INTERNATIONAL ACTION PROGRAMME ON
WATER AND SUSTAINABLE AGRICULTURAL DEVELOPMENT

PROGRAMME D'ACTION INTERNATIONAL POUR L'EAU ET LE DEVELOPPEMENT AGRICOLE DURABLE

PROGRAMA DE ACCION INTERNACIONAL SOBRE EL AGUA Y EL DESARROLLO AGRICOLA SOSTENIBLE

COUNTRY AND SUB-REGIONAL ACTION PROGRAMMES
PROGRAMMES D'ACTION NATIONAUX ET SUB-REGIONAUX
PROGRAMAS DE ACCION SUBREGIONALES Y DE PAISES

SUMMARIES
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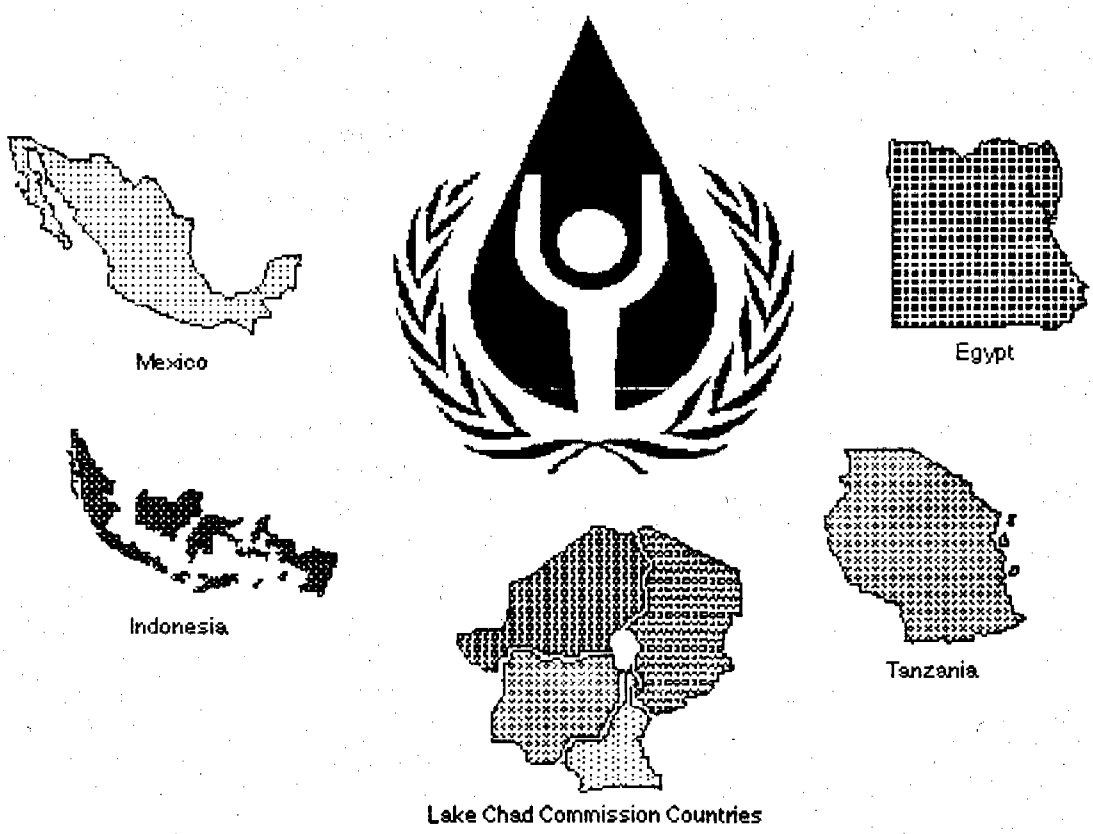

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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ACTION PROGRAMME

ON

WATER AND SUSTAINABLE AGRICULTURAL DEVELOPMENT

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ACTION PROGRAMME

ON

WATER AND SUSTAINABLE AGRICULTURAL DEVELOPMENT

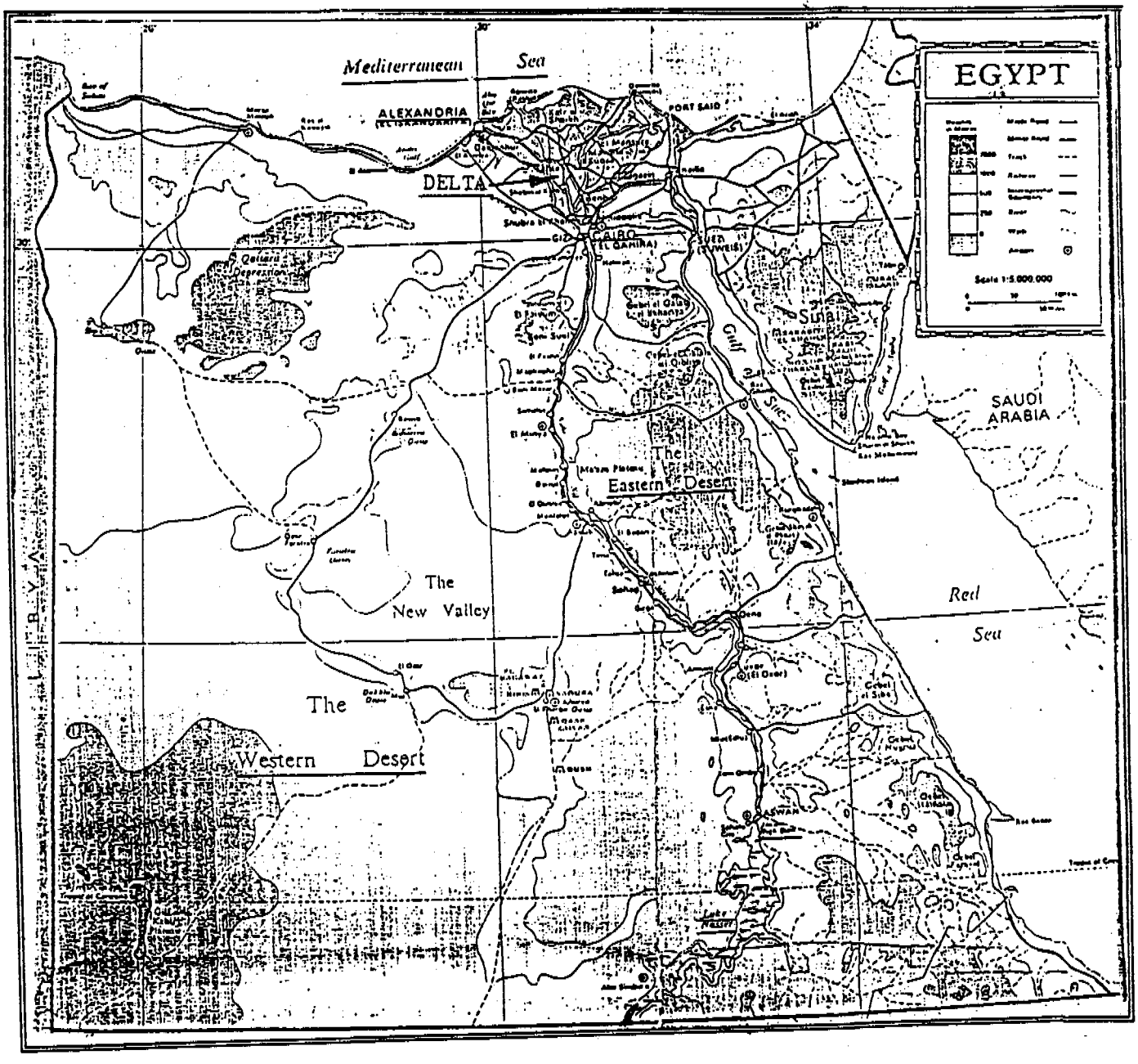
ARAB REPUBLIC OF EGYPT

SUMMARY

Ministry of Agriculture and Land Reclamation
Arab Republic of Egypt
Food and Agriculture Organization of the United Nations

and

Canadian International Development Agency


EGYPT
Mediterranean Sea
ALEXANDRIA
PORT SAID
DELTA
CAIRO
SUEZ
Sinai
Gulf of Suez
SAUDI ARABIA
The Eastern Desert
The New Valley
Red Sea
The Western Desert
ASWAN
Lake Nasser

1. BACKGROUND

Despite the River Nile, the High Aswan Dam (HAD) and the world's most ancient and extensive irrigation systems, Egypt seems unable to keep pace with the increasing food demands of it's population growing at an alarming rate of 2.5% annually. Although HAD enabled Egypt to double it's irrigated area and increase the cropping intensity to nearly 200%, the country is importing nearly 50% of its food requirements.

Of the total surface area of just over one million km^2, arid desert land accounts for 96.5%, leaving only 35 000 km^2 or 8.5 million feddans of urban and agriculturally productive land. About 99% of the total population of 56 million is concentrated along the coastal zones and in the Nile Valley and Delta. The population density of 1300 people per km^2 in the Delta is one of the highest in the world.

Under the 1959 Nile Agreement with the Sudan, the availability of water to Egypt from HAD is limited to 55.5 BCM annually. Although a large potential exists to augment Nile's inflow to HAD by constructing the water conservation schemes in the Equatorial Plateau, the most optimistic estimate of possible augmentation by the completion of the Jonglei Canal does not exceed 2 BCM. If all feasible additional conventional and non-conventional resources are added, the total annual water availability by the year 2000 would be 74 BCM and this would be just adequate to satisfy the total irrigation and other demands of an additional new land area of about 3 million feddans. However, as the population and its food requirements continue to rise beyond 2000, the availability of water rather than land would become the major constraint.

Already, intensive and often improper agricultural practices have caused problems of land degradation; namely, reduced soil fertility, rise in groundwater table, waterlogging and soil salinization. The pollution of water sources is another serious problem; the main causes of pollution are: (i) inefficient application of irrigation water to the fields, (ii) excessive use of fertilizer and pesticides, and iii) discharge of untreated sewage into the Nile, irrigation canals and drainage ditches. The use of nitrogen-based fertilizers has increased four-fold during the 28-year period 1960-88 and the nitrate contamination of groundwater has become a major environmental hazard.

It is evident from the foregoing, that the country has to develop its agricultural sector under several limiting natural resource base and environmental situations. In this effort water management will play a key role, as Egypt's agriculture is one hundred percent dependent on irrigation. Therefore, sound water resources development and management policies and programmes will constitute key components of Egypt's efforts to achieve sustainable agricultural development.

2. THE ACTION PROGRAMME

In developing the Action Programme, the following guidelines have been adopted:

a. it conforms, as much as possible, with the definition of sustainable development, namely, not detrimental to environment, technically appropriate, economically viable and socially acceptable;

b. complies with the natural resources of the country; seeks an integrated rather than a sectoral approach to development; aims at satisfying the wishes of the main target groups: farmers, villagers and the fishermen;

c. takes into account the national objectives as set out in the 5 year economic development plan and reinforces some of the ongoing programmes being implemented by bilateral and multilateral technical and financial assistance.

d. aims at assisting the GOE in implementing the land and water master plans by adopting an integrated approach to development.

The strategy

In the first place, the programme aims to strengthen intersectoral collaboration and institutional coordination. Considering the vital need for an integrated and holistic approach, coordination and cooperation at all levels between the Ministry of Agriculture and Land Reclamation (MALR), Ministry of Public Works and Water Resources (MPWWR) and other relevant ministries involved is given high priority in the Programme. The Programme calls for the establishment of a special national coordination unit (NCU) consisting of representatives from MALR, MPWWR and other ministries (e.g. planning, environment and health). The NCU will play the dual role of coordinating and monitoring the Action Programme as well as enhancing inter-institutional coordination.

Monitoring of natural resource, developmental activities and the environment and establishment of data base are given high priority in the Action Programme. Emphasis is given to the monitoring of land and water quality and quantity in the Delta, considering the fact that these resources have already undergone severe degradation in this area. Concurrently, the creation of a national water and soil data bank is recommended.

The Action Programme emphasizes an integrated village level agricultural development approach, particularly in the Delta area, where local expertise exist and peoples' participation will be a vital requirement for sustainable development.

Development of agriculture in the new lands is expected to accelerate in the future, the strategy here should be based on a critical re-assessment of the lessons learnt so far. The Action Programme gives importance to systematic training of technicians, extension personnel and farmers in all aspects of agriculture in an arid and desert environment. Establishment of a " demonstration - training - adaptive research facility " is recommended as a component of this strategy.

3. PROJECT ELEMENTS OF SUB-PROGRAMMES

I. Institutional strengthening

This sub-programme consists of two elements: (a) the strengthening of the MALR and MPWWR by the establishment of a national coordination unit (NCU) to coordinate and monitor the Action Programme and to improve inter-institutional collaboration especially at field level, and (b) a critical review of various options available for the possible introduction of a water pricing policy in Egypt.

EGYPT: ACTION PROGRAMME FOR SUSTAINABLE DEVELOPMENT

OBJECTIVES AND PROJECTS

Objectives		Projects	
I.	Institutional strengthening	1. 2.	National coordination unit (NCU) Water pricing
II.	Water and soil management at farm level	3. 4. 5.	Village level agricultural development in old lands (improved irrigation and agricultural practices Strengthening agricultural extension and adaptive research (New Lands Demonstration Farm) Soil survey of the Delta
III.	Environmental monitoring and protectio-.	6. 7. 8. 9.	Monitoring of soil and water quality and creation of National Soil and Water Quality Database Nubaria/Ismailia canal seepage Improving rural water supply and sanitation Water-borne diseases
IV.	Use of marginal quality water	10. 11. 12.	Re-use of treated sewage water Re-use of drainage water Protection of nitrate pollution of groundwater
V.	Management of scarce water resources	13. 14.	Conjunctive use of groundwater Protected agriculture
VI.	Development of fisheries and ancillary services	15. 16. 17.	Marine fish hatcheries Lake Nasser fish stocking and methods of fishing Marketing/cooperatives

II. Water and soil management at farm level

Three project elements of this sub-programme are: (a) a village level agricultural development scheme in the old lands, located preferably in the middle Delta close to the existing agricultural research station at Sakha. This model scheme will be based on an integrated approach to development and will include training and demonstration facilities for farmers and extension workers in on-farm water management, land improvement, re-use of drainage water in addition to improving existing drinking water, sanitation and health facilities in the area; (b) the establishment of a " demonstration-training-adaptive research facility " in the new lands to promote training and transfer of technology in all aspects of water management land improvement, waste water re-use and the environmental aspects of desert irrigation; and (c) soil survey of the Delta, which has not been carried out since 1965.

III. Environmental monitoring and protection

This sub-programme constitutes four projects; (a) monitoring of qualitative and quantitative changes of water and land resources and establishment of a national monitoring net work, analysis of data, and creating a national soil and water quality computer data base; (b) prevention of excessive seepage from the Ismailiah and Nubaria canal system which has resulted in serious waterlogging and high water tables in many areas along the canals; (c) improvement of water supply and sanitation ;and (d) the control of water-borne diseases; the last two project elements to be implemented in village(s) selected for integrated agricultural development.

IV. Use of marginal quality water

Under this sub-programme, three elements namely, (a) re-use of treated waste water (sewage effluent) (b) the re-use of saline drainage water; and (c) the protection of groundwater water from nitrate pollution are included. Egypt has already built up some expertise in the re-use of municipal effluents and saline drainage waters and the proposed projects aim at enhancing this expertise for more extensive use of these non-conventional water sources in future. The nitrate pollution of groundwater due to the intensive use of nitrogen-based fertilizers is a matter of great concern and needs to be investigated and remedied as a priority issue.

V. Management of scarce water resources

The project elements of this sub-programme are:(a) conjunctive use of groundwater, and (b) protected agriculture. As a result of the 1979-88 African drought, which seriously affected the Nile inflows to HAD, farmers have started using groundwater for irrigation. The proposed project aims to look at the optimal use of groundwater in an area where a tube well network already exists. The project's emphasis will be on the conjunctive use of surface and ground waters during peak demand periods and in the water-deficient tail-end area of the canals. The protected agriculture project will be an extension of an ongoing successful FAO/UNDP project which will be transferred from its present location in Cairo to the most needy regions.

VI. Development of fisheries and ancillary services

The first two elements of this sub-programme are mainly concerned with the development of marine and freshwater fisheries. In this regard, the two areas which require immediate action and technical assistance are: (a) development of fish hatcheries along the Mediterranean coast since the sardine and other sea fish population has literally disappeared as a result of HAD, and (b) research on the existing fish stock, introduction of new varieties of fish and methods of fishing in the Lake Nassar. Lake Nasser yields some 15 000 to 18 000 tonnes of fish annually. However, sustainability of fish production in the lake is seriously questioned. The third component of this programme pertains to assistance to farmers in marketing their agricultural produce and in assessing the role of cooperatives in marketing and other agricultural activities.

SUMMARY OF PROPOSED ACTION PROGRAMME

	Sub-programme/Project	Egypt Cost £E	Donor Cost	Implemented by	Duration Years
1.	**Institutional strengthening**				
1.1	National coordination unit	660 000	300 000	MALR/MPWWR	5
1.2	Water pricing	275 000	255 000	MPWWR	2
2.	**Water and soil management**				
2.1	Village level agricultural development	1 347 000	2 114 000	MALR	5
2.2	New lands demonstration farm	2 620 000	4 343 000	MALR	5
2.3	Soil survey of the Delta	2 475 000	1 114 000	MALR	4
3.	**Environmental monitoring and protection**				
3.1	National soil and water quality computer database	1 000 000	715 000	MALR/MPWWR	3
3.2	Seepage from the Nubariah and Ismailiah canals	1 450 000	500 000	MALR	3
3.3	Improving village water supply and sanitation	1 100 000	1 015 000	MALR	3
3.4	Water-borne diseases	1 000 000	330 000	MALR	2
4.	**Use of marginal quality water**				
4.1	Re-use of treated sewage water	825 000	300 000	MALR	3
4.2	Re-use of drainage water	390 000	205 000	MPWWR	3
4.3	Protection from nitrate pollution	825 000	1 000 000	MALR	3
5.	**Management of scarce water resources**				
5.1	Conjunctive use of groundwater	110 000	205 000	MPWWR	2
5.2	Protected agriculture	1 000 000	1 000 000	MALR	3
6.	**Development of fisheries and ancillary services**				
6.1	Marine fish hatcheries	2 000 000	1 000 000	MALR	5
6.2	Lake Nasser fish stock	500 000	250 000	MALR	3
6.3	Review of existing marketing and cooperatives	100 000	50 000	MALR	2
	TOTAL	17 677 000	14 696 000		

MALR : Ministry of Agriculture and Land Reclamation
MPWWR : Ministry of Public Works and Water Resources

4. SUMMARY OF PROGRAMME COST AND SCHEDULE

The costing of the Action Programme and its various elements has been done using available data and current estimates and hence should be regarded as tentative at this stage. The time-scheduling and targeting of each sub-programme has also been agreed with the concerned Government departments in majority of the cases.

PROGRAMME D'ACTION

DE

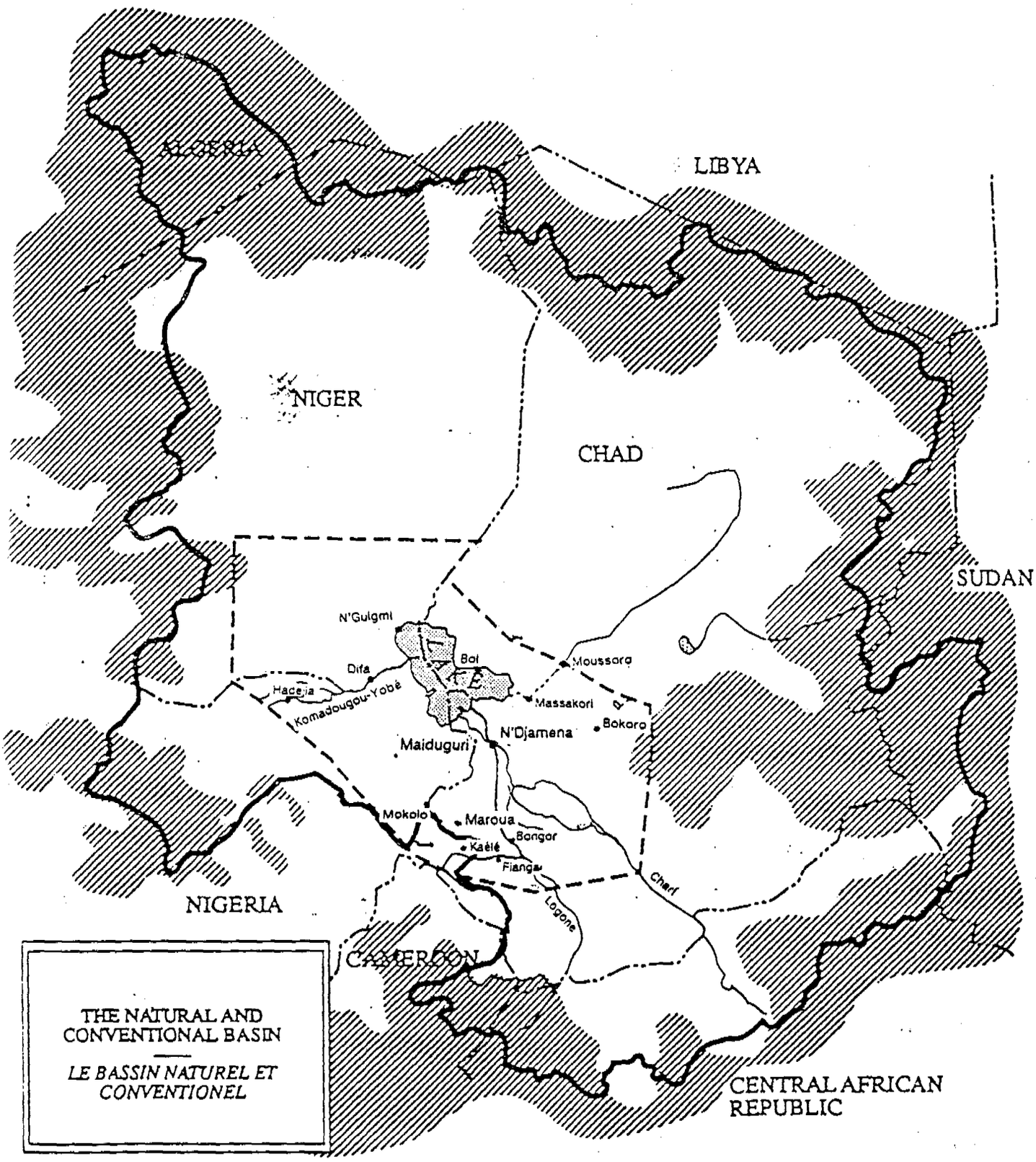
MISE EN VALEUR ET DE GESTION DES RESSOURCES EN EAU POUR UN DÉVELOPPEMENT AGRICOLE DURABLE

BASSIN CONVENTIONNEL DU LAC TCHAD

SOMMAIRE

Commission pour le Bassin du lac Tchad, N'Djamena, Tchad
Organisation des Nations Unies pour l'alimentation et l'agriculture, Rome, Italie

avec la collaboration
du Département de la Coopération Technique pour le Développement
et du Programme des Nations Unies pour l'Environnement



Source: A Diagnostic Study of Environmental Degradation, LCBC/UNEP

1. GÉNÉRALITÉS

Il y a 25 ans, les pays riverain du lac Tchad ont créé la Commission du Bassin du lac Tchad en vue de coordonner et de superviser le développement socio-économique de la région. Une zone dite conventionnelle s'étendant sur 427 000 km^2 passa de la sorte sous la tutelle de la CBLT.

A l'époque les conditions climatiques étaient favorables au point que le lac, au maximum de son remplissage, occupait une superficie d'environ 25 000 km^2.

La conjoncture économique était tout aussi favorable. Le Nigéria mettait en valeur ses ressources pétrolières et programmait des investissements importants dans tous les domaines y compris la création de périmètres irrigués.

Le Niger mettait en valeur ses ressources minières, en particulier l'uranium, dont l'Europe avait, à l'époque, grand besoin.

Les cours du cacao, du coton et des autres produits de l'agriculture étaient satisfaisants et profitables au Cameroun et au Tchad.

Très rapidement, la conjoncture économique internationale s'est dégradée. Parallèlement, les conditions climatiques dans la région du Sahel sont devenues catastrophiques au point que les dimensions du lac, par exemple, sont tombées à 1 500 km^2 en fin de saison sèche.

Entre-temps, la population a doublé pour atteindre le nombre de 11 millions d'habitants dans le bassin conventionnel du lac.

La conjonction de ces éléments négatifs a entraîné une pression démesurée sur les ressources naturelles et sur l'environnement en général.

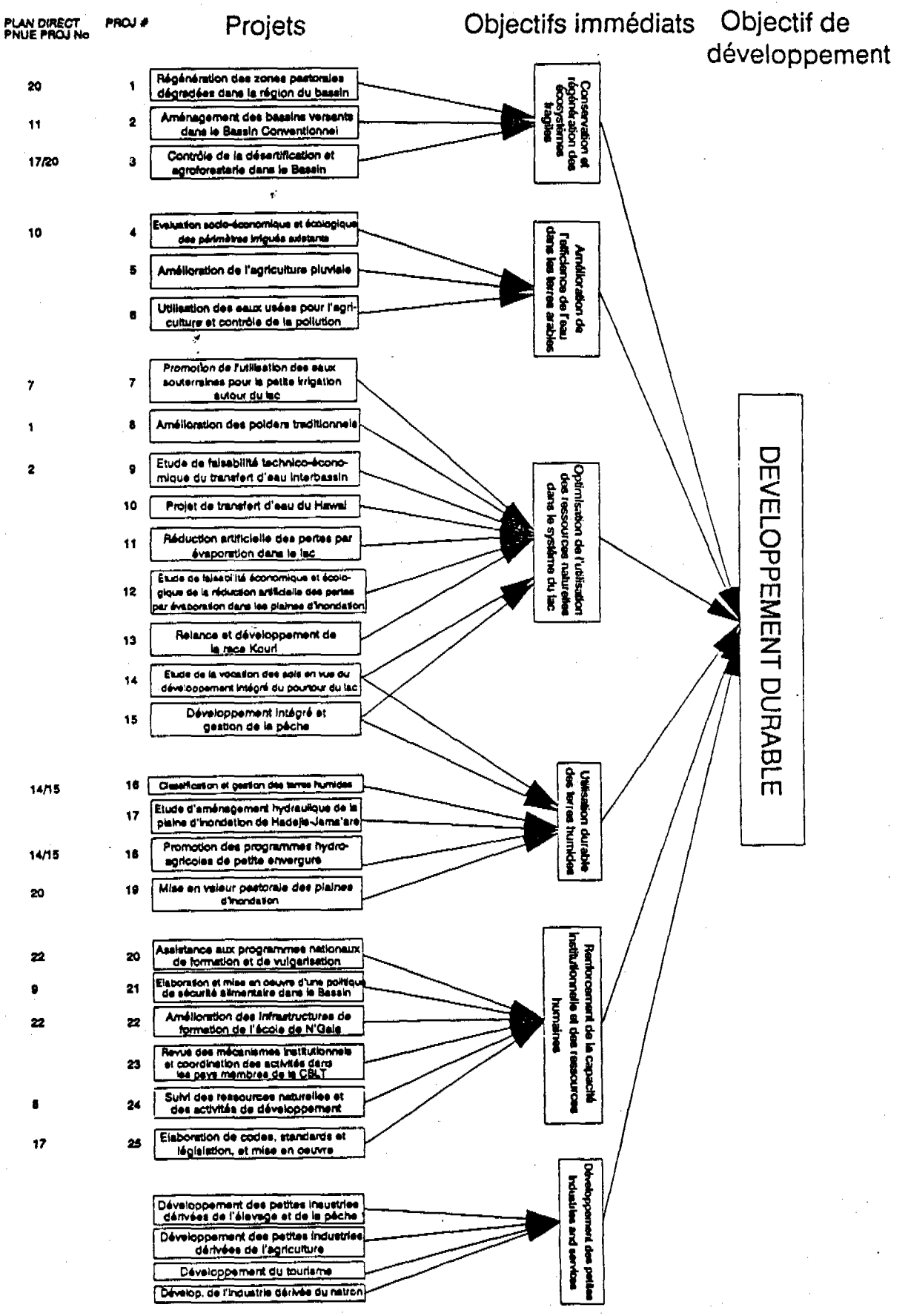
La CBLT a reçu depuis sa création une assistance soutenue de la part des bailleurs de fonds traditionnels, en particulier de la part du système des Nations Unies.

Devant cette situation nouvelle, elle reçoit depuis peu l'assistance d'un projet DTCD intitulé "Planification et gestion des ressources en eau du Bassin du Lac Tchad ". Elle s'est adressée également au PNUE et à l'UNSO avec l'assistance desquels elle a préparé une étude diagnostique de la dégradation de l'environnement dans la région du bassin conventionnel de même qu'un Plan Directeur.

Enfin, elle a reçu de la FAO une assistance spécifique pour la préparation d'un Programme d'action de mise en valeur et de gestion des ressources en eaux du bassin convention du lac Tchad pour un développement agricole durable.

2. LE PROGRAMME D'ACTION PROPOSÉ

Les principes directeurs qui ont guidé la préparation du programme d'action ont été les suivants:


PLAN DIRECT PNUE PROJ No
PROJ #
Projets
Objectifs immédiats
Objectif de développement
20
1
Régénération des zones pastorales dégradées dans la région du bassin
11
2
Aménagement des bassins versants dans le Bassin Conventionnel
17/20
3
Contrôle de la désertification et agroforesterie dans le Bassin
Conservation et régénération des écosystèmes fragiles
10
4
Evaluation socio-économique et écologique des périmètres irrigués existants
5
Amélioration de l'agriculture pluviale
6
Utilisation des eaux usées pour l'agriculture et contrôle de la pollution
Amélioration de l'efficience de l'eau dans les terres arables
7
7
Promotion de l'utilisation des eaux souterraines pour la petite irrigation autour du lac
1
8
Amélioration des polders traditionnels
2
9
Etude de faisabilité technico-économique du transfert d'eau interbassin
10
Projet de transfert d'eau du Hawal
11
Réduction artificielle des pertes par évaporation dans le lac
12
Étude de faisabilité économique et écologique de la réduction artificielle des pertes par évaporation dans les plaines d'inondation
13
Relance et développement de la race Kouri
14
Etude de la vocation des sols en vue du développement intégré du pourtour du lac
15
Développement intégré et gestion de la pêche
Optimisation de l'utilisation des ressources naturelles dans le système du lac
14/15
16
Classification et gestion des terres humides
17
Etude d'aménagement hydraulique de la plaine d'inondation de Hadejia-Jama'are
14/15
18
Promotion des programmes hydro-agricoles de petite envergure
20
19
Mise en valeur pastorale des plaines d'inondation
Utilisation durable des terres humides
22
20
Assistance aux programmes nationaux de formation et de vulgarisation
9
21
Elaboration et mise en oeuvre d'une politique de sécurité alimentaire dans le Bassin
22
22
Amélioration des infrastructures de formation de l'école de N'Gala
23
Revue des mécanismes institutionnels et coordination des activités dans les pays membres de la CBLT
8
24
Suivi des ressources naturelles et des activités de développement
17
25
Elaboration de codes, standards et législation, et mise en oeuvre
Renforcement de la capacité institutionnelle et des ressources humaines
Développement des petites industries dérivées de l'élevage et de la pêche
Développement des petites industries dérivées de l'agriculture
Développement du tourisme
Dévelop. de l'industrie dérivée du natron
Développement des petites industries and services
DEVELOPPEMENT DURABLE

- Le programme d'action doit se conformer strictement à la notion de durabilité, à savoir être non dégradant sur le plan environnemental, techniquement approprié, économiquement viable et socialement acceptable.

- Le programme doit conduire à un développement économique de la région.

- Le programme s'appuie sur deux études antérieures déjà citées, à savoir; l'étude diagnostique de la dégradation de l'environnement et le Plan directeur préparée par le CBLT en collaboration avec le PNUE et l'UNSO. La notion d'environnement retenue dans le cadre de la préparation de ce programme d'action est celle d'un réseau de tous les éléments ou ressources qui jouent un rôle dans le maintien de la vie sur terre. Ce réseau relie intimement entre elles touts les créatures vivantes et les ressources naturelles, et une partie du programme est consacré à mettre en évidence ces liens de telle sorte que le développement d'un secteur dépendant de l'eau n'ait pas un impact négatif sur un autre secteur également dépendant de l'eau.

- En outre le programme s'inscrit dans une stratégie visant à renforcer le rôle de la CBLT en lui donnant l'occasion de jouer pleinement un rôle de coordination et d'utiliser les capacités dont elle est dotée à travers le projet d'assistance: "Planification et gestion des ressources en eau du Bassin du lac Tchad".

Au total, le programme a identifié 25 idées de projet regroupées sous les six objectifs immédiats suivants:

i. Conservation et régénération des écosystèmes fragiles

ii. Amélioration de l'efficience de l'eau en vue d'un utilisation durable des terres arables

iii. Optimisation de l'utilisation des ressources naturelles dans le système du lac

iv. Utilisation durable et gestion des terres humides

v. Renforcement de la capacité institutionnelle et des ressources humaines des pays membres et de la CBLT

vi. Développement des services et de la petite industrie.

L'objectif (vi) indique simplement l'importance du secteur des services et de la petite industrie dans le développement de la région. Il devrait faire l'objet d'une réflexion et d'un programme d'action spécifique.

Objective (i) Conservation et régénération des écosystèmes fragiles

La diversité des situations écologiques dans une zone aussi vaste que le Bassin Conventionnel a conduit à différents dégrées de fragilité des écosystèmes. Les plus vulnérables ont été les plus sérieusement endommagés par les longues périodes de sécheresse s'ajoutant aussi effets de la croissance démographique et de la réduction des ressources naturelles. Trois projets ont été préparés pour atteindre cet objectif.

Objectif (ii) Amélioration de l'efficience de l'eau en vue d'une utilisation durable des terres arables

Outre la réduction des précipitations atmosphériques et des ressources en eau en général, on cite de nombreux exemples d'inéfficience et même de gaspillage dans l'utilisation de l'eau à l'intérieur du Bassin Conventionnel: utilisation de l'eau pur produire du riz difficilement commercialisable, rejet incontrôlé d'eaux usées en provenance de grandes agglomérations, très faible efficience dans l'utilisation de l'eau de pluie pour l'agriculture. Trois projets ont été identifiés pour contribuer à cet objectif.

Objectif (iii) Optimisation de l'utilisation des ressources naturelles dans le système du lac

Les ressources naturelles existantes dans le Bassin - eau de surface, eau souterraine, sols, poisson, animaux, végétation, etc. pourrait être utilisées d'une façon plus efficace si quelques études complémentaires indiquaient la direction à suivre ou si des infrastructures de développement (système de crédit, vulgarisation, commercialisation) étaient garantis aux usagers.

L'importation de ressources naturelles en provenance de l'extérieur du Bassin peut également être envisagée mais ces solutions nécessitent des études supplémentaires pour évaluer leur faisabilité économique et leur impact sur l'environnement. Neuf projets ont été identifiés pour contribuer à cet objectif.

Objectif (iv) Utilisation durable et gestion des terres humides

Les plaines d'inondation et les bas-fonds constituent la plus grande richesse du Bassin Conventionnel. Ces terres humides forment le plus haut potentiel de terres agricoles, les meilleurs pâturages pour les troupeaux de l'ensemble du Bassin et l'endroit privilégié pour la reproduction des poissons qui iront peupler le lac lors de son remplissage en saison des pluies. Ces différents usages cependant sont souvent en conflit les uns avec les autres et parfois même préjudiciables les uns aux autres. Tout projet de développement doit donc être soigneusement étudié et planifié avant son exécution afin d'en assurer la durabilité.

Six projets ont été identifiés pour contribuer à cet objectif; deux d'entre eux auront aussi un impact sur l'objectif (iii).

Objectif (v) Renforcement de la capacité institutionnelle et des ressources humaines des pays membres et de la CBLT

Etant donné que la coordination entre les différentes activités de développement et par conséquent le suivi et l'évaluation continue des ressources constituent les conditions principales de la durabilité, le programme d'action vise également le renforcement de la capacité institutionnelle de la CBLT et le développement des ressources humaines des pays membres.

Six projets sont proposés pour développer le potentiel de formation à l'intérieur du Bassin, pour améliorer le suivi et l'évaluation des ressource naturelles et pour élaborer un cadre juridique destiné à organiser la mise en valeur de ressources en eau limitées.

Numéro du projet	Titre du projet	Recherche développement	Etude de faisabilité - Evaluation - Schéma développement	Projet Pilote	Renforcement institutionnel	Projet investissement	Coût en 1000 $ EU
1	Régénération des zones pastorales dégradées dans la région sahélienne du Bassin			□		□	1,500
2	Aménagement des bassins versants dans le bassin du lac Tchad		□			□	4,000
3	Contrôle de la désertification et agro-foresterie dans le bassin		□				160
4	Evaluation socio économique et écologique des périmètres irrigués existants		□				175
5	Amélioration de la culture pluviale		□				130
6	Utilisation des eaux usées pour l'agriculture et contrôle de la pollution			□			650
7	Promotion de l'utilisation de l'eau souterraine pour la petite irrigation autour du lac		□	□		□	2,000
8	Amélioration des polders traditionnels	□					150
9	Etude de faisabilité technico-economique du transfert d'eau inter bassin		□				630
10	Projet de transfert d'eau du Hawal		□				825
11	Réduction artificielle des pertes par évaporation dans le lac	□					825
12	Etude de faisabilité économique et écologique de la réduction artificielle des pertes par évaporation dans les plaines d'inondation						p.m.
13	Relancement et Développement de la race bovine Kouri	□					2,080
14	Planification de l'utilisation des sols en vue du développement de la zone cotière du lac		□				1,100
15	Développement integré et gestion de la pêche		□		□	□	2,700
16	Classification et gestion des terres humides		□				2,100
17	Etude d'aménagement hydraulique de la plaine d'inondation Hadejia-Jamaare		□				600
18	Promotion des programmes hydrauliques de petite envergure		□				345
19	Mise en valeur pastorale des plaines inondées					□	3,500
20	Assistance aux programmes nationaux de formation et vulgarisation				□		1,400
21	Elaboration et mise en oeuvre d'une politique de sécurité alimentaire dans le Bassin conventionnel				□		135
22	Renforcement de l'école régionale de N'Gala				□	□	2,000
23	Renforcement institutionnel et coordination entre les pays du Bassin				□		400
24	Suivi des ressources naturelles et des activités de développement	□			□		1,200
25	Elaboration de codes, standards et législation et leur mise en oeuvre				□		335
	TOTAL						28,940,000

4. MISE EN OEUVRE DU PROGRAMME D'ACTION

Environ 50 % des idées de projets concernent des investissements et nécessitent des justifications économiques complémentaires pour qu'elles soient acceptables par les bailleurs de fonds.

Etant donnée la nature du problème. Le développement durable de ressources limitées -la majeure partie des composantes du programme nécessiteront un ferme engagement politique des quatre pays pour se conformer aux recommandations de la CBLT.

Le coût total du Programme d'action est estimé à environ 30 millions de dollars.

PROGRAMA DE ACCION

SOBRE

EL AGUA Y EL DESARROLLO AGRICOLA SOSTENIBLE

ESTADOS UNIDOS MEXICANOS

RESUMEN

Comision Nacional del Agua de Mexico

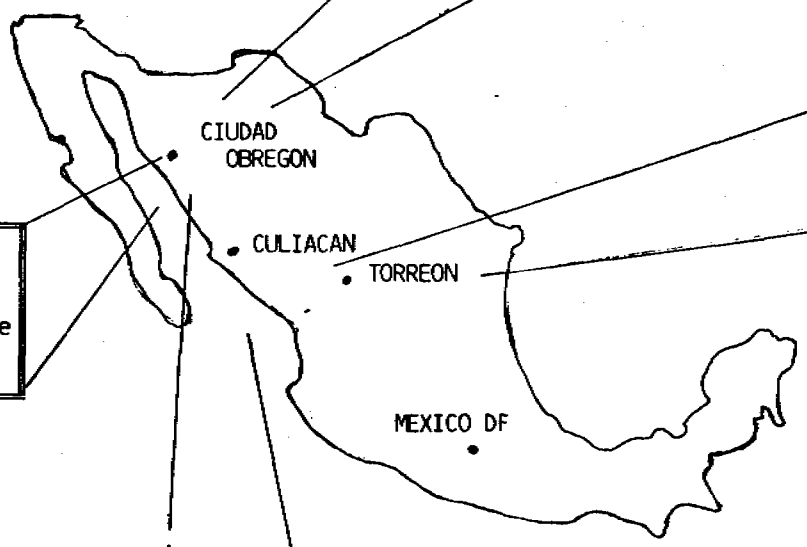
Organizacion de las Naciones Unidas para la
Agricultura y la Alimentacion

PROGRAMA DE ACCION SOBRE EL AGUA Y EL DESARROLLO AGRICOLA SOSTENIBLE (PA-ADAS)
EN MEXICO - 1991|2000

AREAS DE ACCION
PRIORITARIAS IDENTIFICADAS

1. Uso eficiente del agua a nivel de parcela
2. Encharcamiento, salinidad y drenaje
3. Control de la calidad del agua
4. Manejo de recursos de agua de disponibilidad limitada

SUBPROGRAMA 1 - Apoyo a la Transferencia y Modernización de los Distritos de Riego y otras Areas de Riego en Mexico
Presupuesto : EEUU$ 6.771.448



SUBPROGRAMA 2 - Hidrología Forestal y Manejo Integral de Cuencas
Presupuesto: EEUU$ 4.805.952

SUBPROGRAMA 3 - Sistema de Manejo Integral de Recursos Naturales para el Desarrollo Agricola Sostenible
Presupuesto: EEUU$ 6.217.292

PROBLEMAS ESPECIFICOS

1. Ineficiencia de riego
2. Salinidad de suelos
3. Encharcamiento
4. Sobreexplotación de aguas subterráneas
5. Intrusión de agua de mar
6. Deterioro de la calidad del agua
7. Aguas urbanas servidas
8. Manejo de cuencas

SUBPROGRAMA 4 - Establecimiento de un Sistema de Referencia para el monitoreo de la calidad y la disponibilidad de agua para la acuacultura.
Presupuesto: EEUU$ 2.083.739

COSTO TOTAL DEL PA-ADAS EN MEXICO
EEUU$ 19.878.431

La Organización de las Naciones Unidas para la Agricultura y la Alimentación (FAO) inició en 1991 el Plan de Acción Internacional sobre el Agua y el Desarrollo Agrícola Sostenible (PAI-ADAS). El PAI-ADAS será ejecutado en la presente década.

Con la finalidad de preparar un Programa de Acción para el país sobre ADAS, una Misión de la FAO trabajó en México desde el 7 de octubre al 4 de noviembre de 1991.

El trabajo de la Misión fué coordinado tanto por la Gerencia de Programación de la Subdirección de Infraestructura Hidroagrícola de la Comisión Nacional del Agua (CNA) como por la Representación de la FAO en México.

Los campos de especialización de los miembros de la Misión fueron : a) Salinidad, Drenaje y Encharcamiento, b) Hidrología Forestal y Manejo de Cuencas, c) Hidrobiología y Pesca en Aguas Continentales, y d) Calidad del Agua y Contaminación y Aspectos Ambientales

Con base en la información proporcionada por las dependencias técnicas de la CNA y por el Instituto Mexicano de Tecnología del Agua (IMTA), en visitas de campo a Distritos de Riego en Torreón (Región Lagunera), Valle EL Carrizo, y Río Yaqui (Región Noroeste) y Tula, y en entrevistas con las autoridades nacionales, la Misión preparó un Programa de Acción sobre ADAS en México.

Las principales esferas de acción dentro del PAI-ADAS en México son: uso eficiente del agua a nivel de parcela; drenaje, salinidad y encharcamiento; control de la calidad del agua; y uso de recursos de agua escasos. Dentro de estas áreas de acción las principales líneas de trabajo son: manejo de cuencas, eficiencia de riego dentro de los Distritos de Riego, salinidad de suelos, problemas de mal drenaje, sobreexplotación de aguas subterráneas en acuíferos costeros y continentales, intrusión marina, contaminación de aguas de drenaje agrícola por aguas residuales urbanas y residuales y deterioro de la calidad química y bacteriológica del agua.

Cuatro subprogramas fueron identificados, ellos son:

SUBPROGRAMA 1. Apoyo a la Transferencia y Modernización de los Distritos y Otras Areas de Riego en México. El objetivo de este subprograma es contribuir a los esfuerzos nacionales de incrementar la producción y la productividad de las zonas regadas del país, fortaleciendo el desarrollo nacional y mejorando el bienestar social de los agricultores mediante un uso eficiente de la infraestructura hidráulica y del riego a nivel parcelario.

Además se persigue: una mayor autosuficiencia técnica y financiera de las organizaciones de usuarios de los Distritos de Riego; fortalecer la capacidad institucional y técnica de la CNA y del IMTA. El Servicio de Recursos, Desarrollo y Ordenación de Aguas de la FAO ya había preparado un documento provisional de proyecto antes de la llegada de la presente Misión a México. El presupuesto de este subprograma es EEUU$6'771,448.

SUBPROGRAMA 2. Hidrología Forestal y Manejo Integral de Cuencas. El objetivo de este subprograma es la administración de las cuencas hidrográficas con un enfoque integral ecológico dirigido a lograr un desarrollo agrícola sostenible. Además se tiene como objetivos: planear y normar el manejo de las cuencas, determinar los impactos ambientales de actividades forestales, agrícolas y otras sobre las cuencas y preservarlas desde el punto de vista ambiental.

Las actividades complementarias dentro de este subprograma son: desarrollo de bases de datos adecuadas, investigación adaptiva, desarrollo de recursos humanos, protección ambiental y transferencia de tecnología. El presupuesto de este subprograma es EEUU$4'805,952.

SUBPROGRAMA 3. Sistema de Manejo Integral de Recursos Naturales para el Desarrollo Agrícola Sostenible en México. El objetivo general de este subprograma está implícito en su título; los objetivos específicos son controlar la sobreexplotación de las aguas subterráneas, determinar el impacto ambiental del uso agrícola de aguas residuales urbanas y preservar la capacidad productiva de los suelos de los Distritos de Riego. Las acciones complementarias de este programa son: desarrollo de bases de datos adecuadas, investigación adaptiva, desarrollo de recursos humanos, protección ambiental y transferencia de tecnología. El presupuesto de este subprograma es EEUU$6'217,292.

SUBPROGRAMA 4. Establecimiento de un Sistema de Referencia para el Monitoreo de la Calidad y la Disponibilidad de Agua para la Acuacultura en México. El objetivo general de este subprograma es favorecer el desarrollo sostenible del agua y la tierra a través del manejo racional de los recursos naturales. Además se pretende establecer un sistema de referencias para el monitoreo de los niveles de acumulación de nutrientes y biocidas en suelos, sedimentos y aguas en sistemas lagunarios-costeros y un sistema de referencia para integrar el inventario de cuerpos de agua epicontinentales, determinando su potencial productivo. Las acciones complementarias dentro de este subprograma son: desarrollo de bases de datos adecuadas, desarrollo de recursos humanos, protección ambiental y transferencia de tecnología. El presupuesto de este subprograma es EEUU$2'083,739.

El costo total del Programa de Acción sobre el Agua y el Desarrollo Agrícola Sostenible en México, consistente de cuatro subprogramas es EEUU$19'878,431.

ACTION PROGRAMME

ON

WATER AND SUSTAINABLE AGRICULTURAL DEVELOPMENT

REPUBLIC OF INDONESIA

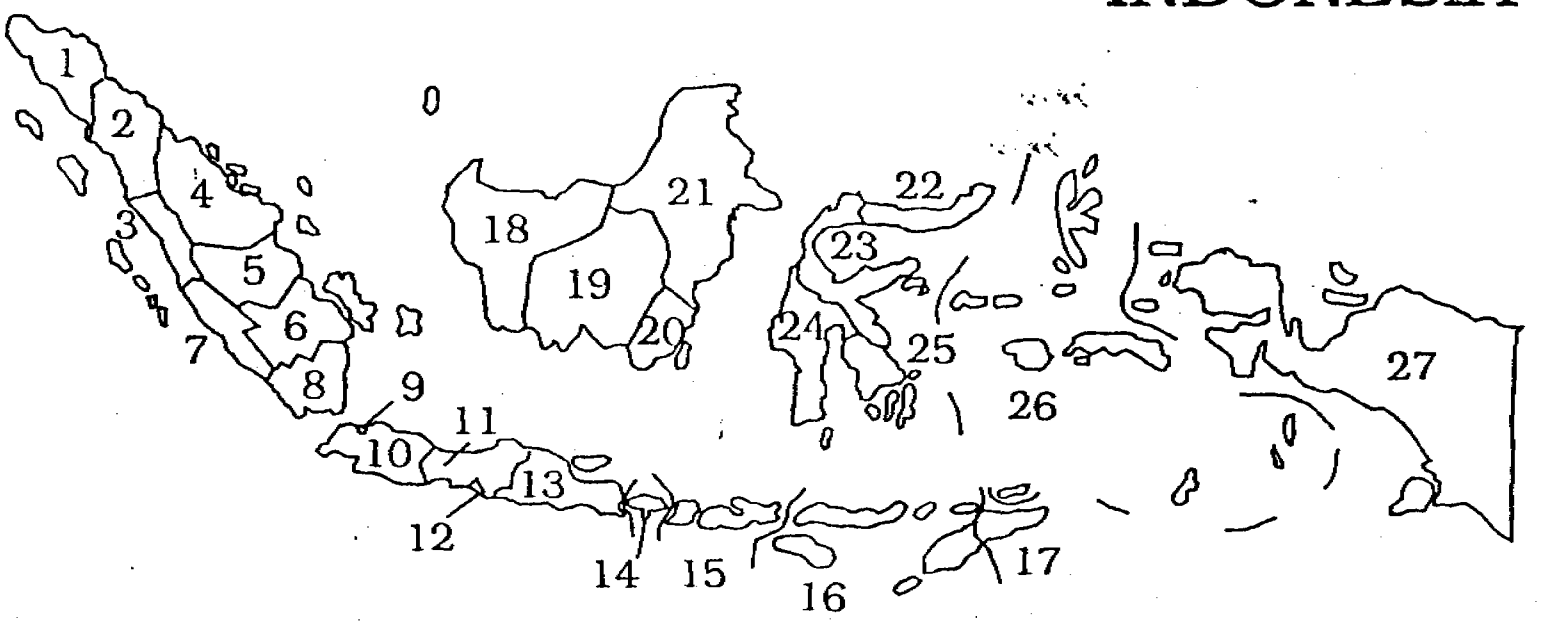
SUMMARY

Government of Indonesia
Food and Agriculture Organization of the United Nations

and

Canadian International Development Agency

INDONESIA



1. DI Aceh
2. Sumatera Utara
3. Sumatera Barat
4. Riau
5. Jambi
6. Sumatera Selatan
7. Bengkulu
8. Lampung
9. DKI Jakarta
10. Jawa Barat
11. Jawa Tengah
12. DI Yogyakarta
13. Jawa Timur
14. Bali
15. Nusa Tenggara Barat
16. Nusa Tenggara Timur
17. Timor Timur
18. Kalimantan Barat
19. Kalimantan Tengah
20. Kalimantan Selatan
21. Kalimantan Timur
22. Sulawesi Utara
23. Sulawesi Tengah
24. Sulawesi Selatan
25. Sulawesi Tenggara
26. Maluku
27. Irian Jaya

1. BACKGROUND

With a population projected to reach 250 million in the year 2015, agriculture will continue to be the key sector in Indonesia. The country was one of the world largest importer of food in 1970, but since then it has achieved self-sufficiency in rice in 1984. A successful economic and social development with structural changes have been largely responsinle for this commendable achievement. Programmes were focused to improve more backward areas with relative disadvantaged population mainly through the introduction of low and stable consumer food prices and active public sector investments in economic infrastructure. At the present time priorities are changing to activate Indonesia's rich social assets and improve farm income and employment opportunities in rural areas through diversification and expanded production of raw materials for domestic and export oriented agro-industry.

With the high pace of development in the 1970s and 1980s management of the natural resources had been handled in a somewhat pragmatic manner and with less coordination. Economic development has therefore, in some areas, been achieved at high economic and environmental costs. The earlier focus on physical infrastructure and direct agricultural inputs is now re-directed to institutional development and capacity building, encouraging involvement of the private sector, efficient management of resources at operational level and regulation for environmental protection and control.

Water and agricultural land are becoming short, especially in the heavily populated Inner Islands. However the "marginal" uplands, if put under and proper landuse and forestry management practices, could offer good potential for rainfed agriculture and agro-forestry. Indonesia's largely untapped lowland resources, estimated at 45 million hectares, will require longterm and integrated planning based on resource potentials and socio-economic factors, for their sustainable development.

Inland fishery resources are threatened by water pollution and improper land-use. Production constraints are experienced by the highly potential brackish water aquaculture industry due to lack of secure year around fresh water supplies.

2. THE ACTION PROGRAMME

The timing of the IAP-WASAD Programming Mission coincided with the development of guidelines for the 2nd 25-Year Long Term Development Strategyby the at the legislative and executive levels of Government. This gave an opportunity for the Mission to incorporate into the Action Programme the following general policy guidelines which are expected to be emphasized in the Government's Strategy document.

- more efficient utilization of the existing agricultural infrastructure and lands;
- full consideration of the social assets as strategy for economic development; improved social conditions and facilities with enhanced financial capacities of rural populations;
- accelerating overall economic development, including areas that have at present relatively disadvantaged population, to even out regional differences and create an environment for the planned 'take off' of the Indonesian economy;

- transfer of marginal arable lands and low yielding forestry lands into productive areas based on diversification with agro-forestry and agri-business. The protection of sensitive eco-systems as natural swamp lands and rain- and mangrove forests;

- integrated development of water and land, including forestry and fisheries, following a river basin development approach.

The action programme has taken into consideration several of the above objectives in an integrated manner. In this context, it is imperative that institutional strengthening and mechanisms for inter-sectoral coordination is given high priority. The Action Programmes supports soil and water conservation activities from an approach to integrate agronomic and forestry based watershed management. With the objective to address difficult and diverse problems and constraints originating from social and cultural as well as institutional differences, the programme has adopted a broad based approach and scope.

3. PROJECT ELEMENTS AND SUB-PROGRAMMES

Sub-Programme 1: Programme Coordination

This sub-programme contains one project element to strengthen and support coordination and provide technical guidance to all project activities initiated under the Action Programme during the first half of period of programme execution.

Sub-Programme 2: Institutional Development

This sub-programme consists of two project elements, namely; one, to assist in managing competitive demands for water and land; and the other to address outstanding legal and institutional issues in close relation to the existing national programme.

Sub-Programme 3: Implementation Capacity

This sub-programme has three project elements. The first element aims at improving the capacity for construction management and securing efficient and timely implementation of development projects. Another element aims at promoting and supporting participation of the private sector in water resources and agricultural development. The objective of the third element is to improve data management as a priority requirement to support planning and monitoring.

Sub-Programme 4: Rainfed and Marginal Land Farming

This is a large sub-programme with seven project elements addressing different aspects for enhancing production from rainfed farming, improving social conditions and promoting soil and water conservation in marginal land areas, with emphasis on Eastern Indonesia.

Sub-Programme 5: Watershed Management

This sub-programme has four elements addressing different problems at the level of research and development in watershed management. The elements support the development of more efficient forest based production systems for the differing conditions in the Outer Islands, improvement of agro-forestry with economic and environmental benefits, watershed

management for downstream hydrological benefits. An element to improve public awareness and commitment to conservation in densely populated watersheds is also included.

Sub-Programme 6: Operation Aspects of Irrigation, Drainage and Aquaculture Systems

This sub-programme consist of five elements, all aiming at improving the operation of existing infrastructure for irrigation, drainage and aquaculture. The first element, complementing earlier studies, aims at the introduction of sustainable financing systems for irrigation operation and maintenance. The second element of the sub-programme supports small scale irrigation as a rural development strategy to increase food production and improve conditions in upland areas. The third element is focused on improved planning and design of drainage schemes; and the fourth element supports systems for conjunctive ground water use as supplementary and dry season irrigation supplies. The last element under the sub-programme is directed towards improved coordination of fresh water supply for brackish water aquaculture in lowlands ponds with irrigation water supply.

4. SUMMARY OF PROGRAMME COST AND SCHEDULES

The total cost of the Action Programme, estimated at about 29 million US$, should be considered as tentative. The time-scheduling is based on many considerations, such as: to achieve even progress of the sub-programmes; provisions of necessary programme coordination; development and strengthening of the institutions; and priority assigned to the activities.

Summary of Action Programme
Time and Cost Schedule

Priority Category */	Sub-Programme/Proj.	GOI Cost million Rp	External US$ 000	Implement Ministry/Unit	Duration Years	Period (yrs 1-1)
	1. PROGRAMME COORDINATION					
•••	1.1 WASAD Programme Coordination	630	630	Agriculture secr.gen.	5	1-5
	2. INSTITUTIONAL DEVELOPMENT					
••	2.1 Competitive Demands	300	525	water resources	3	2-4
••	2.2 Legal and Institutional Aspects	140	280	agriculture secr.gen.	3	2-4
	3. IMPLEMENTATION CAPACITY					
••	3.1 Construction Management	140	610	water resources	3	4-6
	3.2 Data Management	140	895	" "	3	2-3
	3.3 Investment Opportunities for Private Sector	160	595	" "	3	3-5
	4. RAINFED FARMING					
•••	4.1 Pilot Group Pasture in Eastern Indonesia	330	1,030	agriculture livestock	5	3-7
••	4.2 Optimal Farming Systems for Agri-business on Marginal Land	220	460	" "	3	4-6
••	4.3 Crop Diversification as Drought Management Strategy	460	1,330	agriculture resources	5	5-9
•	4.4 Crop Rotation Systems for Stabilized Agriculture	700	1,920	" " MOA/RC-SAC	8	3-9
•	4.5 Local Land Tenure Systems	250	610	home affairs	3	3-5
	4.6 Farm Water Supplies in Rural Areas in Eastern Indonesia	240	580	home affairs	3	6-8
	4.7 Broadening Rural structure for Off-Farm Employment of Marginal Farmers in Eastern Java	250	860	home affairs	4	6-9
	5. WATERSHED MANAGEMENT					
	5.1 Sustainable Forest Based Production Systems for the Outer Islands	550	2,100	forestry S&W conserv.	5	4-8
•••	5.2 Agronomic Aspects of Soil Conservation in Upper Watersheds	200	750	forestry S&W conserv.	3	2-4
••	5.3 Catchment Forestry	450	1,500	forestry & wat.res.	8	3-10
••	5.4 Soil and Water Conservation Awareness	200	490	forestry S&W conserv.	3	4-6
	6. OPERATIONAL ASPECTS OF IRRIGATION, DRAINAGE, AQUACULTURE					
•••	6.1 Sustainable Financing for O & M	500	3,040	water resources	5	3-7
	6.2 Small Scale Irrigation & Rural Development at Village Level	350	2,600	water resources	5	4-8
•••	6.3 Lowland Management: Drainage Planning & Design	450	3,200	water resources	4.5	2-6
•••	6.4 Conjunctive Groundwater Use for Supplementary Irrigation Supply	260	990	water resources	4	3-6
••	6.5 Water Management Systems for Brackish Aquaculture Development	200	640	agriculture & wat.res.	4	2-5
	TOTAL:	7,120	25,635			

*/ ••• First priority
•• Second priority
• Third priority

Action Programme on Water and Sustainable Agricultural Development in

INDONESIA

Programme Structure

Sub-Programme 1:
PROGRAMME COORDINATION

Project:

1.1 WASAD PROGRAMME COORDINATION

Sub-Programme 2: INSTITUTIONAL DEVELOPMENT	Sub-Programme 3: IMPLEMENTATION CAPACITY

Projects:

2.1 COMPETITIVE DEMANDS	3.1 CONSTRUCTION MANAGEMENT
2.2.LEGAL & INSTITUTIONAL ASPECTS.	3.2 DATA MANAGEMENT
	3.3 INVESTMENT OPPORTUNITIES

Sub-Programme 4: RAINFED FARMING	Sub-Programme 5: WATERSHED MANAGEMENT	Sub-Programme 6: OPERATIONAL ASPECTS; IRRIGATION DRAINAGE AQUACULTURE

Projects:

4.1 PILOT GROUP PASTURE IN EASTERN INDONESIA	5.1 SUSTAINABLE FOREST BASED PRODUCTION SYSTEMS	6.1 SUSTAINABLE FINANCING O&M
4.2 OPTIMAL FARMING SYSTEMS, AGRIBUSSINESS	5.2 AGRONOMIC ASPECTS OF SOIL CONSERVATION	6.2 SMALL SCALE IRRIGATION; AT VILLAGE LEVEL
4.3 CROP DIVERSIFICATION,DROUGHT MANAGEMENT	5.3 CATCHMENT FORESTRY	6.3 LOWLAND MANAGEMENT:DRAINAGE PLANNING AND DESIGN
4.4 CROP ROTATION, STABILIZED AGRICULTURE	5.4 SOIL AND WATER CONSERVATION AWARENESS	6.4 CONJUNCTIVE GROUNDWATER USE FOR SUPPLEMENTARY IRRIGATION SUPPLY
4.5 LOCAL LAND TENURE SYSTEMS		6.5 WATER MANAGEMENT SYSTEMS FOR BRACKISH AQUACULTURE DEVELOPMENT
4.6 FARM WATER SUPPLIES; EASTERN INDONESIA		
4.7 BROADENING RURAL STRUCTURE FOR OFF-FARM EMPLOYMENT		

PROJECT CATEGORIES; EXTERNAL PROJECT COSTS

proj no.	Project Title	Coordination	Inst Development	Inst strength	Research	Pilot Scheme	External Cost US$ 000
1.1	WASAD Coordination	X					630
2.1	Competitive Demands		X				525
2.2	Legal & Inst. Aspects		X				280
3.1	Construction Managm.			X			610
3.2	Data Management			X			895
3.3	Investm. Opportun.			X			595
4.1	Pilot Group Pasture					X	1 030
4.2	Optimal Farming Syst.			X			460
4.3	Crop Diversification				X		1 330
4.4	Crop Rotation Systems				X		1 920
4.5	Local Land Tenure					X	610
4.6	Farm Water Supplies					X	580
4.7	Off-Farm Employment					X	860
5.1	Forest Prod. Systems				X		2 100
5.2	Agronomic Aspects; Soil&Water Cons. in Uplands				X		750
5.3	Catchment Forestry					X	1 500
5.4	Soil&Water Conservation Awareness					X	490
6.1	Sust. Finance for O&M					X	3 040
6.2	Small Scale Irrigation					X	2 600
6.3	Lowland Man. Drainage Planning & Design				X		3 200
6.4	Conjunctive Ground Water Use					X	990
6.5	Water Man. Brackish Aquaculture		X				640
22	TOTAL:	1	3	4	. 5	9	25 635

ACTION PROGRAMME

ON

WATER AND SUSTAINABLE AGRICULTURAL DEVELOPMENT

UNITED REPUBLIC OF TANZANIA

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Ministry of Agriculture, Livestock Development and Cooperatives
United Republic of Tanzania
Food and Agriculture Organization of the United Nations

and

United States Agency for International Development

THE UNITED REPUBLIC OF TANZANIA

1. BACKGROUND

The purpose of the "Programming Mission" under the umbrella of the International Action Programme on Water and Sustainable Agricultural Development (IAP-WASAD) was two fold; namely,(a) to assess current conditions within the Country's agricultural sector; the role this sector is being expected to play in helping meet national development goals; and the major factors constraining efforts to meet this obligation, with particular emphasis on the effective development, management and utilization of Tanzania's water resources, and (b) based on this assessment, to identified a set of priority "Action Areas and Strategy" by which the relevant issues can be addressed, thereby, providing a sound basis upon which Tanzania can formulate effective policies and programmes for bringing about sustainable development within its water resources and agricultural sectors.

The domain of the IAP-WASAD programme is defined very broadly, to include an assessment of Tanzania's upland watersheds and inland (freshwater) fisheries subsectors, as well as both rainfed and irrigated agriculture. The assessment has been comprehensive, in that it not only examined the technical, economic and environmental aspects of water-resource and agricultural development, but also the policy, institutional and infrastructural dimensions as well. Thus, the concern was not merely with "sustainability" but with "sustainable development", requiring that agriculture be dynamic, progressive and focused on identified development objectives.

Using this broadly defined domain of agriculture as the overall analytical structure, three levels of analyses were carried out; namely, at national, sectoral and subsector levels. Considerable attention was give to macro-economic policy, as agriculture dominates the Tanzanian economy, greatly affecting overall economic stability as well as being very sensitive to policy decisions at the macro-economic level. Sector level policies, as well as institutional performance and infrastructure deficiencies affecting agriculture were also analyzed, as were technical, economic and environmental constraints at the production level.

While a full-fledged (costed, targeted and scheduled) "Action Programme" was called for, the Mission chose not to carry the exercise beyond the "action-area specification" and "strategy formulation" stage, for various reasons. Thus, the Mission's efforts have focused on developing a sound "programmatic basis" upon which a costed, targeted and scheduled action programme could be prepared by subsequent missions.

2. MACRO-ECONOMIC AND SECTORAL-LEVEL ADJUSTMENTS

As a result of a number of far reaching macro-economic policy adjustments since the mid-1980s, the Tanzanian economy has rebounded quite vigorously, lead by an equally impressive recovery in its agricultural sector. This growth and revival is in stark contrast to the economic crisis and agricultural productive decline that characterized the decade earlier. However, while a commendable start has been made, many more adjustments at the macro-economic and sectoral levels are needed to broaden and deepen the economic growth underway and to ensure that the gains achieved will be sustainable. This is particularly true for the agricultural sector, which is the main "economic engine" for Tanzania's overall economy.

The following major policy adjustments and other macro-level actions are recommended to support sustainable agricultural development:

- continued monitoring and adjustment of foreign exchange rates to keep Tanzania's agricultural exports competitive and profitable;

- further liberalization of agricultural markets, especially the export market, with increased price incentives for both food crop and export crop producers:

- extensive reform in the financial and banking sectors, to improve the availability and access to credit by smallholder farmers as well as private entrepreneurs;

- streamlining and revamping the civil service system and other needed steps to improve public institutional performance, with particular emphasis on parastatals, and cooperatives;

- stepped-up efforts to rehabilitate the country's road and railway network to reduce agricultural marketing and transport costs and improve access to inputs by farmers in remote areas.

3. LEGAL AND LEGISLATIVE ASPECTS

Over the last two decades, Tanzania has enacted numerous legal statutes having direct bearing on water resources and agricultural development. Besides water legislation, also relevant are laws on forestry, fisheries, land tenure, and environmental protection.

After reviewing laws, legislation and statutes in the above mentioned areas and subsectors, the following conclusions and recommendations are made:

- water legislation is basically appropriate, but it could be further improved and extended. Issues outstanding are: water resource planning and inventory; construction, operation and maintenance; water user associations; water fees and charges; and shared water resources;

- forestry legislation should be amended to provide for better legal protection of forested public lands, and to give more emphasis to social forestry, watershed management and conservation;

- fisheries legislation should, in due course, be extended to cover aquaculture;

- land legislation needs amending, with a particular view to reinforcing security of tenure;

- specific environmental legislation, providing for the use of environmental impact assessments, should be adopted to support and foster sustainable agricultural development;

- finally, to avoid duplication and conflicts in legislation, consistency and complementarity should be ensured between present and future legislation.

4. WATER RESOURCES

Although Tanzania is classified as a water-surplus country, based on its relatively low population density and estimated annual exploitable water supply of 110 billion cubic metres annually, the country presently makes poor use of its surface and groundwater resources. This is due primarily to the nature of the country's rainfall, runoff patterns and lack of storage facilities on its rivers. The former is exacerbated by overgrazing and deforestation in the upland watersheds, as well as inappropriate cultivation practices that are causing erosion, downstream flooding, siltation and a much reduced retention and shorten release-time from these catchments.

Information regarding its groundwater resources is very limited for most areas, with its use being largely for potable water supplies. Over 4000 boreholes exist and additional ones are being added at the rate of 100-150 per year. However, only 25 percent of the population have ready access to an adequate water supply, partly because of the high level of inoperative systems throughout the country.

While urgent attention needs to be given to the degradation taking place in the upper catchments, major constraints and action areas under water resources are:

- formulation of a long-term water resources management strategy, based on reliable data, analysis and planning, to support and carry out the country's recently approved water resources policy;

- establishment of a water resource data base, along with appropriate equipment for its establishment, maintenance and utilization, including meteorological as well as hydrological data;

- strengthening the Water Research Division of the Ministry of Water, Energy and Minerals, including rehabilitation and upgrading of the National Hydrological Network;

- undertaking of a Reservoir Sedimentation Study and Catchment Degradation Survey;

- development of an integrated operational water resources management system for operation and monitoring of the Lake Basin and its waters, including hydrometeorlogical and remote sensing data components.

5. IRRIGATED AGRICULTURE

Irrigation is of growing importance to Tanzania, due both to the need to intensify production in particular geographic regions and crop specific categories, as well as to help meet food security requirements at both national and local levels. Irrigation is especially needed to increase rice production; expand production of a wider variety of diet-improving food crops in nutrition-deficient parts of the country; and reduce risks to (staple) food production in climatically marginal areas.

Most of Tanzania's irrigation, estimated to be around 120 000 hectares, is of the traditional type and carried out by smallholders in small-scale irrigation schemes. Water sources are mostly from rivers, streams and springs, some of which are seasonal and do not permit irri-

gation on a year-around basis. The potential for expansion is great (some estimates as high 800 000 hectares), as is the corresponding need to improve productive performance of existing systems. Water use efficiency is poor, due to an almost complete lack of sound water management practices, both at farm and system levels. Cultural practices also need to be modernized, with the level of off-farm input use also increased, to raise yields and improve production.

The following areas require urgent attention:

- broader institutional support for irrigation development, including establishment of a clear and coherent National Irrigation Policy; up-grading the Irrigation Department to at least Division status and developing well-defined objectives and programmes for carrying out its mandate; and increasing development and recurrent budget allocations to the subsector;

- development of a Country-wide Operation and Maintenance Plan, to address needed improvement in water-use efficiency, establishment of on-scheme management facilities, water-user associations, the installation of record keeping systems and use of appropriate water measuring technology;

- renovation of the Irrigation Department's construction and system maintenance equipment fleet, establishing the needed repair and rehabilitation facilities and capabilities, the provision of spare parts and improved operation, maintenance and repair procedures;

- strengthening and expansion of the extension service, relative to its understanding and ability to support the needs of irrigated agriculture.

6. RAINFED CROPPING AND LIVESTOCK SUBSECTORS

With rainfed agricultural being the most important component of Tanzania's overall economy, it is vital that this sub sector is expanded and it's productive performance improved to help meet the country's food security and other national development objectives. And, because of low and unreliable rainfall in many regions, it is also crucial that every effort be made to conserve and efficiently utilize this scarce productive resource. This requires not only improving farming techniques that hold water on the land but also improved cultural practices and the more optimal use of inputs to make most effective use of the limited moisture available.

Similarly livestock production, which contributes about 20 percent to the national economy and fulfils important nutritional and social functions, needs greater support. Nearly 90 percent of the population derive all or part of their livelihood from livestock, with most livestock keepers also involved in farming in various degrees. Overgrazing in marginal areas is resulting in serious loss of vegetative cover and soil erosion. Judicious location of stock-water points and better range management and reductions in herd size are the most pressing needs.

Achieving these production-level improvements will require a more effective agricultural-services system, including better access and availability of credit, especially by smallholders, including women. A much stronger and well-equipped extension service to train farmers and promote the use of productivity improving practices is urgently needed.

7. FORESTRY AND MANAGEMENT OF THE UPPER WATERSHEDS

With nearly one-half of its land surface covered by forests, this subsector is clearly an important part of Tanzania's economy, as well as an essential part of the country's broad ecological environment. Prudent management and use of forest resources are also crucial to long-term sustainable development of the agricultural sector.

Tanzania's scattered catchment forests, mountain grasslands and agricultural watersheds, which are the major sources of its many rivers, streams and springs, are crucial in meeting the country's water resource needs. For, some 50% of its land area receives less than 800 mm of rainfall annually, making much of it very dependent upon these generated surface flows. These areas, therefore play an important role in helping meet these needs.

These areas often suffer from deforestation by fire, overcutting for fuelwood and clearing for crop production, as well as unsustainable agricultural practices and other forms of land misuse. The current rate of deforestation is estimated at 300-400 000 hectares per annum, which is particularly alarming in view that only about 10 000 hectares are reforested each year. Soil erosion, flooding of lowland agricultural lands and towns and sedimentation of reservoirs are some important adverse impacts of deforestation in addition to its direct threat to the nation's water supply.

Hence, there is need for deliberate policies and management efforts focused on conservation in the upland watersheds; and, this needs to be carried out as an integral part of a broader programme of sustainable agriculture development. Following actions are recommended in this regard:

- coordinated programmes of land use planning is needed at all levels (from national to village levels) to prevent and correct serious degradation that is taking place in many of the upper watersheds;

- land husbandry programmes are needed in those high-potential catchments where agriculture is practised, to both conserve the land resources and ensure sustainable production, as well as to protect down stream areas and maintain an adequate national water supply;

- upland conservation efforts, especially with respect to deforestation, need to be strengthened through deliberate policies and programmes aimed at this end, including better coordination at the national level and among the several agencies who have responsibilities in this area of concern;

- Development of farming systems that incorporate agro-forestry principals and benefits should be high on the agenda, to both conserve land and water resources, improve access to fuelwood, livestock feed supplies and other needs.

8. INLAND FISHERIES SUBSECTOR

Tanzania's inland fishing industry provides employment for some 55 000 full-time and 275 000 part-time workers; produces 350 000 metric tons of fish and fish products annually; and contributes significantly to meeting the food requirements of a high percent of the country's population, particularly those in more remote rural areas. Thus, freshwater

fisheries is not only an important part of the overall agricultural sector but also vital to the nations economy.

Moreover, with over 61 000 km^2 of inland surface water, the potential for further development of freshwater capture fisheries is substantial. The estimated exploitable annual (potential) catch is 630 000 metric tons. Further, with per capita fish consumption rapidly growing (from 10 kg in 1980 to 15 kg in 1990 and projected to reach 20 kg/per person by the end of the century), there is ample justification to support the development of this potential.

Aquaculture is another fast growing component of Tanzania's inland fisheries, with production more than doubling over the past ten years. While small compared to capture fisheries, the potential from present ponds is near 100 000 metric tons annually; the present annual yield is thought to be around 135 metric tons, although there are no good statistics and much of the production is consumed locally and not reported.

However, there are substantial obstacles to developing and effectively exploiting this potential. The following action areas are identified as priorities needing attention in the inland fisheries subsector:

- lack of credit by fisherman to purchase improved boats, equipment and fishing gear is substantially curtailing their ability to fully fish the waters of the larger lakes;

- establishment of primary fish processing centres that can consolidate typical small catches, process them efficiently and improve access to them by traders (fish mongers) would remove large obstacles to marketing of the fish catch;

- improvement in artisanal processing skills is also needed, as many catch sites are inaccessible or produce low volumes, making local processing necessary; current processing practices and skills in these areas are inefficient resulting in high wastage and low profit margins;

- concerted efforts to encourage and facilitate expansion of aquaculture are needed; construction of ponds and integration of fish raising with irrigated cropping and livestock production should be promoted.

9. FOOD SECURITY AND THE ROLE OF WOMEN

Food security is one of Tanzania' highest development goals, both at the village and household levels as well as nationally; achieving one does not necessarily ensure attainment of the other. For, while the country presently has ample food supplies overall, some 25-30 percent of its population suffers from protein and energy malnutrition; the figure is over 50 percent for children. Chronic malnutrition can be traced to low farm productivity, inadequate household incomes, poor health and insufficient time for meal preparation, much of the problem stemming from the heavy burden rural women bear in this respect.

Women are largely, if not solely, responsible for preparing the land, weeding and harvesting all food crops, in addition to their other household chores, including food processing and preparation; care for children, the sick and elderly; fetching water and firewood; washing clothes; and keeping the house clean. They are often required to help

their husbands with his livestock and cash crops as well. Women's ability to fulfil these multiple roles is further hampered by pregnancies, frequent illness and malnutrition.

In sum, a woman on a typical small farm works 12 hour days at hard physical labour, is pregnant or breastfeeding and has three or four children to feed and care for; thus, she has little time to supplement household income with off-farm activities. Consequently, any serious effort to improve household food security must focus on to key areas:

- women's productivity needs to be improved, both in the production of food as well as in her other household chores. For agriculture, this requires improved technologies that increase output and the productivity of labour through, for example, better land preparation and weed control techniques;

- having access to better information and farming practices, ability to obtain fertilizer, improved seed and other inputs would also make a significant difference. This requires, in turn, that women be included in rural extension activities, that they be given access to credit, as well as to other farm inputs, and that other interventions be made to improve their abilities to undertake off-farm activities;

- interventions aimed at improving the health of women would also have a direct impact on household and farm productivity, as well as nutritional status. Improved pre and ante-natal care and the provision of family planning services would also have a direct impact on productivity;

- efforts to control malaria, and diarrhoea-related diseases would also improve health status and, in turn, farm and household productivity, all leading to a more secure food situation at the household level, better health and improved economic well-being.

10. PRIORITIES AND STRATEGY FOR THE ACTION PROGRAMME

While the above "Action Areas" are identified as priorities within their individual subsectors, following are the overall priorities, when viewed from a broader sectoral perspective:

a. National Level Priority

- Make Sustainable Agriculture Development a bonified National Objective, supported by appropriate policy action and adequate (domestic) budgetary allocations.

b. Overall Agricultural Sector Priorities

- Encourage farmers to increase productivity and output, through price incentives, more efficient marketing systems and improved access to inputs and credit.

- Improve performance of Divisions and Departments within Agricultural and other related Ministries through adoption of clearly defined objectives, strategies and programmes, improved interagency coordination and in-service training.

- Increase emphasis on protection of the upper watersheds and catchments, through improved land use and appropriate cultivation, grazing and forestry practices.

- Develop improved data/information bases regarding land and water resources, to better identify problems, establish policies and strategies and carry out effective programmes.

- Train and encourage farmers, both irrigated and rainfed, to make more efficient and effective use of their water sources, through improved on-farm water management, in the former case, and water harvesting, terracing, micro-catchments and flood irrigation in the latter.

c. Strategy for Sustainable Agricultural Development

While any strategy for sustainably developing Tanzania's agricultural sector must address the constraints action-areas identified, these should be addressed the following broad strategy is recommended:

Productivity Increasing Thrust: While lateral agricultural expansion opportunities are widely available, emphasis should be on improving productivity, both to improve incomes as well as food security.

Small-Farm Production Structure: While efficient, large-scale production should not be discouraged, major emphasis should be on achieving productive gains in the small-farm sector.

Private Sector Expansion: Although there are vital roles for government to play, the private sector should be encouraged to assume a larger role in marketing, input-supply and provision of credit within the agricultural sector.

Through such a strategy, and focus on the above priority areas, development can be stimulated in all of the various productive subsectors, without undue concern regarding which should be given more emphasis. Given an economically viable and socially acceptable environment, development will be spontaneous; rainfed farmers will increase production; when water is available, farmers will make irrigation a profitable venture; where possible and fishermen will expand their activities.