into industrial branches, and involvement in technology-intensive industrial production facilities.

(f) Y has followed a different pattern of growth. It started as a sectoral CEDO but developed later into a diversified one. This development took place as a result of a government decision to replace the sectoral CEDO by a more diversified type;

(g) In its performance, X has pursued the "project engineering" strategy in that it has supplied some of the CED services but has also assumed, on a number of occasions, overall responsibility for project execution. This is shown by the heavy involvement of the CEDO in pre-investment services as well as engineering design, construction supervision and project management services. Y has generally followed the same strategy, but to a lesser degree, as X. It has provided fewer types of CED services, mainly to the oil sector, and has only recently and after it was converted into a diversified CEDO, started to assume overall responsibility for projects. In general, the emphasis of this strategy is more on project execution than on technology development;

(h) CEDOs are labour-intensive organizations with high professional qualification levels. In both X and Y the share of professional engineers is larger than that of the technicians

and the combined share of these two categories of personnel is larger than that of administrative personnel. Furthermore, technicians in both CEDOs are abundant. This may be explained by the fact that they are intensively involved in detailed engineering and construction supervision. This, however, is more pronounced in the case of X than Y, reflecting a deeper involvement of the former in such services.

(i) The marketing capability of X is fairly well established. It is in effect one of the important factors to contribute to its development and expansion. Because it is an independent private CEDO, the availability of and access to markets constitute a necessary condition for its survival and growth and thus the marketing structure of the CEDO is reasonably well organized. This is shown by the issuance of pamphlets, brochures and booklets about its background and capabilities, by systematic visits to the clients by the use of a regular information system and by the establishment of a fairly large number of branch offices which facilitate direct access to clients and identification of potential projects;

(j) In the case of Y, the marketing aspect does not have the same type of importance. Being a state-owned enterprise serving public investment projects, the market for this CEDO is mainly determined by the Government through economic policies and plans translated into concrete investment programmes and projects. However, the structural composition of public investment programmes and national policies for the transfer of technology are two particularly important variables which affect the volume and nature of demand for the services of Y and hence its participation and role in investment projects. Hence, the variables of paramount importance to the development of Y lie in a set of co-ordinated government policies which ensure that the CED capacity of Y is optimally utilized by the public and mixed sectors.

(k) Closely related to the above point is the marketing strategy pursued by the two CEDOs. X has followed a diversification and export-oriented strategy. It has mainly operated in export markets covering a large number of countries and it has participated in a fairly large number of projects of different categories and sizes. These pertain to infrastructure and industry, and within the two categories the projects have belonged to diversified types of infrastructure activities and industrial sectors. The main reasons for that appear to be the capturing of large CED markets and the acquisition of diversified experiences. In the case of Y, the strategy pursued by the Government has changed over time. It started mainly as a sectoral CEDO servicing projects which were predominantly in the

oil sector. But after ten years, it adopted the diversification strategy which enabled it to cover more diversified types of investment projects. This was done because of a decision taken by the Government to reorganize and enlarge the field of activities of this CEDO, which in turn, may have been dictated by changes in the composition of public investment programmes.

(l) The attitude of the clients of X has also changed over time. The confidence of state enterprises in the work of X has increased with its performance and growth. At present, more than 95 per cent of the clients of X consist of public enterprises, the attitudes and policies of which have an important bearing on the CEDO's future development;

(m) The pattern of investment in the regions and countries where the CEDOs operate has had a direct effect on their development. This is shown by the fairly large investment programmes/projects in urban development schemes which have led X to develop an in-house multi-disciplinary capacity and Y to change its strategy for handling such projects. Similarly, large investments by Governments in other types of infrastructure like roads, highways, railways, harbours and airports and other transportation projects have made X build an integrated CED supply capacity in this sector.

(n) The involvement of X in industrial projects has not been as large as its involvement in infrastructure. As mentioned earlier, this may partly reflect the pattern and stage of industrial development in the countries where the CEDO has operated. But at the same time it may be due to the comparative advantage that X has developed in supplying CED services to infrastructure compared to industrial production facilities. Another reason for that may be the heavy involvement of foreign independent and captive CEDOs, particularly those contained in foreign manufacturing enterprises, to provide, through turnkey contracts or licensing agreements, the full spectrum of industrial CED services, including process and product engineering as well as specifications for equipment and design and layout of industrial plants.

(o) The role of X in industrial manufacturing facilities has varied depending on the contractual agreement signed with the client. But in general, one finds that X has supplied pre-investment services, mainly feasibility studies, for these projects and detailed engineering design as well as production planning and scheduling, specifications for and selection of equipment and construction supervision services. Process engineering know-how has occasionally been supplied by the CEDO. It

is important to mention here that the acquisition of foreign industrial technology by this CEDO has centred around understanding the performance and characteristics of this technology rather than on efforts to innovate on the technologies or introduce significant adaptations. In other words the involvement of X in industry-specific know-how should be viewed within the "project execution" strategy it has pursued over a fairly long period of time;

(p) The technological capacity of the two CEDOs has developed in an implicit and explicit manner. The repetitive supply of similar services to similar and diversified types of projects has led over time to the appropriation by both X and Y of learning effects and hence accumulation of knowledge which has enabled them to improve the quality and efficiency of their services. This has taken place implicitly with the growth of CEDOs and with their increased involvement in handling projects. It should be noted however, that the additional knowledge acquired as a result of learning by doing seems to be more pronounced when the CEDO handles different types of projects with varying engineering characteristics and complexities. This has characterized the implicit technological development of X while that of Y seems to have been generally confined to providing similar services to more or less similar types of projects. The evolution of the CED capacity of these two CEDOs has also resulted from explicit decisions and actions. The hiring of qualified professional engineers has been the predominant mechanism for enhancing their technical capacity. This acquisition of "person-embodied" technology has been further supported by other means like in-house training programmes, attendance at seminars and training courses to upgrade the skills of professionals. The use of foreign expertise has also been resorted to as a mode of technology acquisition. This has led to the absorption by X of engineering design know-how for providing CED services to power stations and by Y of design services for handling certain types of oil projects. Direct investment in technological knowledge has been identified in the performance of X. This has led to the establishment of a technical library, computing facilities and maintenance of project records. Y, on the other hand, has recently recognized the need and made plans for such investments;

(q) X has succeeded in developing managerial skills at various levels. Many of these skills have been acquired by hiring senior professionals with more than ten years practical experience and others were developed through in-house and on-the-job training. The mobility of staff among branch offices and between these and Headquarters may also have contributed to building up managerial talents. These have played an important role in the successful development and functioning of this CEDO;

(r) Neither CEDO has been engaged in developing in-house technologies. These have been developed elsewhere but have been acquired by the CEDOs. X has actively participated in various types of infrastructure projects, the technology content of which is generally established, fairly well known and accessible. It has, however, adapted this technology to meet various characteristics of projects, locations, and countries. That is evident in the CED services it has offered for infrastructure, and particularly transportation and urban development, projects in a fairly large number of countries with different socio-economic and physical characteristics.

(s) Technical change experienced by the CEDOs does not seem to be a function of the CED capacity only. It often takes place in response to changing demands in product and input markets. This is evident in the widening of CED services supplied by X as a response to demand generated by increased urban development activities and diversified types of transportation projects;

(t) The capital of the two CEDOs ranges from \$US 26 million for X to \$US 10 million for Y. This capital is not large and is, in effect, much smaller than that of foreign engineering firms of similar sizes. The reason is that the latter firms offer financing services to users, either directly or indirectly through their close relationships with financing agencies, and commercial and development banks. Such financing services, in the form of loans and credits extended by CEDOs to clients, have not yet sufficiently developed within local Arab CEDOs. This integrated structure of financial and technical services within the same establishment is emerging but its development is constrained by the absence of support or facilities granted to the CEDOs by national commercial banks or financing agencies. The performance of X, for example, shows that these banks and agencies have not provided any support of this nature. That may have adversely affected its negotiating ability to capture a larger CED market and may have put it at a disadvantage vis-a-vis foreign engineering firms. In the case of Y, the absence of financial services does not constitute a serious problem for its development. This is because the Government has control over the CEDO as well as the national banks and financing agencies in the country. Furthermore, projects for which Y has rendered CED services are generally those for which investment funds have been allocated in the state budget. However, the existence of such a marriage between technical and financial services may have placed Y in a better position and strengthened its ability to monitor and follow-up on the implementation of investment projects. It may also enable it to contribute more

effectively to fund-raising activities on a bilateral and multi-lateral basis to finance developmental project. This marriage in the case of a state-owned enterprise operating in a centrally-planned economy is more likely to be achieved through the creation or strengthening of a built-in co-ordinating mechanism encompassing the work of CEDOs and that of national banks and financing agencies.

(u) It has been shown that the operation of X over a fairly long period of time has not led to the establishment of linkages with research and development institutions in the countries where it has operated. X has supplied CED services without drawing on work carried out by those institutions. X has not had a professional working relationship with academic institutions either. According to X, links with local machine and equipment manufacturers have been established, but no information is available to analyse the type of this relationship.

(v) X has had working relationships with regional and international development organizations and funding agencies. We have shown that these have commissioned the CEDO to provide services for investment projects, mainly for infrastructure. It should be noted however that this linkage has gained in importance with the growth of X and the development of its technological capacity.

3. As we have stressed earlier, the study has focussed on two types of CEDOs with certain internal characteristics. It has discussed their evolution and more specifically their functioning, performance and growth over time, from creation to maturity. It has generated some knowledge about the pattern of their emergence, development path and linkages with other scientific and technological functions. It is recommended that this research exercise be extended to cover other types of CEDOs in each one of the ECWA countries. This will serve to generate information and analyses about the composition and structure of a national CED capacity in the member States, and the establishment, functioning and growth of independent and captive CEDOs constituting this capacity. These analyses will help to identify key opportunities, principal problems, obstacles, deficiencies, constraints and other critical endogenous and exogenous variables inherent in the development process of a CED capacity. On the basis of these findings, policies in consulting and engineering may subsequently be formulated which take into consideration the overall policy framework and contextual factors prevailing in the countries of the ECWA region.

TECHNOLOGICAL DECISION-MAKING IN THE INVESTMENT PROCESS



1. There is now increasing awareness of the technological dimensions involved in the development effort in the ECWA region. In many of the ECWA countries there are now specialized institutions and government departments to assess technology agreements, to select technologies, to identify problems concerning imported technology, and to improve the conditions for the development of local technological capabilities. There are, however, very few concrete studies available of the process of technology decision-making in the investment activities in these countries. Even in those ECWA countries which are comparatively advanced in the field of development and industrialization, there is very little that can be obtained, except for the official documents, to tell us about how technology decisions are made. At best, what can be obtained are studies relating to prefeasibility and feasibility studies, to descriptions of production processes, and to terms of agreement with foreign suppliers. But such questions as, for example, how the projects are conceived; why a particular technology is selected; what long-term factors have been considered; why one source of supply is preferred to another; who makes the decision; what alternatives are considered in making them; and what consequences are entailed, are still questions which are either not answered, or are treated inadequately. The same applies to the subject of local efforts in the region to adapt imported technology and develop local technological capabilities. Although some of the countries by now have more than three decades of history in industrialization, little is known about their experience in adapting imported technologies to local conditions, and about their successes or failures in developing local capabilities and attaining self-reliance. This study deals with the type of questions just mentioned.

#### A. Statement of the problem

2. The demand for technology is generated in two areas: through investment in new projects and production facilities, and through reviving, improving and expanding existing activities. In the ECWA region there has been, in the last three decades, considerable investment in technology. Substantial funds have been spent on acquiring new technologies, particularly in manufacturing.

3. Often the way in which this demand for technology is expressed, and the way in which the demand is channelled to a particular type of supply source, plays a decisive role in the development of the local scientific and technological system. Thus in order to develop the technological base in any country, the local system should be operated in such a way that the local demand for technical knowledge is channelled towards local sources of supply. Otherwise attempts and policies to develop

or improve local scientific and technological capabilities, no matter how serious, would fail to achieve very much.

4. The study therefore perceives the problem in the following way. All important and broad patterns of demand for technology are the result of a set of micro-decisions about technology which are taken within the process of investment. This structure of micro-level decision-making ultimately determines the sources and nature of technology needed in establishing and expanding production. Policy efforts to develop the capabilities to supply technical knowledge in various forms may be rendered relatively fruitless if, for example, the patterns of demand do not impinge on the local scientific and technological systems.

5. However, despite the importance of technology-decisions within the investment process, very little is known about:

(a) Who actually takes the key-decisions about technology?

(b) Do different kinds of decision-makers in similar situations take different kinds of decisions?

(c) What factors effort the way decisions are taken?

(d) When, within the investment process, are key decisions taken which more or less irrevocably fix the technological dimensions of the investment activity?

(e) What options as to specifications and sources of technology are considered within the decision-making process, and what considerations influence the choices made? And is development of local technological capabilities considered?

(f) What are the development implications of alternative patterns of decision-making?

6. These are the type of questions which are considered in this study. The information generated is based on concrete cases of technology decision-making. It is hoped that the information, together with the methodology used, will help others to undertake similar studies at national and regional levels.

#### B. The working hypothesis of the study

7. The major emphasis in this study is on providing information on technology decision-making in the investment process in selected manufacturing activities. The study follows an analytical approach in which causes and effects are investigated to

help technology policy-makers draw their own conclusions. However, while this is the major aim of the study, there are also a number of underlying hypotheses which are investigated in the course of the study:

(a) That in the ECWA region there has been some significant adaptation and development of technology but this neither has been properly recorded, nor have the right inferences been drawn from it. This situation is denying technology decision-makers in the region the benefit of the learning process involved;

(b) That with careful research more appropriate technologies can be obtained and developed. This would enable the countries concerned to follow a technology transfer process with a lower degree of packaging and a lower cost, and one which ensures a higher degree of local participation both in technological decision-making and in technological functions. Therefore, the learning opportunities will be enhanced and allow greater acquisition of technical knowledge;

(c) That although not always consciously, or overtly stated, some technology decision-makers, both in the public, private and mixed sectors, are nevertheless aware of the long-run strategic consequences (learning opportunities, self-reliance, etc.) of various technologies.

### C. Methodology of the study

8. The strategy followed in the study is to provide methodological guidance based on concrete case studies, and engage national, (and regional) institutions themselves to undertake similar technology policy research. The purpose of the strategy is to generate solid information on the basis of which useful inferences can be drawn.

9. To attain this end, the most suitable approach was to conduct a comprehensive analysis of technological decision-making in a small number of pioneering cases, where the type of technological decisions taken have significant relevance to the type of problems the region is facing in the field of transfer of technology and development of local capabilities.

10. The factors, which were taken into consideration when selecting the cases were:

(a) The potential of the cases to enrich our knowledge of the process of technology adaptation and negotiation. These two factors are among the vital problem areas in the field;

(b) The usefulness of the cases for illustrating the relation between the process of adaptation of technology on the local level and changes in technology on the international level. This included changes and adaptation in the production techniques, in the production process, in the product design and the materials used;

(c) The informative nature of the cases regarding the role played by the process of the search for technology;

(d) The ability of the cases to show the effect of access to the sources of technology changes;

(e) The potential of the cases to reflect the critical importance of knowledge of the trade and keeping abreast with technological progress;

(f) The potential of the cases to illustrate the mechanism of technological decision-making;

(g) The inclusion of the cases of informative interaction between the process of decision-making and the trade, economic, industrial and financial policies in the country;

(h) The usefulness of the cases for depicting different patterns of management and ownership.

11. Two cases have been selected for this study. The first is a factory which produces refrigerators, and the second is a factory which produces television receivers. The two cases are different in the pattern of ownership, in the way they were established and developed, in their operation, financing, and management, and in their relation with suppliers of technology. They are also located in two different ECWA countries.

12. The first case study is of Al-Haj's Factories for assembling refrigerators and manufacturing refrigerator parts. This is a privately-owned, and family-operated company with branches in four countries. It produces commercial and household refrigerators (which have open display shelves). It has been responsible for constructing and operating a refrigerator factory in another Middle Eastern country with an output capacity of 150,000 units a year. This case illustrates the decision-making process in the ingenious local technological adaptation and innovations which were continuously introduced into the production methods and processes, and which were the corner-stone in the company's success.

13. The second case study deals with a company which assembles television receivers and produces television components. The company was formed by amalgamating a number of small private enterprises brought together as part of a government industrial-

ization strategy. It is a joint-stock holding company with the State owning a large, but not the largest, share. It is engaged in a number of manufacturing activities, but only one of its major activities has been considered, namely production of television sets. The company is now composed of a number of integrated factories and produces more than 100,000 television sets a year. It employs nearly 300 workers, and it is managed as an independent enterprise. The decision-making process here was studied at various stages: conception, amalgamation, prefeasibility, feasibility, designing the contract, selection of contractors, unpackaging, construction, operation, adaptation, management and expansion, as well as the type of strategy pursued to attain self-reliance as defined by the Company.

14. Finally, it is to be noted that the aim in these two case studies is not to compare the decision-making process. It is rather to study the different aspects of the technological decision-making involved in the two types of industrial activities considered.

D. How will this project help policy-makers and decision-takers in the field of science and technology in the ECWA region?

15. The working hypothesis in this respect is that the policy and decision problems which are faced at the enterprise level can only be effectively handled by entrepreneurs and technical managers, and those which are faced at the national level by national policy-making bodies and local decision-making authorities. These are usually in possession of detailed information and are better placed to formulate strategies and policies, as well as to find a solution for technology problems. However, as a study in technology policy research, this study is aimed at helping technology-decision makers in the following ways:

(a) In a number of ECWA countries the organizations and agencies responsible for decision-making and for the management of technology may not be as well-developed as in others, or as well-established as in other fields (e.g. finance, mineral). Therefore, in-depth case studies of the type carried out here will help to inform decision-makers in similar industries about the experience in neighbouring countries;

(b) As the strategy for conducting this study necessitates close association and co-operation not only between ECWA and the member countries, but also among the member countries themselves, it is hoped that they will help to promote regional co-operation;

(c) In the countries in which the case studies are located, the study will show the type of technological problems

faced and how they were dealt with. This may help to identify and deal with similar problems elsewhere:

(d) By showing the complexity of the decision-making process, and by illustrating the interactions and interrelations between the various technological decisions from the region's own experience the study will help to enlighten us about the type of problems to be dealt with.

#### E. Summary and conclusion

16. The first case study analyses the technological decision-making process involved in adapting production methods, machines and products in a refrigerator factory. By adapting the products the company was able to secure the local market. By adapting the machines and the production methods the company was able to enter a competitive market, and to design, set-up and operate refrigerator factories elsewhere, inside and outside the region. One indicator of the company's success in technological adaptation, was its ability to acquire and adapt the know-how which gave it the advantage of attaining economies of scale even with a relatively small-scale production. This advantage helped the company to win contracts for establishing refrigerator factories abroad. The case also highlights how the management of the company came into contact with the technology involved, how they learned and accumulated the knowledge, how they followed-up on technological changes, what methods they used to up-date their knowledge and the pattern of technology transfer they relied upon.

17. The second case is almost an exercise in how to prepare the ground for the transfer and development of technology in a semi-public sector industry. The case involved was a television factory. However, it was not a mere television factory which was being considered, but the role of that factory in building the electronic industry in the country. For, unlike the case study of the refrigerator company, where the technological changes seem to have been confined to product design, material use, machines and production method, the changes in the television factory included the technology system itself. Hence in selecting the technology suppliers preference was given to innovators and technology leaders in the field. Localization of production of parts as well as interrelation with other industrial activities was also emphasized.

18. In both case studies examples are given of how the companies managed their affairs in familiarizing themselves with the dynamics of the market structure.

19. The two cases considered provide further evidence that industrial development is a dynamic process, and that this dynamism will have to be maintained from the moment the idea of establishing the industry is conceived. The dynamism of the industrial development process stems primarily from the dynamism of technological development. The two cases demonstrate that the more care taken of long-term strategic factors, the better is the search carried out for the technology needed; the more well-prepared technology transfer agreements are; the better is the access to the sources of technology supply and technology change, and the better are the changes that the industry will attain its goal of self-reliance. The two cases also demonstrate that within the concept of self-reliance there is a prospect for considerable gain if the technology decision-makers conduct market research for the technology needed.

20. Most of the intricacy of technological decisions stem from the need for close interaction with a number of factors. Some of these factors are internal to the production operation and some external. These factors have been discussed in detail in the study. Briefly, they include:

(a) Environment of the operation. This includes the type of technical and technological changes that are taking place, whether in the production process, product design, or use of raw material, etc. It also includes the nature of the market for the product, the raw materials and the technology;

(b) Interaction with government trade, economic, financial and technology policies;

(c) Interaction with regional co-operation schemes and policies;

(d) The state of supply of technical know-how;

(e) The state of access to information on foreign and local supply of technology and technology changes;

(f) The pattern of management and ownership;

(g) The policies and strategies applied for accumulating technological capabilities;

(h) Avenues of interrelations that exist between the various sources of supply of technological know-how;

(i) The existing institutional set-up concerned with industrial and technological development;

(j) The style of management, the philosophy of life of the decision-makers and the type of incentive.

21. The study also spells out the ingredients of a successful technology strategy. These can be delineated as follows:

- (a) Possession of full knowledge about the product, the method of production and the the machines;
- (b) Awareness of the type of changes to which each element of the production is exposed and flexibility in the decision process to acquire the changes needed;
- (c) Easy and efficient access to the sources of technological changes;
- (d) Application of modern means of communication to secure contacts with the sources of technology changes;
- (e) Emphasis on up-dating management and other decision-makers' knowledge of the various aspects of the production process;
- (f) Close contact with the product market and speedy response to changes in consumer taste;
- (g) Speedy incorporation of efficiency-enhancing changes, whether in the type of raw materials used, in the design of products and machines, or in the organization of the factory;
- (h) Maintaining an element of continuity in the work of the decision-makers to enable them to use the results of their learning process to the company's advantage;
- (i) Emphasis on special training for those responsible for searching for technology and drawing up technology contract agreements;
- (j) Strategic importance given to establishing links between the operation of the industries and the operation of education and scholarship systems so that the new cadres will have advance preparation in the type of scientific and technological problems they will be dealing with;
- (k) To keep close links with the supply sources of technology. To do this decision-makers may have to use several of the following:
  - (i) Visiting and working in foreign factories;
  - (ii) Frequently visiting exhibitions;
  - (iii) Enrolling in relevant new courses;



- (iv) Receiving current publications;
- (v) Continually training employees in new developments in its operations;
- (vi) Keeping abreast of all changes introduced in competitive products;
- (vii) Establishing close and formal links with students in higher education institutions inside and outside the country;
- (ix) Responding to consumer demands;
- (viii) Participating in meetings and seminars: the production.
  - (x) Responding to consumer demands;
  - (xi) Developing internal capabilities in all sensitive areas of the production.

**TECHNOLOGY POLICY CRITERIA AND PROJECT EVALUATION PROCEDURES**

1. In the past decade there has been increasing concern about the technological dependence of the least developed countries (LDCs) on the developed countries (DCs). This concern arose especially in Latin American countries and often in relation to the general dependency theories developed in that period. Concern about overall dependence has not been great in the ECWA countries, but concern about technological dependence in this region has become more pronounced with the increasing awareness of the undesirability of this state of affairs.

2. The characteristics of technological dependence can be summarized as follows:

(a) Foreign rather than domestic inputs in new plants with respect to: (i) system-specific technical knowledge; (ii) engineering services required to transform (i); (iii) capital goods; and (iv) consultancies and techno-managerial services;

(b) Stagnant or static production units with: (i) limited increases in productivity; (ii) limited technical changes to fit or adjust to domestic inputs or new combinations of inputs; (iii) limited creation of backward linkages to domestic suppliers; and (iv) limited production-differentiating technical change.

3. Within the general dependency approach the causes for technological dependence are consistently taken to be external and attention is focused on the items under (a) above, which leads to a dominant concern with the terms and conditions of the transfer of technology and efforts to move away from the turnkey approach by means of unpackaging. The main and general objective is to reduce the monetary costs of establishing new production capacity and to reduce restrictions on its operation such as clauses forbidding exports to certain markets. This monetary attention does not achieve much in reducing technological dependence as outlined above, and in many cases the monetary aims are harder to obtain than anticipated, owing mainly to the limited indigenous technological capacity available.

4. From the technological point of view, the creation of new industrial capacity basically involves the transformation of system-specific knowledge into an operational production system. This transformation requires both the techno-transforming knowledge to transfer the system-specific knowledge and the techno-managerial knowledge required to execute the associated techno-managerial, decision-making tasks. All this knowledge then has to be applied to select the material inputs - from construction materials and semi-finished products to ready-made equipment - and to process and combine them into a new production unit. It is important to stress that the possibility to develop technological capacities in connection with investments

in new production capacity is well recognized, but a number of incorrect notions inhibit the proper use of this possibility.

5. In the process of industrialization, most of the attention is usually given to the selection of the right type of industry followed by the selection of the right type of techniques to be chosen in the selected industries. Thus the focus is on questions dealing with the establishment of new production units, and this may be called a static perspective with the attention when compared the dynamic perspective of focusing on how to improve the operation of established units.

6. The question of institutional relevance in the ECWA region is empirically taken up in the study. The scheme used is useful for pinpointing the comments, made on different levels of basic project evaluation methodology. Comments were made on: the level of data availability and sophistication; the level of implementation of approved projects; dynamic versus static resource allocation; the level of interaction between enterprise and evaluation; the level of interaction between evaluation and national policy; inconsistencies between evaluation objectives and national policies.

#### A. Summary

7. Concern about technological dependence was initially linked to concern about overall dependence of less developed countries on developed countries in a self-perpetuating way. The development, however, of what are now called the newly-industrialized countries, has released most of the prevailing pessimism and shifted attention to the conditions prevailing and to the policies pursued.

8. Concern in the ECWA region with technological dependence has been more pronounced in the face of the rapid development of project in the oil-rich countries and the 'technology-free' methods of implementing these projects.

9. A major requirement for reducing technological dependence and breaking vicious circles is the development of technological capacities. These have been defined as the capacities to create and change productive capacities and they include the stock of technological resources - mainly in the form of qualified manpower with access to the relevant knowledge - and the institutional organization to activate and employ these resources. The capacity to operate and maintain a productive unit explicitly is not included in the technological capacity, but it is part of the productive capacity, i.e. the capacity of a production unit to produce output in the form of goods and services.

10. Technological capacities can be broken down in four different components: system-specific, techno-transforming, techno-managerial and techno-improvement capacities. The system-specific capacities comprise the knowledge of, and experience with, the design of the system-specific elements, and they are different for, and thus specific to, different sectors or industries. Techno-transforming capacities comprise the resources to translate and transform the specific knowledge into a production unit and the techno-managerial capacities are needed to manage all the stages of what has been called the transformation process.
11. The three capacities just specified are all inputs into the transformation process together with the material resources. Output of this transformation process is, on the one hand, the addition to the productive capacity in the form of the new productive unit and, on the other hand, additions to all four technological capacities through the experience gained in the involvement in the transformation process. The fourth capacity, i.e. the capacity to improve an existing operating unit, depends to a large extent on the involvement in the design and construction, i.e. in the transformation process.
12. Even though technological capacities are developed in the involvement of the process of establishing a new production unit, one unit will not be sufficient, nor will this development take place as an automatic, free and unavoidable by-product of this involvement. (see point 13, 14 and 15).
13. The development of technological capacities in most sectors normally is a matter of decades and the choice to develop those capacities has to be made on a sectoral basis instead of on a project basis; the development will require a sectoral and long-term strategy and commitment which will require involvement in projects, national and foreign resources and continuing educational and training programmes.
14. A variety of learning mechanisms is involved in the development of these capacities. Those based on 'doing' or even 'changing' are rather limited and are fully inadequate for transitions into qualitatively different methods of production. Other learning mechanisms require both attention and resources and are related to systematic performance evaluation, searching and others. Application of these methods reinforces both the enterprise performance and the various technological capacities.
15. Extensive training has been obtained in a number of firms in newly industrialized countries. Mechanisms, in addition to learning and training, are those of 'reverse engineering' and 'parallel activities.' The first entails analysis of machinery, often beyond the point of dismantling, and the latter refers to design and engineering activities undertaken by the 'local'

staff parallel to those activities by consultants in the transformation process, just to test and improve their own capacities.

16. Policy attention is often focussed on the 'right' choices with respect to sector and technology, with little attention to the dynamic aspect of improving and adapting a production unit once it has been established. Evidence from most of the case studies in the ECWA region, confirm the importance of this dynamic perspective in which the establishment of a new unit or an expansion is an important, but not the only, concern.

17. Methods for project evaluation tend to emphasize the static or selection aspect. The purpose of the methods is to assess the costs and benefits of a project in national social economic terms and this will usually involve the calculation of a set of shadow prices for its inputs and outputs, different from the market prices on which the private assessment has been based. The standard methods developed do not seem to be very suitable for the developing countries for which they are intended and the survey of the ECWA region has made clear that standards as set by the main schools of thought are not being adhered to.

18. The lack of suitability is partly related to the sophistication of data and assumptions required and partly inherent in the inconsistencies in national policies, which cannot be solved by evaluation methods at the project level. Project evaluation is a practical necessity as long as projects are selected on a project basis. The result of a project evaluation, however, is contingent on many of the national policies and not an objective result independent of these policies, and certainly no substitute for them. And in all evaluations a lot will depend on the judgement of the evaluator. With these limitations in mind, project evaluation can be a useful tool, both in the selection of projects and as a source of feedback for the policy levels. With this more limited approach, attention should be shifted from obtaining the correct present value to raising the relevant questions. In line with this, the evaluation should not be a one-way station in the process of decision-making to assist the higher levels in their decision, but it should interact with the project formulators to improve the formulation. Sophisticated selection methods alone do not improve project proposals.

19. In all countries the selection of projects is based on a combination of economical and technical considerations and other ones, which may be grouped as political. In this respect, the ECWA region is not different from any other region, nor is it so in its limited adherence to standard evaluation methods. In many of the ECWA countries, the agencies engaged in project evaluation have developed their own standard method which is a combination of elements from the standard schools and rules of thumb.

20. In all countries, visited for this study projects need a licence from government - usually from the Ministry of Industry - and thus all projects are registered. To obtain a licence would usually not pose too many problems, unless the selected sector was overloaded or unless some other conditions were not met. These conditions were more strict in the more developed countries. In most countries the attitude towards projects was promotional rather than restrictive and some countries were facing a shortage of projects even though there were numerous incentives. A common requirement for obtaining a licence was the presentation of some study or at least some data to show the viability of the project. The larger the project, the stricter the rules. And to be eligible for incentives such as tax holidays or rebates, additional requirements had to be fulfilled and decisions on the selection of the projects qualifying for these incentives were usually taken by a committee at the deputy ministry level and often sent upwards for approval.

21. No one of the 10 out of 13 ECWA-countries visited, had a separate agency for and with the sole responsibility of project evaluation. Some of the countries had a significant capacity to carry out their own pre-feasibility and evaluation studies, while others had to depend to quite some extent on outside sources.

22. Some of the other differences between the countries are rather obvious. The most important ones are the differences in wealth related to oil, differences in size and population, in the political system and in the overall level of development. These differences are reflected in different problems, priorities, objectives, constraints and policy options. Most of the Gulf States are so small in terms of population and area, that co-operation between them will be a logical and necessary step in many areas. On the other hand, their very smallness allows them to use institutional arrangements which are not suitable for other countries.

23. Thus, even though some of the options available will be conditioned by the national circumstances, the differences in performance by different enterprises in the same country indicate clearly, that their possibilities for developing their technological capacities are not fully conditioned by the national data, but depend to a considerable extent on the attitude and the capacities of the management.

24. The case studies in the ECWA region covered about half the ECWA-countries and a variety of sectors: cement, phosphate, television and refrigerator assembling and manufacturing, clay bricks, military aircraft and steel. Success or failure does not seem to depend on the type of sector and within most sectors a variety of subsectors and of strategies is available. In most of the cases a strong government backing was available and in

some cases the protection provided may not have served the right purpose. One case only was a fully privately-owned company and the lack of support resulted in a completely competitive and highly flexible one. In another case the support from the Government was only partial and there was continuous conflict between a result-oriented department and an experimental or development-oriented one which did not seem to be typical. The case of the military aircraft is encouraging in the sense that it shows what results can be reached if support is sufficient and sustained.

25. However, all cases show that it is hard to generalize and that a lot of specific research remains to be done, both in relation to the (sub)sector and in relation to the institutional arrangements in the specific country.

26. The limited scope of generalizations at the sectoral level is supported by the information on the design and construction of airports and larger dams obtained in some of the ECWA countries. The design of an airport, for instance, should be broken down to the design of the runway, the terminal, the hangars and so on. An overriding constraint in the development of capacities in both of these areas is the limited and unsecured workload on a national basis or even at a regional basis in the case of dams, where most of the major ones have been implemented already. In the case of airports a wide variety of consultants and contractors is available and just from the economic point of view it does not seem to make much sense to aim at full-fledged indigenous capacities in this field with all its system-specific knowledge. The relevant question then, is not whether or not to develop this capacity, but which elements of it and to which extent.

#### B. Some Suggestions

27. the borderline between conclusions in a summary and suggestions is rather narrow and some of the suggestions have been indicated already. The suggestions in this section will be rather general as far as they do not deal with the central questions of this study: is it possible and sensible to include criteria relating to the development of technological capacities in the methods and procedures of project evaluation and selection, as they are applied in the ECWA region? The answer given is "no"; it might be possible but it would not be sensible. Instead of concentrating efforts on improvements of selection and evaluation methods, it is preferable to concentrate on the improvement of the process of project formulation. For this purpose a check-list has been made to be used both by the project formulator and by the project evaluator. The check-list contains an introduction on the subject of development of tech-



nological capacities to make it self-contained and the main purpose of the 30 questions is not so much to obtain an answer, but to direct the attention of the project formulator. Answers to the question will certainly be needed by the evaluator and again not so much the answer, but the fact that the question has been answered, can serve as some check on the proper attention in the formulation, but of course not as a guarantee. If the capacities of the evaluating agency are sufficient, it can go into the details of the answers and provide the formulator with suggestions and comments. Preferably evaluation should not be only to report to the decision-maker, but to improve the formulation of the project proposal. As a third option, the check-lists can be used by the evaluating agency to monitor projects from the perspective of the development of technological capacities.

28. No one of the ECWA countries has at present a central agency dealing with project evaluation as its central task. The functions described are analytical and do not suggest the establishment of any such agency with just this task, even though it might be conceivable. No institutional suggestions will be given, as they can only be properly made in country-specific studies.

29. Thus the proposed task of project evaluation with respect to technological development is not to select between 'good' and 'bad' projects from this perspective, but to check whether projects, which are acceptable on other criteria, have given due attention to technological development or whether improvements in this connection are possible. Decisions as to which technological capacities are to be developed, i.e. in which sectors and to which extent, have to be made previously and at a higher level. Technological capacities are sector-specific for their system-specific component and in some sectors the specificity is well below the sector level. The development of the capacities in most sectors will require a number of projects and a commitment for several decades. Thus the project level is not the proper level to make these strategic decisions. The considerations that will have to go into this decision go beyond the context of the present study. One of the requirements, however, will be a detailed analysis of the sector, in terms of the capacities needed and the resources required to establish them, the number of components within the sector and their interrelatedness etc. Decisions at this level and over such a time span cannot be supported by any accurate economic analysis, but will depend on clues if not on absolute priorities and will involve an enormous element of risk. It took some countries over 20 years to establish a viable rayon industry or a steel industry, and there was no guarantee that the effort would become successful and worthwhile. However, once the strategic decision has been taken, economic analysis can be helpful in defining subsequent steps and their phasing and in an evaluation of their

partial successfulness. Efforts and resources required can be very costly and may involve many steps; a Korean steel company sent a total of 1,300 engineers and technicians abroad for on-the-job training in developed iron and steel mills, and a Brazilian steel plant awarded over 200 contracts over a 10-year period to obtain specific knowledge from external sources. These figures are much higher than what will be required on the average, but they clearly indicate the relevance of continued and unambiguous support. On the other hand it shows that companies and their Governments take decisions to engage in such efforts because ultimately they expect to benefit from them.

30. Decisions about sectors on which to concentrate will normally be related to national policies dealing with education, import and export, regional co-operation etc. Policies at these levels provide the parameters for the project evaluator and set the overall climate for the development of technological capacities. Important issues are the question of protection of infant technological capacities and 'right' and 'wrong' methods of providing this protection. These issues are not the subject of this study and all that can be offered in the study is a number of references to studies dealing with general technology policy issues. A suggestion that might be considered is a risk-covering system either on a national or on a regional basis to insure companies that invest in the development of their technological capacities. Such a scheme would raise quite a lot of insurance, technical and institutional problems, but it might be worth investigating.

31. The suggestions so far, may have given the impression that solutions have to be provided from and by the top. It has been argued, indeed, that strategic decisions about the development of certain technological capacities should be taken at a higher level than that which deals with project evaluation. Similarly it has been indicated that whatever method of project evaluation is applied, its result will be in the context of higher policies and can be no substitute for these. However, development of technological capacities is not a question of yes or no but of degree and a selection of components. This leaves considerable scope for the management of any organization to take initiatives and to develop capacities, especially in relation to the necessity to improve and adapt existing production units. The choice of sectors, however, in which to develop a full and competitive capacity, should be taken at a high level because of the commitment required and because of the empirical necessity to concentrate efforts on certain sectors or industries, instead of spreading them too thinly all over.

WORKSHOP ON STRATEGIC FACTORS INVOLVED  
IN IMPORTING TECHNOLOGY FOR  
INDUSTRIAL DEVELOPMENT,  
2-24 OCTOBER 1983

1. The workshop focussed on the possible complementarity between (a) importing technology for investment projects, and (b) the development of technological capacity in the importing economy.
2. Industrial technological capacity has been delivered in a limited way. It does not consist of all skills and knowledge concerned with industrial production. It consists of those skills and knowledge which contribute to changing the technical basis of industrial production, either by:
  - (a) Improving the technical (economic) efficiency of production facilities which already exist; or by
  - (b) Contributing to the creation of new production facilities which may or may not incorporate innovative elements.
3. The overall process of industrialization involves the creation of two kinds of industrial resources:
  - (a) Industrial production capacity, the output from which is manufactured goods with given specifications and costs;
  - (b) Industrial technological capacity, which contributes to change in industrial production capacity.
4. Industrial technological capacity consists of:
  - (a) Technical knowledge related to a particular industrial production system (the knowledge which is incorporated or embodied in product specifications, production processes or operating procedures);
  - (b) Technical knowledge, skill and experience requested to carry out particular functions involved in changing or creating production facilities;
  - (c) Organizations to contain, absorb and deploy those two kinds of technical knowledge.
  - (d) Patterns of institutional interaction which link different organizations to each other, as well as to investment projects and ongoing industrial production;
  - (e) Physical facilities (instruments, tools, etc.).
5. Industrial technological capacity incorporates four broad categories of capacity, namely the resources required to carry out:
  - (a) Various types of industrial R & D (usually delivered as creating new knowledge about industrial production);

(b) Various types of engineering which draw on new and existing knowledge to create the specifications for new production facilities or for changes and improvements in existing facilities;

(c) Various types of equipment production, which transform engineering specifications into the hardware of production;

(d) Various types of techno-managerial function, which decide about, co-ordinate, and monitor the activities listed above.

6. The relative importance of those different components (and subdivisions of them) will vary:

(a) For a given sector, it will vary with different objectives about the degree of control over and direct responsibility for, the process of changing the production capacity of industry;

(b) For given objectives it will vary between different sectors of industry.

7. Central concerns for technology policy are therefore about the scale and composition of the technological capacity which should be built up over particular time periods alongside the investment in industrial production capacity in particular sectors. A derived policy concern is about how to achieve those objectives. Within that, one more detailed concern is about how to manage and organize the process of importing technology to create production capacity in ways which will contribute to, not conflict with, the realization of those objectives.

8. Typically there appears to be little or no complementary relationship between technology imports and the development of local technological capacity. By a slow process of accretion, local capacities may be accumulated to play a role in providing relatively peripheral inputs to investment projects or to implement intermittent minor changes to existing facilities. But, the process of international technology transfer usually adds little to local technological capacity - and adds that very slowly. Technology imports add to local production capacity, but at best only marginally to local technological capacity.

9. With the slow growth of technological capacity alongside the rapid growth of production capacity, significant economic (and other) costs are incurred by the technology-importing economy. These are most evident in two areas:

(a) Initially-imported production systems often remain technically stagnant, and are not improved by incremental forms

of technical change which yield significant economic gains in technologically dynamic economies. Indeed initial levels of production efficiency may decline if capacities are not available to manipulate technology and offset reunifiable decay processes. (This also points to the importance of acquiring adequate operating skills and knowledge, especially those which overlap with the skills and knowledge required for technical change);

(b) Progress through various levels or degrees of technological self-reliance is at best very slow; the substitution of locally-produced for imported technico-managerial and technological imports for investment proceeds very slowly. That progress typically runs into "thresholds" where a step-jump is needed to develop kinds of technological capacity which are qualitatively different from those already accumulated. This slow progress and periodic stagnation often imposes significant costs on the economy.

10. The limited or non-existent complementary relationship between technology inputs and the development of technological capacity is not inevitable. Particular approaches can be taken to the acquisition of foreign technology which will result in a positive complementary relationship. These include:

(a) Various steps at the preparatory phase of investment/transfer projects (details illustrated and elaborated in the workshop and in related documents);

(b) Various actions during the implementation of projects (details illustrated and elaborated as above);

(c) Follow-up action after the completion of investment projects. These may constitute steps taken in advance of subsequent projects (details illustrated and elaborated as above).

11. These steps would constitute the means of implementing longer-term strategies using transfer investment projects to complement other measures for investing in industrial technological capacity alongside the process of investing in industrial production capacity.

12. These efforts will involve costs and risks over and beyond those involved merely in using transfer/investment projects to add to production capacity. Depending on the situation, attempts to proceed very rapidly with the development and use of local technological capacities may run into areas where costs exceed benefits. What it is sensible to try and do will therefore depend on the specific characteristics of particular situation - although usually the benefits of doing more than is typically done, will far exceed the costs.

13. A major problem arises because many of these benefits will accrue outside the scope of individual investment projects and in the longer-term for the enterprise established by the project. Those whose interest and responsibilities are specific to the projects will seek to minimize immediately the costs and risks of those projects, and will give little significance to benefits which accrue outside the particular project/enterprise concerned. The effort that is actually made to use transfer investment projects to develop technological capacities will therefore usually be less than would be desirable in the light of broader perspectives at the national (or even multi-country) level.

14. In principle, Governments might step in to close the gap between interest and project-specific interests. They might:

(a) Set broader objectives for the management of transfer investment projects, which take account of the social desirability technological capacity alongside production capacity;

(b) Take measures to ensure that project management is in practice aligned more closely to those broader objectives (e.g. administrative regulation, subsidy, risk-offsetting insurance).

15. However, governments are neither abstract nor homogeneous entities. They constitute agglomerations of representatives of different interest groups including interest groups within their own bureaucracies which may have responsibility for implementing investment projects. Significant elements within these various groups may see their own interests in the short-term minimization of the costs and risks involved in investment projects. They may have no interest in raising those costs and risks to invest in the resources of technological capacity which will yield benefits that accrue only in the uncertain longer-term and to others unrelated to their specific projects. In such situations Governments may set no coherent long-term objectives about developing technological capacity. With these absent, there is nothing to articulate down to the particularities of individual sectors, and nothing to link from these through to the management of particular projects.

16. This highlights the potential significance of bodies within the structure of Government which have responsibility for technology policy. Such bodies can act in the interests of the nascent technological capacity in industrializing economies. However, to play that role, they cannot rely on restating generalities about the desirability of 'technological self-reliance'. They must generate 'hard-nosed' empirical evidence about the returns to investment in technological capacity (evidence about the costs of not investing in these resources). That evidence must be meaningfully rooted in the experience of their own societies. It must also be accompanied by (a) outlines of

defensible strategies for the cumulative development of technological capacities in particular sectors of industry, and by (b) indications of the measures that may be effective in realizing these strategies and in ensuring that these capacities, once created, are actually used (where efficient) in the process of industrialization.