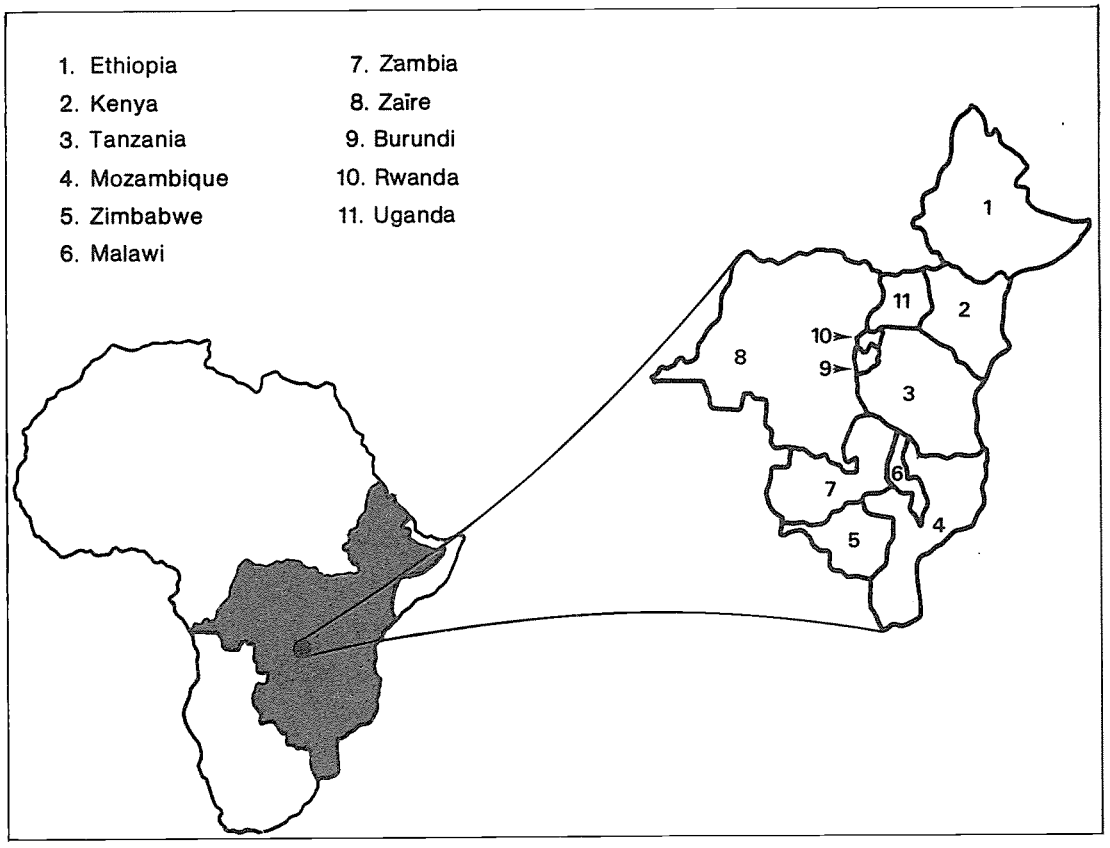
REGIONAL PROJECT FOR INLAND FISHERIES PLANNING, DEVELOPMENT AND MANAGEMENT IN EASTERN/CENTRAL/SOUTHERN AFRICA (I.F.I.P.)

I.F.I.P.

RAF/87/099-TD/02/89 (En) December 1989

Selected Papers presented at the SADCC/FAO Training Workshop on Fisheries Planning, Victoria Falls, Zimbabwe, 15-24 November 1988



UNITED NATIONS DEVELOPMENT PROGRAMME

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

UNDP/FAO Regional Project
for Inland Fisheries Planning
Development and Management in
Eastern/Central/Southern Africa

RAF/87/099-TD/02/89 (En)

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Selected Papers presented at the SADCC/FAO Training Workshop on Fisheries Planning, Victoria Falls, Zimbabwe, 15-24 November 1988

edited
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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
UNITED NATIONS DEVELOPPEMENT PROGRAMME
Bujumbura, December 1989

PREFACE

The IFIP project started in January 1989 with the main objective of promoting a more effective and rational exploitation of the fisheries resources of major water bodies of Eastern, Central and Southern Africa. The project is executed by the Food and Agriculture Organisation of the United Nations (FAO), and funded by the United Nations Development Programme (UNDP) for a duration of four years.

There are eleven countries and three intergovernmental organisations participating in the project: Burundi, Ethiopia, Kenya, Malawi, Mozambique, Uganda, Rwanda, Tanzania, Zambia, Zaire, Zimbabwe, The Communauté Economique des Pays des Grands Lacs (CEPGL), The Preferential Trade Area for Eastern and Southern African States (PTA) and the Southern African Development Coordination Conference (SADDC).

The immediate objectives of the project are: (i) to strengthen regional collaboration for the rational development and management of inland fisheries, particularly with respect to shared water bodies; (ii) to provide advisory services and assist Governments in sectoral and project planning; (iii) to strengthen technical capabilities through training; and (iv) to establish a regional information base.

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The present document contains eleven papers dealing with various aspects of fisheries and aquaculture planning. The papers were prepared by the staff of FAO Fisheries Policy and Planning Division (FIPP) and FAO consultants for presentation at the SADCC/FAO Training Workshop on Fisheries Planning held in Victoria Falls, Zimbabwe, from 15 to 24 November 1988. This training course was co-sponsored by the IFIP Project under its preparatory phase.

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IFIP PUBLICATIONS

Publications of the IFIP project are issued in two series:

- A series of technical documents (RAF/87/099-TD) related to meetings, missions and research organized by the project.

- A series of working papers (RAF/87/099-WP) related to more specific field and thematic investigations conducted in the framework of the project.

For both series, reference is further made to the document number (2), the year of publication (89) and the language in which the document is issued: English (En) or French (Fr).

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PART I : INTRODUCTION

The SADCC/FAO Training Workshop on Fisheries Planning was held in Victoria Falls, Zimbabwe, from 15 to 24 November 1988. It was convened by the Southern African Development Coordination Conference (SADCC) and organized by the SADCC Coordinating Unit for Forestry, Fisheries and Wildlife based in Malawi. The participation of the Food and Agriculture Organization of the United Nations (FAO) was funded by the Fishery Policy and Planning Division (FIPP) and the Regional Project for Inland Fisheries Planning, Development and Management in Eastern/Central/Southern Africa (IFIP).

The workshop was attended by the nine SADCC countries : Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe.

The present publication contains the FAO contributions to this workshop. Eleven documents are included, dealing with various aspects of fisheries and aquaculture planning:

- Fisheries development planning in SADCC countries;
- Information requirements for planning;
- Notes on selected aspects of strategic planning;
- Major policy instruments for fisheries development and management;
- The project approach;
- The relationship between development plans and projects;
- The performance of fishery investment projects;
- Some aspects of the analysis of small-scale fisheries projects;
- Monitoring and evaluation in fisheries development projects;
- Some policy issues for aquaculture planning and development in Africa with special reference to the SADCC region;
- The selection of aquaculture systems for use in Southern Africa and the practices which may be employed.

Other documents have been presented during the workshop and will be included in the final report of the workshop to be published by SADCC.

The list of these supplementary papers is given below:

- Major characteristics, constraints and key issues faced by SADCC countries in fisheries and fish culture development (technical, social, economic and institutional aspects and considerations);

- Introduction to sectoral planning as applicable to the fisheries sector (key issues, methodology, information, requirements,etc);

- Country papers on sectoral planning procedures, institutional arrangements, methodology, manpower linkage with information system assessment of major constraints and requirements;

- The role of the fisheries sector within the national development plan and the relationship between development plans and projects;

- Project analysis techniques;

- Project monitoring and evaluation.

Other documents already published elsewhere have been distributed during the workshop:

- Thematic Evaluation of Aquaculture, Joint Study by the United Nations Development Programme, the norwegian Ministry of Development Cooperation and the Food and Agriculture Organization of the United Nations, Rome 1987

- The acquisition of socio-economic information on fisheries (with special reference to small scale fisheries) : A Manual, ICLARM (draft)

- Report of the expert consultation on the acquisition of socio-economic information in fisheries (with particular reference to small-scale fisheries), FAO Fish.Rep. (344)

- Report of the ACMRR working party on the management of living resources in near-shore tropical waters. FAO Fish.Rep. (284)

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ANNEX 2 : AGENDA OF THE WORKSHOP

15 November: 10.00	Registration of participants Opening of Workshop by the Hon. Minister of Natural Resources and Tourism Election of Chairman and General Rapporteur Key note address by SADCC Coordinator Fisheries with summary presentation of SADCC's Programme of action in the Fisheries Sector.
15 November: 14.00	Address by representatives of Director General of the Food and Agriculture Organisation.
1.	INTRODUCTION ON SUBJECT OF WORKSHOP
1.1	Major characteristics, constraints and key issues faced by SADCC countries in fisheries and fish culture development (technical, social, economic and institutional aspects and consideration.
1.2	Introduction to sectoral planning as applicable to the Fisheries Sector (key issues, methodology, information, requirements, etc).
16 November: 8.00	
2.	EXPERIENCE IN FISHERIES PLANNING IN THE SADCC REGION
2.1	Country papers Sectoral planning procedures, institutional arrangements methodology, manpower linkage with information system assessment of major constraints and requirements.
14.00	
2.2	Information requirements for proper planning at sectoral level.
17 November: 8.00	
3.	PLANNING FOR AQUACULTURE DEVELOPMENT
3.1	Review of major planning issues and guidelines (conclusions of the Norway UNDP Thematic Evaluation

on Aquaculture Development; Conclusions of FAO/ SADCC results and proposals of guidelines and recommendations).

3.2 Determination and transfer of appropriate technologies in the SADCC Region (major technological alternatives; implications and requirements; criteria for selection; relationship with the agriculture and fisheries sectors, etc.)

14.00

3.3 Major approaches and policy instruments (extention, R & D, integrated projects, legislation, economic incentives etc) and their use in development strategies as applicable to small-scale rural and commercial fish culture.

18 November:
8.00

4. INTRODUCTION TO THE FORMULATION OF FISHERIES PROJECTS

4.1 The methodology of strategic planning

4.2 The role and use of various policy instruments (legal, economic and institutional) and the relationship of these instruments to fisheries projects.

4.3 The role of the fisheries sector within the national development plan and the relationship between development plans and projects.

14.00

5. FISHERIES PROJECT CYCLE

5.1 Project approach: definition of the project cycle, definition of project, range of potential projects with subsequent case study on "Project Identification"

19 November Excursion

20 November Free

21 November:
8.00 and 14.00

5.2 Critical components in project identification and preparation; reasons for projects failure with subsequent discussion on 'Project experience of participants'

22 November:
8.00 and 14.00

5.3	The preparation of project feasibility studies
5.4	Project implementation monitoring and evaluation with subsequent round up discussion on "critical features of the fisheries Project Cycle

23 November: Excursion

24 November:
8.00

6.	CONCLUSION OF WORKSHOP
6.1	Regional collaboration in Fisheries development in the SADCC Region (with special reference to planning)
6.2	Review of Workshop deliberations
6.3	Presentation and adoption of recommendations
6.4	Evaluation of Workshop

13.00 Closing of Workshop by Chairman

PART II : LECTURE NOTES

1. FISHERIES DEVELOPMENT PLANNING IN SADCC COUNTRIES

2. INFORMATION REQUIREMENTS FOR PLANNING

3. NOTES ON SELECTED ASPECTS OF STRATEGIC PLANNING

4. MAJOR POLICY INSTRUMENTS FOR FISHERIES DEVELOPMENT AND MANAGEMENT (discussion notes)

5. THE PROJECT APPROACH

6. THE RELATIONSHIP BETWEEN DEVELOPMENT PLANS AND PROJECT

7. THE PERFORMANCE OF FISHERY INVESTMENT PROJECTS

8. SOME ASPECTS OF THE ANALYSIS OF SMALL-SCALE FISHERIES PROJECTS

9. MONITORING AND EVALUATION IN FISHERIES DEVELOPMENT PROJECTS

10. SOME POLICY ISSUES FOR AQUACULTURE PLANNING AND DEVELOPMENT IN AFRICA WITH SPECIAL REFERENCE TO THE SADCC REGION

11. THE SELECTION OF AQUACULTURE SYSTEMS FOR USE IN SOUTHERN AFRICA AND THE PRACTICES WHICH MAY BE EMPLOYED

LECTURE NOTE N°1

FISHERIES DEVELOPMENT PLANNING IN SADCC COUNTRIES

by J-L. Gaudet

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1. FISHERIES SITUATION IN SADCC COUNTRIES

Fisheries in the SADCC region are important. Total catches by SADCC countries in 1986 were 561 000 tons. Catches by foreign fleets in the marine waters of SADCC countries were about 662 000 tons.

1.1 Marine Fisheries

Although only three SADCC countries have access to the sea, domestically produced marine fish catches account for about 22 percent of total SADCC fish catches. Angola is the most important marine fishing nation of the region. In 1972, about 600 000 tons of fish were landed by the Angolan fleet, of which more than 80 percent were reduced to fish meal. Because of war and internal instability, Angolan fish catches decreased drastically to the present level of 58 000 tons.

The Mozambican marine fisheries is at present producing about 31 000 tons from two main sectors, the industrial shrimp trawling sector and the artisanal sector. Shrimp trawlers produce 8 000 - 9 000 tons of shrimp which are frozen on board and exported directly to Spain and Japan. These exports account for about one-fourth of all Mozambican export earnings. The shrimp trawlers also take 20 000 - 30 000 tons of by-catch which are generally discarded at sea because of their low economic value and the lack of space on board. The artisanal marine fisheries of Mozambique produce no more than 20 000 tons. This is insufficient to meet internal demand. Large quantities of marine fish have to be imported. The Government of Mozambique is making a big effort to develop the artisanal fisheries by the establishment of community fishing centres called "Combinados Pesqueiros", which support the artisanal fishermen through supply of equipment and the organization of marketing activities.

Tanzanian marine fish catches come mainly from artisanal sources. Many attempts have been made, however, to develop an industrial marine fishery. The artisanal fisheries are operating on a subsistence level with dug-out canoes near the shore.

More than 660 000 tons of fish have been caught in 1986 by foreign fleets off SADCC countries. This represents more than six times the aggregate marine domestic production. Only about 100 000 tons of the foreign fleet catch are landed in the region under agreements with the national governments.

1.2 Inland Fisheries

The SADCC countries are generally rich in inland water systems with many lakes, rivers, reservoirs and dams. The inland fisheries production is of crucial importance in the local supply of animal protein, especially near the

main landing place. Fishing techniques are different from water body to water body, but most of the inland fishing activities are carried out at small-scale level, near shore with canoes. "Kapenta" (a sardine-type fish) is exploited with industrial purse seiners in Lakes Kariba and Tanganyika. The industrial catch of "Kapenta" in Zimbabwe and Zambia is of about 15 000 tons and most of it is for human consumption.

The main constraints experienced are the lack of appropriate gear and sea-worthy boats to exploit species further from the shore. Many near-shore fish species are exploited close to their maximum sustainable yield. Off-shore species still offer a large potential for increased catches (Table 1).

1.3 Aquaculture

Aquaculture is not important in the SADCC region. Estimates put production at about 2 000 tons, the bulk of which comes from Zambia and Zimbabwe. Intensive and integrated fish culture techniques of duck-cum-fish and pig-cum-fish have shown to be the most successful. Aquaculture could provide an opportunity for increasing fish supply, particularly in those areas where capture fisheries are negligible, for example in Lesotho and Swaziland.

1.4 Utilization of the Catch

More than 90 percent of SADCC fish catch is used for human consumption in the region. Most of this is consumed fresh in areas close to landing places. Urban markets are, nevertheless, important where mainly dried or smoked fish are found. Fish is processed only in areas with a low population density and where local demand is limited. Traditional forms of processing result in high post-harvest losses due to spoilage and insect infestation. Small pelagic species in sun-dried form are the most common processed products, and in this form are generally accessible to low-income groups. An additional small quantity of fish landed by the industrial fisheries is frozen and marketed in urban centres. The distribution problem in most SADCC countries is the major constraint to fish trade.

Though the average *per caput* supply of fish in the SADCC region (8.0 kg/year) is slightly below the African average, more than 20 percent of animal protein is provided on the average by fish but, locally, fish may account for more than 60-70 percent of animal protein intake. This is the case in Malawi, Zambia and Tanzania. In most areas, including the north western part of Botswana and the Lake Kariba area of Zimbabwe, fisheries are extremely important locally also as a source of employment and income. Foreign exchange earnings from fisheries are very high in Mozambique, where 25 percent of total export values comes from the shrimp fisheries, and in Angola. Of local importance is also the export of shrimps and lobster by Tanzania and the export of fish from Botswana to Zimbabwe.

1.5 Potential for Development

Total marine fisheries potential is about 780 000 tons (Table 1) of which more than 660 000 tons are presently caught (mostly by foreign fleets), thus leaving little space for further expansion. As most underexploited species are of low value, their further exploitation could be uneconomic. Shrimp catches off Mozambique are near the maximum sustainable yield, and management measures need to be taken to protect this important resource.

TABLE 1

SADCC Countries - Total Catches and Potential (1986)
(tons)

	Local Catches (1986)					Foreign fleet Catch (1986)	Potential		
COUNTRY	MARINE	INLAND	AQUACULTURE[1] INLAND MARINE (BRACKISH)		TOTAL		MARINE	INLAND	TOTAL
Angola	50 442	8 000	2	-	58 442	658 225	655 000	113 000	768 000
Botswana	-	1 900	n.a	-	1 900	-	-	24 000	24 000
Lesotho	-	16	12	-	16	-	-	290	290
Malawi	-	72 852	73	-	72 852	-	-	150 000	150 000
Mozambique	31 154	767	-	4	31 921	3 836	85 000	55 000	140 000
Swaziland	-	44	n.a	-	44	-	-	200	200
Tanzania	44 085	265 770	200	-	309 855	-	40 000	297 000	337 000
Zambia	-	68 199	975	-	68 199	-	-	270 000	270 000
Zimbabwe	-	17 500	816	-	17 500	-	-	22 000	22 000
TOTAL	125 681	435 048	2 078	4	560 729	662 061	780 000	931 490	1 711 490

1/ Included in figures for Inland or Marine as applicable

Development prospects in the marine sector can only be reached through the substitution of foreign fishing effort by increasing domestic landings. This is especially true for Angola. The landing of by-catches by Mozambican shrimp trawlers could supply an additional 20 000 - 30 000 tons of fish, but this problem, common to the shrimp trawler fisheries everywhere, is not easily solved.

Inland fisheries offer slightly more opportunities for development, the potential being more than twice the present catch at 931 000 tons.

The development of untapped inland fishery resources is further complicated, however, by the vastness of the area where fisheries are found, difficulties of access, lack of local markets and lack of fishing gear, boats and equipment.

A good potential for the establishment of large-scale fish farms exists in Zimbabwe and Zambia. To a lesser extent, aquaculture activities could be developed in Tanzania and Malawi. Small-scale family fish pond culture in Lesotho and Swaziland could provide fish and additional income for women who are often the head of the family in these two countries because of the export of male power.

1.6 Demand

Although about 600 000 tons of fish are available for human consumption in the SADCC region, demand for fish is generally unsatisfied. Fish is a well appreciated commodity. Consumption levels *per capita* are lower than the Africa average.

2. NATIONAL POLICIES AND STATED OBJECTIVES

Fishery potential and development is not homogeneous among SADCC countries. Some countries have important marine fisheries, others are well endowed with lakes, rivers and swamps, while others depend entirely on man-made lakes, dams and fish ponds for their fish production. Nevertheless, all countries want to develop their fisheries in order to:

(a) increase fish supplies;

(b) provide enough animal protein to the local population;

(c) create employment;

(d) earn foreign exchange through the export of fish and fish products;

(e) raise the standards of fishing communities.

All SADCC countries, however, face similar basic constraints in achieving the desired goals:

(i) lack of inputs, such as fishing nets, twine, hooks, floats and engines, due to lack of foreign exchange;

(ii) shortage of well-trained manpower both in the fishery administration and among extension personnel, as well as among the fishermen;

(iii) lack of communiction, i.e., access roads to fish production and consumption centres;

(iv) lack of fish processing and marketing systems and infrastructures, such as ice plants, cold storage, ice boxes and transport facilities;

(v) lack of credit facilities to fishermen.

To achieve the stated fishery management and development objectives, the above constraints have to be removed. It is obvious, however, that some objectives are contradictory and political choices must be made.

One of the main constraints to increased fish production in the region, particularly in the inland sector, is the lack of fishing gear. In order to overcome these constraints, governments must develop strategies to use to the extent possible local facilities and raw materials in the manufacturing of equipment and gear. There is a good possibility of regional collaboration in this sector. For example, there are net-making factories in Tanzania and Zambia but they generally work under capacity as raw material is missing and foreign exchange to purchase it is non-existent and machinery is outdated.

Increase of production depends also on training and extension. There are good opportunities for regional collaboration (TCDC) in these fields.

The provision of additional animal protein from fish means increasing fish catches. Increased landings by foreign fleets in Angola, and to a lesser extent in Mozambique, could increase considerably the animal protein supply of these two countries, and possibly that of the neighbouring States. Substitution of foreign landings by national fleets is a long-term objective.

Generally speaking, the SADCC countries look at fisheries as a means of creating employment. Existing fishery potential justifies these views. Furthermore, unemployment is a major problem in some countries such as Zambia. In Botswana, Swaziland and Lesotho, however, the problem is less acute as there is an important emigration of workers to South Africa. This emigration could be substituted to some degree by developing the fishery/fish culture sector.

3. INTRODUCTION TO FISHERIES PLANNING

3.1 Types of Planning

SADCC countries need to improve planning of fisheries development if they want to fulfil the abovementioned development objectives and goals of that sector. Good planning will direct investments in priority areas: it will encourage the participation of communities and private entrepreneurs; it will provide goods (public) and services which normally may not be available to the sector and will ensure a proper balance between artisanal and industrial fisheries development.

There are three conditions that must be met if the fishery resources of the SADCC countries are to yield the derived economic and social benefits to the coastal States:

(a) the State must have clear objectives that it wishes to achieve from the exploitation of the fishery resources;

(b) the administration must have the necessary knowledge and information about the resource and the authority and capacity to establish and enforce the conditions of its exploitation;

(c) the administration must be able to translate government objectives into achievable goals and targets.

For the purpose of this paper, planning is generally defined as the process of working out how to achieve an objective or objectives in practice. There are various types of plans and planning.

The economic plan of a country is concerned with national aggregates of population, investment, savings, foreign exchange, etc. It sets development targets for the economy as a whole, targets for growth in gross national product, etc., including investment levels for both public and private sectors. It also allocates scarce resources, such as foreign exchange and investment funds, to particular sectors.

Sector plans deal with specific areas of production, such as fisheries, analyzing their role in meeting plan objectives and targets, setting sectoral goals consistent with these and defining policies and activities needed within the sector in order to attain these goals.

The need for systematic fisheries planning stems from a recognition that uncontrolled fishing effort will reduce catch per unit effort and sometimes even destroy a particular fish stock. To make sure that objectives laid down in the sector plan are attained, exploitation must be regulated through appropriate management measures.

Since both the economic and the sectoral plans deal with aggregates, they are referred to as macro-plans.

Micro or project planning concerns the identification and appraisal of individual components or programmes chosen to carry out plan objectives.

Regional planning is concerned with a specific geographic area which may be a Province or a State in a federal system or a municipal administration in a unitary State. Planning can also take place within an individual enterprise (entrepreneurial planning).

Development planning (as distinguished from entrepreneurial) implies some form of participation by government in the planning process. It involves exercise by the public of conscious control - or direction - of the economy or the sector.

Incentive planning involves devising a system of economic inducements which make the planned course of action for economic units also the most desirable or profitable for them. Indicative and incentive planning are found mainly in market economies. As most economies are now mixed, planning, in practice, tends to combine elements of two or three of the basic types of planning.

In fisheries planning the circumstances that the resources of the sea are common property and a renewable resource which may be destroyed through uncontrolled activity of the fishermen account for the need for the State to shoulder responsibilities for managing and developing marine fisheries.

Depending on the time period encompassed, a distinction is made between perspective plans, medium-term plans and annual or short-term plans. The purpose of a long-term plan is to establish the broad lines of what will or should take place over an extended period of time, such as a decade. The long-term plan provides a framework for medium-term plans, which may be broken down into annual plans to conform with the periodicity of budgetary appropriations.

Development planning at the national level is of fairly recent origin and has been possible only since the development of appropriate planning tools, such as national income statistics. Although sector planning has had a longer history, its usefulness had been limited by the lack of national plans.

As planning is "the process of working out how to achieve an objective", the objective must be relevant and attainable; the necessary resources must already exist or, if not yet in existence, must become available within the plan period. As there can never be sufficient resources to achieve all objectives, planning requires the setting of priorities. National and sectoral objectives will, therefore, reflect political compromises.

Planning is not a magic formula for achieving development progress. Poor planning will yield poor results.

The process of producing national plans tends to proceed either from the top down or from the bottom up. Neither approach is satisfactory by itself. Macro-planners usually cannot know in sufficient detail what can and cannot be done in practice with the resources and constraints that actually obtain at the operational level. At the same time the operational unit is unlikely to be sufficiently aware of national constraints (of capital, foreign exchange, etc.) which determine the desirable balance between different sectors, projects and activities. Planning needs to be a balance between the two, incorporating the guidance that can only come from above, and the knowledge of what can and cannot be achieved in practice that exists at the bottom.

3.2 Terminology

The following terms are commonly used in the literature on planning:

Objectives - formulated by governments and, therefore, based mainly upon political considerations.

Goals and targets - interpret the political objectives in physical and monetary terms.

Policies or strategies - indicate how the objectives, and the consequent goals and targets, are to be achieved by an executive agency, e.g., the Fisheries Department.

Policy instruments and measures - tools, such as legislation and taxes, employed to pursue strategies.

Programmes, projects and activities - concrete elements which translate the plans for achieving the objectives into actual development.

3.3 Objectives of Fisheries Development Planning

The objectives of fisheries development planning can be defined as the benefits that the owners of a fishery resource wish to achieve from its exploitation. As the State is usually the owner, objectives are generally formulated by the Government and, accordingly, are based mainly upon political considerations. Objectives are, therefore, broad national aims that have to be translated into physical and quantitative terms called goals and targets. It is the task of the planner to do this, a task often confused with the setting of objectives. Of course, in his role as adviser to the politician, the planner may help to elaborate and clarify the objectives that best represent the wishes of the politician.

As we have seen above, the most common objectives of fisheries development are:

- feeding the population
- earning foreign exchange
- providing employment and
- creating revenues for the State in terms of taxes or licence fees.

Some of these objectives may conflict with one another. For example, feeding the population may leave no surplus for exports; or there may not be enough affordable fish for the population while there is a considerable surplus of expensive species. This is the case in Côte d'Ivoire where tuna and some shrimps are exported and cheaper fish, mackerel, is imported. In Canada the reverse is the case: large surpluses of cod and herring are exported and shrimps and expensive prepared fish are imported.

In other instances, revenue in the form of rent or royalties may have to be foregone so that more employment can be provided on fishing boats. Or, on the other hand, employment on shore may have to be foregone to increase foreign exchange earnings if foreign markets only take available fish in raw or semi-processed form.

The resolution of conflicts among objectives is always a matter for compromise in setting priorities. Some objectives may be desirable in the short term but only realizable in the longer term. The task of the planner is to assist the politician to resolve these conflicts by providing him with data and analysis on the benefits and costs of the alternatives. It is also the planner's task to assess the capacity of an administration to implement the programmes and projects required to achieve the objectives.

No fisheries development plan can be prepared until the objectives have been set, conflicts among them have been resolved and priorities have been established. It is well to remember that in most countries there are stated national objectives covering the economy as a whole. Sector objectives must be in harmony with these national objectives because the former should support the latter.

3.4 Planning System

From a functional standpoint, four phases may be distinguished in a planning system: pre-planning, plan preparation, plan implementation, and plan follow-up. Under these phases the major functional sub-divisions may include the following:

(1) Pre-planning:

- clarification of development values, goals and criteria.
- inventory and assessment of fish and other living aquatic resources;
- identification and analysis of fisheries development problems and constraints;
- identification of relevant intersectoral development goals;
- identification of international aspects related to fisheries planning;
- formulation of fisheries development goals.

(2) Plan preparation:

- translation of fisheries development goals into plan objectives;
- establishment of priorities;
- formulation and analysis of alternative strategies;
- formulation of key management and investment programmes;
- decision-making on areal, scope and time frames of programmes.

(3) Plan implementation:

- allocation of development resources to programmes;
- preparation of budgets;
- preparation of schedules;
- preparation of the fisheries operational plan;
- setting of targets to be attained in the plan period;
- setting up information systems, including feedback mechanisms;
- ensuring availability of qualified management for the operational phase of programme implementation;
- ensuring creation of facilities for servicing on-going operations.

(4) Plan monitoring and evaluation:

- monitoring operations;
- choosing measures to obtain adherence to plan objectives and choosing tools that will encourage compliance with control measures;
- organization development;
- evaluation of plan performance.

The above step-by-step outline should not be viewed as a temporal sequence that must be followed in planning since there are tandem relationships, functions, overlaps, feedbacks and common threads between the various functions.

3.5 Pre-planning

It is during this phase that the process of data gathering takes place. As data collection in fisheries is time-consuming, expensive and in certain cases technically complex, the planner will hardly ever have all the data he would like. Moreover, he will not be able to gather much new data, although that possibility should always be investigated. Normally, the planner will have to work with data already collected and processed, although he may sometimes have to work with raw data.

The data required is biological, economic and social, starting with the size, quality and current exploitation of the resource. This includes such things as species and stocks, their location, migration patterns, spawning habits and seasons, their reproductive capacities, exploitation levels, catch rates, etc. There must also be a knowledge of safe harvesting levels. The economic statistics include such items as landings by species, volume and value, ports of landing, costs and earnings of vessels, processing fcilities, location, size, products, markets, etc. The social data will include wages and salaries, fringe benefits, living conditions, education and training facilities related to fisheries, skills of the labour force, ethnic groups, etc.

When the data have been processed, it should be possible to assess their adequacy in relation to the objectives of the plan. For example, if all species and stocks are fully exploited by the national fleet, in the biological and economic sense, the need for planning is not necessarily reduced. The shape of the plan would be quite different, however, in the event of surpluses. In the former case, depending upon the State's principal objective, the emphasis will likely be on lowering the cost of fishing, improving the quality of the landed fish, looking for higher-value markets, etc. If there are surpluses, the plan should examine the feasibility of increasing the catch either by expanding the national artisanal and industrial fleets, creating joint ventures or authorizing foreign fishing under licence for a fee. The first plan requires an assessment of markets, the adequacy of infrastructure, the availability of skilled labour, vessels, etc. The foreign partner in the joint venture may have vessels, skilled labour and access to markets. The foreign fleet fishing under licence would require none of these things from the coastal State but the latter would require surveillance capabilities to control the fishing activities of the fleet to ensure that

they abide by the rules. Which of these alternatives is chosen will depend upon the objectives of the State. The planner will have to demonstrate how each strategy differs in its costs and benefits, its social impact, its administrative requirements, etc. The final choice may be in the form of a mix of the three -- some expansion of the national fleet, some joint ventures and some foreign fishing under licence.

At this stage of the planning process the planner should be able to translate the objectives into achievable goals and establish targets to achieve these goals. He should be able to state, for example, by how many vessels of a specified type the national fleet will be expanded over a specified number of years, given a determined infrastructure, financial support, skills profile, etc.

The above is an obvious over-simplification of the pre-planning process but it contains the heart of the matter. By the end of the pre-planning phase, the objectives should be clear and the goals and targets established.

3.6 Plan preparation

By the end of the pre-planning phase, the choices of objectives, goals and targets have been made and accepted by the authorities. The task of the planner at this stage is to prepare a draft plan showing how the goals and targets will be achieved. If the plan is directive, the planner identifies not only what is required and how it is to be provided but also who will do what. If the required body does not exist, he indicates how it can be established.

If the plan is indicative, the planner simply defines the allocation of resources required to achieve the goals and leaves the rest to the private sector. If the plan is an incentive plan, the planner devises s system of economic inducements which makes the planned course of action the most desirable or profitable for the private sector.

It is during this phase that the policy instruments and measures, such as legislation, taxes or subsidies, are identified and elaborated. This involves drafting legislation, designing the taxation incentives and outlining the form subsidies should take. These tasks are usually not performed by fisheries planners (although they are involved) but by legal experts from the Justice Department and tax experts from the Finance or Revenue Departments.

The bulk of plan preparation is the development of programmes, projects and activities that will translate the goals and targets into fishing vessels, ports, processing plants, trained personnel, fish products, etc. The lines of demarcation between programmes, projects and activities are sometimes blurred but it is useful to keep them distinct. It makes the implementation of the plan less confusing and cumbersome. An example of a programme would be the creation of an artisanal fishing fleet as one of the strategies if increasing the fish catch by nationals is one of the goals. The programme would identify the available resource and its location, the number and type of boats required and where they should be located. A project could be the development of one port to accommodate the artisanal fleet, as well as the purchase of gear and training of fishermen. The usual financial and economic analysis would have to be carried out and there are technical papers available explaining the methodology normally utilized to perform such analysis. After such analysis has been completed, investment plans and budgets must be prepared. During this

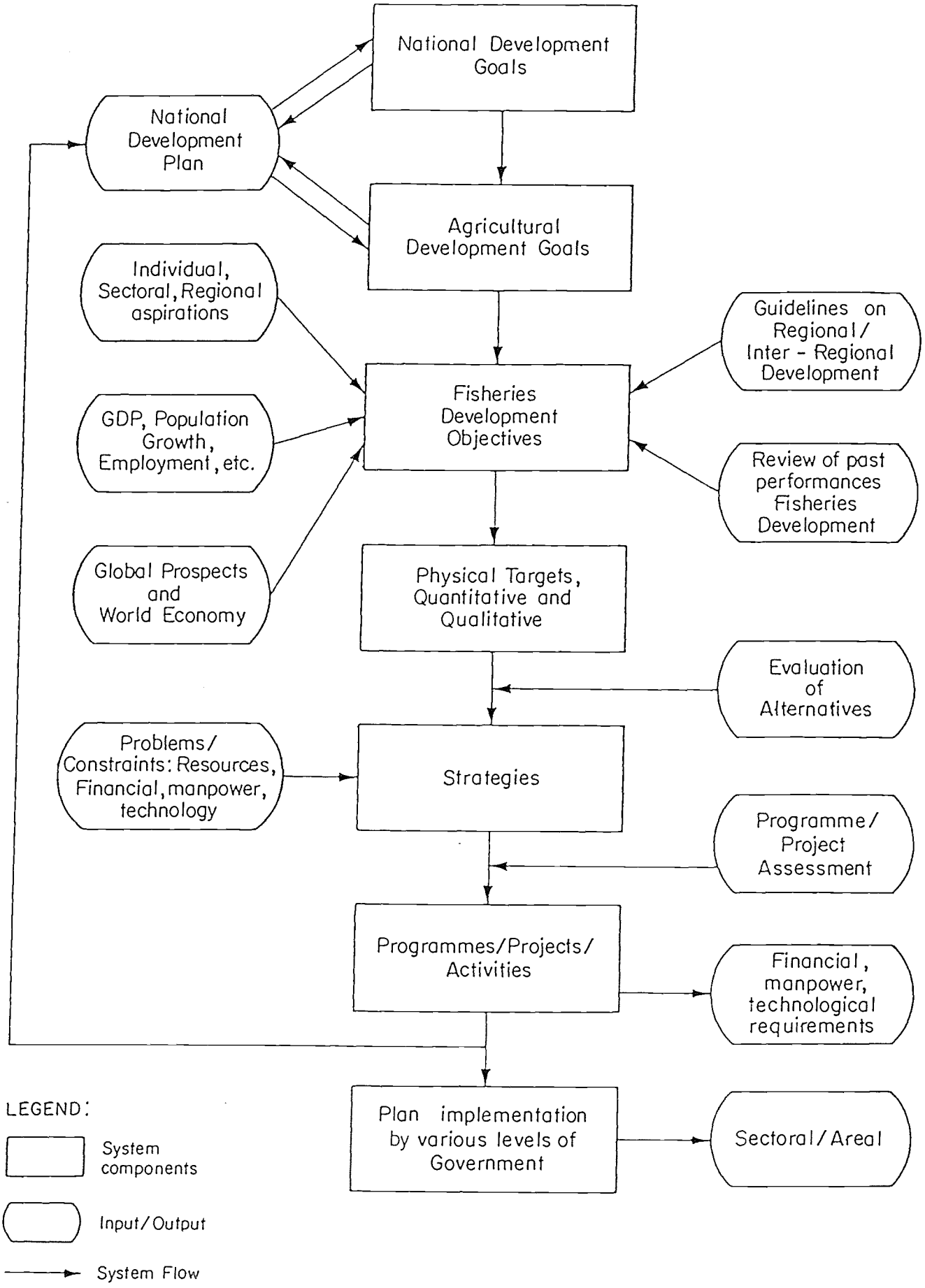

Figure 1
The Fisheries Development Planning System

process it may happen that a particular project is not viable and has to be abandoned or redesigned. The reasons may be due to problems within the project itself (expenses higher than expected costs) or external to the project (a drop in the market prices of the product).

This is a much abridged version of plan preparation but indicative of the process.

3.7 Plan implementation

It is well to remember at the beginning of this phase that the involvement of fisheries planners and operational staff depends upon how the project is being financed and who has final management responsibility. In a market economy some projects may be financed entirely by private capital and the planner may have no direct involvement. He may be involved in making sure that there is coordination between the private sector project and publicly financed infrastructure that will be utilized. For example, the provision of vessels may comprise the private portion of the project and the port development the public part. It is obviously important that the port be ready when the vessels start fishing.

Normally, planners do not implement plans even in a controlled economy where all projects are implemented by the State. That responsibility is carried out by operating units either within the fisheries administration, or by fishing enterprises or other government agencies charged with specific activities like port construction. In both systems the planner must watch the implementation process to make sure that the process does not frustrate the intent of the plan.

3.8 Plan monitoring and evaluation

The monitoring of the plan begins at the start of the implementation process. It is an ongoing activity that continues until the end of the planning period (say five years) when the evaluation would normally be undertaken.

Monitoring during the implementation processs is carried out by different persons, depending upon who is responsible for the project (private sector or State) and on the nature, size and complexity of the project. This monitoring activity is principally concerned with the construction phase and hence with the supply of material and equipment, with the performance of contractors, etc.

The monitoring activity changes considerably after completion of the implementation stage; the emphasis shifts to the performance of the project instead of those constructing the physical facilities or ordering equipment. If, for example, an artisanal fishing fleet has been introduced, a fishing port constructed and fishing crews have been trained, the monitor must now ascertain whether the boats are fishing and the port is operating satisfactorily. This requires the gathering of data on the costs and earnings of the vessels, the turn-around time in the port, the performance of the crews, etc. Such data not only helps to assess progress but provides the data that will form the basis for evaluating the project at the end of the plan period.

3.9 Tools and techniques for fisheries developing planning

Benefit-cost analysis

The conventional application of benefit-cost analysis in the evaluation of economic efficiency is still the best approach for economic analysis of development planning. Its scope and utility should be broadened and extended to include such things as social equity, distribution of benefits and costs and consideration of long-term development costs in environmental degradation and its impact on human health and the ecosystem.

Cost effectiveness analysis of natural systems

Where most benefits cannot be evaluated in monetary terms, this technique can be used to assess the least cost method or strategy to arrive at a particular development decision.

Multiple-objectives analysis

This method of analysis usually considers economic and non-economic objectives. In particular, it attempts to analyse unquantifiable objectives, such as quality of life and social equity, together with measurable economic objectives.

Risk-benefit analysis

This is very similar to classical benefit-cost analysis except that a risk function is attached to the cost function, such as the assessment of negative impacts or the probability of their occurrence, as well as the social consequences of these impacts.

Input-output analysis

It involves a set of sectoral outputs (fisheries, forestry, mining, etc.), a matrix of fixed total inputs coefficients and a set of final demands all expressed in monetary terms.

System analysis

It is based on the premise that large and complex problems and systems have components that should be considered as a whole but the interdependence of which should be emphasized. It involves the identification and formulation of a problem, the selection of tools for arriving at solutions, data collection and analysis and review and presentation of results for final decision-making. Examples are network analysis or flow diagrams.

Environmental impact assessment

The process involves the identification, prediction and evaluation of environmental changes arising from specific development activities. It helps planners and decision-makers in weighting alternative courses of action, evaluating development projects and formulating development objectives and strategies for implementation.

Anticipated results evaluation

This method applies to the selection of both a strategy and projects. In short, it summarizes in table form the effects of a strategy or projects on the various persons involved, e.g., fishermen, fishing enterprises, fishing communities, the State, etc. In the analysis, it incorporates feasibility studies, economic evaluations, internal and national value added, and the study of other requirements for implementing projects and programmes.

LECTURE NOTE N°2

INFORMATION REQUIREMENTS FOR PLANNING

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1. INTRODUCTION

The information requirements for the planning of a country's fisheries sector will vary from country to country. The following notes outline the type of information and describe the sequence in which it might be assembled for the capture fisheries sub-sector of a country within the region; the aquaculture sub-sector will require some information additional to that shown below.

The presentation of information amounts to a sector study. Sector studies are the necessary basis for sector planning and are the subject of discussion later in the Workshop.

2. GENERAL INFORMATION

The State of the Country's Economy

Brief description of the national economy. Key indicators, shown for a 10-year period, should include:

- GDP (deflated),
- Population, regional distribution, growth rates.

For a shorter period, reference should be made to:

- Rural/urban employment trend,
- Inflation rate,
- Balance of payments,
- External value of the national currrency,
- Principal exports and imports.

The intention is to give a short introduction to the overall economic situation which will provide an appropriate context for the sector analysis.

The Role of Fisheries in the Economy

Reference should be made in this section to elements such as:

- Statement on production (food fish, other);

- Contribution of fish to per caput animal protein consumption;

- Employment (part-time/full-time, primary and secondary levels); numbers of families (people) wholly and partly dependent on the sector for their livelihood; regional distribution of employment; processing;

artisanal and industrial fisheries production; fish farming; distribution and marketing;
- Contribution to GDP (in absolute and percentage terms, over a 5-10 year term, if possible);

- Contribution to exports;

- Contribution to Government revenues (licenses, taxes, others);

- Government (Department of Fisheries) expenditure research, counterpart funding, subsidies, etc.).

Institutional Framework

The purpose in this section is to describe fully the fisheries support institutions (responsibilities, structures, staff) and legislation. This section is of importance since a well functioning institutional framework is vital for the further development of the sector. It is important that the description should be as comprehensive as possible and objective. It should include:

- Fisheries Department (parent ministry, functions, staffing);

- Regional development authorities with fisheries responsibilities (relationship to Department of Fisheries, activities, interface areas);

- Universities and training institutes (number, type, functions, levels of equipment; numbers qualifying, graduating, etc.);

- Fishery laws and legislation (brief description, areas covered, review of fisheries management related measures.

3. FISHERIES DEVELOPMENT PROGRAMMES AND POLICIES

Government Policies

- The economic policy;

- Policy measures and goals relevant to fisheries;
(This element should be concerned not only with fisheries policy but also with other areas that impinge on fisheries. Examples are: the role of public sector involvement, foreign currency regulations, government policy with regard to foreign investment, regulation and practice regarding repatriation of profits,taxes, subsidies and tariffs on fishery inputs and outputs, investment policy and incentives, consideration of the impact of these policies on the sector).

Current Government Services and Development Programmes

There is a close relationship between the activities described in this section and the description of the institutional framework. The intention here is to describe the principal activities undertaken by the Government to support fisheries including aquaculture. The review should be objective and comprehensive, identifying weaknesses and disappointing performance as well as strengths in order that appropriate corrective measures may be taken, if

appropriate, or opportunities identified for the strengthening of institutional support for the sector. It will include:

- Fisheries management programmes,
- Implementation of management measures (including MCS, enforcement),
- Fisheries and aquaculture statistics,
- Fisheries and aquaculture extension services,
- Fisheries and aquaculture training,
- Fisheries and aquaculture research,
- Other programmes.

External Assistance and Flows

- External assistance: Description of all external assistance consisting of projects completed within the last five years, current projects and projects in the pipeline; projects which were completed more than five years ago but for which the results are relevant to the sector study, e.g., a resource survey, should be included also. Project descriptions should be provided and objectives, amount of total funding, foreign funding and type (e.g., technical assistance, grant, loan). Where there has been a project evaluation carried out, a summary of the project performance may be included.

- Other external flows (commercial banks, equipment suppliers, bilateral lines of credit, etc.) where precise data is difficult to obtain, give an estimate of the magnitude or relative importance of the flow.

4. CAPTURE FISHERIES

Fishery Resources and Exploitation

For marine and inland resources as appropriate:

- Description of fishing areas, including their size. This information may be useful for arriving at a clear understanding of concentrations of fishing effort and eventual overlaps.

- Description of existing fisheries on individual resources.

- Description of the state of knowledge of the resources.

The latter two items provide an opportunity to link potential with existing fisheries. Reference should be made to resources exploited for sale as aquarium fish where appropriate.

Fish Supplies

- Landings and values by area and by species (time series).

Vessels (including artisanal boats)

- Numbers (by type, size, horsepower/type of engine, area, gear, fishing area);

- Sizes of crews;

- Costs (investment, other fixed,operating, by type of boat, area).

Marine Parks

- Description of marine parks and conservation areas: location, size, characteristics, benefits, etc.

Existing Management Measures

- Description of measures in force, e.g., fishmeal vessel licensing systems; space/time constraints, mesh sizes, etc.

Socio-economic Characteristics

- Ownership patterns (owner operated, cooperative ownership, absentee owner, company owner; distribution, employment attributable to each; volumes and values of fish attributable to each).

- Share systems.

- Role of women.

- Fishermen's associations and cooperatives (numbers, main duties, distribution, levels of members' satisfaction).

- Industrial companies (number, distribution, ownership, types of assets, profitability).

- Conflicts (kinds and frequency, costs).

- Use of income generated from fishing (e.g., investment in other sectors, other uses).

- Other sources of income (employment) of fishing households by ownership status and area (type of economic activity; number of family members by sex; income in cash/kind by activity and season).

- Barriers to exit from fisheries (ownership of property, level of indebtedness/savings; level of skills, age structure; ethnic/other grouping; lack of alternative employment; level of awareness of other employment opportunities).

- Barriers to entry into fisheries (regulations, skills, other).

- Average age of fishermen by area.

- Constraints in fishing time (time taken off, weather, etc., average number of fishing days/year).

Physical Infrastructure

- Landing facilities;

- Repair and maintenance facilities; availability of gear; spare parts; fuels/lubricants;

- Access by road, boat, train, etc.;

- Electricity, water supply at the landing points;
- Preservation, handling and distribution facilities at the landing points.

Credit

- Sources of credit (present sources of credit; access to formal credit market; administrative procedures to obtain credit on formal credit market; economic, social and other aspects of the informal credit market; present level of indebtedness/savings by ownership/household).

- Loan recovery issues (rate of loan recovery by credit institutions; use of procedures designed specifically to meet fishermen's needs).

Ancilliary Industries (Boat building, net making, ice making, fish boxes, etc.)

- Number of employees, by region, sex;
- Incomes (to employees, owners);
- Ownership pattern.

Environmental Degradation/Pollution

- Location,
- Causes,
- Consequences/costs.

Damage to coral reefs, siltation, destruction of mangrove, agricultural/industrial based pollution, damage to water quality through dam or barrage construction may be cited where appropriate.

5. AQUACULTURE

Physical Resources

- Climate,
- Rainfall and evaporation,
- Water bodies,
- Soils,
- Fertilizers and agricultural inputs and by-products run-off.

Living Resources

- Local species,
- Non-local species.

Existing Aquaculture

- Brackishwater and mariculture,

- Inland warm-water culture,

- Inland cold-water culture.
  (For each of the above: realistic statistics on aquaculture production and areas (ha) under cultivation; locations, ownership, status, size and range of units, investment and operating costs, fry

stocking sources, yields, markets, revenues, feed supplies, other economic activities of fishfarmers.)

- Culture based stock enhancement (inland) of sport fisheries.

Credit

- Demand for credit by fishfarmers.

- Source of credit (present sources of credit; access to formal credit market; administrative procedures to obtain credit on formal credit market; economic, social and other aspects of the informal credit market; present level of indebtedness/savings by ownership/household).

- Loan recovery issues (rate of loan recovery by credit institutions; use of procedures designed specifically to meet fishermen's needs).

6. DOMESTIC AND EXPORT FISH MARKETING

Fish Supplies to the Domestic Market

Domestic Consumption and Demand

- Consumption by species (time series).

- Per caput consumption regionally (time series).

- Contribution of fish to average per caput protein intake and nutrition levels on a regional basis.

- Estimates of per caput subsistence consumption from fisheries and fish farming, respectively.

- Estimates (or assessments) of price and income elasticities.

- Projected demand to the year 2000.

- Constraints on consumption.

Export Markets

- Exports by type of products, value and country of destination (time series).

- Market situation and outlook (factors determining prices and demand for exported products and their likely development).

- Potential for further product and market diversification (brief review).

Fish Handling, Processing and Marketing

- Structure (channels of distribution, numbers of traders in each channel and at each level, product flows; price spreads; costs; ranges of profitability; sales arrangements; influence of fishermen's and

traders' organizations on fish supply/demand and prices, price and other relationships between export and domestic sub-sectors).

- Post-harvest losses (estimates of quantities, causes, points in the processing/distribution chain where losses are occurring; values).

- Processing (types of processing; facilities; numbers, sex of processors).

- Quality (standards; identification of areas requiring attention; inspection/quality control measures).

- Infrastructure (roads, transport, telecommunications, especially for export; sources of packaging; banking services).

7. POLICY ISSUES

For example:

- The close connection at present between the regulatory and extension aspects of the work of Department of Fisheries.

- Role of cooperatives.

- Interface with Development Authorities and other development organizations.

- Revision of fisheries legislation to include provision for local management areas.

PROPOSED DEVELOPMENT APPROACH

Major Development Concerns

For example:

- Projected food fish shortfall.

- Low incomes of coastal artisanal fisherfolk.

- Over-exploitation of the shrimp fishery resource.

- Conflict between industrial trawlers and artisanal fishermen.

- Loss of shrimp by-catch.

- Low incomes of lake fisherfolk.

- High level of post-harvest losses.

- Excessive profits of fish middlemen.

- Inadequate availability of institutional credit to the catching sub-sector.

- Inadequate supply of fish to the low-income rural segment of the domestic market.

- Lack of national participation in the tuna fishery within the EEZ.

- Destruction of coral by fishermen.

Potential and Constraints

For example:

- Potential for increased production from certain fishery areas.

- Potential for increased production from lakes which are under-exploited.

- Potential for (i) increased yield of shrimp from capture fisheries through management of the resource, (ii) removal of conflict between industrial trawlers and artisanal fishermen, and (iii) moderate increases in yields from certain lakes resulting from the improvement of fisheries management programmes.

- Potential for reduction of post-harvest losses.

- Potential for an increase in landings by minimising discards in the industrial shrimp fishery.

- Possibility of an increase in supplies from aquaculture.

- Trained fisheries and aquaculture extension workers who can receive further training and be redeployed as required.

- Inadequate access roads to many of the principal landing points.

- Inadequate transport facilities and extension tools/equipment for many extension workers.

LECTURE NOTE N°3

NOTES ON SELECTED ASPECTS OF STRATEGIC PLANNING

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1. STRATEGIC PLANNING IN REFERENCE TO PLAN PREPARATION

Strategic planning can be described as a process for determining the broad framework in which objectives and targets are to be achieved through the implementation of specific strategies, policy measures and programmes. As such, it is not only a basic step in plan preparation but provides the essential background for the proper and coordinated design of programmes and projects (tactical planning) and for working out the details of their implementation (organizational planning). Selected aspects of strategic planning are addressed in this document in reference to the preparation of a medium-term plan (e.g. 4-5 years).

1.1 Components of a plan

The development planning system involves many tasks and phases which must be carefully coordinated. The following list summarizes 12 major components of a sector plan of which the first five deal with strategic planning and the remaining with tactical planning:

1. Development objectives for the sector
2. A stock-taking and diagnostic survey
3. A set of targets
4. Selection of a limited set of strategies from among available aternatives
5. Policies and policy instruments for achieving programme objectives and targets
6. Policy measures and projects (preferably organized in programmes) to be carried out in fisheries, as well as in related sectors, to achieve the plan's objectives and targets
7. Research and studies to obtain the technical information needed for further elaboration of development/management programmes
8. A programme of public expenditure for financing each year of the plan periods including the source of finance
9. A programme of manpower training
10. Improvements and reforms needed in organizations, institutions and administrations
11. Consultancy services/technical assistance required
12. A system of plan evaluation and control

1.2 Weaknesses observed in the preparation of plans

In reference to the above sequence, the major weaknesses observed in the preparation of plans for the development and management of fisheries in the SADDC region concerns especially:

(a) The lack of carefully established priorities with too many plans attempting to achieve all the common long- and short-term objectives (increased production, increased employment, increased fish and protein supply, etc.) without any indication of priorities, even if the programmes will contribute only marginally to some of these objectives. Similarly, programmes and programme elements are seldom ranked in order of priority.

(b) The inadequacy of the information base and related analyses: Generally information and analysis seldom serve the decision-making process and lack the focus and pluridisciplinarity required to allow for the periodic assessment of the structures (number and kinds of companies, vessels, fishermen, infrastructures, etc.), the conducts/behaviors (relationships between inputs and outputs, use of technology, mode of production, products, pricing and investment practices and strategies, past and present government policies, etc.), the performance (production, profitability, contribution to employment, nutrition, foreign exchange earnings, etc.), the constraints (lack of gear, limited access to financial resources and trained personnel, resource limitation or competition between gear and markets, deficiencies of existing infrastructure or present government policies, etc.), the opportunities for development or ensure the sustainability of certain fisheries through proper management.

(c) Insufficient attention to project strategic planning: Symptomatic of this problem is the fact that planning is often limited to a series of uncoordinated and unharmonized projects, thus showing that attention is essentially limited to tactical planning. In the absence of a broader view of how the concrete interventions of the government will fit together, the programmes and projects which are implemented would generally be inadequate. Strategic planning is not only required to harmonize the proposed actions of the government at sectoral level, but also: (a) to ensure the complementarity of policy measures, programmes and projects; (b) to assist with the mobilization of international aid and assistance; and (c) to provide the operators of the fisheries sector with information concerning the government's medium- and long-term strategy for the development of the sector, thus providing for a less uncertain politico-economic climate. This is especially important if planning is indicative or directive in nature.

(d) Insufficient assessment of policy measures: This is indeed one of the most serious flaws of the present planning practices, and certainly the consequence of the over-emphasis put on projects to achieve development goals. Very often it is not projects but good policies which are required for development of fisheries. There are, at this level, numerous examples of projects which are doomed to fail, not only because of the lack of appropriate accompanying policy measures but because they are in direct contradiction with the existing policy measures, e.g., a small-scale fisheries development project and the absence of law or enforcement to protect small-scale fisheries from

infringements by industrial vessels, projects aimed at providing gear or fishing equipment which compete with existing national companies often unable to operate adequately because of import limitations, projects aimed at developing fisheries and price-fixing policies (low prices to consumers should be the result of development and are certainly a counter-productive ingredient to development at its initial stages), etc. Furthermore, major policy measures such as subsidies on inputs and capital are often adopted without proper assessment (even if they often prove a useful tool), are poorly monitored and too often continued even when no longer required.

1.3 Planning sequence

The above deficiencies reflect mostly the fact that fisheries administrations pay insufficient attention to strategic planning in general and to its five key components in particular. These are discussed in more detail in the second section of this paper.

The sequence in which the 12 components are given has significance and follows a definite logic. Obviously, some elements should be carried out before other, even if only tentatively. For example, the setting of development objectives and the stock-taking and diagnostic survey should precede target fixing since targets are really quantified objectives as specified through a carefull assessment of constraints, opportunities and available development resources (natural, human and financial). Similarly, economic policies and measures should be adopted in reference to the requirements for achieving targets and to an assessment of their relative expected efficiency.

Although some aspects of planning precede others, it would be a mistake to suppose that no deviation is permitted from the suggested sequence, and that each component must be dealt with consecutively in the order given, one at the time. Work on some components low in the list may have to begin before work on others higher up. Such is the nature of the planning process. Project identification and preparation, for example, may take two or three times as long as the preparation of the entire fisheries development plan.

Usually, work must proceed simultaneously on two or more components, with the emphasis changing from one component to another. This is because sector planning is a continuous process, with interrelated and mutually interacting elements. Each component must be coordinated with the others if the plan is to be consistent. Targets may have to be altered as planning proceeds if, for example, the strategy or policies required to achieve them are politically or socially not feasible. Projects may have to be reduced in number and size. Strategy may have to be modified in the light of rates of return realisable from available projects, and even objectives revised or discarded if, for example, investment funds prove to be insufficient. Conversely, additional funds may have to be found to permit retention of objectives and projects which are considered of the utmost priority.

In short, planning starts with assumptions and speculations which may turn out to be untenable and, by iteration or successive approximation, moves towards what is possible.

1.4 Discrete stages for plan preparation

In practice much planning is done on a continuous and partial basis viz specific fisheries, regions, programmes, projects and activities aimed at solving immediate problems. The act of committing a medium-term plan to paper can therefore be seen as a series of successive adjustments of major plan components for which partial planning has already taken place. Generally partial planning would focus on tactical and operational planning, often but regretably not always in relation to priorities indicated in the previous plan or to those *a priori* dictated by the more recent evolution of the sector.

Medium-term plans aim fundamentally at periodically and comprehensively appraising the consistency and realism of partial planning conducted prior to plan preparation *per se*, and at providing an updated strategic background for future partial planning activities. Key word here are comprehensiveness, realism, consistency and perspective.

The role of planners is to facilitate the decision-making process by providing background information and analysis; assessing alternative strategies, policies and programmes, further specifying expected requirements and expected outcome. However, the determination of objectives and targets, and the selection of key elements such as policy instruments and programmes remain the prerogative of decision-makers. Extensive consultation in general and with decision-makers in particular, is therefore an essential part of plan preparation, especially at the strategic level.

To allow for extensive consultation and a gradual determination of priorities, planners should break the plan preparation process in discrete stages corresponding to the preparation of partial drafts to be followed by extensive consultations. The first draft may focus for example on objectives, diagnostic survey and the identification of possible strategies; further providing indications of the relevance of on-going or recently elaborated programmes/policy instruments/projects to these strategies. With the third or fourth draft, plan elements corresponding to strategic planning *per se* could be fully elaborated with a summary presentation of plan components related to implementation.

1.5 Planning for plan preparation

It is quite critical for planners to organize carefully the progressive formulation of the plan. Aside from "pre-planning" activities related to information gathering, analysis and evaluation, the preparation of the plan may take from 3 to 12 months depending upon the recent evolution of the sector, the outcome of partial planning activities and its relevance to the strategic planning framework, and other factors such as major changes in national policies for example.

As seen above, plan preparation implies essentially a series of successive adjustments of plan elements aiming at both internal consistency and realism. The first stage in plan preparation is to roughly assemble existing information on the various plan components. On this basis the overall time frame of plan preparation can be determined viz the expected difficulty in achieving internal consistency and the foreseen need for short complementary investigations. It is recommended that this review/assessment takes place quite early in the process - e.g., 9 to 12 months prior to the plan completion deadline.

Once the overall time frame of plan preparation is determined, it is essential that a precise schedule be adopted, preferable along a number of stages as discussed earlier in this paper. Proper organization of plan preparation should further allow for a precise identification of tasks, their allocation and the adoption of a timetable for delivery of plan elements (drafts) and related working papers.

The importance of committing to paper at different stages the adjustments made and the suporting analysis should be stressed. Above all it allows planners to put together the results of their investigations in an iterative way and to organize consultation/discussions on a concrete basis. Planners are advised at this level to present the results of their analyses and complementary investigations in a series of working papers while preparing short and synthetic drafts of major plan elements for the purpose of consulting with decision-makers and other concerned parties.

The responsibility for strategic planning lies with senior management of the Fisheries Department. A small multidisciplinary team should be appointed for this purpose with team members working under the general guidance of a fishery economist/planner. On the other hand primary responsibility for working out how to achieve the goals of the strategic plan in the short- to medium-term rest with middle management at both headquaters and regional level with lower level field staff assisting with operationalization. Because information and planning are very much interrelated, it would generally be sensible that these tasks be assumed by a specific service which role will be to assist with overall planning activities. It is to be emphasized that the role of a service is not to plan but to support planning activities through the systematic processing and analysis of related information.

The above division of responsibilities in planning should not be interpreted as meaning that effective planning requires a rigid hierarchical system in which plan prescriptions are imposed from above. It follows from the need to ensure that senior managers do not engage in tactical or operational work at the neglect of establishing the guidelines that can only be established at this level.

2. SPECIFYING KEY ELEMENTS OF STRATEGIC PLANS

2.1 Formulating objectives

It is possible to identify a wide range of functions through which the fisheries sector might contribute to meeting national objectives of rapid economic growth, better distribution of income, improved balance of payment position, reduced unemployment and so on. These functions may include:

- a source of capital
- a renewable source of food in general and of animal protein in particular
- increase production and income
- a basis for industrialization
- earning and saving of foreign exchange
- the creation of employment opportunities in rural areas
- a safeguard for agriculture (e.g. viz fluctuation in production)
- a wildlife base, etc.

These functions provide the framework within which fisheries objectives must be defined, with only a limited subset of functions being appropriate to any given situation. Precision and consistency are key words for the definition of objectives.

Typical government statements such as "managing the fisheries resources to the greatest benefit of the country as a whole" need to be translated into more specific objectives which in due course must be quantified (even if the plan is fundamentally indicative rather than directive).

Specific objectives can further be specified as medium or long term with high or low priority. For example, the long-term objectives of a plan may be to achieve a certain level of per capita consumption while simultaneously raising foreign exchange earning and increasing employment in fisheries and related industries. These objectives can be ranked in that order of priorities and quantified after further analysis. In the medium term, priority objectives can be further specified in order of priorities as developing fisheries production from selected inland water bodies, developing the interior market for fish and creating the base for the industrialization of specific marine fisheries.

An obvious starting point in the identification and ranking of objectives is the stated objectives of the past fisheries plan and their actual relation to on-going and recently elaborated programmes. They may or may not be consistent; if not, one may try to reconstruct what have actually been the objective/priority of the last plan. A next step is to analyze the relevance of changes in national priorities and policies to future sectoral orientations, further considering the recent and expected evolution of the sector. It is likely that the identification of major objectives will be an easier task that their ranking as the latter requires a further consideration of sectoral requirement and of strategies which may be considered to achieve these objectives. For that matter, priorities would likely be established only after a few iterations.

Conflicts will likely arise in connection with the pursuit of several objectives. Programmes aiming at the creation of new jobs may be expected to clash with programmes seeking to increase earnings of established fisherfolks; programmes promoting export market expansion may reduce domestic supplies; short-term expansion of production may, for some fisheries, result in lower production in the longer-term, etc.

Conflicts between objectives and selected programmes should be clearly identified. While there is no way to avoid what economists call "externalities", these conflicts/side effects may be partially resolved first by carefully ranking objectives and, second, by introducing measures aimed at achieving the desired balance among a priori conflicting objectives and related programmes, e.g. through an MCS (Monitoring, Control and Surveillance) programme aimed at lessening the impact of industrial fisheries activities on these of small-scale fishermen.

2.2 Stock Taking and Diagnostic Surveys

A stock-taking and diagnostic survey is needed early in the planning process to provide information about the wide range of factors influencing fisheries performance. The scope of the survey should be limited and closely linked to presumed plan objectives. Stock-taking depends very much on the

data collection, monitoring and information system in place. Indeed, the survey is different from basic research and short-term fact-finding surveys or ad hoc studies. Although these could be complementary, a stock-taking and diagnostic survey should be, as its name implies, a broad-gauge inventory and an assessment of largely existing information about the fishery sector.

The following classification is proposed as one possibility:

(i) Basic data, e.g., on production, international trade, technologies/propulsion methods, etc.

(ii) Inventory of fisheries development resources, providing an indication of opportunities and scarcities. This is to include fish stocks and other relevant natural resources (e.g., water level/quality); capital resources with focus on investment and working capital; insitutional resources including the role, function and effectiveness of entities such as research and training institutions, marketing boards, cooperatives; human resources (labour supply and demand, qualifications, extension work).

(iii) The role of the fishery sector in the economy, (key indicators such as production, value added, net contribution to foreign exchange and nutrition, etc.). This analysis can be undertaken in reference to the whole economy but it is likely that reference to the agricultural sector (food production) will be more relevant.

(iv) Present state and potentialities of fisheries, summary analysis of: development opportunities, needs and constraints; impact and adequacy of ongoing or recently completed interventions by the public sector. This summary has to be based on ample consultations with the industry and relevant authorities at the decentralized/field levels.

(v) Analysis of special survey on issues of key relevance to the sector: occasional or periodic surveys of key issues or aspects of the sector which require special assessment, preferably on a periodic basis. At this stage of development of many of the SADCC fisheries likely issues will be the supply of fishing equipment or the development of new technologies. At a further stage a major issue might be the rational control of fishing effort and related management issues.

(vi) Trends, Demand and supply projections of fisheries products involve the use of methodological techniques of some complexity, especially because of the special relationship linking the two major determinants of supply: the fish resources and the fishing effort. One aspect is to project demand and supply; another is to reconcile them through some sort of commodity balance sheet constructed as a basis for determining what adjustments may be required (e.g., supply, i.e., initial stocks + production + imports = demand, i.e., direct consumption + consumption by processing industry + exports + waste + final stocks).

(vii) Information gaps, During this first review, focus should be placed on immediate information gaps. Later on, in the plan preparation process, information gaps will be identified which require action during the plan implementation timeframe.

2.3 Strategies and goals in reference to sector analysis

Sector analysis seeks to establish a quantitative basis for assessing what goals/targets are feasible, what contribution the sector can make to meeting national and sectoral objectives by pursuing particular goals within the sector, and the framework with which to identify policies, project and activities to effect this contribution. This is achieved through analysis of major relationships, both within the sector and also between the sector and the rest of the economy and the rest of the world (viz demand and supply of inputs and outputs).

The scope of activity within the fishery sector is subject to various constraints and opportunities, and conditioned by the interrelationship which exist between the different components making up the sector. A basic purpose of sector analysis is consequently to establish the limits within which planning of development in the sector can take place, and thus to identify how best to manage the sector within these limits. As these will seldom, if ever, be only one way of developing and managing fisheries in a given situation, sector analysis in practice involves identifying and analysing a range of alternative option or strategies that are available to decision-makers.

If the sectoral objectives and the criteria for measuring the worth of fisheries development options in terms of these objectives are clear-cut, the subsequent choice between the alternatives can be made at the executive level.

However, as pointed out earlier, several objectives or contributions may well conflict with each other and be measured by different criteria. In this case, no single measure of what is best exist, and policy decision would have to be taken at a higher level. Actually and because of the iterative nature of the plan preparation process, sector analysis can also provide an important aid towards further specifying and ranking objectives themselves (quantified as goals/targets), by clarifying for the policy makers what feasible options (broad strategies/policies) they actually have available.

In order to provide the necessary basis for decision, sector analysis needs to be policy-oriented. The alternatives analyzed need to be assessed in terms of their contribution to national income, redistribution of income, employment creation, earning or saving foreign exchange, or whatever other criteria reflect the national and sectoral priorities. The analysis should shed as much light as possible on what policies within the sector which will best achieve a given goal or goals, and what would be the effects of applying particular policies.

(1) Modelisation of the sector and quantification of the interrelationships or flows linking major components.

(2) Estimation of major trends especially viz supply and demand for goods and services and identification of gaps.

(3) Estimation of the quantities of goods and services that the sector could provide in the future under alternative supply and demand assumptions.

(4) Assessment of the feasibility and efficiency of the different future supply and demand scenarios.

(5) Analysis of the contributions of each of the alternatives to meeting national and sectoral objectives and presentation of the resulting information to the decision makers.

Actually sector analysis is very much a systematic follow-up of a stock taking and diagnosis survey. The major difference is that drawing from system analysis, it allows for the simulation of a model (quantitative representation) of the sector. Although the uncertainty characterizing the resource base is a key constraint to fisheries planning in general, it should not prevent the elaboration of simple models such as these used for input-output analysis. These models involve identifying and quantifying all the inputs into the system and their source, and all the output and their distribution; linking those with simple relationships and basic constraints such as estimated maximum production. Basic sets of accounts may be built into such model to relate consumption, trade, harvesting and production requirements within the sector and to measure these in terms of requirements of capital, labour, foreign exchange and inputs from other sector of the economy and in terms of contribution to national production, foreign exchange earned, employment, etc. If much work remain to be done to develop widely applicable models of this type for the fishery sector, some have already been successfully developed (e.g., in Morocco).

Such model would generally and rightly put emphasis on the reconciliation on supply and demand. Indeed planning is very much related with ways and means of closing an expected gap if the comparison of supply and demand shows a prospective shortfall in supply, or with ways and means of disposing of a prospective domestic surplus. This situation may apply to the sector as a whole or some of its components. The determination of policies and strategies would generally be linked to the result of such reconciliation exercise. For example the major steps which may be taken to reduce an expected shortfall in supply may include:

1. raising domestic fisheries production
2. developing fish culture production
3. reducing post-harvest losses (if important)
4. increasing imports
5. reducing exports
6. reducing industrial use (e.g. fish meal)

Of course, several of the above goals (specific objectives) can be sought simultaneously through alternative strategies with further iterative analysis of requirements and likely benefit being required to quantify these goals (targets). For example in reference to the broader objective of increasing per capita consumption, an option may be to raise domestic fisheries production through a number of alternative strategies (intensification of small-scale fisheries on such and such water bodies/fisheries; development of new fisheries; management of largely over-exploited stocks, etc.) and to reduce post-harvest losses (through improved conservation methods, greater availability of ice and cold storage, etc.).

A first level of analysis should enable planners to identify the range of alternative goals and related strategies which are *a priori* consistant with the size and nature of the future market and fisheries resources, and with the likely cost of making the latter available, and with the likely price prevailing in the market. As seen above simple sector model can be used to evaluate the likely impact of alternative demand/supply schemes in reference

to possible goals/strategies. Depending upon major national and sectoral objectives, the contribution of alternative goals/strategies may be measured in terms of economic growth (value added, i.e., the difference between total revenue and the cost of raw materials, services and components), return to capital, employment (e.g., total employment, investment cost per new job created, net value added, productivity by worker, location of jobs, etc.), foreign exchange, fish and animal protein consumption per caput, etc. Trade-offs between criteria which are not easily quantifiable would generally be a difficult question, even if objectives are ranked. Alternatives would thus have been presented to decision makers.

This first level of analysis should preferably be done on the basis of a sector model assessing the feasibility of alternative goals and selected broad strategies. Further assessment of alternative goals/related strategies needs to be extented to encompass two further factors:

(1) Availability of sufficient capital, fisheries resources, manpower, technologies, skills and other inputs needed to, for example raise the domestic production of specific fisheries (broad strategy) by a certain level (goal and target).

(2) Adequacy of the institutional framework which exist and should be created in the time available to bring about the changes needed to raise production to the required level.

In reference to physical inputs such as labour or capital, these need to be broken down to recognize the likely diversity of these inputs. For example, per unit capital requirements can be assessed viz a number of sub-sectors and activities. Similarly for separing out outlays in foreign exchange. A balance sheet of requirements and availability of the basic categories of skilled manpower will further reveal whether there are, for a given option, major in-balance in trained personnel demand and supply. This information will either show that alternative goals/strategies must be selected or that the strategy should comprise an important training component.

Alternative targets and selected broad strategies will require different policies if these are to be attained. A final stage of sector analysis is therefore concerned with assessing what policy instruments are available, the nature of their impact and the extent to which they can be applicable, and made effective, in practice.

The availability of policy instruments depends very much on political factors and budgets, while effective application of available instruments depends on a host of institutional factors, including the organization of government services. The availability and appropriateness of policy measures or instruments will differ according to the degree of government control; clearly, something quite different is possible, and needed, where the state can do no more than induce change in a particular direction through the provision of relevant incentives, and where it can intervene through the issue of directives. The choice of policy measures will also differ according to whether control can be exerted or not on the resource (viz jurisdiction/shared stocks).

There are three generally recognized categories of policy instruments relevant for fisheries:

- public investment
- regulations
- incentives and disincentives

Government can manipulate change by investing directly in projects in the sector and so control, or influence, their management. Incentives or disincentives to private enterprises to act in the way desired by government are created by giving subsidies or imposing taxes which respectively make desirable activities more attractive, and undesirable activities less attractive, in terms of profitability and other private sector criteria. While disincentive policies say "you may do such and such, but you will have to pay an additional tax of so many dollars", regulations say "you may not do such and such". A classic example of the difference is the distinction between an outright export embargo and tax on export of certain species. Regulations tend to be easier to apply, more certain and less complicated, but less flexible, and often less acceptable, than incentives or disincentives.

There are various general policy instruments, such as minimum wage rates, tariffs, income or corporate taxes which affect the fishery sector but which are administered not by the fisheries authorities but by other arms of government. Though these can consequently seldom be manipulated specifically to bring about change in the fisheries sector, it is necessary for the fishery sector analyst to be aware of such exogenous policy factors, and to recognize what their impact on the sector will be. For example, it will be difficult for the fisheries sector to encourage capital intensive fishing and processing technology within the sector at a time when the country's fiscal and monetary policy measures undervalue the national currency in terms of foreign exchange, as this will mean expensive imports, including imported machinery, which will encourage the private sector to move towards more labour-intensive rather than more capital-intensive options.

The Table on the next page lists the major categories of policy instruments available to the sectoral authorities in fisheries, some specific examples from each category of instruments which are actually being used in fisheries development programmes, and some examples of the types of objectives to which the instruments apply. They include such familiar tools as management regulations and fiscal incentive. From an analytical point of view, and in terms of defining the costs and benefits involved in different alternatives, we need to dissect these familiar tools since, in general, they contain more than one type of policy instrument which will affect objectives. For example, most management schemes contain a combination of regulations and incentives. Development programmes also tend to be a "package" of different types of instruments, including both regulations and incentive and disincentive provisions. Unless we have some idea of the specific instruments involved, we cannot adquately analyse and evaluate the effects of applying the tools and the workability of the alternative courses of development presented in the sector analysis.

Most of these measures are well known. However, it is also well known that their application in practice has all too often resulted in developments that have been quite other than what was desired and planned. To cite but a few cases: legislation has often proved to be an obstacle rather than an incentive to sustained development because of the emphasis on deterrent and

POLICY INSTRUMENTS FOR FISHERIES DEVELOPMENT[1]

Category	Examples of instruments	Examples of objectives
I. Direct public investment and management	Public fishing and/or processing corporations of various kinds	Develop a relatively untapped fishery resource where private development is not readily available
II. Regulation of private sector activity	export embargos (certain species) Import quotas Quality standards (e.g. on exports) Utilization standards Labour laws Price controls Stimulation of competition	to encourage domestic processing ; to encourage import substitution ; to promote and secure export market; to promote higher efficiency and possible consumption; to protect labour and provide fair pay; to control inflation, protect industry, etc., ; to promote efficiency
III. Incentives for private sector[2]		
A. Direct price incentive		
1. fiscal	Exemption, remission or deferred payment of all kinds of taxes (e.g., property, income, sales, export and import taxes)	to encourage various types of private development which are socially desirable but which would not take place without incentives
2. non-fiscal	Subsidization of inputs through low cost credit, outright subsidies, price supports, insurance schemes, export performance awards, etc.	to achieve generally the same purposes as above (choice between fiscal and non-fiscal depends on institutional and other particular circumstances)
B. Indirect price incentives	Government research support, training programmes; technical assistance, marketing services, export promotion, etc.	to overcome lack of economic and technical knowledge, reduce investment risk, etc.

NOTES 1/ These are specific instruments which may be combined in various workable ways.

2/ The opposite of incentives is disincentives: e.g., instead of tax exemptions, we impose taxes; or instead of an uniform tax rate, we have discriminatory taxes (which amounts to the same thing as an incentive to the sector having the lower tax rate)

punitive aspects. Attempts to develop industrial fisheries have sometimes led to destruction or downgrading of the resource with very little benefit to the country concerned. Tax incentives and subsidies to induce development of specific activities by the private sector have on occasion led to dissimination with little impact on target groups. Tariff protection for "infant" industries have all too often led to high cost production which has inhibited the further growth of the industry, and hindered the expansion of the other related industries.

There are a number of criteria by which the suitability of policy instruments may be judged.

(a)	Workability	Administrative complexity, suitability of administering agency
(b)	Efficiency	The relationship between results and cost of administration
(c)	Degree of certainty	Does the level of subsidy or the strength of a regulation have the desired result or target group?
(d)	Flexibility	How much is the Government committed? How much recurrent as opposed to once and for all expenditure? What legal obligations are created?
(e)	Consistency	Social aspects, welfare, equity, integration with other agencies, external effects on, for example, land costs, social effects.
(f)	Timing	Are the instruments being introduced at the best time?

Failures to correctly assess the institutional feasibility of a given course of action are usually twofold. The first is failure to fully understand the nature, or magnitude, of the relationship between a policy measure and the response to that measure, so that the wrong policy instrument is chosen for a particular situation. For example, an "infant" industry might in some circumstances be better established by means of a subsidy to cover its operating losses while it builds up to full efficiency rather than by a protective tariff, which by increasing the price of the product that industry has to sell, can inhibit, and even reverse, the growth of the market on which the industry depends for viable operation.

The second common area of failure is in the workability of the instrument. Regulations will not be effective if the agency responsible for implementing them is not capable of doing so. Taxes will not be effective if they can be evaded, etc. Such institutional weaknesses constitute a major impediment to sound Fisheries sector development in most developing countries. In assessing what can be achieved in a given period, a realistic view must be taken of the institutional constraints that exists.

Again, an assessment of key policy instruments is required which should relate both to the afore-mentioned criteria and to the more general objectives/criteria of the plan (domestic production, foreign exchange, etc.).

LECTURE NOTE N°4

MAJOR POLICY INSTRUMENTS FOR FISHERIES DEVELOPMENT AND MANAGEMENT (Discussion notes)

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1. INTRODUCTION

There are two broad types of policy matters concerning sectoral planning. First, there are the priorities to be established with regard to sectoral objectives. Sector analysis and the identification and assessment of a priori adequate goals and strategies provide a broad outline, or framework, which show where the sector is to go. This is only guidance, however, for the further work which has to be done on policy issues like incentive structures, input supply or management schemes.

The second type of related policy problems involve the choice of instruments for achieving these goals along the line of broadly defined strategies. There are a wide range of policy instruments which can be used alternatively or complementarily to reach specific goals.

The problem of planners/decision makers is to identify and assess these alternatives vis-à-vis a) the relevance of each alternative to the situation/constraints which are hindering movement towards a specific objective and related goals and strategy ; b) the efficiency of the instrument in terms of likely impacts both direct and indirect as measured through performance criteria (production, value of production, distribution of benefits, etc.) and c) the applicability of the instrument vis-à-vis expenditure, administration, investment, private cost and other requirements.

In practice, there is usually no easy way to determine whether a policy instrument will work without trying it. Even if successful as far as the target group/activity is concerned, side effects might be more detrimental than expected. The effects of institutional constraints, in particular, are only roughly known. Experience in the use of policy instruments will often, therefore, have to be gained through trial and error experiment, e.g. pilot schemes.

It remains that planners/decision makers have at their disposal a wide range of policy instruments which should be considered and analysed, and that the more knowledgeable they are about the various features of these instruments, the more likely they are to select the right instrument or mix of instruments. For example, it is often noted that preference given to direct government intervention does not necessarily reflect a political choice but rather an insufficient attention paid to alternative solutions such as the use of incentives.

Proper monitoring and evaluation is a key related issue, both for assessing the efficiency of past policy instrument and of new ones on a

trial basis. It is indeed too often noted that inadequate policy instruments or inadequate use of these instruments are applied unchecked over extended periods before being eventually modified or abandoned.

The aim of this short paper is to review the main policy instruments which could be used for the development and management of fisheries and to outline their main features as a basis for further discussions by participants. Following the framework presented in related paper SADCC/FAO/88/9, policy instruments are classified either as direct public investment and management ; regulation of private sector activities ; or incentives, either direct or indirect.

2. DIRECT PUBLIC INVESTMENT AND MANAGEMENT

Management refers here to business/sector management. Fisheries management on the other hand might involve the simultaneous use of the three types of instrument (e.g. institutions, regulations, incentives). Among the instruments related to direct public investment and management one may consider in relation to various objectives/strategies :

(1) Establishment of an industrial fishing state corporation :

The development of fisheries resources which are not readily accessible to small-scale fishermen may appear to justify the development of industrial or semi-industrial fishing activities. The lack of experience of the private sector (often combined with the lack of capital) has often prompted the establishment of state corporations which performances throughout Africa have been generally poor although there exist some exceptions like in Malawi for example.

Aside from poor financial performances due to the lack of experience and the difficulty to operate fishing vessels in the rigid framework of public entities, state corporations have seldom been instrumental in promoting similar development by the private sector. Generally, the main causes of failure have been poor maintenance and management, chronic cash flow problems and government interference in commercial operations leading, for example, to wide- spread overstaffing. Nevertheless, lessons have been learned and experience gained from the use of this instrument and some companies are now run more successfully under more rigourous and autonomous management.

(2) Processing/marketing state corporation (domestic market) :

On the domestic market, failure of the market forces to supply adequately some remote area ; apparently important/exploitative margins prevailing at ex-vessel-wholesale-retail levels ; port-harvest losses ; seasonal excess supply ; or poor product quality have prompted the creation of processing and/or marketing state corporations. Aside from the generally poor performances associated with public business management, the limited success of corporations created in Africa for this purpose is often linked to the difficulty of profitably doing what the private sector does not do. This calls for a fairly thorough investigation of the reasons why, for example, margins are high, or cold chains not used. Generally failure to properly assess constraints and market forces leads the companies involved to have the choice between chronic cash flow problems because they cannot

operate profitably or a readjustment of their mandate towards more profitable activities already undertaken by the private sector.

(3) Joint venture between public/private domestic concerns and other forms of arrangements :

There are alternatives to direct public involvement in commercial activities. The state or public institutions (e.g. a fish processing and marketing authority) may wish to participate directly in both the capital and management of certain companies in order to share the risk involved in larger scale or new activities, and to be able to guide the activities of the companies concerned in a certain direction. It may further be desirable at a certain stage of development to enter into such arrangement in order to progressively privatize already existing state companies or some of their activities.

Private management of public assets might also be considered when it comes to operating under concessional or contractual arrangements, assets such as cold stores, ice plants, fishfry production centers, or fishing input stores. Generally such a solution will be considered if such an activity is not expected to be sufficiently profitable to attract private entrepreneurs.

(4) Access rights to foreign fishing vessels :

This is an alternative or a complement to other forms of foreign participation like joint ventures. It is usually more beneficial in the short term and easy to manage. Its main drawback, compared to joint venture agreements, is that access rights do not contribute appreciably to the progressive development of national capabilities. A key joint- requirement is the establishment of a proper monitoring, control and surveillance system. Reciprocal access right with neighbouring countries can also be considered when it come to exploiting certain species (highly and seasonally migratory species in particular).

(5) Promotion of fisheries management organization :

The need for extensive consultation with the industry and other concerned parties requires the establishment of specific institutions/mechanisms such as national, regional or fishery specific consultative bodies. Furthermore, it may be possible to create community-based management institutions where there are suitable opportunities for the introduction of this type of institution or where traditional management schemes already exist which can be strengthened. One needs to assess the delegation of power involved, the mechanism which may be used to regulate the functions of these instituions vis-à-vis others like research, administration etc.

(6) Direct provision of fishing inputs :

This is a popular instrument in Africa, which has been used with usually net positive results although the indirect costs have seldom been considered. Whether fishing inputs are distributed by the fisheries administration or by parastatals, they have generally been acquired through externally-funded projects, grants, or loans and sold at cost and/or on a duty free basis. The indirect cost is often that domestic producers (e.g.

net-making companies) or importers/distributors are often made uncompetitive (especially if they have to pay high duties), or, at least, their supply of inputs is temporarily upset. Another factor is the dependency of fishermen on this type of input supply schemes as private or commercial input production/importation/distribution companies are relegated to a minor role, with serious adverse effects such as periodic shortages when government schemes run out of funds or when aid projects end.

(7) Package programmes :

When fisheries departments intervene to raise output and productivity a logical approach is often to put together a "package" of physical inputs (e.g. advanced fishing units/ice plants/marketing framework for artisanal fisheries with credit and other incentives used to complement this action). In practice, the difficulty arises that for the package to have maximum impact all its ingredients must be available in the right quantities, at the right time and in the right place. Frequently, however, such policy instruments fail because of the difficulty in putting together the most appropriate package or to ensure that its particular inputs are in practice available together. One way of coping with this is to concentrate efforts in a few areas/target groups at the time.

Technical packages further require basic ingredients in order to be effective, i.e. appropriateness of technology in general, profitability, due consideration paid to the priority to be given to each sub-component of the package and to required changes in the mode of operation and organization of the fisherfolks.

(8) Infrastructures :

Infrastructure requirements are important for industrial fisheries but not for small-scale fisheries. Many development programmes in Africa have put undue emphasis as providing infrastructure to small-scale or medium-scale fisheries. A frequent result is that a large number of cold stores, ice plants, etc. remain idle. Often, such development attempts have ignored the irrelevance of, for instance, cold chains to a particular fishery. On the other hand, another major problem has been the neglect of basic infrastructure support, such as the improvement of landing places (e.g. shaded areas, running water, fencing, etc.) and the improvement or maintenance of feeder roads. This type of intervention can frequently have a highly significant impact, as seen in Zambia (CIDA-funded feeder road project), for example.

3. REGULATIONS

Effective regulations require monitoring and control and a complementary assessment of both expected impact (adequacy of the regulations), and of expected enforceability and related cost. A wide number of regulations apply to a wide range of activities, e.g. labor laws, corporate laws, etc. Some are specific to the fishery sector such as :

(9) Standards and grades :

Standards and grades are absolute requirements when it comes to exporting within sophisticated world markets (e.g. shrimps) and for quality

control in general. At the domestic level enforcement requirement will generally be much higher but such regulations might be introduced for health protection or to improve marketing practices (e.g. standard crates/bags) and to facilitate monitoring.

(10) Price control :

Price control can be introduced as a matter of national policy for food and other key products. In this context it is difficult to enforce and generally it helps urban consumers but not producers. A major problem of any price control, for inputs or outputs, is that someone has to pay the cost. Many countries do control export prices or impose minimum export prices for fiscal reasons (e.g. Tanzania for shrimps). Such a control generally requires the establishment of an efficient marketing intelligence service and needs to provide some flexibility to producers. Input and output price control mechanisms are also required for the operation of joint ventures with foreign partners. For the domestic market, output prices can be more easily controlled indirectly, e.g. through import quotas and price stabilization.

(11) Import quotas :

Significant imports of cheap fisheries products may have a marked impact on domestic prices at all levels (depending on market substitutions). To stimulate production, a government may impose import quotas over a period of time if these are expected to induce increased domestic production. Whether it does will generally depend on marketing structures and the propensity of fishermen to invest.

(12) Export embargoes

Many countries attempt to ban exports of certain species, either for conservation/management reasons, or to increase the availability of fisheries products on their domestic market. This is easily done with regard to the formal export market but more difficult to achieve for the informal trade ; indeed, it may itinerate the latter. Another harmful consequence of such controls is that they might significantly affect domestic producers as a result of lower domestic prices.

(13) Price stabilization :

Price stabilization can reduce risks to producers, encourage the use of new technologies and stabilize prices for consumers. It can be achieved through government buying, selling and storage operations for domestic markets and by financial averaging for exports. Such operations require significant investment especially for storage and may be costly if gains and losses do not average out over time. Generally, investment and management cost will be quite high if seasonal price stabilization is required over short periods.

(14) Fisheries management regulations :

There are a number of alternatives and/or complementary types of regulations related to the management of fisheries resources, for example :

- licensing schemes
- access tax
- collective quotas
- individual quotas
- input restrictions (gear ban, mesh size)
- access restrictions (closed seasons, closed areas).

An assessment of these regulations is presented in Table 1 with respect to key criteria.

4. INCENTIVES

4.1 Fiscal incentives

(15) Duties on physical inputs :

These vary greatly from country to country in the SADCC area and one further notes that fishing inputs are often taxed while agricultural inputs are not. Also noted is the importance of tax free sales by government agencies which compete with regular taxed imports or national production (of nets, for example). Low duties can be a very efficient policy measure for small-scale fisheries development and a fairly easy one to implement.

(16) Import - export duties of fisheries products :

These are simple and efficient policy instruments for the control of the formal import - export trade. However, in the SADCC area and for inland fisheries in particular, the control of foreign trade is difficult to achieve for the small-scale/informal sector. Even if it is in conflict with national objectives of self-sufficiency, this trade does provide an outlet for surplus production in remote areas and thus provides producers (for exports) and consumers (for imports) with benefits which may not be produced otherwise. Improved communications/processing/storage may be required to limit undesirable cross border trade.

(17) Corporate, income and other taxes :

For small-scale producers, income and business taxes do not generally amount to a significant portion of net disposable income. However, one notes a tendency on the part of governments/fisheries administrations, to levy a wide range of taxes, e.g. landing tax, market tax, transport tax, registration tax, licence fees, navigation permit, etc. Two important issues to consider at this level are the cost of gathering these taxes and the association of fisheries administration/extension with tax collection/enforcement. For semi-industrial and industrial fisheries activies, tax exemption and deferred payment of corporate and business-related taxes can be used as an incentive for investment in new and/or risky activities.

4.2 Non-fiscal price incentives

(18) Credit :

Improved credit facilities for small-scale fishermen and low-cost credit, in general, may be used to finance the increased use of new inputs. Improved rural banking and special credit schemes may be used to that

effect with due attention being paid to the specificity of the fisheries sector, loan administration and financial viability. Consideration should, above all, be given to carefully assessing credit needs. Although fishermen frequently report a need for credit, it is clearly not a need in the same sense that physical inputs are. Fishermen receive considerable credit from informal sources (kins, traders, money lenders). Even in situations where informal credit is pictured as exploitative, private lenders are able to compete successfully with public credit due to more flexible and streamlined loan procedures and overall competitive financial terms. Institutional credit should attempt to complement rather than replace informal credit. Poor repayment rates of institutional loans (a wide spread problem) , a poor take-up of credit or lack of interest (if credit terms are quite strict) point to the need for more adequate approaches and assessments. Considering the characteristics of the small-scale sector (lack of collateral, scattered and mobile operators, uncertain outcome and seasonality of fishing operations, risks attached to highly perishable products, etc.), the cost of credit is likely to be high.

While subsidized credit is an option, experience has shown that the most successful credit programmes for small producers in general tend to be those that charge the full cost of funds and credit administration with rigourous management keeping administrative cost low and repayment rates high. Subsidized credit has two unfortunate effects : it reduces the amount of funds that can be loaned and it increases the demand for loans, often for less productive purposes.

Credit is often tied to technical packages (delivery in kind). Although the government may wish to link the provision of credit to the purchase of inputs in general, or certain inputs in particular, there are difficulties associated with loans in kind : adequacy of inputs to a wide array of situations, constraints affecting prompt delivery, maintenance and availability of spare parts, etc. End use may further be of little importance as consumption credit does often induce increase production.

(19) Subsidization of inputs :

Input subsidies are commonly used in the fisheries and aquaculture sector, e.g. sale of gear and equipment at cost (duties and distribution cost excluded); petrol and fuel subsidies; sale of fingerlings and feed at less than production cost; etc. Subsidies can be introduced for social reasons (i.e. to keep consumer price at low level) or as a general economic incentive to sector wide development or to induce development of specific activities in relation to new technologies or new fisheries. The key advantage of subsidy programmes is that they are easy to implement and globally quite efficient in the short run. There are, however, a number of problems associated with their use in the fisheries and fish culture sectors: subsidized inputs can easily be transferred to non-target fisheries which are already largely overexploited; sector-wide subsidies are difficult to stop because of socio-economic pressure and are no longer efficient when a significant part of national fisheries resources are becoming overexploited; low prices for inputs discourage private producers from entering the input supply trade (e.g. fingerlings), and they are difficult to withdraw, leading in the long-term to economic distortion !

(20) Price support :

Price support can apply to the production of either inputs or outputs. For example the government may guarantee a minimum price for new products, paying producers the difference between market and minimum price. The government may also subsidize inputs by paying fingerlings producers, for example, the difference between estimated market price and the officially-set subsidized price.

4.3 Indirect incentives

(21) Marketing service :

Market information for national and export markets is seldom available to the industry in general and to potential investors in particular. This generally results in missed opportunities and/or sub-optimal performances. Close monitoring and analysis of export markets for key species in connection with such institutions as INFOPECHE should be considered a first step towards the establishment of marketing services. A second step could be to monitor import prices for fish and key inputs and regularly ask for quotations from major foreign supplies.

(22) Promotion of new forms of organization :

At every level of the production process, operators can gain from being organized, whether it be through the creation of coopératives, corporations, joint-ventures, associations, etc. This allows for more effective participation in sectoral development and for jointly taking advantage of opportunities. Many organization schemes (e.g. producers cooperatives) have unfortunately been forced upon fishermen and other operators without their full understanding of what it was all about, or has been done clumsily, merely imposing costs upon the fishermen. Such coercion is counterproductive.

(23) Product promotion :

In Africa, promotion campaigns for new products or new technologies have seldom been used in fisheries but have proven to be a fairly efficient instrument in the development of fish farming. The design of such campaigns is a key factor and as such calls for ample testing on pilot scale. Another important factor is the determination of the duration/geographical coverage of the campaign in relation to cost and likely impact. Monitoring of impact is also essential to determine the scope and nature of follow-up activities, especially as far as the promotion of new products is concerned.

(24) Development and promotion of new technologies :

This has been a key policy instrument in the development of small-scale fisheries with some successes but, unfortunately, many failures. The main issue is that the traditional techniques are usually well adapted to the socio-economic context in which they are being used and that appropriate technologies require changes in socio-economic behaviour that have to be feasible, i.e. which the fisheries department can induce and which the operators can adapt to. Many technologies have in the past been developed from a technical/technological point of view with little

attention paid to socio-economic and cultural factors. A crucial missing step is R & D work on the conditions required for actual "appropriation" of the technologies by target groups. This work, with ample field testing, should help to determine how the technology and the socio-economic environment would have to be modified in order to fit. For example, a new processing technology may alter the relationship which exists between fish processors and fishermen and/or traders, e.g. in terms of financing, terms of exchange of products and services, etc. It may either be adapted to minimize this impact in the short term or fully taken into account in the promotion package. This example is related to a very important constraint to the introduction on new technologies. The fact that many small-scale fisheries are very much integrated at the production-processing-marketing levels. The promotion of more advanced technologies is generally constrained by the lack of modern management skill (business management, accounting, marketing, etc.) and by the fact that most entrepreneurs have a very short-term investment horizon, expecting rapid profitability (this leads in particular to poor maintenance and repair and insufficient long-term planning for major as well as minor investments). A key issue here is that entrepreneurs and senior management staff need as much assistance in this area as in the improvement of technical skills.

(25) Extension and training services :

The provision of extension and training services is much related to the introduction of new technologies/technological improvement. It is important to note, however, that development has also much to do with organizational aspects. The provision of advisory services should be extended to such areas as marketing, management, accounting, finance, etc. whether it be for large-scale or small-scale activities(see above). Another major issue concerning extension services is cost - efficiency. Large extension services are expensive to run and seldom effective because they are difficult to manage, and because it is difficult to properly train a large number of extension personnel. Extensionists have to be very well trained at both practical and theoretical levels to have a real impact. From a cost - effectiveness point of view a small number of well-trained extensionists should be preferable. Furthermore, extensionists should not be involved in administrative and enforcement tasks. Focus is also important. Extension programmes should address a limited number of aspects at the time, with extensionists attending regular refresher courses/seminars in order to upgrade their skills and to receive complementary training whenever new programmes are initiated.

(26) Research :

Research is essential and can provide key information/outputs for development if appropriately geared to do this. Unfortunately, it is noted that too often inadequate attention is paid to determining research priorities. The result may be that too much attention is paid to theoretical research (academic bias in fisheries/fish culture research institutions) or to minor aspects (i.e. research on species which are of no actual or potential economic importance). Furthermore, key aspects such as sociology, economics, marketing are often neglected. Finally, research should be regularly assessed and programmes which have not - or are unlikely to - produce tangible and relevant results should be terminated.

(27) Vocational and technical education/training :

This instrument has been widely used in the area of fisheries. Success depends very much on the adequation of programmes to industry requirements and on the emphasis put on practical training. Too often, practical training has been limited by the lack of required equipment and by inappropriate allocation of funds for normal operation of this equipment.

(28) Higher education :

The major constraint to the development of fisheries/fish culture academic programmes is the limited demand which most SADCC and African countries in general have for this type of expertise. This calls for regional cooperation as initiated under the aegis of SADCC. Precise and realistic assessments of staffing needs are called for to avoid overcapacity or too many trainees inflating artifically the staff of fisheries departments.

Table 1

Development and management of small-scale fisheries: Constraints, objectives and outcomes (A preliminary qualitative assessment)

TYPE OF INTERVENTION		Cost of Intervention Implementary enforcement			CONSTRAINTS									OBJECTIVES AND OUTCOMES: Resource Constraint Binding									Resource Constraint Not Binding							
Development	Management	Economic	Political	Fishermen's objection	Limited fishing range	Multi-species short life span	Open-access resources	Scattered multi-gear	Conflicts with other fisheries	Distorted capital market	Low educational skill	Low mobility	Surplus labour/Lack of alternative employment	Protein supply	Employment	Income	Social effects	Integration	Gross economic surplus	Net economic surplus	Average fishing cost	Innovation	Food supply / Exports	Employment (FE) (UN)	Income	Social effects	Integration	Gross economic surplus	Net economic surplus
1. Fish subsidy	No management	H	L	L		X	X							♀-	?	♀	0	-	0	-	n/a		+	0	+	+	0	-	♀	?
2. Fuel subsidy	No management	H	M	L	X		X	X						♀-	?	♀	0	-	0	-	n/a		+	0	+	+	0	-	♀	?
3. Motorization	No management	H	L	L			X	X	X		X			♀-	?	♀	?	?	0	-	n/a		+	0	+	+	0	?	♀	?
4. Credit	No management	H	L	L	?		X	X			X			?	?	♀	0	?	0	-	n/a		?	0	?	+	0	?	?	?
5. Marketing/ Infrastructure	No management	M/H	M/L	L			X	X						♀-	?	♀	0	+	0	(-)	n/a		+	0	+	+	0	+	♀	?
6. Post-harvest technology	No management	M	L	L		X	X							(+)	?	♀	0	0	0	(-)	n/a		+	0	+	+	0	-	♀	?
7. Promotion of cooperatives	No management	?	M	M			X	X			X			?	?	♀	?	?	0	-	n/a		?	0	?	?	0	?	?	?
8. Resource allocation	No management	?	M	L	X		X		X	X		X		?	?	♀	♀	?	0	0	n/a		?	0	?	?	0	?	?	?
9. Relation	No management	H	H	H			?	X			X	X	X	(+)	(+)	(+)	♀-	+	0	-	n/a		+	0	(-)	-	+	?	?
10. Alternative/ Suppl.employment	No management	H	M	L			?	X			X	X		(+)	(+)	+	+	+	0	-	n/a		-	0	+	+	0	+	?	?
1. Fish subsidy	"Limited entry" (Regulation of effective fishing effort)	H												0	0	+	—	or	—	+	0	n/a		+	0	+	+	—	or	—	+	?
2. Fuel subsidy	"	M												0	-	+				+	0	n/a		+	0	+	+				+	?
3. Motorization	"	M-H												0	-	?				?	?	n/a		+	0	+	+				+	+
4. Credit	"	M												?	?	(+)				(+)	(+)	n/a		(+)	0	(+)	(+)				(+)	(+)
5. Marketing/ Infrastructure	"	M/H												0	?	+				+	+	n/a		+	0	+	+				+	+
6. Post-harvest technology	"	M												0	?	+				+	+	n/a		+	0	+	+				+	+
7. Promotion of cooperatives	"	?												0	?	?				?	?	n/a		?	0	?	?				+	+
8. Resource allocation	"	?												+	+	+				+	?	n/a		?	0	?	?				?	?
9. Relocation	"	H												-	?	+/?				+	?	n/a		-	0	-	(-)				(-)	(-)
10. Alternative/ Suppl.employment	"	H												-	+	+				+	+	n/a		-	0	+	+				+	+
1. No development	Catch quotas	M	L	M		X	X	X	X	X				♀+	-	-	(-)	?	0	-	+	+										
2. No development	Area/seasonal clos.	M	L	M	X	X	X	X	X			X	X	♀+	♀?	♀	(-)	?	0	-	+	+										
3. No development	Gear regulation	H	M	M	X	X	X	X	X				X	♀+	♀?	♀	?	?	0	-	+	-										
4. No development	Mesh size regulation	H	L	M	X	X	X	X	X					♀+	?	♀	?	?	0	-	?	?										
5. No development	Trawl ban	H	H	L/H	X	X	X	X	X			X	?	♀?	?	♀/♀	♀/♀	-	♀0	-	(+)	0										
6. No development	Limit No.of boats	M-H	H	(H)			X	X	?			X	X	♀?	?	♀-	-	?	♀0	-	+	+										
7. No development	Taxes on effort/catch	H	H	H				X			X	X	X	♀+	♀?	♀?	-	?	+	(+)	-	+										
8. No development	Licences (free)	H	M	L				X			(X)	(X)	(X)	+	+	+	+	♀+	0	-	0	+										
9. No development	Auction of property rights	L	H	H				?	X	X	X	X	X	+	(-)	0/-	-	?	+	+	-	+										
10. No development	Community rights	L	M	L					X				?	+	(+)	+	+	?	(+)	(+)	-	(+)										

LEGEND:

+	Long-term increase
♀	Short-term increase
-	Long-term decrease
♀	Short-term decrease
0	Zero effect
?	Ambiguous effect
( )	Effect possible but not certain
X	Binding constraint
H	High
M	Moderate
L	Low
FE	Full employment
UN	Unemployment

Source; Panayotou, T., Management concepts for small-scale fisheries: economic and social aspects. FAO Fish. Tech. Pap., (228): 53p. (1982)

LECTURE NOTE N°5

THE PROJECT APPROACH

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1. DEFINING PROJECTS

There is not a universally accepted definition of what constitutes a project. Projects have been referred to as "the cutting edge of development" while the same author (Gittinger, 1982), noting the absence of an academic definition, calls projects "an investment activity in which financial resources are expended to create capital assets that produce benefits over an extended period of time" and "an activity for which money will be spent in expectation of returns and which logically seems to lend itself to planning, financing and implementing as a unit".

A slightly different but equally appropriate description is that a project provides a disciplined and systematic approach by which the allocation of resources, e.g., fish stocks, labour, land and capital, can be determined, analysed and evaluated.

Fisheries projects may range from the construction of a fisheries port with all the appropriate infrastructure and technical assistance to providing a line of credit for use by pond farmers but they will include some or all of the planning elements:

- capital investment in physical infrastructure, e.g., buildings, machinery, fishing boats, vehicles and equipment. Alternatively, the elimination of some of these features from the development process may form part of a project or all;

- service functions of an engineering, technological, operations or maintenance nature;

- institutional strengthening, e.g., statistics collection and analysis systems, monitoring, control and surveillance facilities, research facilities, training and extension services, etc.

- policy changes. These will give rise to projects from changes in legislation, subsidies, taxation and so on.

Project definition will incorporate those elements of which it is composed and will be a discrete package of investments, policy measures, institutional developments or other actions designed to achieve specific objectives within a given time.

2. VIEWS OF THE PROJECT APPROACH

Concern has been expressed about the project approach to development. A number of the reservations made have as their basis poor project planning.

Some observations are, perhaps, more concerned with the method of delivery of projects; others express some scepticism of the project approach and favour other forms of external assistance.

With regard to the first of these areas of concern, criticism has been expressed that the people who decide on projects do not try, or do not have the means of doing so, to assess the way projects interact, with the result that within the same sector projects may be in conflict or a project in one sector may be incompatible with another elsewhere. Poor planning, however, is not a reason for abandoning the project approach. The opportunity is taken in this Paper to draw attention to the relationship between sectoral and national planning on the one hand, and project generation and sectoral policies on the other, to ensure that projects should not suffer from this limitation. Additionally, of course, this issue has formed the subject of another agenda item at this workshop.[1/]

Another criticism of the project approach is that it ignores the policy issues. Quite certainly, projects can hardly succeed where macro-economic and other policies are not supportive. It is incumbent upon project planners, therefore, to ensure that their projects do not have any major policy constraints. As is made clear elsewhere[2/], however, the analysis of major policy issues should preferably form part of the sector survey which should always precede the process of generation of project ideas and, subsequently, of the identification of projects; alternatively, policy issues themselves need to be studied within individual project analyses.

The project approach, with its attendant cost benefit analysis, has been criticised also, particularly in the context of small-scale fisheries projects, of laying emphasis on financial rates of return and not taking social factors sufficiently into account. Again, this criticism has validity in the number of projects undertaken in the past which have fallen, in some degree, into this error. For a number of years, however, analysts and funding institutions have endeavoured to take social issues into some account, both in project criteria and the way projects have been undertaken. Only relatively recently, however, has the importance of social analysis for 'people-oriented' projects, such as small-scale fisheries and aquaculture projects, come to be fully recognized. The validity of this criticism, therefore, is justified to some extent. The appropriate techniques for economic and social analysis within project design are still being developed, whereas those for financial and economic analysis are established. However, where analysts cannot use a quantitative approach to the problem, they have to depend on qualitative assessments.

At a different level, it has been suggested that the hour of the programme approach has come. Particularly in Africa, large donors have increasingly in recent years adopted the programme approach to aid in response to the climatological, social, environmental, economic and political shocks

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1/ See Lecture Note N°4 in this document

2/ Ibid.

the continent has suffered and the tough remedies of structural adjustment quickly as they are required, the very large number of relatively small sums. The solution found by donors is to provide the fast acting financing to back up structural reforms through umbrella programmes.

The programmes, however, consist of individual projects. The essential difference with the "simple" project approach is that all the details of an individual project are defined clearly, whereas all the components of a programme, which is made up of several and maybe a large number of projects, are not known with the same degree of precision at the same time (Auclert, 1987). Before implementation, however, the individual schemes, or projects, are subject to preparation and appraisal.

There is a similarity between the programme approach adopted by some donors and the ongoing investment programme of, say, a Ministry of Transport with its large and continuing responsibility for the maintenance and construction of roads and bridges. There are many benefits which follow from adhering to the discipline of the project approach when dealing with a large number of relatively small investments.

At another level of argument, the perhaps disappointing performance of many projects, for example in the livestock and fisheries sub-sectors, has suggested to some that non-project funding in support of balance of payments and policy reform should be the major external catalyst for development. A factor contributing to this view has been the realisation that unless institutional and structural issues are tackled and necessary reforms undertaken, individual projects operating at the micro level will often fail regardless of the care and skill with which they are implemented. Another factor which has contributed to this argument is the disappointing experience with many projects, particularly in Africa, which in the 1960s and 1970s channelled investment funds into parastatal production and marketing organizations.

Donors and recipient countries learn from experience and are now moving into a more balanced and realistic view of the project approach to development. It seems most likely that project aid will continue as the major vehicle for transferring resources and technology although the balance between policy-based lending and project aid will vary from country to country and change over time.

3. THE PROJECT CYCLE

3.1 The Project Stages

It is convenient to think of the project cycle as taking place in several distinct stages. They are linked to each other and follow a logical progression. The stages, taken as a whole, are often referred to as the project cycle since, as will be described later, there is a feedback from the end of the process to the beginning of the process of another project. An internationally funded project is normally formulated and implemented according to a particular sequence of steps. They are:

(a) Formulation Phase

Identification: Evaluation of alternative development approaches, definition of project concept, basic justification and rationale, confirmation of economic, social, technical and political priority.

Preparation: · Detailed definition of project components, detailed costing, proposals for organization and management arrangements, economic and financial evaluation.

Appraisal: Final check of technical and economic justification, details of financing plan, loan covenants, etc.

Loan approval: By the Board of the funding institutions, followed by formal signature of the loan agreement.

(b) Implementation Phase

Loan effectivenes: Usually, after compliance with some covenants.

Supervision: Periodic review of project progress during implementation with emphasis on verification of disbursement according to schedules.

Completion: At the end of the disbursement period (typically after 5 years) comparison of implementation results with appraisal estimates; preparation of Project Completion Report (PCR) or post-project evaluation.

Impact evaluation: Several years after PCR, analysis of project impact on beneficiaries.

Clearly, while this approach is appropriate to a large, perhaps multi-million dollar project, it may well be impractical or unnecessary to consider it in small projects, although they may be complex, particularly if they are domestically financed.

Frequently, project identification and preparation will be merged into one activity. Even so, the planners will find it useful to keep in mind the framework of the cycle.

Project identification demands the ability to stand back from the day-to-day activities and pressure of fisheries management and administration to see where resources are most required. Special responses to specific needs or requests are not sufficient reason for project identification. An understanding of the role and potential of the fisheries sector within a wider context is required. It is worth emphasising again at this point that the policy and planning framework for fisheries of the country concerned can give strong guidance on where investment resources would be most productively utilised. In particular, where fishery sector studies have been carried out, programmes of action will have been described which will be the basis for the process of project identification.

In their identification stage projects must meet a test of feasibility in the technological and institutional areas. Cost-benefit analysis techniques are also introduced in this stage to be repeated in greater depth in the project preparation stage. This latter type of analysis is essential as the project will be expected to pass certain financial and economic tests, if it is to be accepted for preparation. Moreover, planners have found that what may be termed "cost benefit awareness", provides a valuable discipline in ensuring that all costs and benefits, whether they can be quantified or not, are taken into account.

When a fisheries project has passed the identification "test", it must be advanced to a point at which a firm decision can be made on whether or not to proceed with it. This requires a progressive refinement of the design of the project in all its dimensions, including the technical, economic, financial, social and institutional aspects. This is the so-called "preparation stage". The emphasis in this phase also includes the preparation of the project for implementation.

The preparation report will include:

- The background to the project. This should be well understood. The report will be expected to show in what ways the project is consistent with the current economic situation, the fisheries sector and the wider development and social objectives of the government.

- The reason for the project, or its rationale.

- Relevant aspects. For example, a description of the project locality and its social, economic and institutional features. Benchmark studies may be required. Studies on the economics of the fishery, technical feasibility, engineering, marketing and institutions are carried in depth at this stage.

- Detailed attention to institutional, organizational and managerial issues.

- Expected output and financial and economic results.

The demands of the preparation stage will vary considerably. Where project identification has shown up issues which have to be resolved through information gathering and analysis over a relatively long period, say one or two years, this process may be instituted as a pre-preparation phase. Inevitably, however, project preparation of relatively complex projects undertaken by donor agencies is a costly undertaking, often absorbing 20 or more man months of experts' time.

An appraisal process usually takes place when external funding is employed in a project but is often omitted when projects are domestically financed.

Implementation is the stage at which weaknesses in the project design become apparent. Many of these can be traced back to faulty project identification or inadequate project preparation.

Monitoring and evaluation is gradually emerging as an important function in fisheries development. The main problem is that it is currently carried out by the donor agencies with relatively little involvement by the recipient(s). It is rarely undertaken with domestically financed projects. Contributory factors to this situation include the frequent lack of local expertise in this activity while it can also be a difficult and costly exercise.

There is a need to improve the planning of fisheries projects, and evaluation can make an important contribution. Evaluation allows the policy makers and planners to keep in touch with the progress of fisheries projects and to match their performance with the original expectations. Thus, it improves the process of implementation, enhances the effectiveness of

investment programmes and assists with the re-orientation of plans and sometimes of fisheries policy. Monitoring and evaluation form the subject of discussion elsewhere in this Workshop[1/].

Developing countries will benefit greatly by being able to evaluate projects themselves and, where donors wish to retain some control, by being able to make a major contribution. Factors which will assist in this process are the building in of the appropriate bench-mark studies at the preparation stage, careful monitoring, the development of recipient countries' evaluation capacity and the provision of funds to enable them to do so.

3.2 Progress Through the Cycle

Figure 1 shows the sequence of the stages of the project cycle together with the backward linkages which would be expected to occur as the lessons learned from project monitoring and evaluation are used in subsequent project identification; hence, as noted earlier, the so-called "cycle".

The distinction between the stages of the project cycle, especially between identification and preparation and also preparation and appraisal, can in practice sometimes be blurred. Their relative importance can vary greatly depending on the character and history of each project. An important point is that a significant part of the process is iterative. The same issues may be addressed with different degrees of detail and refinement as the project advances.

4. ADVANTAGES AND LIMITATIONS OF THE PROJECT APPROACH

The project approach has already made a positive contribution to the investment process. Its main value is that it provides a framework for the collection and analysis of both quantitative and qualitative information, for comparing project alternatives, addressing social, institutional and policy issues and assessing the year-by-year benefits and costs of a project; the approach also enables planners to assess the effect of the project on national income and its impact with regard to national and sectoral objectives.

The project approach has many advantages but it also has its limitations. In dealing with these, the training and experience of the project planners are critical elements in the success of a project. In the main, the project approach depends on quantitative data and project analysts are required to make judgements of the quality of the available data and adjust their analysis accordingly. In recent years, the importance of social and other non-qualitative areas has been recognized, especially for "people-oriented" projects but, as quoted earlier, the information is usually not susceptible to quantitative techniques and thus qualitative conditions have to be introduced. Analysts also have to be aware of other issues which are often extremely difficult to quantify. Notable among these is the assessment of the external costs generated when investment, either directly or indirectly, increases fishing effort on stocks which are already fully or over-exploited. Another limitation is that, although the project approach is convenient for comparing options, it becomes more difficult if the projects are in quite different areas, e.g., an aquaculture project compared with an institutional project.

1/ See Lecture Note N°9 in this document

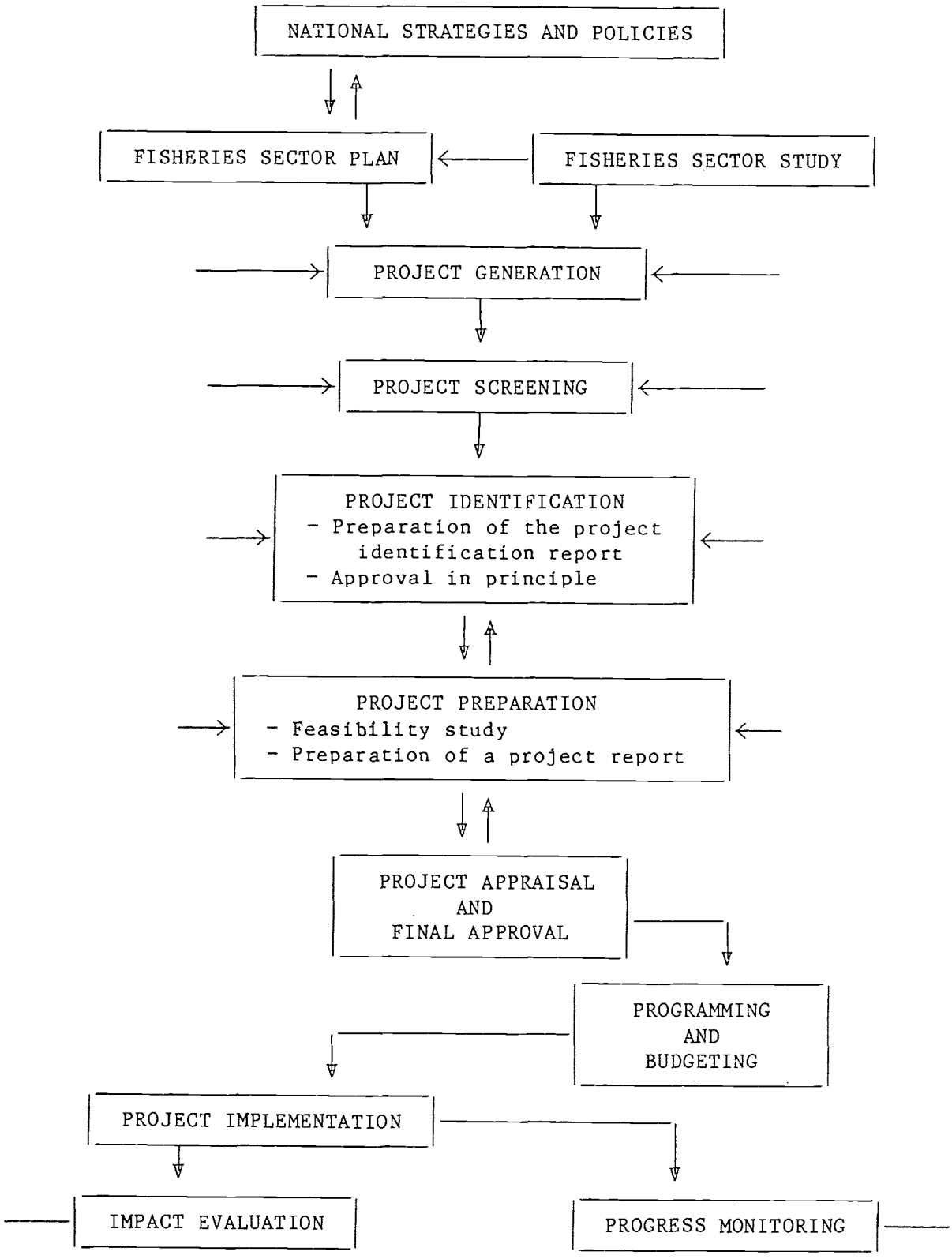

Figure 1 The stages of project planning

Adapted from Bruce, M.F.B. and R.W. McMeekin, 1982

Finally, of course, some issues do not take readily the project format, e.g., issues such as price policies, tariffs, access to new markets or with domestic considerations, such as improving national cohesiveness.

Even so, the project approach does encourage careful planning and project analysis provides a useful additional tool in the many judgements required as part of the national political process.

The generation and screening of projects has been discussed elsewhere. Some of the ways in which projects have been generated in the past, particularly by bilateral and multilateral donors, and ways in which they may be generated in the future are discussed below.

5. SOURCES OF PROJECTS

5.1 The Classical Fisheries Project

In, for example, marine fisheries, the approach was made up of the following elements:

(i) an estimate of resources (MSY) of a particular fishery in a certain area or countrywide, usually based on an extrapolation of fishing trials or exploratory fishing;

(ii) an estimate of present off-take;

(iii) provision over a given period (mostly 5 years) of extra fishing effort (vessels, gear) to exploit the difference or part of the difference between the actual catch and the presumed MSY; usually this involved more powerful vessels and a higher technology than that existing; sometimes newly designed vessels; performance parameters on which financial feasibility was estimated came from fishing trials or experts' estimates based on experience in similar situations;

(iv) provision of supporting and ancillary facilities, such as landing facilities, port infrastructure; extension services; marketing/processing facilities, ice plants, cold storage; fish carriers or trucks; workshops, boatyards, etc.;

(v) proposals for organization and management, e.g., credit arrangements for vessel gear or other equipment purchased by private fishermen or businessmen or, alternatively, outright government ownership and management of productive investment; setting up of an executing agency or management company or of a coordinating committee to ensure cooperation with other local institutions (Public Works, Ports Authority, Research Institute) if the project was to be executed directly by an existing government service;

(vi) project evaluation which consisted of estimating financial and economic cost/benefit flows and working out an internal rate of return (IRR). The basis of estimates of project benefits was usually the catch per vessel as derived from the performance parameters multiplied with the number of vessels supplied by the project (i.e., by linear projection) and applying an average price to this total projected volume of catch; the benefit stream would then be

extrapolated over 20 years or over the typical assumed lifetime of the vessels or another major asset.

Aquaculture projects typically financed pond construction and improvement, hatcheries, extension and training, more rarely marketing and processing and, in brackishwater shrimp culture, occasionally pumping equipment. The IRR was derived, similarly as in marine fisheries, by projecting cost/benefit streams based on production and price parameters.

5.2 Fisheries Management and Institution Strengthening

Where resources are significantly underexploited, the classical approach of increasing fish production by increasing fishery inputs remains viable. In many parts of the world, however, in Africa also, many stocks are under acute fishing pressure.

Where resources are under such pressure, fisheries management will be of growing importance in future project design. This follows from the perception that sustainability of fish resource utilization will acquire precedence over expansion of production. As resource limits are approached, especially in inshore fisheries, projects will be less able to base their justification on additional output but rather on maintenance of an achieved level of production or of fishermen's income.

The growing awareness of the finiteness of the resource in relation to expanding demand and the incentive this gives to increasing fishing effort beyond sustainability levels has profound implications for project design. Where this occurs, project justification will, in future, be more based not on additional production but rather on maintaining present benefits as compared with a likely decline in the absence of a project.

Fisheries management tools are varied. They range from outright interdiction to licensing of fishing effort (the licence fees being set to siphon part or all of the economic rent) and establishing and strengthening of territorial use rights in fisheries. It has even been argued that disinvestment can make an economic contribution by buying up excessive fishing vessels and destroying them.

The nature of fisheries investments will change accordingly. Increasingly, investments in monitoring, control and surveillance will replace, or at least complement, investment in fishing vessels gear and technology improvements. Strengthening of institutions to provide basic statistics on landings and fishing effort, research in bio-economic and socio-economic aspects of fisheries, enforcement efforts, staff training in fisheries management techniques and education of the public in the need for such measures will replace or be added to investments in fishing effort.

5.3 Nutrition and Consumption

One of the most important ways in which fish consumption can be increased is by reduction of post-harvest wastage. This exceeds 25% in many parts of Africa. Projects will thus arise from the need for improved fish processing and preservation methods, shore facilities, plants and distribution facilities.

Potential is still seen in the utilization of the by-catch of the fishery for high value species (shrimp) or the increasing use of small pelagics for human instead of animal consumption through fishmeal. However, attempts to

make better use of these resources must compare the cost of such re-direction of fish with the purchasing power of poor consumers - the ultimate beneficiaries. Any interference with market forces will become counter-productive and only patient research and develoment efforts are likely to better utilize this potential.

It appears important to re-think any fixed idea where it might still exist that fish should necessarily provide protein for the poor. Such a view will lead policy makers to adopt measures that would be harmful to the resources. As a finite supply, fish should instead be allowed to flow into those utilizations (and be facilitated by investments and support measures to do so) which are most remunerative to people deriving their income from the resource. The strong growth of poultry meat consumption in some traditionally fish-consuming societies shows that alternative protein sources are spontaneously being sought and can become competitive with even low value fish in terms of production cost.

5.4 Aquaculture

Major opportunities exist to increase fish production from pond-based aquaculture and through stock enhancement of open waters. These issues are dealt with elsewhere.

6. CONCLUSIONS

Officials in planning offices and in fisheries departments are concerned to make the best use of the resources available to them. It is suggested here that the project approach enables them to make the proper analysis of all the projects that make up their country's investment programme, large and small, and not just those financed by external agencies.

Opportunities arise for increasing fish production from underutilized stocks by the provision of additional fishery inputs. Even so, planners need to be aware of the level of exploitation of stocks and the dynamics of the fishery. Where stocks are becoming fully or overexploited, institutional strengthening and management offer major project opportunities. Reduction of post-harvest loss and spoilage offer further major opportunities for investment in capture fisheries.

REFERENCES

Auclert, André, 1987. Down with projects? In Courier, No. 106, November-December 1987, p. 54

Baum, C. Warran and M. Stokes Tolbert, 1985. Investing in Development. Oxford University Press for the World Bank

Bruce, M.F.B. and R.W. McMeekin, 1982. The Project Cycle - An introduction to the stages of project planning and implementation in the education section. Washington, EDI World Bank

Gittinger, J. Price, 1982. Economic Analysis of Agriculture Projects. John Hopkins University Press, Baltimore and London, for the Economic Development Institute of the World Bank.

LECTURE NOTE N°6

THE RELATIONSHIP BETWEEN DEVELOPMENT PLANS AND PROJECTS

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1. THE POSITION OF PROJECTS WITHIN THE PLANNING PROCESS

Very often, sectoral plans are no more than a collection or "shopping list" of projects. These may be hastily compiled on an individual basis after visits to beaches and markets, in order to present development banks or aid agencies with requests for assistance.

At the same time, it will be appreciated that project creation is probably more of an art form than a science. Administrators with many years of experience can often contribute much. However, a reliance on this expertise can generate problems as well as projects. These include:

- the fact that there is unlikely to be a machinery for identifying and resolving critical policy issues;
- projects may be presented for funding which may be in conflict or contradictory to each other or with activities in other sectors;
- projects may be presented which may dissipate the national resources by not responding to the most important needs.

To avoid this danger planners are adopting a systematic approach to project creation. This consists of a review and analysis of the sector, i.e., the sector study, from which planners may derive, in conjunction with the preparation of the national plan when fisheries is an important element in the economy, the sectoral plan. As described below the process results in project generation, a stage which precedes the project cycle. Thus, project creation should be the result of a relatively lengthy and complex planning process and not an activity which is the sole basis of a sectoral plan.

2. SECTOR STUDIES

The most appropriate place to begin a description of this process is with sector studies. Fishery sector studies vary greatly in their purpose and, certainly, in their structure and quality. However, one designed to assist the planning process might be expected to be in two parts, information gathering, or the sector review, and sectoral analysis (Figure 1). The sector review is concerned with describing the dynamics of the sector. It is a statement of what exists and the linkages between them. Most importantly, the review provides adequate information for the second part of the study to be carried out, which is the sector analysis.

It is most convenient, again, to consider the sector analysis as falling into two stages. First, there is the determination of the major development needs of the sector and of the potentials and constraints within it. Also,

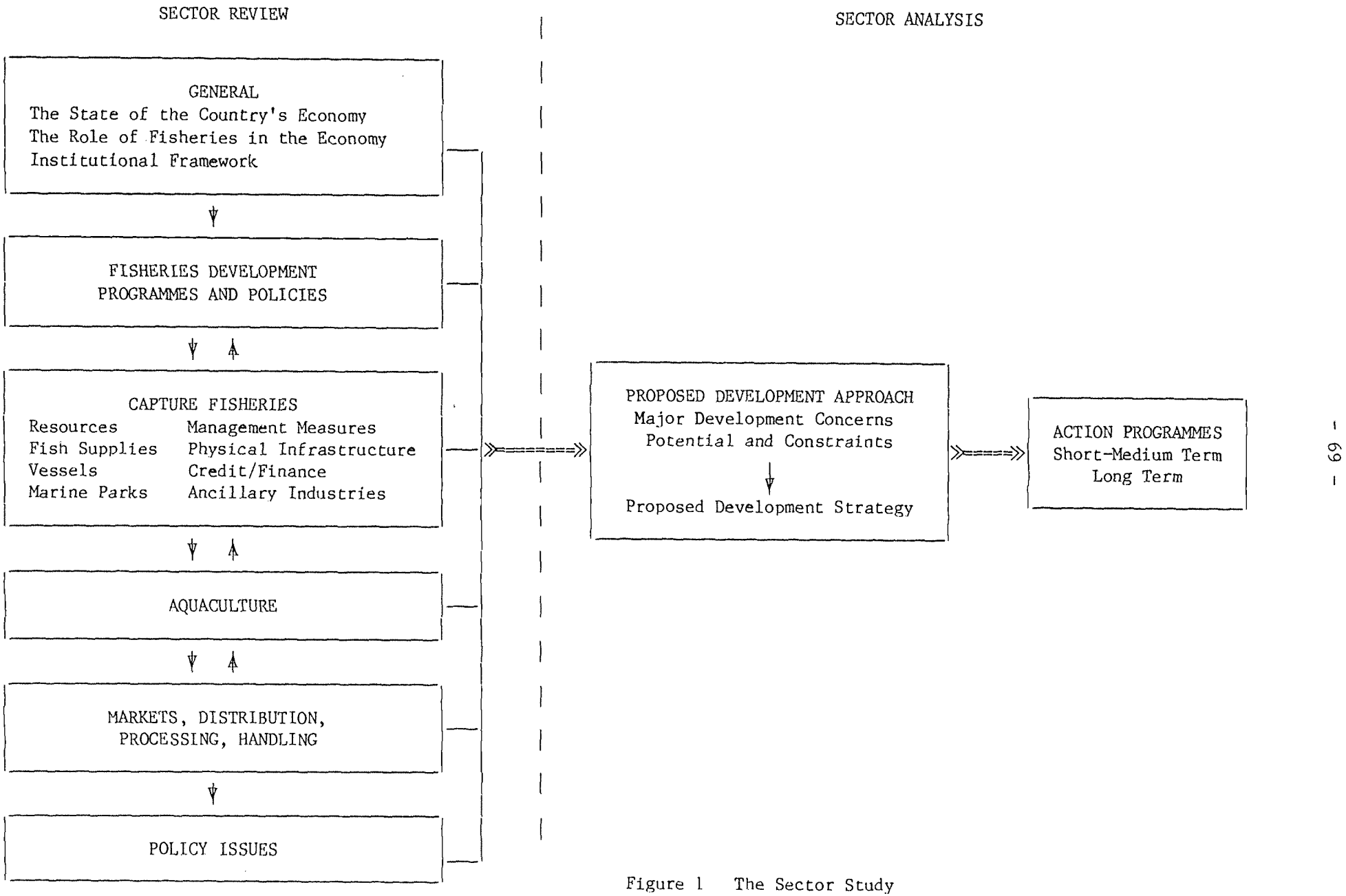

Figure 1 The Sector Study

becoming clear within the analysis at this point of the study will be the major policy issues and their effect on the sector; in some cases, policy issues may be of critical importance to the sector and further development may be dependent upon their resolution. The second part of the analysis uses the earlier sections of the sector study for the formulation of programmes of action. These may be categorized into those calling for attention in the short to medium term, say, two to five years, or perhaps falling within a country's national planning period, and those which are long-term action plans; such plans will often be replications of short-term programmes, say, training or the wider application of pilot projects, but not necessarily so.

Programmes of action will not be concerned only with investment projects. Indeed, in some countries relatively little new investment in boats and equipment may be required but there may be needed extensive support through changes in policy, e.g., legislation, taxation; and through institutional measures such as better statistics systems, improved research, enhanced management measures and better training and extension. Public sector investment may be limited to, say, the building of access roads to landing points or improved markets.

In most countries, programmes of action will consist of a mix of measures. An important aspect of the procedure described here is that where the need for investment is identified, the implications of it elsewhere and the technical assistance requirements and other support needed will be readily identifiable.

3. THE FISHERIES DEVELOPMENT PLAN

The sector study is one of the inputs needed to write a fisheries development plan. Within the preparation of the programmes of action, the planners will have used the study to make a preliminary choice and determination of priorities.

Successful planning requires there to be two-way communication and consultation between those in the central planning office, responsible for the national plan, and the planners working in the Department of Fisheries, or the appropriate institution which is formulating the fisheries development plan.

Looking at the linkage downward, from the national level to the sector, sectoral plans, including fisheries development plans, should be the translation of nation-wide objectives into specific plans for the sector. For example, a government policy to raise the living standards and incomes of the rural poor may result in the Department of Fisheries adopting different priorities than if the prime aim of government policy were to increase food production or to earn foreign exchange. There are many other ways in which national objectives may be important.

The linkage in the other direction, from the sector to the determination of national objectives and policies, will often be roughly in proportion to the importance of fisheries within the economy. There are exceptions. One of the most important may occur where fisheries accounts for a very small part of the Gross Domestic Product (GDP) but provides employment directly and indirectly in remote and often agriculturally poor areas. Naturally, communication and consultation between the sector and the central planners is of vital importance when the sector accounts for a large proportion of GDP. In these instances it is essential for the national planners to be aware of the potentials and constraints within the sector. It is little use, for example, the

central planners predicating a given growth in GDP based on the rate of expansion of the fish catches achieved in earlier years if the stocks are now fully or over-exploited and if the opportunities for producing value added products are limited and can be developed only slowly. Yet this situation has occurred in at least one African country.

A basic purpose of a fishery development plan, therefore, is to bridge the gap beween the macro-economics of country-level policies and plans and the micro-economics of individual projects. This is the fundamental reason why a development plan should not be merely a catalogue of projects.

In doing so, a plan, as opposed to a list of projects, enables countries to optimise the use of the resources. In any sector it is important that projects and activities are not in conflict with each other, that they are designed to meet the objectives for the sector and that they are not in conflict with programmes in other sectors. In fisheries, it is particularly important. In economies where indicative planning is practised, sectoral plans in general will usually contain more details on public investment and those activities which are subject to direct government control and intervention than to private investment which government can influence only indirectly. In the capture fisheries sub-sector, however, great attention must be paid to the private part of the economy since its investment can have a harmful effect on the fish stocks; investment in fisheries has to be controlled as a precondition of development.

The detail into which planners will be able to go when drawing up the fisheries development plan will vary according to the circumstances and, most importantly, to the resources available to them. For some, a statement of the action programmes, their time frame and the resources allocated to them will be sufficient to set against the policy to which the Department of Fisheries is required to adhere.

Time can be saved later on, however, particularly if external assistance is likely to be required, if the planners are able to refine programmes of action into the policy changes required, e.g., in institutional support, taxation charges, additions to legislation, etc., and into project ideas. With the latter activity, they will be starting a continuous process of project generation, screening and refinement which is a valuable tool in development. Clearly, the more specific the planners can be at this stage, the better they will be placed to determine the resources and time required to carry out the action programmes.

In brief, therefore, the sector study will have identified the needs and the problems and proposed the solutions; the plan will have defined the machinery for implementation.

4. THE RELATIONSHIP BETWEEN POLICY INSTRUMENTS AND PROJECTS

There is an oft stated truism among economists that "a good policy beats a good project any day". What economists mean by this statement is that a good policy may affect the whole, while a project will affect only part of a sector. For example, in a country where imports are encouraged of very low priced fish, by their restriction fishermen may be encouraged to land fish in their domestic market rather than into a neighbouring country. On the other hand, a project to provide assistance to a group of these fishermen may benefit only those who receive it.

Another reason that good policies are better than good projects relates to what economists call "the specificity rule". This rule says that the intervention that is chosen should be directed as specifically to the target problem as is possible. In the example quoted above, if the problem is that the incomes of some people are too low for them to buy as much fish as the Government would like them to have, it is more efficient for the Government to buy fish and sell it to them at a subsidized price, or maybe to give it to them, or even give them money, rather than to control the price of fish at a low level and make up for the production disincentive by providing subsidized engines through an investment project. The essence here, of course, is to identify the "target problem" currectly. Too often, it may be described as a lack of fishery inputs.

In an ideal world projects funded by governments or external assistance agencies would not be required. In practice, of course, they are and the following chapter explores how projects are created and some of the questions which the project analyst should ask.

Donors and recipient countries learn from experience and are now moving into a more balanced and realistic view of the project approach to development. It seems most likely that project aid will continue as the major vehicle for transferring resources and technology, although the balance between policy-based lending and project aid will vary from country to country and change over time.

5. PROJECT GENERATION AND SCREENING

Clearly, the process described here will often result in the recognition of specific projects. More often, however, specific action programmes raised by the sector study and incorporated into the fisheries plan will result in the generation of ideas for projects rather than their more detailed specification. For example, consider the need to improve the income of fishermen in a fully exploited fishery. A range of activities and projects may be available to meet this need, from building ice plants, encouraging better handling on board and on shore, improving access to markets (better roads, landing places, etc.), improving marketing and the role of fishermen in the marketing process, improving drying, salting, smoking or storage of cured fish, expanding institutional support, and so on. All may be project ideas. Or again, consider the need to increase catches from underexploited offshore stocks. Many projects can arise in this area, for example: the need to mount a pilot fishing operation which, in all probability, cannot be divorced from the marketing chain, i.e., handling, processing and distribution, improved landing and vessel support facilities, etc.; development of a joint-venture operation; or the licensing of foreign vessels.

It is not difficult to see how many projects can be generated, some independent and others not. Thus, the value of screening projects becomes apparent. This process can be a delicate one as both the donor agencies and the government officers concerned tend to identify and retain certain ideas as priority, i.e., for investment, to the exclusion of others.

There is, therefore, a need for fisheries departments to adopt a procedure which incorporates broad criteria (technical, socio-economic and environmental) to carry out the screening process.

Promising project ideas should be sifted in an orderly manner, with a minimum of wasted time and effort up to the point where only the most suitable

are retained. The remainder can be eliminated from further consideration. This process requires brief reports on individual projects to be prepared with just sufficient detail to indicate the general promise of the project ideas in terms of the alternatives and the reasons for their choice. Aspects thought to deserve special attention should be emphasized in the screening report but the more elaborate technical, engineering, economic, financial, institutional and social analyses postponed until a later stage. The screening reports should briefly examine the following issues, as is appropriate:

- the size and nature of the demand or market for the product or services;
- the intended or expected beneficiary groups or target areas;
- the alternative technical solutions or packages avaiable with corresponding estimates of outputs. This would include identifying the technologies already in local use and their potential for improvement;
- availability of the main production factors. An order of magnitude of the costs (investment and operation) should be given;
- the order of magnitude of financial viability;
- any apparent major constraints or other general factors likely to have an important impact on the proposed project. These might include institutional channels for project preparation and implementation and government policies and regulations related to the project;
- any other issue.

The criteria for screening or modifying project ideas - and, later on, design alternatives - will be very broad initially and become more specific later. For instance, project ideas exhibiting the following characteristics should be quickly eliminated when there are not identifiable viable alternatives or reasonable remedies for their weaknesses:

- technically unsound (or inappropriate technology);
- too risky;
- weak financing;
- wrong market mix;
- inadequate raw materials, skills or other inputs;
- lack of competitive advantages;
- over-ambitious in terms of production possibilities, management capabilities, costs, sales and profitability, and demands on or costs to the economy (including lack of viability in the long run without continued donor support);
- excessive social or environmental costs;
- lack of commitment of the borrower or beneficiary.

Many of these criteria are inevitably rather vague. It is, therefore, important that decision-makers:

- try to arrive at a common understanding of the criteria to be used and their implications (including consistency in their use);

- apply the criteria in a constructive manner, and recognise there is an inherent risk in any project selected.

A review or evaluation of actual experience with similar projects underway can provide valuable insights to aid the screening process. (The monitoring and evaluation of projects is dealt with elsewhere in this workshop.)

6. CONCLUSIONS

Planning is a continuous process. In the approach described here, activities which are to be implemented during the first part of the planning period are likely to enter into the sectoral plan in a fairly well defined form. Other activities, or even entire action programmes, for which implementation is scheduled in the latter part of the planning period, will generate project ideas which will be screened at a later stage before being proposed for project "identification" or pre-feasibility study.

Thus, at any time, the sector plan may consist of action programmes which may or may not have well defined activities or projects attached to them, project ideas which have been screened and are awaiting formulation and projects which are at a stage within the project cycle.

Figure 2 shows the process described in this Paper. Expressed in other terms, review and analysis should be seen as the foundations of a fisheries development plan; the building blocks of the plan are projects to be implemented in the short term, project ideas for the medium term and action programmes, where project ideas have not been through the screening process, for longer-term implementation.

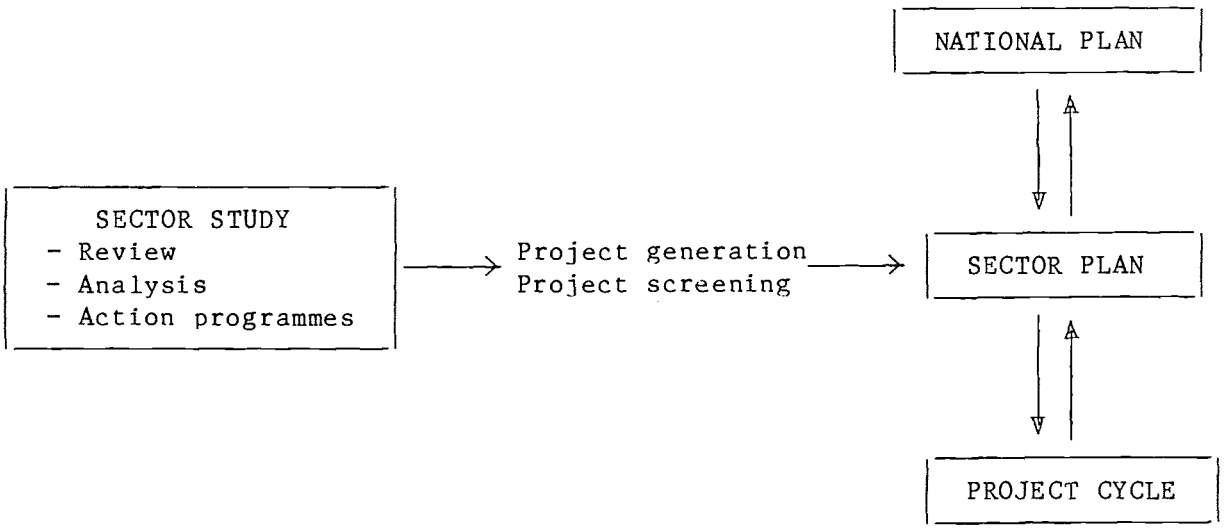

Figure 2 Relationship between development plans and projects

LECTURE N°7

THE PERFORMANCE OF FISHERY INVESTMENT PROJECTS

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1. INTRODUCTION

It has become increasingly apparent in recent years that experience with and the outcome of fisheries development work has not always been as happy or successful as it should be. It also appears that many of the problems and other negative aspects of projects, giving rise to these poor results, have recurred time and again, suggesting a considerable need for attention to the learning process. An awareness of project planners of the potential weaknesses of projects should make them less likely to occur.

Most of the evidence about the performance of projects comes from the evaluation of completed projects. A number of aid agencies evaluate a proportion of their projects and the World Bank has made a systematic review of the fisheries projects which it completed up to the early 1980s. A further source of information about projects comes not from their systematic evaluation but from the experience of those concerned with their identification, preparation and implementation. The evidence from all sources is consistent. When faults are found, they form a fairly common list.

The available evidence suggests that many of the relatively simple but large-scale fishery projects of the 1950s and 1960s were completed more or less successfully at a time when economic and resource constraints were less critical than nowadays. In contrast, many of the recent, smaller-scale, artisanal-type projects which appear to be more demanding, relative to their size, in terms of complexity and the range of skills needed for both planning and execution, have shown a disappointingly poor success rate.

This paper examines some of the more common difficulties which have arisen.

2. INSTITUTIONAL DIFFICULTIES

Institutional difficulties may be the responsibility of a donor agency, perhaps of the organization within the recipient country which is responsible for project implementation or, in many instances, responsibility may be shared between them. Some of the institutional difficulties which may arise are described below. Many are common to a number of sectors, i.e., not specific to fisheries and many, also, have their origin within the identification and preparation stages of the project cycle.

2.1 National Policy

It is only in the last few years that there has emerged a general recognition that projects formulated in an inimical institutional environment are unlikely to succeed. Reasons for project failure have included, for example, lack of foreign exchange to purchase essential inputs, absence of legislation to manage, control and protect fishermen and fish farmers, import policies

which result in prices too low to enable local fishermen to compete, the lack of policies to encourage fisheries and aquaculture, imposed cooperatives which inhibit private investment and a weakness in coordination - or even rivalry - between national institutions which share a responsibility for the development of capture fisheries and aquaculture and, generally, insufficient government commitment.

As noted elsewhere in this Seminar, institutional issues such as these should be identified and resolved prior to project implementation.

Difficulties have arisen in many parts of the world - including Africa - as a result of policies and priorities of external assistance agencies. It is not unknown, for example, for external assistance agencies to seek to finance highly visible rather than low-key projects, such as institutional building. In other regions, multilateral lending to the fishery sector has been characterized by projects which are too big for the country to manage, with too many or with unbalanced components, as financing agencies have endeavoured to increase disbursements in relation to project administration costs.

2.2 Inadequate Technical Inputs at Identification, Preparation and Appraisal

Problems have arisen in the past by the deployment of insufficient, or inadequate, expertise required for good project identification and preparation. This problem may become particularly acute when the fishery project is relatively small, making it difficult for a donor agency to deploy consultants with the required skills and experience or, perhaps, the multidisciplinary teams for an adequate period of time. It follows that the more expertise a recipient country can itself acquire in fishery project identification and preparation, the better will be the level of cooperation between it and donor agencies and the greater will be the chance of success of projects.

Associated with this problem are the charges often made of a lack of consistency by donor agencies in their approach to projects stemming from the shifting of consultants. A further consequence of such shifting is the additional amount of time required for consultants to familiarise themselves with the projects and their environment. In many instances, of course, donor agencies have little option, since the consultants who were responsible for identification may not be available for preparation. Most attempt to obtain at least a nucleus of expertise common to both teams but, again, the problem emphasises the need for recipient countries to play as active a role as possible in project formulation.

Inadequate technical inputs are the reason for many deficiencies. Most notably, at the identification stage of better means of achieving the project objectives and the design of projects are by-passed, often resulting in projects which are not self-sustainable. At the preparation stage, the problem has manifested itself in, for example, schedules which are too tight, underestimated costs and failure to recognize institutional issues and difficulties.

2.3 Inadequate Use of Technical Assistance

It is now widely recognized by donors that in the past there has been inadequate use of technical assistance to develop the technical information needed for good project preparation. Associated with this feature has been the inadequate duration of technical assistance packages, being generally limited to a relatively short period. A factor contributing to this situation was the institutional constraints within the donor agencies. Increasingly,

however, the preparation of sector studies which identify underlying constraints and problems within a fishery sector, together with experience of projects, are encouraging donors and recipient countries to consider assistance over an extended period. However, caution has to be exercised.

2.4 Delays in Project Implementation

Cost overruns, caused by extended implementation periods, may often be caused by unforeseeable or unpreventable factors. More often, however, delays may be preventable. Frequently, the staff of the national organization responsible for implementation may not be familiar with the requirements of the funding agency. Equally, the project preparation team may have paid insufficient attention to the government's tender procedures and the time required to implement them. Both parties need to be certain that the issue has been dealt with satisfactorily. It is often an issue meriting attention at the appraisal stage of the project cycle.

2.5 Project Management

Difficulties are often reflected in poor project management, sometimes because of a lack of suitable personnel and sometimes because of decisions of administrative responsibility between two or more poorly coordinated local institutions or agencies. Again, it is the responsibility of the project preparation team to ensure that, as far as possible, the project organization, staffing and terms of reference are realistic in terms of the experience and capabilities of the national implementing agency. Even the most effective project preparation team, however, cannot make adequate allowances for day-to-day shifts in political direction which can often be arbitrary and sometimes perverse. Where the preparation team does foresee management weaknesses occurring, technical and managerial guidance needs to be provided by including within the project suitable short-term consultancies. A careful balance has to be maintained, however, between key short-term inputs, such as these, and local management capability overall; the former is not a substitute for the latter.

The availability of national management is critical to the self sustainability of the project after expatriate staff has been withdrawn. As stated above, it has not been infrequent for project preparation teams to display a certain naivety, or optimism, regarding the speed with which local managers and technicians will acquire the necessary skills and experience. Here, again, a realistic view has to be taken by both the donor agency's consultants and the national implementing institution.

A second difficulty, less frequent but which merits attention, is where skilled and experienced administrators are taken out of their normal employment to staff a project implementation unit, thus weakening elsewhere the national institutional infrastructure.

3. PROJECT CRITERIA AND TARGET GROUPS

Recently this subject, in relation to investment projects, has received a great deal of attention. Some donor agencies and development banks have been criticised for adhering too rigidly to the requirement for required rates of return on investment and, conversely, paying too little attention to social factors. It is argued that too much emphasis on the former militates against poorer communities and, particularly, against artisanal fisherfolk.

There is some merit in this criticism. In all too many cases in the past, planning has taken place at levels remote from the fisherman or fish-farmer who is the intended beneficiary. Such project plans have often failed to appreciate the way of life, motivations and aspirations of the target groups. Consequently, unrealistic objectives have been set which were rarely met.

On the other hand, it is a mistake to regard financial criteria and the cost-benefit approach as irrelevant to artisanal fishery projects. Identification and preparation teams have, therefore, got to understand the social and economic constraints which exist and formulate their projects accordingly. In doing so they will often be able to avoid an inequitable distribution of project benefits. In such cases, extended time for preparation may be required to collect the necessary sociological information while the projects which are formulated may incorporate a relatively large amount of technical assistance. In the analysis, some form of social evaluation, in addition to economic evaluation, may be required.

4. MARKETS

Increasingly, an assessment of the market and its capacity to absorb increased catches at realistic prices is taken adequately into account in capture fisheries projects. There is some evidence, however, that this is not always the case with aquaculture projects, especially in relation to domestic markets.

Overestimates of output prices and returns have been mainly confined to export marketing where exportable quality, ease of access to markets and producer price levels had been too optimistically assessed at preparation/appraisal. In local marketing it has been observed that prices were sometimes even above appraisal projections, possibly reflecting a relatively increasing scarcity of fishery products.

5. FISH RESOURCES AND STATISTICS

5.1 Forecasting Catches

Catch forecasting is difficult. Knowledge of the resource and the extent to which it can be exploited depends on long-term scientific study and on reliable fish catch and fishing effort data. Moreover, a number of environmental variables, for example variable water levels of lakes and other water bodies, can also influence catch rates, over and above fishing effort.

The record shows that in most instances fish resource data has been far from adequate for safe planning purposes and, in most cases, is likely to remain so in the foreseeable future. Very often, where studies have been begun by national governments, they have been discontinued because of their cost or complexity. Most developing countries concerned are unable to afford the highly trained manpower, equipment and facilities which are necessary. International organizations, of course, make a significant contribution to knowledge but, even so, much remains unknown.

Most importantly also, too often national statistical coverage is inadequate and its reliability suspect. Many governments are unwilling or unable to provide the necessary statistical coverage and analysis.

In consequence of both aspects, projects have frequently been based on resource "guesstimates", on unrealistic assessments of exploitation levels and on over-optimistic expectations as to future catch rates and total catches. Such expectations have been an important factor in the poor performance of many fishery projects. Project analysts and planners, therefore, have to be especially cautious where there is uncertainty in determining the total investment which will be viable. In many cases, a pilot fishing programme, carefully monitored, will be necessary.

5.2 The Hunting Nature of Fisheries

Even when planners exercise such caution, mistakes can be made. An individual fisherman's skills and his knowledge of the fishing grounds and fish movements, where to go and, as importantly, where not to go, may often account for at least as much as advanced technology. That knowledge - often built up by father to son over several generations - is often jealously guarded and explains the often wide disparity between catch rates of otherwise identical fishing craft.

Very often in the past, planners have assumed that the performance of one of the better fishermen in an improved boat or with improved gear will be replicated through the fleet. It usually cannot.

At the preparation stage, therefore, planners need not only information over a fairly long period of fish catches and size distribution but also a clear indication of the relative performance of the different boats in the target beneficiary fleet.

5.3 Fisheries Control and Regulation

Effective management of resources is a precondition of fisheries development where stocks are likely, in its absence, to become fully or over-exploited. Such a situation is more likely to occur than not. In recent years donors and national governments have become increasingly aware of this feature and more projects are being designed with components in them directed to the improvement of national statistics and improvement of management measures.

6. APPROPRIATE TECHNOLOGY

6.1 Selection and Design of Fishing Vessels

The technical design of fisheries components, such as boats and engine installations, etc., has not always proved satisfactory, sometimes because of inadequate consultation beforehand with the end-user, leading to slow adoption and often the need to redesign components.

The provision of equipment under, for example, lines of credit, needs to be planned with great care and the closest consultation with the prospective users who, after all, will have to repay the loan in the end. In particular, the need for any departure from existing vessel, engine or fishing gear designs must be categorically established before proceeding to large-scale ordering or construction. Fishermen's acceptance of the new designs must be firmly established, by demonstration and prototype trials, to ensure the creation of market demand, otherwise stocks will remain unsold or fishermen will find themselves unable to repay their loans.

Until recently few projects were designed to give the fishermen a choice. It was assumed from the outset that existing boats needed to be replaced by bigger substitutes. There are, of course, many situations where it can be beneficial to upgrade the level of technology in use but the rate of change has to be gradual and supported by effective programmes of trial and demonstration of the proposed new equipment.

6.2 Shore Facilities

Many projects have incorporated excessive shore facilities in relation to the actual catch, as opposed to the predicted catch, often incorporating over-sophisticated technology. Often, even where the actual level of catch has justified the size of the facilities, their requirements, in terms of foreign exchange for spare parts, energy requirements and skilled technicians, have been beyond the resources of the recipient country.

In considering whether projects will be self-sustainable after the withdrawal of the donor, planners have to consider carefully the technology incorporated within the project.

7. PROVISION OF CREDIT

7.1 Fishermen's Loans

Providing loans in cash or in kind to fishermen, particularly to artisanal fishermen, has given rise to more difficulties than has any other area of fisheries development. Most countries with significant fishery sectors have established fishermen's credit schemes of one sort or another and almost without exception they have experienced difficulties at one time or other with repayments and high rates of default.

The essential drawbacks of fisheries credit programmes which are subsidised in favour of the fishermen is that they have imposed rigidities on lenders and borrowers alike; on lenders in the way of interest rates and maturities that were not in line with market conditions and of margins which did not cover transaction costs and risks; and on borrowers because compliance was required with cumbersome formalities to obtain a loan and restrictions on end-use and fungibility (e.g., borrowers were obliged to accept a newly designed vessel type they did not like). There is an increasing amount of evidence which shows that the alleged superiority of formal over informal credit terms is a fallacy. If invisible transaction costs to the borrower were added to lending rates of formal credit (e.g., paperwork, time and income lost in obtaining loans, need to use the loan for predetermined purposes), the conditions on formal and informal markets would be quite similar.

7.2 Fishfarmers' Loans

Some of the difficulties encountered in providing credit to fishermen do not apply to fishfarmers. Many, however, are common. Small-scale fish-farmers, for example, like artisanal fishermen, frequently have no collateral they can offer to a bank. While banks are frequently not available to fishermen, they are often physically close to fishfarmers but the bankers know little about fishfarming, are unable to assess the risks and, therefore, frequently nervous about extending credit. Where credit is advanced, it may often be for too short a period of time. Another common feature is that, often, small-scale fishfarmers, like artisanal fishermen, are unfamiliar with and distrustful of banks.

As with the extension of loans to artisanal fishermen, there is no easy answer. It is important, however, that projects incorporating the provision of credit to small-scale fishfarmers take into account on-lending banks' frequent lack of experience in this area and provide the necessary support.

8. LESSONS FROM PROJECT EXPERIENCE

At the detailed level, it will be clear from the above that much has been learned of the conceptual, technical, institutional, social, environmental, financial and economic difficulties that can occur in fisheries projects. These lessons are being incorporated into a training course being developed in FAO. A number of more general conclusions, however, can also be drawn from the PCRs and post-project evaluations which have been carried out.

The first is that projects have to be better integrated into the sectoral and general economic environment. Projects tend to be prepared in an ad hoc fashion, often to enhance the visibility of a special donor's assistance which may not be consistent with national development plans and priorities. The result is a mosaic of individualistic, sometimes quite original development approaches within the same sector where a concerted effort of donors and government would be needed. Two types of initiatives are taken to deal with this problem: one is donor coordination. Although strongly supported by the major financiers, the World Bank and the Regional Development Banks, it has not yet been very successful. Reasons are the above-mentioned need for a donor's visibility of his efforts to secure political support for his funding at home and the intense competition between donors for viable projects. Ultimately, it is at government level that donor coordination ought to be secured. This would require strong institutions able to professionally hold their own against the persuasive power of international donors and supported by consistent realistic and well-prepared sectoral development plans.

The second initiative to deal with the problem of ad hoc projects is a re-discovery of sector work quite fashionable in the 1960s and then relatively dismissed as too costly and academic in the 1970s. This revival of interest in sector studies occurred in connection with structural and sectoral adjustment lending mainly by the World Bank but is also seen to be of great usefulness if the objective is less ambitious than sectoral adjustment, simply to integrate project design into a thorough knowledge of the sectoral and possibly even macro-economic context.

A third suggestion improving performance of project preparation approach follows from the high incidence of institutional problems in project implementation. The approach to deal with this problem is seen in stronger involvement of recipients in project preparation. This is believed to increase government identification with, and commitment to the project which is essential to project success. One way to achieve a greater involvement of recipients is the strengthening of local project identification and preparation capacity.

Finally, more use could be made of sector or programme loans. In the former case it would require a good institutional capacity to prepare sub-projects following the model of a detailed first year development programme prepared with the help of international expertise. In the latter case it would help to address particular financing needs that cannot be handled by conventional projects (usually a time slice of recurrent sectoral import needs). Both types of loans are already accepted by development banks but have hardly yet been used in the fisheries sector. This kind of initiative

also, however, requires sound project identification and preparation capabilities at the national level.

9. CONCLUSION

The foregoing provides some indication of the range of problems that have been experienced in fisheries development and which, on the basis of past experience, are likely to recur. The list is by no means exhaustive but in presenting some of the problems and possible solutions, further ways may be found leading toward better fisheries development.

LECTURE NOTE N°8

SOME ASPECTS OF THE ANALYSIS OF SMALL-SCALE FISHERIES PROJECTS

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1. INTRODUCTION

Small-scale fisheries development projects will often be as complicated as large industrial projects, if not technically then insofar as socio-cultural factors have to be taken into account and the paucity of information which often exists. Typically, a small-scale fisheries development project will include a large number of expected beneficiaries and will have an intended influence over a wide and perhaps remote geographical area. The identification and preparation of such projects usually requires considerable research.

2. RESEARCHING SMALL-SCALE FISHERIES

It is not appropriate to enter here into a detailed description of the information which is normally required to plan the development of small-scale fisheries. It is sufficient to note here that to construct an adequate picture of a small-scale fishery, the following areas need researching:

- The ecology of the water environment and the biology of the fish resources. This would include such features as the extent of the fishing grounds, the state of fish stocks, ecosystem dynamics; hydrographic data may be important.

- Sociological, cultural and anthropological information. This would include such information as occupations, mobility, attitudes to fishing, entrepreneurship, role of women, disadvantaged groups, etc.

- The economic environment, such as costs and earnings, sources of income, trade, complementary economic activities, etc.

- The institutional environment. Institutional factors can make or break a project. Information may be required on such aspects as the management regime, institutions within communities, legislation, finance and credit, training arrangements, etc.

- The fishery's technical features. This is important not only because it constributes to the total picture but also points to deficiencies which might be improved by projects. Descriptions may be necessary of vessels, gears used, trip information, post-harvest handling and distribution.

3. PLANNING SMALL-SCALE FISHERY PROJECTS

3.1 Project Objectives

Under this heading, two principal tasks can be defined. They are as follows:

(a) The first step is to define, refine and check the project's objectives. At this point much can be done to ensure that social factors are taken into account by a tight definition of the objectives to include, in a quite specific manner, what objective planners are trying to achieve. For example, if it is the intention to give additional job opportunities to the women of a particular village, then this can be included among the objectives, and the project planners should show, with some precision, how it is going to be met. Moreover, the analyst will wish to ensure the following:

(i) The project objectives are intelligible, well defined and clear, and not in conflict with the other micro- or macro-economic or social objectives.

(ii) The project objectives are not in conflict with biological imperatives. It is especially important to avoid the dangers of overfishing.

(iii) The project objectives are consistent with the insights of fisheries economics. That is, they should contribute to increasing, rather than reducing, the surplus from the fishing industry.

(iv) The project objectives are consistent with the socio-cultural factors.

(b) The second step is to check the assumptions underlying the logic of the project. Items for consideration include the following:

(i) The planner should find out who are the intended beneficiaries of the project.

(ii) He should assess what the main inputs and outputs are expected to be.

(iii) He will also want an initial idea of what the main costs and benefits are likely to be.

(iv) The planner should think through how the project is going to work. He has, in effect, to build a working model of the functioning of the project in all respects and check carefully that the machinery stands a reasonable chance of generating benefits. He must also check that the intended beneficiaries will be the ones to gain (and not already well-off middlemen, or land-owners, etc.).

(v) He must look at this stage for other ways of achieving the project objectives, apart from the means of the proposed project. It may be possible to set up a smaller-scale

operation with just the same results, or different locations may be more suitable.

3.2 Project Design

Following the definition and clarification of the project's objectives, the next stage is to work out, in detail, the project design. The design of a fisheries development project means putting it together from a technical point of view. Very often, small-scale fisheries development will be technically less complicated than large industrial projects. For example, a project to construct and operate a single small ice plant may be not much more than an exercise in a well known technology; many projects will be of similar levels of technological sophistication.

However, some small-scale fisheries development projects are more complex than projects for other aspects of fisheries development, largely because they have many strands to them. They are apt to consist of a number of components, which may be interactive. For example, a project might consist of vessel motorization, ice plants, harbour improvements and fish carriers. Some caution has to be exercised here, however, because experience shows that the complex fisheries project of this type carries very serious risks, primarily because all the normal uncertainties are multiplied.

Planners should take note that small-scale fisheries development is often best approached sequentially and cautiously. The consequences of each step, especially on the fish resources, are often very difficult to predict. A slow approach implies that progress can be monitored carefully and interpreted before the next step is taken.

3.3 Social Analysis

The clarification of social objectives and the corresponding social analysis are essential components of the preparatory work of any project. The justification for this view is well expressed in the following comment: "A recent review of evaluation reports for fifty-seven bank (World Bank) assisted projects purposively selected for the quality, detail and depth of material on social issues in the reports found that failures or disappointing results were often attributable to neglect of the social environment. Conversely, a deliberate effort to take that environment into account clearly contributed to project success. Moreover, the economic rate of return of the thirty projects found to be compatible with the social environment was more than twice that of the others" (Baum and Tolbert, 1985).

The importance of social analysis in the project preparation process is now widely appreciated. With such analysis it is possible to test the validity of the project objectives against the socio-cultural reality. The planner must be sure that at the very least the project does no damage to people from the poorest sections of society. But he may wish to go beyond this and introduce features into the project which are designed to help these people directly. Moreover, many aid agencies now intend that projects should improve the conditions of life of the poorest people.

Small-scale fishermen and their families are often among the poorest section of the community. They are, therefore, the target of development efforts attempting to reach the most deprived people. In this context project failure may be much more serious and could imply disastrous consequences for

some or all of the people affected. It is particularly important to get the project right even if this adds to the initial costs through the large technical assistance component which is required.

In general, social analysis is concerned with five main areas (the first four points are drawn from Baum and Tolbert (1985). They are as follows:

(a) The description of the people within the project area and affected by it. The issues addressed are aspects such as the size, age and sex distribution of the population, its ethnic and tribal characteristics, the class structure.

(b) The collection of data concerning the relationship between the proposed project activity and the people affected, and its analysis, is the second main purpose of social analysis. For fisheries projects, plans must take into account the extent to which fishing is currently carried out, how it is done, who does it, were are the fishermen in the social and economic scale, why it has its current economic and social status and similar issues.

(c) Looking toward what the project might do for the affected population, social analysis should deal with the project's acceptability and its capacity for bringing about sought-after changes in socio-economic behaviour. For example, in fisheries projects it might be desirable for fishermen's groups or communities to be strengthened to encourage the capacity of a target population to manage fisheries resources themselves.

(d) Fourthly, social analysis should indicate how the objectives and design of the project should be adapted to elicit the sought-after response from the people concerned. For example, a social recommendation of a project might be that the project should include special training courses for mothers in child health care.

(e) The fifth aspect of social analysis is to give advice on the monitoring of the projects social effects. This is part of monitoring and evaluation, but at the preparation stage planners need to know what administrative structure must be set up and with what personnel and skills, to conduct the monitoring and evaluation of the social effects of the project.

It is clear from the above that a contribution from a skilled sociologist is desirable, if the social analysis is to be conducted in a satisfactorv manner, and that sufficient time is allowed for the necessary investigations.

3.4 Financial and Economic Analysis of Small-Scale Projects

The principles of financial analysis of small-scale projects are no different from those applied to other projects. In essence, the costs and benefits over the lifetime of the project must be ascertained as accurately as possible. A difficulty can arise in relation to the sheer number of different aspects of the project if it is relatively large. In particular, the planner may need be able to determine, in quantitative terms, the influence of the project on a large number of fishing vessels.

At the outset it is important to recall that successful small-scale fisheries development depends on a range of quite detailed research into the fishery, its biological, economic and sociological aspects. Such research ensures that the planner does not start from a position of ignorance but has good data which can be used for project preparation.

It should be noted that the planner does not have to be an expert statistician as well as a project analyst and he may need to take expert advice if detailed sample surveys are necessary. He can also refer to one of a number of textbooks on statistics. In the imaginary case presented below it should be possible to arrive at sufficiently convincing baseline statistics from questioning the participants in the fishery. Information from one vessel can be cross-checked against another, and it should be possible to build up a picture of the current performance of the fleet.

A discriminating approach to statistics is very important. The planner should normally be able to differentiate between good and bad statistics. For example, he will be very suspicious of information collected over a short time period because he will know that fishing often follows seasonal patterns; he will also be wary of data from a small sample unless it is purposively designed to yield just the information he is seeking.

The planner should also be aware that the calculation of the project benefits and costs should be a "with and without" analysis and not a "before and after" analysis. If many of the envisaged changes occur without the project, the incremental change should be calculated from this base rather than the state of affairs before the project. The "without" project would be projected forward exactly as is done in the case of the "with" project case. The difference between the two constitutes the incremental net benefit arising from the project.

3.5 An Example of Financial and Economic Analysis in a Simple Project

Let us take an imaginary project which has already been identified. It is for the provision of engines for sailing craft. The vessels, gillnetters, have been divided into two classes, vessels between 1 and 5 GRT and vessels from 6 to 15 GRT. There are 20 vessels in each size group, i.e., 40 vessels to be included in the project. In addition, there are a further 20 vessels in each size group which are not included within the project. The engines are all inboard and therefore require some fitting.

3.6 Financial Considerations

Table 1 sets out some of the basic data for the smaller craft. The "Without project" column refers to the current performance of the fleet. The data would be collected by means of a survey. Ideally, it would include all vessels and the data would be among data collected as a matter of course by the Fisheries Department prior to the identification of the project. Sometimes, however, data will not be available and it must then be collected either using a sample of fishing vessels or the whole population.

Table 1 summarizes the weekly fishing routine of the smaller vessels. Most of them undertake one or two day trips but the fishing pattern can be averaged to provide the summary listed. The main effects of enginization, shown in the "With project" column, are expected to be a shorter sailing time to and from the fishing grounds and an increase in the number of days during

which fishing is possible. The effect of the shorter sailing time appears in Table 1 as a reduction in the journey to and from the grounds of, on average, one day per week. However, because vessels are now assumed to be at sea for more days per year, fishermen partially compensate by spending longer time in port between trips under the project compared with the position without it (a conclusion which might be derived from the sociological observation of the other commitments, social and economic, that the fishermen may have. Even so, it is calculated that the nets will be in the water for half a day more each week.

Table 1

Fishing trip cycles, vessels 1-5 GRT

Fishing trip cycle	Without project (days)	With project (days)
To and from grounds	2.0	1.0
Nets in water	3.0	3.5
Stoppages at sea	0.5	0.5
Turn-round in port	1.5	2.0
Total fishing cycle	7.0	7.0

It might, for example, be assumed also that the provision of engines, allowing vessels to operate in weather conditions in which sailing boats could not, would increase the number of fishing cycles from 20 to 30 a year. Hence, the analysis may proceed to Table 2.

Table 2

Annual fishing cycles, vessels 1-5 GRT

Annual fishing cycle	Without project (days)	With project (days)
To and from grounds	40.0	30.0
Nets in water	60.0	105.0
Stoppages at sea	10.0	15.0
Turn-round in port	30.0	60.0
Total fishing cycle	140.0	210.0

Table 3 shows the fishing performance without the project and with it. As shown in Table 2, the average number of fishing days per vessel per year with the project is increased from 60 to 105. Most commonly in the past, project analysis has been based on the assumption that the resultant catches will continue at the initial level. In this project evaluation, however, a warning of the biologists that the catch rates cannot be sustained has been

built into the analysis. Accordingly, the incremental catches are initially high, as the vessels take advantage of the increased number of fishing days coupled with high catch rates but decline as the catch rates fall.

Table 3

Projected fishing performance, vessels 1-5 GRT

Fishing performance	Without project/ year	With project			
		Year 1	Year 2	Year 3	Year 4+
Number of nets/set	30.0	30.0	30.0	30.0	30.0
Kg/net/hour	0.8	0.8	0.7	0.6	0.5
Days fishing/year	60.0	105.0	105.0	105.0	105.0
Net hours/day	8.0	8.0	8.0	8.0	8.0
Catch/vessel (kg)	11 520.0	20 160.0	17 640.0	15 120.0	12 600.0
Incremental catch/ vessel		8 640.0	6 120.0	3 600.0	1 080.0
Incremental value/ vessel at $2/kg		17 280.0	12 240.0	7 200.0	2 160.0

The performance of the larger class of vessels is shown in Tables 4, 5 and 6. The larger vessels are noted as undertaking trips of one week rather than one day, but this does not alter the analysis as it is based on the fishing days per year. The fall in catch rate, from 0.8 kg/hour to 0.5 kg/ hour in response to the increase in fishing effort and the consequent decline in incremental catch follows a similar pattern to that described above in respect of the smaller vessels.

Table 4

Fishing trip cycles, vessels 6-15 GRT

Fishing trip cycle	Without project (days)	With project (days)
To and from grounds	2.0	1.0
Nets in water	3.0	3.5
Stoppages at sea	0.5	0.5
Turn-round in port	1.5	2.0
Total time	7.0	7.0

Table 5

Annual fishing cycles, vessels 6-15 GRT

Annual fishing cycle	Without project (days)	With project (days)
To and from grounds	50.0	35.0
Nets in water	75.0	122.5
Stoppages at sea	12.5	17.5
Turn-round in port	37.5	70.0
Total time	175.0	245.0

Table 6

Projected fishing performance, vessels 6-15 GRT

Fishing performance	Without project/ year	With project			
		Year 1	Year 2	Year 3	Year 4+
Number of nets/set	30.0	30.0	30.0	30.0	30.0
Kg/net/hour	0.8	0.8	0.7	0.6	0.5
Days fishing/year	75.0	122.5	122.5	122.5	122.5
Net hours/day	8.0	8.0	8.0	8.0	8.0
Catch/year	14 400.0	23 520.0	20 580.0	17 640.0	14 700.0
Incremental catch/ vessel		9 120.0	6 180.0	3 240.0	300.0
Incremental value/ vessel at $2/kg		18 240.0	12 360.0	6 480.0	600.0

The financial analysis (Table 7) brings the data together. The incremental catch values - the incremental catches multiplied by 2 because it is assumed that the price of fish is US$ 2/kg - are grossed up by 20, representing the numbers of one type of boat. Assumed costs are put into the Table. The figures presented in this Table are, of course, arbitrary; in practice, they should be calculated as carefully as possible. Here, it is assumed that the engines cost, on average, US$ 900 each and installation costs are US$ 300 for each vessel. From year 4 onward 10% of the engines are replaced each year through to year 10, hence a charge of US$ 3 600 per year for engines and US$ 1 200 per year for installation from years 4 to 10. Labour costs are assumed 50% of earnings, fuel costs and repairs and maintenance are US$ 2 300 and US$ 1 800, respectively.

Table 7

Financial analysis of the vessel mechanization project

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Incremental benefits											
Small craft (20)	0.0	345 600.0	244 800.0	144 000.0	144 000.0	43 200.0	43 200.0	43 200.0	43 200.0	43 200.0	43 200.0
Large craft (20)	0.0	364 800.0	247 200.0	129 600.0	129 600.0	12 000.0	12 000.0	12 000.0	12 000.0	12 000.0	12 000.0
Total revenue	0.0	710 400.0	492 000.0	237 600.0	273 600.0	55 200.0	55 200.0	55 200.0	55 200.0	55 200.0	55 200.0
Incremental costs											
Engines	36 000.0	0.0	0.0	0.0	3 600.0	3 600.0	3 600.0	3 600.0	3 600.0	3 600.0	3 600.0
Installation	12 000.0	0.0	0.0	0.0	1 200.0	1 200.0	1 200.0	1 200.0	1 200.0	1 200.0	1 200.0
Labour costs	0.0	355 200.0	246 000.0	136 800.0	136 800.0	27 600.0	27 600.0	27 600.0	27 600.0	27 600.0	27 600.0
Fuel	0.0	2 300.0	2 300.0	2 300.0	2 300.0	2 300.0	2 300.0	2 300.0	2 300.0	2 300.0	2 300.0
R & M	0.0	1 800.0	1 800.0	1 800.0	1 800.0	1 800.0	1 800.0	1 800.0	1 800.0	1 800.0	1 800.0
Total costs	48 000.0	359 300.0	250.100.0	140 900.0	145 700.0	36 500.0	36 500.0	36 500.0	36 500.0	36 500.0	36 500.0
Net benefits	-48 000.0	351 100.0	241 900.0	1 132 700.0	127 900.0	18 700.0	18 700.0	18 700.0	18 700.0	18 700.0	18 700.0
NPV 10%	713 783.0										
NPV 20%	581 033.5										
IRR	7.0										

The net result is that, because the capital cost of the engines is low, the profitability of vessels remains above pre-project levels, especially in the early part of the project despite the decline in catch rates. The net present value is very large at 10% and 20% discount rates and the IRR (Internal Rate of Return) is 7%. On the face of it, the project could be attractive.

An important feature of the analysis, which should be taken note of, is its incremental character. The analysis does not measure the value of the new project in isolation but is concerned with the difference in values between the situation without the project and that with the project. This particular analysis is very simple. Books dealing with the economic analysis of agriculture projects (for example, Price Gittinger (1984)) describe the method which will enable complex projects to be analysed.

This analysis demonstrates the approach taken with regard to financial analysis. It is important to note here, however, that the illustration simplifies the required analysis. The calculation in Table 7 in a real situation, for example, would include information relating to the loan (if externally financed), including the grace period and subsequent annual repayments before calculation of the NPV and IRR. The financial analysis, also, would include an item for contingencies (to take account of physical and inflationary contingencies). Very importantly, there would be separate analyses at the individual enterprise to show if boat owners could afford loan repayments and earn an additional profit. It is likely, too, that the analysis would take into account market research to determine if there was likely to be a fall in fish prices in response to the increase in supply under the project.

3.7 Economic Considerations

To complete the analysis, an assessment of the economic effects of the project should now be undertaken. The economic analysis can be difficult. The paragraphs below, however, show how the example of the financial analysis above can be adapted to take into account one of the main external economic effects.

One of the economic effects that should never be ignored is external resource and congestion costs. It will be clear that if the project generates significant external costs on other, non-beneficiary, vessels, then some or all of the apparent gains will be dissipated. Suppose, for example, that the effects on catch rates is also felt by the other remaining 40 vessels in the fleet. This is quite plausible and merely simulates the sequence of events for many fisheries throughout the world as fishing effort has increased. It will be recalled that 40 vessels are still locked into the old production patterns because engines have not been installed in them. It is estimated that their catch rates will fall from 0.8 kg/net/hour in year 1 of the project to 0.7 in year 2, to 0.6 in year 3 and to 0.5 in year 4, at which point they will stabilise. These vessels suffer a decrement to earnings, only partially offset by lower payments to fishermen because vessel earnings are lower.

Table 8 shows the costs to the non-beneficiaries of the project. For these vessels, trip lengths and number of fishing days remain unchanged but the catch per vessel declines in response to the fall in catch rates stimulated by the increased fishing effort resulting from the vessel mechanization project. Clearly, lower catch rates result in a lower incremental catch per

Table 8

Costs to non-beneficiaries

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Number of nets/set	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Kg/net/hour	0.8	0.7	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Days fishing/year	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Net hours/day	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Catch/vessel	11 520.0	10 080.0	8 640.0	7 200.0	7 200.0	7 200.0	7 200.0	7 200.0	7 200.0	7 200.0
Incremental catch/vessel	0.0	-1 440.0	-2 880	-4 320.0	-4 320.0	-4 320.0	-4 320.0	-4 320.0	-4 320.0	-4 320.0
Labour costs	0.0	-720.0	-1 440.0	2 160.0	-2 160.0	-2 160.0	-2 160.0	-2 160.0	-2 160.0	-2 160.0
External costs/vessel	0.0	-2 160.0	-4 320	-6 480.0	-6 480.0	-6 480.0	-6 480.0	-6 480.0	-6 480.0	-6 480.0

vessel. The damaging impact of the project can be seen in the bottom line, "External costs/vessel".

Table 9 shows, in one line, the net economic benefits of the project. To simplify the presentation, the detailed calculations are not shown here. Moreover, the external costs/vessel (see Table 8) have been multiplied by 40 and the aggregate deducted in each year from the respective net financial benefits. These benefits are large and positive in the first two years of the project life but thereafter deteriorate. If the damaging external effects of the project are extended over time, beyond the 10 years envisaged for the project, the position will, of course, be made worse. This is the position, in fact, of many artisanal fisheries.

Perhaps surprisingly, the Internal Rate of Return (IRR) is very high (27.5%) while Net Present Values (NPV) are also high. This apparent anomaly has a technical rationale which merits a digression. The project presented here is rather unusual in the standard texts. This project has significant early benefits followed by large losses later on. Although generally unusual, it is for the reasons described above not unusual in fisheries which are close to or fully exploited, which applies to many situations. The effect of loading the costs toward the end of the project makes the IRR a misleading indicator of project worth. This is because the greater the costs toward the end of the project, the higher will be the discount rate needed to reduce the whole benefit stream to zero. We are, therefore, in the paradoxical position that projects generating lower overall net benefits produce a higher IRR. In cases like this, a project with a higher IRR is not better - it is worse.

The most important feature about the procedure adopted above, of making a distinct and separate analysis of the impact of project on non-beneficiaries, is that it highlights the damaging effect on them of the proposed project. Very often such impact is obscured inadvertently by analysts when they aggregate the data for beneficiaries and non-beneficiaries. It is always worthwhile making the discrete analyses as described above.

3.8 The Project Boundary

The small-scale fishing project may be much larger than the example described above. For example, it may include harbour facilities or fish processing equipment. Adding these extra facilities elements to the project implies simply that their capital and operating costs must be put into the sum. The benefits continue to be measured by the expected value of the output of the project. In the case we have described here, the higher costs of the project would only serve to increase the unfavourable results.

4. CONTENTS OF THE REPORT

Many national planning offices will have their own formats for project identification and preparation reports. Similarly, the requirements of donors and funding agencies often differ. Planners will use the format recommended by the organization for which the report is being prepared. In the absence of a suitable format from this source, planners may be guided by the headings which follow closely the format adopted by the multilateral financing agencies. An example is shown below.

Table 9

Vessel mechanization project: net economic benefits

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Net economic benefits	-48 000.0	351 100.0	155 500.0	-40 100.0	-131 300.0	-240 500.0	-240 500.0	-240 500.0	-240 500.0	-240 500.0	-240 500.0
NPV	20%										
NPV	10%										
NPV	1%										
IRR	27.5%										

(i) Summary and Conclusions

This section of the report should be no more than one or two pages long. It should summarize the project's rationale and its objectives. It should describe the main elements of the project, the hardware, the institutions (especially the executing institutions concerned), the beneficiaries, the investment costs in local and foreign currency, and the phasing of the investment. It should also summarize the principal financial and economic results as well as the conclusions. These should include net present values and internal rates of return, together with any other important social or environmental results. This section should also note the technical cooperation requirements of the project. It may be laid out in sections. These will vary according to the type of project. An example of a simple production/marketing project is shown below:

A: Constraints
B: Marketing
C: Credit
D: Project components
E: Output and prices
F: Benefits, financial and economic justification
G: Issues

(ii) Introduction

In this section the writer should aim to tell the reader what he needs to know by way of introduction to the main body of the report. The introduction should note the circumstances under which the project was identified and describe the identification mission(s) that resulted in the project concept. It may note the government departments and other organizations that assisted in the identification, their terms of reference and the period over which it took place. The members of the planning team, together with their positions and organizations, should also be mentioned.

(iii) Background to the Project

The writer should aim to be highly discriminating in including background material into the main body of the report. He should restrict his choice to data and other information that is strictly relevant to the project. In general, it is not necessary to include information about the economy which is well known and available elsewhere. General background information can be put into appendixes. It may be laid out in sections, which will reflect the design of the project, viz:

A: Fish resources
B: Fishing fleets
C: Processing and marketing
D: Institutional infrastructure
E: Fisheries management
F: Physical infrastructure

(iv) Project Rationale

This section advocates the project by setting out, as clearly as possible, the reasons for it. The project objectives will be restated, amplified and justified. It may be set out as follows:

A: General framework or overall situation into which the project fits
B: Medium-term potential
C: Justification of key elements of the project
D: Project strategy
E: Regional/socio-cultural aspects

(v) The Project

This section should describe the physical investment, the operation of the project, its location and timing, details of the cost and proposed financial scheduling and details relating to the execution of the project, e.g., financing channels, legal aspects and procurement and likely environmental impact. Supporting information and analyses are placed in appendixes. For example, following the model of a simple production/marketing project might be as follows:

A: Brief description
B: Location
C: Project components
- physical components (e.g., vessels, ice plants, etc.)
- credit
- extension
- technical assistance
D: Project costs and phasing
E: Monitoring and evaluation

(vi) Organization and Management

(vii) Output and Prices

(viii) Benefits, Financial/Economic Evaluation

This will be a summary of the analyses which will be included in the appendixes.

(ix) Outstanding Issues

This section will describe those issues which have to be resolved at the appraisal stage.

(x) Technical Appendixes

REFERENCES

Baum, Warren C. and M.S. Tolbert, 1985. Investing in Development. Oxford University Press for the Economic Development Institute of the World Bank, Washington, pp. 473-4

Price Gittinger, 1982. Economic Analysis of Agricultural Projects. Baltimore and London, The Johns Hopkins University Press for the Economic Develoment Institute of the World Bank, Washington

LECTURE NOTE N°9

MONITORING AND EVALUATION IN FISHERIES DEVELOPMENT PROJECTS

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1. INTRODUCTION

Project monitoring is distinct from project evaluation. The former is an integral part of project implementation whilst the latter, undertaken during a project or on its completion, is an independent study of the effectiveness or impact of a project and of the efficiency with which it has been carried out. The establishment of a simple, cost-effective monitoring system ought to be a standard part of project planning and management practice. In many circumstances the use of micro-computers has made project monitoring a simple and inexpensive task, albeit requiring some serious thought, especially at the beginning of a project. Project evaluation is a more specialist activity, usually requiring a small independent team of persons with the appropriate skills. A short list of further reading is provided at the end of this paper.

2. MONITORING

2.1 The Analytical Sequence of Projects

A development project consists of inputs, which result in outputs by project beneficiaries. These generate effects, and the project has an impact. Each of these elements can be monitored.

2.2 Monitoring Inputs

The inputs into a fisheries development project include the initial investment and subsequently those resources absorbed as the project proceeds. These include manpower, operating requirements and, for fish production and marketing projects, the fish resources themselves.

Monitoring is a normal management tool to assess if the project inputs are being supplied, if the supply is on time and as planned, if they are being used as intended and if they are having the initial effects as planned. As a matter of course, project management should develop a system for being in control of this type of information. One aspect of the skill of the project manager is the ability to judge exactly what critical variables should be monitored and to decide on how it should be done. It will always be important that the cost of monitoring should not be disproportionate to the expected benefits.

Normally at the planning stage, a detailed timetable, or Gantt chart, will have been prepared to show the timing of the procurements, deliveries, buildings, installation of machinery, or whatever investment is proposed. The project preparation report will also include detailed costings for the various elements in the investment. Project management should devote time and resources to measuring actual progress against the timetable and actual

compared-to-predicted costs. The procedure can help to keep project costs within budget and can be helpful when new projects are planned.

When the project is running, both the physical inputs (including staff) as well as the costs of the inputs should be monitored. In the case of the former, the same questions need to be raised as at the investment phase. Are inputs being delivered on time? Is the quality of the project purchases satisfactory? Is the fish resource standing up to the additional fishing effort? Are sources of fish supply to a fish marketing project changing over time? Is the staff turnover too high? Is the training programme proceeding as planned? Many of these questions can be answered if the manager has given careful consideration to suitable monitoring indicators. The general criteria for the choice of indicators are discussed below (paragraphs 17-33).

2.3 Monitoring Outputs

One of the major outputs of a fisheries development project is likely to be fish sold into the marketing chain. However, some fisheries development projects are not concerned directly with fish production, and in these cases planners should be fully aware about what it is that is intended to be produced, because this will have a bearing on the choice of monitoring indicators. For example, a project designed as a credit system for small-scale fishermen is providing a banking service. A project instituting a fish resource monitoring and control system is providing a policy and fisheries management service.

At the planning stage, careful consideration must be given to what units to measure. However, even in the cases of simple fish production and distribution projects, it is not always obvious what to measure. Biologists may require detailed information on species caught and economists will not be satisfied with global production figures. For example, it will not, generally, be enough simply to measure the volume and value of fish sold daily, weekly or monthly from a fish marketing project. For planning and management purposes it will be important to know more about the response of fish buyers to different species, although it may be unnecessary to collect information about every fish sale; a carefully designed regular sample study may be sufficient.

The possibility of projects producing a service for the fishing industry or the government has been noted. The nature of the output must be carefully defined, and then project management must devise an index of performance. For example, in the case of credit projects, loan repayment rates might be used. Three simple indices (which can be expressed in percentage terms by multiplying them by 100) are:

- Number of disbursements;
  the total potential number of borrowers.

- The volume of collections or repayments in a period;
  the total volume of repayments due in the period.

- The value of total arrears at the end of the period;
  the total loan portfolio in a period.

Taken together, these could give a useful indication of credit performance. (For further details see Casley and Lury, 1982).

2.4 Monitoring Project Effects

The effects of a fisheries project might include improved incomes for fishermen in a locality, better or worse fisheries management, altered food consumption patterns, a changed distribution of income and many other possibilities. They may be social or economic; they may be intended or unintended and they may represent an improvement, or the reverse.

Monitoring project inputs and outputs is a fairly obvious requirement of project management. The manager should know what is going on if the project is to function. However, project managers have not been so careful in respect of project effects. This part of the monitoring task requires managers to go beyond the normal management role of managing the project and may demand, as well, inputs of specialist skills (such as from sociologists and economists) to devise suitable indicators.

Most of the literature on project monitoring is concerned with monitoring project effects. The intended effects of a project are normally implied in the objectives. Clearly stated, verifiable objectives have the advantage that indices may be devised to test if they have been achieved. For example, if a project objective is to increase the income of fishermen by providing improved fishing vessels and gear, the effect of the project on their income should be assessed. It has to be noted that income is a notoriously difficult variable to measure, so project planners may opt for some index of income appropriate to the location, such as the ownership of a highly regarded family asset (for example, bicycles or radios). Other examples of measurable project effects include the extent to which new techniques are adopted as a result of an extension component of a project, or a measure of the value and volume of fish saved as a result of the dissemination of a new processing technique.

In the case of credit offered by a development bank or non-governmental organization for a number of income-generating projects (such as small-scale fish culture or fish-catching projects), in addition to take-up of loans and loan-repayment rates (see paragraph 9), the organization offering the credit may also wish to know the returns to the beneficiaries so that they can be encouraged, if necessary, to invest in more profitable directions. In order that this measurement can be done, a monitoring system of costs and returns of the beneficiaries would be required.

2.5 Monitoring Project Impact

A distinction is frequently made between "effects" and "impact". The former are the immediate results of the project, such as changed income or expenditure of the target group. The latter is the wider, diffused results, such as a more general increase in regional incomes. An example of impact in the case of fisheries development might be the general spread throughout a region of more intensive fish culture techniques following the establishment of a fish hatchery. Clearly, effects and impact can frequently shade into each other.

Some fisheries development projects have an impact well beyond their immediate area. However, the wider development aims are usually reserved for the larger-scale integrated projects and not fisheries projects which are often too small to justify the random or purposive sampling needed to assess their wider development impact. However, if a wider development impact is claimed for a project among its objectives, planners should explore the means by which the monitoring of some suitable index might be achieved.

There are, however, some exceptions to this generalization. One important factor which may have to be taken into account is the impact on fishermen outside the target group of project measures, e.g., on their catch rates, prices obtained, etc.

2.6 Criteria for the Selection of Monitoring Indicators

The key criteria for the selection of project monitoring indicators are as follows.

Unambiguous definition: Project planners should aim for clear indicators of project performance that can be collected easily and readily understood. Examples of unambiguously defined indicators are the volume of fish production, recorded sales, operating profits or numbers of outboard motors in a defined locality. However, in a subsistence economy, income is very difficult to define and measure in an objective way. The definition and measurement of employment is also problematic, at least in fishing communities where there may be a great deal of fluidity between fishing and other activities, including leisure. Planners have to be aware of the difficulties in any given situation when determining the indicator(s) to use.

Accurate and precise measurement: Indicators chosen should be simple to measure accurately and precisely. Some examples are given in paragraph 18 above.

Absence of bias: The indicator selected should not give a false picture of the events it is intended to reflect. An example has been quoted above with regard to income measurement. If fishermen have more than fishing as a source of income, income measurement may be biased by the income taken from outside fishing.

Contribution to explanation of variation: Indicators, selected to measure project effects and impact, should account for changes resulting from the project, rather than changes in economic and social conditions generally. For example, if a project is intended to encourage motorization of fishing craft in a situation in which motorization is, in any event, taking place, the monitoring indicator should compare the target group with another, similar, but untargetted group to establish whether the project is meeting its objectives. A statistic reflecting motorization generally, without distinguishing between the impact of the project and other economic changes, would not account for the specific influence of the project.

Consistency: If monitoring indicators are to explain project effects and impact, they must be collected over a number of years. At the planning stage, indicators must be chosen which are expected to be a consistent series. For example, planners should avoid choosing to monitor a wide range of data at the commencement of a project which cannot realistically be collected over a number of years.

Cross-section data should also be selected for consistency. For example, in the measurement of project effects, the indicators for the target group and the control group should measure the same variables and be constructed in the same way.

2.7 The Management of Project Monitoring

Project management should conceive of project monitoring as a normal procedure designed, above all, to supply the objective information which will help the management team do a better job. This means that the monitoring unit should not be a separate power base, undermining the manager's authority. Rather, it should be a unit servicing project management and under the supervision of the management.

Project monitoring is standard practice in the private sector. Accounting and other reporting systems are designed to give senior managers rapid information about performance so that decisions can be taken quickly. It should also be standard practice in fisheries development projects. Although the information requirement for the latter overlaps with that of the private sector, much of the information monitored in a development context will be different. For example, the socio-economic impact and the consequences for fish resources are both likely to be of paramount concern in fisheries development.

3. PROJECT EVALUATION

Whilst monitoring is a normal, internal project activity, evaluation is an exercise undertaken from time to time, usually by an independent person or group, to provide an objective overview of the project. Evaluation assesses the relevance, efficiency, effectiveness and impact of the project in the light of its objectives. Ongoing evaluation takes place during the implementation, terminal evaluation on completion and ex-post evaluation some years after completion, when the project has reached its full development.

In the best situations, evaluation attempts to make a comparison between the with-project and without-project situation rather than before and after. Evaluators must ask, therefore, what would have been the situation if the project had not taken place. Ideally, there should be a comparison of the target group with a control group, but this is not often possible in practice. Nevertheless, the evaluation team should bear the comparison in mind.

Eventual evaluation should be anticipated at the planning and implementation stage. The link between evaluation and planning and implementation lies in the careful selection of monitoring indicators which give a true representation of the performance of the project against its objectives throughout its life.

Evaluation commences by examining the project objectives. The relevance and logic of the objectives come under the microscope. Among the points considered are:

- Who were the intended beneficiaries?
- How were the intended beneficiaries to benefit?
- What were the intended inputs?
- What were the intended outputs?
- How were project inputs to generate project outputs, and how did the outputs relate to the objectives?

- What was the implementation plan?

- Were alternative methods of achieving the objectives considered?

The next stage is an analysis of the planning and implementation of the project. A comparison of planned and actual investment costs, operating costs, physical outputs and the value of output would be relevant. Other issues would include delays in procurement, the administration of the aid and the adequacy of management.

The evaluation then compares the effects and impact of the project with its objectives. The aim is to assess what were the actual results of the project and to compare these with the planned objectives. Changes in objectives during the life of the project need to be identified. Anticipated and unanticipated results, as well as factors explaining them, should be described and the beneficiaries identified. If possible, the evaluation should include a cost-benefit analysis comparing the actual returns to the project with what was envisaged at the appraisal stage.

Evaluation cannot be undertaken satisfactorily by those close to the project, such as its own management or the monitoring unit, although their cooperation will be essential. They should be encouraged, therefore, to think of evaluation as a means of improving development policy in the future, rather than as a personal criticism of their performance.

4. SOME LESSONS FROM FISHERIES PROJECTS EVALUATION

A number of evaluation studies of fisheries projects by various development agencies, including the World Bank, have now been undertaken. A number of general factors not specific to fisheries, contributing to project weaknesses, have been identified through project evaluation, as shown in Baum and Tolbert (1985). Institutional problems, inappropriate technology, socio-cultural factors, inconsistency between project objectives and other government policies, lack of working capital and the difficulties of meeting recurrent costs are frequently occurring weaknesses.

Also, problems specific to fisheries, such as marketing a highly perishable commodity in a very discriminating and sometimes limited market, have been shown to exist. But most of the difficulties with fisheries development projects may be summarized by stating that, at the planning stage, fisheries planners have not systematically linked project performance with the productivity of the fish resource. A too optimistic view of the resource has often been taken. Consequently, the fact has often been overlooked that projects meet their objectives and generate net benefits only if the fish resource is capable of sustaining them and if there is a surplus to be earned.

REFERENCES

Baum, Warren C. and Stokes M. Tolbert, 1985. Investing in Development. Oxford University Press for the World Bank, Washington, p. 385

Casley, Dennis J. and Denis A. Lury, 1982. Monitoring and Evaluation of Agriculture and Rural Development Projects. Johns Hopkins for the World Bank, Baltimore

Casley, Dennis J. and Krishna Kumar, 1987. Project Monitoring and Evaluation in Agriculture. Johns Hopkins for the World Bank, Baltimore

Casley, Dennis J. and Krishna Kumar, 1988. The Collection, Analysis and Use of Monitoring and Evaluation Data. Johns Hopkins for the World Bank, Baltimore

Anon., 1983. Guidelines for the Preparation of Evaluation Studies. Overseas Development Administration, London

_____, 1984. Guiding Principles for the Design and Use of Monitoring and Evaluation in Rural Development Projects and Programmes. The United Nations ACC Task Force on Rural Development, Rome

LECTURE NOTE N°10

SOME POLICY ISSUES FOR AQUACULTURE PLANNING AND DEVELOPMENT IN AFRICA WITH SPECIAL REFERENCE TO THE SADCC REGION

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SUMMARY

The levels of aquaculture practices, the role of aquaculture and the opportunities and constraints for aquaculture development in Africa have been summarily presented. Pertinent policy issues on the promotion of both small-scale rural aquaculture and large-scale commercial aquaculture in the Southern African Development Coordination Conference (SADCC) countries have been discussed. The list of issues is not exhaustive and is only intended to serve as a base for further discussion by the policy makers and planners. In presenting the issues, special emphasis has been put on the recognition of aquaculture as an economic activity and the roles of government and the private sector in its development have also been discussed.

1. INTRODUCTION

African countries have recognized the importance and potential of aquaculture for increased fish production as a means of improving the nutrition, economic and social condition of their people especially the rural poor. Most of the countries in the African region are experiencing the levelling-off or decline of domestic fish catches and landings. In order to bridge the widening gap between fish supply and demand for food fish, most countries have formulated policies to promote aquaculture development.

The history of aquaculture in most African countries is very recent compared to the Asian countries which have a long tradition of fish farming. Early attempts to experiment with tilapia culture in Africa started in 1924 in Kenya. However, it was not until after the second world war that aquaculture was actively introduced in most African countries. Between the mid 1960s and 1970s there was a general slow down in the aquaculture development activities caused partly by the disappointing results of the earlier attempts. However, during the past 10 to 15 years, there has been a revitalization of aquaculture development activities and a number of countries have recorded a good level of development. In the SADCC region better results on fish farming have been recorded on pilot activities in Lesotho, Malawi, Zambia and Zimbabwe. Popularisation of fish farming as aspired to in the national aquaculture development objectives has not yet been realised.

Aquaculture development practices in Africa can be put into two broad categories, small-scale rural aquaculture and large-scale commercial aquaculture (Pillay, 1977). There is generally an increase in the size and magnitude of operation, capital investments, degree of intensification and management levels from the former to the latter. A number of intermediate levels can also be recognized.

1.1 Small-Scale Rural Aquaculture

This level of aquaculture practice is characterized by the use of small ponds of 100-500 m^2 with very low investment costs, usually utilizing monoculture of tilapia or common carp. The little supplementary feeding and fertilization which is used is usually from domestic wastes. Production is primarily for domestic consumption although excess production may be sold on the local market. In certain countries it is necessary to distinguish between family fish ponds as described above and artisanal fish farming which use a little larger ponds with more investments and sometimes utilizing polyculture of common carp, catfish and tilapia with supplementary feeding and fertilization. The system may be integrated with animal husbandry and production is mainly for financial profit.

In most countries small-scale rural aquaculture is dependent on the public sector for the supply of the major inputs such as fish seed and feed and for the provision of support services such as new technologies, extension and training. Very few countries have privately owned, specialized seed production farms supplying the small-scale rural fish farmers.

This level of aquaculture practice is the most common in Africa, accounting for most of the aquaculture production. Most of the policy issues on aquaculture development are directed at promoting this level because of its direct nutritional and social benefit to the rural communities. Some policy issues are discussed below under section 4.2.

1.2 Large-Scale Commercial Aquaculture

This level of aquaculture practice is characterized by the use of large ponds, flow-through/recirculation systems, cages and other culture systems in mariculture involving high investment costs and centralized management. Species cultured are usually of high market value for export or local luxury market with the main objective of a good rate of return on investment. Most of the farms incorporate some form of vertical integration producing their own seed, feed and marketing channels. It is generally a private sector investment although in some countries it is a government corporate investment or a cooperative's activity. In SADCC countries large-scale commercial aquaculture is emerging in Malawi, Zambia and Zimbabwe.

Governments' policies towards the development of large-scale commercial aquaculture are not usually explicit other than general statements on increasing food production, foreign exchange earnings and import substitution. For this level to develop, goverment policies will need to go further to make it conducive for the private sector to invest in commercial aquaculture as in any other industry. Some policy issues are discussed below under section 4.3.

2. PURPOSES OF AQUACULTURE IN AFRICA

When discussing the purposes of aquaculture in Africa, it is necessary to distinguish between the governments' generalized aquaculture development objectives and the aspirations or expectations of the individual producer when he decides to engage in aquaculture.

The government's or "national" major purposes of aquaculture usually include food production for direct human consumption, income generation, foreign exchange earnings and savings and creation of rural employment. There are other minor purposes which are not yet developed in Africa but which may have importance in the future. These include biomedical research and pharmaceuticals, water treatment, sport fishing and ornamental fish trade.

On the other hand, an individual producer engages in aquaculture basically as a business to earn returns on his investment comparable to other opportunities available to him. The returns in this case may be in kind as fish for food or in cash. Individuals hardly consider the overall social benefits to the society which is the primary concern of the government. Even in small-scale rural aquaculture it is becoming more obvious that individuals are engaging in aquaculture more for financial profitability reasons than as a supply of food. For example, in Kenya where the average pond size is 150 m^2 with an average production of 13.5 kg/year, farmers market between 40 and 50 percent of their fish (Coche and Balarin, 1982). Similarly, in the Central African Republic, as much as 60 percent of the production from the small ponds of about 100 m^2 is sold for cash.

It is this purpose of financial profitability for individuals engaging in aquaculture that has often been overlooked in the past when formulating aquaculture development policies.

3. OPPORTUNITIES AND CONSTRAINTS FOR AQUACULTURE DEVELOPMENT

3.1 Aquaculture Development Opportunities

The general consensus in the African region is that development of capture fishery alone will not be able to meet the increasing demand for food fish and that the opportunity for long-term increase in fish production to meet the increasing demand lies in aquaculture. Recent regional and country reviews on the fisheries and aquaculture potentials of SADCC countries show that projected future fish consumptions cannot be satisfied by projected sustainable yields from capture fisheries (Balarin, 1984, 1985, 1986 and 1987; Chondoma, 1988, 1988a; FAO, 1984). The deficit in these countries will more likely be met by increased fish production from aquaculture.

Although the potential for aquaculture development may sound obvious at the regional level, there are considerable differences and variations between countries and even between smaller geographic units. For the policy makers and planners in aquaculture development there are important issues which need to be addressed in assessing aquaculture potential at these lower levels. The issues are the circumstances of the producers and consumers (including cultural and socio-economic), the selection of appropriate species for aquaculture, and the selection of appropriate culture systems. Past experiences show that these issues did not receive

adequate attention (FAO, 1987). The analysis of these issues is not the subject of this paper, but the general possible opportunities in the SADCC region are indicated below:

(a) Opportunities for development with high social benefit and profitability lie in the artisanal small-scale rural aquaculture. Use of tilapia species, common carp and to some extent catfish with supplementary feeding and manuring and/or integration with animal husbandry in small- to medium-sized ponds is developing successfully in Lesotho, Malawi and Zambia. It is expected that this system will spread within the region.

(b) Large-scale commercial aquaculture ventures, although having high private profitability potential, have not yet taken ground in the SADCC region. Some successful large-scale farms have emerged in Malawi, Zambia and Zimbabwe which use relatively simple systems proven to be profitable, although some problems are encountered with the introduction of freshwater prawns with regard to seed availability. The highest potential for development of this level lies with the estate farms (for sugar, tea, etc.). Most of these estates have plenty of water supplies through irrigation schemes, earth-moving equipment for excavations, management skills and financial accountability, and market outlets through their staff canteens (ECA/FAO, 1985). What is needed are policies which will stimulate their participation (see section 4.3).

(c) Another area of potential for aquaculture development in Africa is the use of small- and medium-sized reservoirs for enhanced or culture based freshwater fisheries. These reservoirs are too small for a natural capture fishery to develop. However, through planned and managed stocking and harvesting, fish production could be increased. This is one of the areas given emphasis for development in the recent thematic evaluation on aquaculture (FAO, 1987). Almost all SADCC countries have opportunities for this development (Bernacsek, 1986). However, as is discussed below under sections 4.1.2 and 4.2.1, there is a need for an integrated approach on the multiple usage of water resources and some legal reforms on land tenure systems and ownership of water bodies if this system is to develop.

3.2 Aquaculture Development constraints

Being a relatively new husbandry system to SADCC countries, aquaculture faces a number of constraints in its development. The constraints vary from country to country and opinions on how to eliminate or reduce these constraints also vary. However, the approaches selected to deal with these constraints have a direct bearing on the aquaculture development policy of the country. Therefore it is important to critically analyze the development constraints during the process of policy formulation and planning, a process which most African countries are now involved in. The following is a list of the major constraints:

3.2.1 Environmental constraints

(a) Unavailability of suitable land;

(b) Unavailability of good quality water;

(c) Water security and multiple usage of water resource;

(d) Pollution problems;

(e) Environmental degradation.

3.2.2 Biotechnological Constraints

(a) Lack or shortage of fish seed supply;

(b) Unavailability or high costs of fish feed;

(c) Fish diseases;

(d) Adoption of aquaculture technologies without local long-term pilot trials;

(e) Shortage of trained manpower.

3.2.3 Financial and Economic Constraints

(a) Underdevelopment of national infrastructure (roads, communications, etc.) which isolate potential production areas from markets;

(b) Public sector's lack of long-term capacity to support aquaculture especially on programmes started by donors;

(c) Inaccessible credit facilities;

(d) Insufficient marketing facilities;

(e) High opportunity cost of inputs even in the rural areas.

3.2.4 Social and Human Constraints

(a) Fish eating habits and patterns. Aquaculture usually develops in areas far removed from the influence of capture fishery and naturally these are also the areas with low demand for fish due to unfamiliarity with fish or taboos;

(b) Common property and common ownership problems (see section 4.2.1);

(c) Lack of analysis in identifying target groups in traditional rural set-ups for the introduction of rural aquaculture and farmer training (issues on women, youth, the landless, etc).

3.2.5 Administrative and Legal Constraints

(a) Absence of, or inadequately prepared government aquaculture policy

(b) Lack of, or low administrative support on aquaculture within Departments of Fisheries and in ministries responsible for fisheries

(c) Inappropriate administrative organization in a few countries

(d) Problems on land tenure and access to water resources in inland aquaculture (see section 4.2.1)

(e) Legal problems on user rights and access to coastal waters in mariculture.

4. SOME POLICY ISSUES

4.1 Overall Aquaculture Development Policy in the Context of the National Economy

Having determined that there is potential for aquaculture development, it is necessary to assess the potential of aquaculture to compete with related economic activities such as capture fishery, animal husbandry and agriculture for the major inputs of land, water, labour and capital; in other words, to evaluate the opportunity cost of these inputs by foregoing the related economic activities.

The opportunity cost of labour (including leisure) for aquaculture is high in most SADCC countries. For example, in Lesotho and Swaziland, most adult male labour find paid employment in South Africa, leaving a predominantly female labour force in the rural areas (Chondoma, 1988, 1988a). In most other countries wage employment in the modern sector, industrial urban centres and estate farms have higher returns than agriculture and aquaculture. These activities drain the adult male labour from the rural areas. Thus the opportunity cost of female labour is lower than that of male labour for aquaculture in most SADCC countries. However, in most cases the participation of women in aquaculture development is hindered by policies which discriminate women especially households headed by women in things like ownership of land, access to credit facilities, etc.

There is also seasonality in the availability of labour for aquaculture in most SADCC countries. Since fish farming is carried out as a supplementary activitity to agriculture, usually there is an increase in available labour after the crop harvesting season and before the start of the ploughing season when agricultural activities are low.

The opportunity cost of capital is also high in most SADCC countries. Investments which have high turnover and high rates of return, such as retail businesses, are preferred to agricultural investments. Within agriculture the more traditional farming systems in which the farmers can predict their risks are also preferred to aquaculture. The opportunity cost of land for aquaculture is very variable in the SADCC region. In a few countries where suitable land for agriculture is scarce and the average land holding per family is small (less than 2 ha) as in Lesotho and Swaziland, the opportunity cost of land is very high. However, in some countries, the land holding per family is large (more than 5 ha) and the opportunity cost of land is low. This may partly explain why in some countries the increase in aquaculture production is accomplished through the increase in pond area rather than in intensification of production in the existing ponds.

The policy directives of course will vary from country to country and are not necessarily on a choice between aquaculture development and

alternative economic activities but rather on the priorities and relative emphasis of the various related economic activities. Within aquaculture development, there are also policy options on the level of aquaculture practice, whether small-scale rural aquaculture, or commercial aquaculture or both, culture systems and species selected which will favour some national objectives.

4.1.1 Aquaculture Versus Capture Fishery

As mentioned previously one of the major reasons for promoting aquaculture development in Africa is to bridge the gap between fish supply from capture fisheries and the increasing demand for food fish. It is usually argued that a developed capture fishery will complement the development of aquaculture in the use of established distribution channels and the availability of the market (Huisman, 1986). Although this may be true in some cases, there are also areas of competition which include:

(a) Financial resources allocations within the Departments of Fisheries;

(b) Human resources allocations especially for extension;

(c) Market place competition where fishermen may have a competitive advantage over fish farmers;

(d) In the case of mariculture, coastal fishermen regard aquaculture as a threat.

It is therefore imperative that when formulating policies for aquaculture development the relative importance of aquaculture to capture fishery be stated and backed with realistic budgetary commitment. In assessing the potential of aquaculture development, a thorough analysis should be made on the potential and development possibilities of the existing capture fisheries. It should be examined whether or not the development of the capture fisheries can meet the fish demand at a lower cost than the introduction of aquaculture. Consideration should also be given to the competitive advantage of capture fisheries in terms of fish prices and the broader species range and acceptance of fish caught in capture fisheries as opposed to the cultured species.

4.1.2 Aquaculture Versus Agriculture

Since inland aquaculture uses much the same inputs as agriculture, viz. land, water, feeds, fertilizers and labour, there is direct competition for these inputs. Aquaculture products will also be competing for protein demand with livestock products in the same markets. However, when aquaculture and agriculture activities are considered together a number of harmonies for co-existence and integration become obvious, which can overcome some of the above problems. Smith, 1986 and Haight, 1987, discuss these relationships in detail for the Southern African region.

Most of the potential fish farmers in the SADCC region are already involved in one form or another of agricultural activity. Therefore, policies which will integrate aquaculture in the agricultural development programme are likely to be successful. Areas of interest may include:

(a) Integration of fish farming with intensive livestock production in those countries with developed intensive livestock production or parallel development of the two activities. Experience from Asian countries could be useful (Pullin and Shehadeh, 1980);

(b) Integration of fish farming with irrigation schemes.

4.1.3 Locating Aquaculture Activities

When introducing or revitalizing aquaculture in Africa, there is a tendency to launch large-scale national campaigns to attract farmers. In most cases aquaculture technologies insufficiently tested under local conditions are used. In the light of the above discussions, it may be important to examine the following issues at the national level when locating regions for aquaculture development:

(a) Since environmental and socio-economic conditions vary from region to region, a profitable proven technology in one region is no guarantee that it will work in other regions. Countries may consider policies which favour focussed approach carrying out long-term pilot projects which will offer biotechnical evaluations and economic analysis before recommending fish farming to the majority of farmers. However experience in SADCC countries shows that most countries favoured immediate national expansion of aquaculture using insufficiently tested technologies and spreading their development resources too thinly. This may account for some of the failures.

(b) Given the financial and human resource situation and the development of national infrastructure (roads, communications, markets, etc.), it should be asked whether aquaculture should be introduced country-wide or focussed in strategic areas where people have no access to capture fishery products as is being done in Malawi.

4.2 Policy Issues towards the Promotion of Small-Scale Rural Aquaculture

The governments' major purpose in promoting small-scale rural aquaculture is to increase local food supply to the rural communities and generate some income. The development strategy for this level of aquaculture practice involves a number of direct interventions by the Government or public sector. A number of arguments have been forwarded for the public sector intervention and they include:

(a) The infant stage of the aquaculture industry and the subsequent risks and uncertainties for those engaging in aquaculture;

(b) Socially undesirable inequalities of income distribution in the society putting rural communities at a disadvantage. Aquaculture is seen as one of the activities for improving income distribution. However, the use of aquaculture as a means of income distribution in rural areas may be questioned at the infant stage of aquaculture development. Would it not be a better policy to address the question of income redistribution in the rural areas on the basis of proven agricultural production

technologies rather than using the new technologies of aquaculture? It will be the better-off farmers who will engage in aquaculture and learn the new technologies much faster and it is very unlikely that aquaculture will help the disadvantaged rural people, the poor, the landless, etc.

(c) Provision of public services such as infrastructure development, research, extension and training. These services are government's responsibility because of the broader benefit to the whole society.

Direct economic profitability to the individual producers involved in small-scale rural aquaculture is hard to demonstrate at this early stage of aquaculture development in Africa. The major thrust behind the governments' desire in promoting rural aquaculture is based on the premise that, although it may not be financially attractive for an individual to invest in fish farming at this stage, the institutional benefit which is not acknowledged by the individual producer is such that the government will have to support aquaculture until it develops an autonomous growth.

Therefore, governments' policies will have for some time to focus on those issues which will minimize risks and uncertainties to those individuals who engage in aquaculture; also create a conducive economic environment which will make aquaculture competitive with other rural economic activities for inputs and markets.

To implement this, some governments opted for subsidy policies. The common subsidy scheme is to provide inputs such as fish seed, feed and fertilizer at prices below their market value. A number of issues need to be looked at when engaging in such a subsidy scheme. The long-term capacity of the government to continue such a scheme should be assessed. If the private sector is expected to take over at a later stage, plans for phasing out should be worked out at the beginning of the scheme. The selling of inputs below their market value rules out the participation of the private sector in the production of the inputs unless the government subsidizes at the level of production. It should also be asked to what level should the subsidy scheme be applied. Subsidy schemes applied at the credit level may attract private sector participation in inputs production, as these can now be sold at market prices without interrupting the competitive nature of the market. Should the subsidy scheme on credit be applied to the capital investments only or to the operating costs as well?

Although subsidy schemes may have value in a start-up situation, the long-term benefit of most subsidy schemes is questionable. Experience has shown that when such schemes are withdrawn the situation hardly gets better and in some cases the situation worsens. It is necessary at the beginning of such schemes to establish the long-term benefit of shifting the resources into implementing aquaculture subsidy schemes.

However, the more important issue is the fact that, by accepting the financial unprofitability of aquaculture to the individual producer and promoting it through subsidy schemes, the governmnent is then limited in its catalytic role in aquaculture development. Aquaculture will have to demonstrate economic profitability even at the rural small-scale level if it is to develop an autonomous growth.

Policy issues to be considered include:

4.2.1 Land Tenure and Access to Water

In at least three SADCC countries, Lesotho, Swaziland and Zimbabwe, the land tenure system in the traditional land is insecure and discourages aquaculture investments (Chondoma, 1988, 1988a; Balarin, 1985). Aquaculture involves capital investments on permanent features such as ponds, canals, shelters, etc., which take a number of years to recover. A number of countries will need reforms in the land tenure system which will give security to investment.

Failure to reform land tenure system has led to multiple or common ownership of land and water resources in some countries. Under these conditions there is no incentive for an individual to develop or invest in the common property since the benefits will be shared by all. This has led to underutilization of these resources. Ironically it is the areas with greatest potential for aquaculture, such as public dams and reservoirs, small water impoundments and rivers, that are affected.

Where development such as construction of ponds was done by the public sector for the community, problems prevail on labour investments and management. Alternatives could involve properly structured cooperatives, long-term leases, single ownership allocations giving priority to the landless, and user rights for large inland water bodies and coastal waters.

4.2.2 Credit Facilities

All SADCC countries have one form or another of financial institution which offers credit to agricultural farmers which theoretically covers fish farmers (FAO, 1987a). However, with an exception of Botswana where credit is easily available to the poor rural farmers in easy terms, it is not easy for a poor farmer to obtain credit in the other countries.

It is even more difficult for a fish farmer because aquaculture is new with unknown risks to the lending institutions. Although the interest rates are usually favourable, the major problem arises from the requirement of the collateral by the financial institution. Unless governments offer collateral-free loans or accept family labour investments as a collateral, it will be difficult for small-scale fish farmers to obtain credit. To overcome this problem the government could also underwrite commercial credit to fish farmers and back it with extension system for training the farmers to ensure that they can pay the loans and introduce institutional loan recovery system such as collection branches near the farmers.

4.2.3 Access to Major Inputs and Support Systems

Availability of fish seed and, to a lesser extent, feed are very important to the development of rural aquaculture. Experience in SADCC countries so far indicates that seed production will be the responsibility of the public sector for some time to come. Support systems such as extension, training, research and disease control are also the responsibility of the public sector. The important issue here is to assess the government's long-term capacity to continue to supply the inputs and offer the support system. It is not enough to base rural aquaculture development activities on the short-term donor support. Continuation of supplying seed and feed inputs once started by the public sector is crucial to the survival of rural aquaculture. Transferring this responsibility to

the private sector should be the medium to long-term objective of the government and should be reflected in the location and sizes of seed production centres, which will make it easier for the private sector to take over in the future.

4.2.4 Availability of Consumers and Markets

The primary purpose of small-scale rural aquaculture is to improve rural nutrition. This presupposes that first there is demand for fish (consumer acceptance) and secondly the producers will also be the consumers. However, as more rural farmers engage in aquaculture, production increases and, if no new markets are found, the prices will fall. Therefore, in order to maintain the prices and profitability, new marketing networks including inter-village marketing and urban markets will be needed. This is an important issue and should be evaluated at the beginning of aquaculture development planning.

With an exception of the BLS countries (Botswana, Lesotho and Swaziland), fish is an important ingredient in the average diet of most SADCC countries. Therefore fish is expected to be well accepted although there may be some micro-geographical variations. In those areas where fish in not well accepted either because of tradition, taboo, or simply unfamiliarity with fish, cultural and sociological studies need to be done before introducing aquaculture (Hayward, 1987). In some areas it may be necessary to promote the development of alternative protein sources which are more culturally and socially acceptable.

4.3 Policy Issues in the Promotion of Large-Scale Commercial Aquaculture

The Governments' major purposes in promoting large-scale commercial aquaculture include increasing national food supply, earning foreign currency through exports and saving foreign exchange through import substitution. On the other hand the participation of the private sector in commercial aquaculture is motivated by profits and usually aims at the high income group with luxury fishery products. If popular fish such as tilapia is produced, its local price will be determined by the costs of production and the market forces. Therefore, it is unlikely that commercial aquaculture will produce cheap fish which would solve nutritional problems of the low income groups.

Some of the policy issues discussed above for the small-scale rural aquaculture especially at the artisanal level are relevant here, albeit on a larger and more comprehensive scale. These include issues on land tenure and ownership of small water bodies, development of national infrastructure, support systems, etc. and will not be repeated here (see Section 4.2). However, commercial aquaculture needs a more economically conducive environment to develop and the following policy issues are of interest:

(a) Availability of commercial credit. Since aquaculture capital investments take a long time to recover, loans with low interest rates and long repayment periods will encourage investments in aquaculture. Governments may also consider establishments of revolving funds. Commercial credit can come from both the public and private sectors.

(b) Fiscal incentives, subsidies, taxes, etc. similar to those given to agricultural production.

(c) In case of high value fishery products for export such as shrimps, trouts, etc., the government may assist in market studies through ministries of commerce and industry, assist in quality control and offer incentives as given to other agricultural exports.

(d) Development of broader markets and distribution channels within the country.

(e) Price control policies should seriously take into consideration their effects on both the consumers and producers and how this will influence private sector investment.

(f) A number of policies used to promote agricultural production can be extended to fish farmers as well.

Some of the above issues will have different implications if the public sector decides to invest in large-scale commercial aquaculture.

5. ROLES OF THE PUBLIC AND PRIVATE SECTORS IN AQUACULTURE DEVELOPMENT

It has already been shown in the preceding discussions above that both the public and private sectors have important roles to play in the development of aquaculture in African countries. Unlike the aquaculturally developed countries of Asia where aquaculture is primarily carried out by the private sector, aquaculture in Africa is still underdeveloped and public sector intervention will be needed for some time to come. The problem is usually in deciding where does the public sector intervention end. The answer will vary from country to country and is partially linked to the political system of the country.

However, there is a general agreement at this stage of aquaculture development in SADCC in the obvious areas of public sector intervention and private sector participation (Coche and Demoulin, 1986). Then there is an intermediate area where both sectors could participate.

5.1 Public Sector Participation

Provision of major inputs, fish seed, feed and fertilizer particularly to the small-scale rural aquaculture at the early phase of aquaculture development; provision of support systems, extension, training, research, and disease control; collection and dissemination of information; testing and demonstration of new technologies; development of national infrastructure (roads, communication, etc.).

5.2 Private Sector Participation

Provision of inputs, fish seed, feed and fertilizer; production, distribution and marketing; and supply of equipment.

5.3 Collaboration between Public and Private Sectors

Usually as aquaculture develops and becomes more profitable the role of the private sector increases. But, even at the early stages of

development, both sectors may participate in production and marketing, provision of the major inputs, introduction of new technologies and training. However, during the development process, there should be an emphasis on the transfer of the production of major inputs, such as seed and feed, from the public sector to the private sector. Basically, when the public sector is involved in the input production at the early phase of aquaculture development, it should be planned beforehand as to how the future phasing-out from the public to the private sector will be carried out. This phasing-out should be started as early as possible during the development process.

In some countries with state monopoly policies, the public sector may decide to carry out all the above-mentioned aquaculture activities.

6. REFERENCES

Balarin, J.D., 1984 National reviews for aquaculture development in Africa. 1. Zimbabwe. FAO Fish.Circ., (770.1):69 p.

_____, 1985 National reviews for aquaculture development in Africa. 11. Tanzania. FAO Fish.Circ., (770).11):105 p.

_____, 1986 Role of aquaculture and potential for development in the SADCC Region. In Report of the SADCC Aquaculture Workshop held in Kariba, Zimbabwe, 23 Sept.-30 Oct.

_____, 1987 National reviews for aquaculture development in Africa. 12 Malawi. FAO Fish.Circ., (770.12):82 p.

Bernacsek, G.M., 1986 Fisheries in small water bodies: an overview of their potential for supplying animal protein to rural population of Africa. In Summary of the proceedings and selected papers, edited by J.L. Gaudet and D. Parker. Symposium on the Planning and Implementation of Fisheries Management and Development Programmes in Africa. Lusaka, Zambia, 7-11 October 1985. FAO Fish.Rep., (360), pp:77-94

Chondoma, E.C., 1988 National reviews for aquaculture development in Africa. 19. Lesotho. FAO Fish.Circ., (770.19):132 p.

_____, 1988a National reviews for aquaculture development in Africa. 20. Swaziland. FAO Fish.Circ., (770:20):104 p.

Coche, A.G. and J.D. Balarin, 1982 Kenya: Report on the preparatory assistance mission. FI:DP/KEN/80/006, Field Document 1. FAO, Rome, 127 p.

Coche, A.G. and F. Demoulin (eds.), 1986 Report of the Workshop on Aquaculture Planning in the SADCC countries. CIFA Tech.Pap., (15):22 p.

ECA/FAO, 1985 Rural fish culture development and technology transfer in Eastern and Southern Africa. A proposal for subregional cooperation. ECA/FAO (W.H. Allsopp) W/R8542

FAO, 1984 SADCC Agriculture: Toward 2000. FAO Rome

_____, 1987 Thematic evaluation of aquaculture. FAO, Rome

_____, 1987a Baseline survey report on present situation in inland fisheries planning development and management in East (Central/Southern) Africa. FAO Rome, 130 p.

Haight, B., 1987 Biotechnical aspects of aquaculture in rural development. In Reports prepared for the aquaculture for local community development programme. FAO, GCP/INT/436/SWE.1, pp:42-51

Hayward, P.B., 1987 Socio-cultural aspects of aquaculture in rural development. In Reports prepared for the aquaculture for local community development programme. FAO, GCP/INT/436/SWE.1, pp:1-14

Huisman, E.A., 1986 Current status and role of aquaculture with special reference to the African region. In Proceedings of the African Seminar on Aquaculture, edited by E.A. Huisman. IFS, Kisumu, Kenya, 7-11 October 1985

Pillay, T.V.R., 1977 Planning of aquaculture development. An introductory guide. FAO, Rome, 71 p.

Pullin, R.S.V. and Z.H. Shehadeh (eds.), 1980 Integrated agriculture/aquaculture farming systems. ICLARM Conference Proceedings, 4, 258 p.

Smith, I.R., 1986 Aquaculture development: it is a matter of broader economic context. In Report of the SADCC Aquaculture Workshop held in Kariba, Zimbabwe, 23 September-3 October 1986, pp:303-317

LECTURE NOTE N°11

THE SELECTION OF AQUACULTURE SYSTEMS FOR USE IN SOUTHERN AFRICA AND THE PRACTICES WHICH MAY BE EMPLOYED

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1. INTRODUCTION

Fish provide people with essential nutrients when consumed, with cash or other products when sold, and with ingredients for certain productive activities. Historically, almost all fish have been, and continue to be, obtained through fishing activities, some of which include management practices to enhance fish yields. Over time these management practices have evolved into various systems of culture for many species of aquatic organisms. Aquaculture is now seen as a method for people, especially those who do not have access to productive fisheries or fish products, to produce their own fish. The spread of these techniques poses problems for planners and fish farmers in deciding which systems and practices to adopt. A few guidelines which relate aquaculture systems and practices to experiences with agriculture and fisheries can be suggested to facilitate the decision making process.

This paper will address issues concerning the selection of freshwater aquaculture systems since the majority of southern African countries are landlocked. Although some of the issues raised here are transferable to mariculture systems, some technical factors are fundamentally different. To further narrow the scope of discussion, emphasis is placed on small-scale rural aquaculture systems as opposed to large-scale commercial aquaculture. Rural fish farming development is dependent on public sector support which, to be effective, requires careful planning and allocation of resources on a long term basis. This in turn presupposes that public sector managers understand the technical issues facing small-scale farmers concerning aquaculture. Large-scale commercial aquaculture, on the other hand, is an activity guided by government policy, market forces, and the technical state of the art. The aquaculture systems considered are analyzed from the point of view of the farmer, who must allocate his/her resources to produce crops in the most efficient manner consistent with social and cultural conditions. This paper is intended to assist policy-makers in making informed decisions on resource allocations and incentives to assist fish farmers.

2. CHARACTERIZATION OF AQUACULTURE SYSTEMS

The process of farming fish involves exerting some sort of control over the organism, other than simply harvesting (which defines fishing). This process may be broken down into fundamental factors common to all

systems. Analysis of these factors yields specific characterizations for particular systems.

2.1 Fundamental Factors

From the technical point of view, aquaculture factors are well understood. Fundamental technical factors are land and water suitability, fish seed, consumable inputs (feed, fertilizer, treatment), management process, and form of output. Large-scale commercial enterprises are guided by these technical factors, together with government policy and market forces, all of which are relatively well understood (although not always effectively practised) (Haight, 1987a).

The small-scale rural farmer, however, must contend with complex and not so well understood socioeconomic and cultural factors which guide the integration of fish farming practices into his/her milieu. Cultural factors include the process of social change, the concept of conservation of resources, and the relationship between technician and farmer (Hayward, 1987). Access to the technical factors of production is governed in part by local custom. Socioeconomic factors include alternative uses for inputs, labour and capital availability, perception of local cropping systems, ability to innovate to meet changing circumstances, motivation towards risk taking, and attitude towards producing income (ALCOM, 1988; Haight, 1987a).

Work is being undertaken in Eastern Province, Zambia, to clarify the most critical socioeconomic and cultural factors relevant to the uptake of small-scale rural aquaculture. Seen as an innovative enterprise by farmers, it appears that their close involvement in the process of selecting a fish farming system is the most effective way, at present, to account for socioeconomic and cultural factors (van der Mheen, 1988).

2.2 Production Methods

The degree of intensification of the aquaculture process is a useful way to characterize production methods. Whereas technical innovation at any point in the aquaculture process can be used to overcome environmental constraints and increase the perceived carrying capacity of a system, intensification relates more to economic growth and the application of greater resources to the aquaculture process. Thus degree of intensification may be used to initially identify those production methods which are relevant in particular economic situations. General characteristics of production methods at three levels of intensification are given below.

2.2.1 Extensive

(a) Use of existing impoundments, or labour intensive improvements to basic land and water resources to create ponds.

(b) Mono- or polyculture of unimproved species reproducing naturally in the production unit or stocked from outside sources.

(c) No or low consumable inputs, similar to levels in rural small-scale agriculture.

(d) Periodic management schedule similar to rural small-scale agriculture with scope for production improvements based on strategy and skill development.

(e) Low risk due to low investment of time and capital.

(f) Low yields (0.5 - 2 ton/ha/yr) from continuous or periodic harvesting sufficient for home consumption and possible minor income generation.

2.2.2 Semi-Intensive

(a) Labour intensive construction of ponds on otherwise unimproved land with some capital improvements relating to water control; not inconsistent with improved farming systems, especially irrigation, although lack of skilled labour and capital may limit the extent of improvements.

(b) Mono- or polyculture, or monosex culture, of selected fish species from a certified source; possible propagation of seed in the production unit after initial supply, otherwise restocking from a separate seed production system.

(c) Level and timing of consumable inputs essential to system performance and similar to improved small-scale agriculture practices requiring fertilization and animal husbandry requiring feeding; inputs may be gathered on-farm, or purchased with operating capital.

(d) Daily management requiring semi-skilled labour similar to that in agriculture and animal husbandry, with special skill development for fish harvesting.

(e) Increased risk due to higher inputs and sensitivity of system.

(f) Medium yields (2 - 5 ton/ha/yr) and periodic harvest of crop favoring local marketing with scope for high income production; system may still be cropped continuously for home consumption.

2.2.3 Intensive

(a) Labour or capital intensive construction of ponds or other water holding systems requiring major capital improvements relating to water and fish control.

(b) Mono- or polyculture, or monosex culture, of selected species at high density from a certified source; propagation of seed in a separate highly technical system.

(c) Level and timing of consumable inputs highly intensive, produced using equipment on-farm from purchased inputs or procurred ready-made.

(d) Continuous management by trained personnel.

(e) High risk consistent with sophisticated level of inputs and high density system.

(f) High yields (5 - 10 ton/ha/yr) require well developed marketing and transport system for large amounts of fish harvested continuously or periodically.

From the description of aquaculture production methods in relation to their economic and resource level, it is evident that extensive and, to an extent, semi-intensive production methods are more appropriate to the small-scale rural farmer. Large-scale commercial farming can take place at any level of intensification, but it is more likely to lead to increased application of resources and thus increased intensity.

2.3 Small-Scale Rural Aquaculture Systems

Within extensive and semi-intensive production methods, there are four aquaculture systems which can be proposed for the rural farmer:

(a) Extensive system: stocking/fishing of reservoirs;

(b) Extensive system: stocking/fertilization/harvesting of ponds;

(c) Semi-intensive system: stocking/fertilization/feeding/harvesting of ponds;

(d) Semi-intensive system: stocking/fertilization/feeding/harvesting of ponds in association with animals.

The biotechnical details of these systems and examples of their implementation are given in an appendix to this paper.

3. FACTORS IMPORTANT TO SYSTEM SELECTION

Aquaculture production methods are distinguished by combining the factors of production in different ways. The particular physical and socioeconomic setting will determine the level of factors available for application to fish farming activities. Relationships among factors can be described to determine which will be most limiting and thus of interest to farmers and decision-makers.

3.1 Interralated Factors and Limits

3.1.1 Site (Size, form, soil quality of land; volume, quality of water). Each system has specific minimum site requirements which must be met, but amounts beyond the minimum of a given system do not improve the performance of the system so much as the absolute production result.

3.1.2 Organism (Fish and animal species). Each system requires fish with particular breeding, feeding, and growth habits in minimum quantities at specific times. The quantity and size of seed fish available together with the size of the unit will determine productivity potential in relation to stocking density and input levels, up to the carrying capacity of the system. Systems can overcome environmental limitations using locally adapted species of otherwise similar habits. Production may vary among different species and mixes of species which otherwise fit the system. Adding animals in association with fish will increase overall productivity of the system, but they will only improve the aquaculture system's

productivity if they provide it with an additional consumable input not already available.

3.1.3 Consumable inputs (Fertilizer and feed). Animals require a basic metabolic energy input to survive, an enhanced energy input to grow. The level of energy provided depends on quality and quantity of fertilizer and feed. Increased energy input per animal will increase growth rate only up to the energetic limit of a particular species. Increased density requires increased absolute consumable energy inputs into the system to maintain per animal ration. The feeding and digestion habits of fish and associated animals directly influence the growth effects of feeds. Water quality affects the ability of fertilizer to produce aquatic plant and animal growth.

3.1.4 Treatment (Labour, capital, management). Deficient or untimely labour and capital input may cause the system to malfunction due to site preparation deficiencies, lack of consumable inputs, or poor management. Each system has a minimum level of management, which if improved and combined with increased inputs and/or improved organisms can increase production toward carrying capacity.

3.2 Issues for Community Development

When considering the interrelationships and limits of technical factors within the context of promoting small-scale aquaculture in rural agricultural communities of southern Africa, socioeconomic issues are often ignored. Yet these issues are crucial to understanding how communities view new activities and act to allocate resources.

3.2.1 The availability of suitable land and water for aquaculture will, in the first instance, determine whether an interested community can even consider developing aquaculture. Thereafter the suitability of land in terms of form, size, and soil quality, and the suitability of water in terms of amount, seasonal variability, and quality, will determine the range of aquaculture systems a community may choose from.

3.2.2 The availability of suitable fish in terms of species choice, size, and source will determine whether an interested community with a useable site can effectively proceed with aquaculture. Fish suitability will narrow the range of systems that can be developed.

3.2.3 The availability of consumable inputs will further limit the range of systems and also the intensity of the system and the level of production results.

3.2.4 Labour and capital inputs will limit the scale and intensity of the system.

3.2.5 Management capability will limit the intensity but can be improved through training and experience.

4. AQUACULTURE PRACTICES RELEVANT TO SOUTHERN AFRICA

Decision-makers will feel comfortable using the logical processes described above to decide which aquaculture system they feel is right in a

particular situation. However, farmers may take the same information and come to different conclusions. This can occur because decision makers have incomplete information about the operating environment, and because of the complex and culturally sensitive nature of the farmer's decision-making process.

Further, it is misleading to generalize about aquaculture practices for the whole of southern Africa due to wide variations in agroclimatic zones and cultural traditions. Rather, a cycle of planning, implementation, and monitoring can take account of differences between farmers' and planners' points of view. In the long run this process is likely to yield practices relevant to particular settings.

4.1 Planning

(a) Inventory of resources relative to aquaculture:
- -land form, size, soil quality, alternative uses;
- -water amount, quality, seasonal variability, alternative uses;
- -fish seed species, size, source, environmental needs;
- -potential fish feeds/fertilizers composition, amounts, source;
- -state of the local fishery and farmer knowledge of fishing and aquaculture techniques.
- -labour availability and seasonality;
- -capital availability and amount;
- -fish supply and demand;
- -community and cultural factors (to be elaborated by ALCOM).

(b) Does the aquaculture system finally chosen match the resources available to the community?

(c) Review of aquaculture development plan for technical feasibility.

4.2 Implementation

(a) On-site technical review of site selection, pond construction.

(b) Production cycle:
- -Stocking record of fish species, size, source, quantity, condition;
- -Management record of feed/fertilizer inputs; how does the management performed compare with the system requirements?
- -Harvest record of number, size, total weight, disposal of fish and any associated animals.

4.3 Evaluation

(a) How do the actual planning and implementation activities compare with the plan of operation?

(b) How does the actual result compare with the expected result?

(c) Are certain biotechnical issues more difficult to resolve?

5. INTEGRATION INTO AGRICULTURE, FISHERIES, AND RURAL DEVELOPMENT

5.1 Relation to Agriculture

Throughout this paper aquaculture has been examined more in the context of agricultural activities than of fishing activities. In the southern African region, it is likely that most communities considering aquaculture will be made up of farmers. To assist them in the development process, some useful relationships between aquaculture and agriculture systems can be described.

-Aquaculture activities can take place on land which is unsuitable for farming due to poor soil conditions or water saturation, or on land with low opportunity cost in relation to other potential farming activities.

-Some aquaculture systems directly complement crop activities, such as fish-rice culture.

-Pond aquaculture can make use of water from irrigation sources prior to irrigating the land, since the water passes through fish ponds with little loss.

-Stocking of irrigation reservoirs adds productivity to these bodies of water.

-Rich organic mud accumulations on pond bottoms can be used to fertilize cropland.

-Vegetable crop wastes can be used as fertilizer and feeds in some systems.

-Wastes from animal husbandry activities, both leftover feed and animal manure, are good on-farm consumable inputs for some aquaculture systems.

-Extensive and semi-intensive aquaculture systems require the same basic cultivation tools as used by poor rural farmers.

-The level of management required for aquaculture can be matched to that used in local farming systems.

-Production can be timed to meet the needs of local agricultural markets.

5.2 Participatory Planning

An important aspect of integrating aquaculture into rural development is the role played by rural farmers in the planning process. For the greatest effectiveness, in terms of farmer interest and knowledge of local conditions, rural farmers should initiate and have control over the planning process. Promotion of aquaculture involves not simply the removal of constraints but also the active interest of participants.

While many farmers may want to produce, eat, and sell fish, it will require guidance by change agents to insure that farmers understand and consider the limiting factors when making their decisions. If farmers have a poor understanding of aquaculture techniques to begin with, then it will be important to emphasize the role of technical factors, since other

factors, especially socioeconomic and cultural, may be better represented in farmer decision making. This task may be made easier for change agents and more effective for farmers by closely relating technical issues to the local farming system. This method will also promote the practical integration of the selected aquaculture system into the local farming system.

5.3 Training and Extension

Training and extension service needs of large scale commercial farmers differ from those of small-scale rural farmers. Competent technicians able to answer technical and economic questions from commercial farmers may be all that is needed to serve this group. However, to meet the needs of rural farmers an awareness of the social and cultural factors and setting are required.

One issue here is whether to train technicians in socioeconomics or to train general extension workers in fish farming. Since the rural farmer is likely to be using relatively simple aquaculture techniques in a complex social setting, it makes more sense to train general extensionists in fish farming. As rural fish farming practices intensify, the role of technicians will become more important.

6. REFERENCES

ALCOM. 1988a.
Report of the Technical Consultation on Aquaculture in Rural Development, Lusaka, Zambia, 27-30 October 1987. GCP/INT/436/SWE/REP/2. SIDA/FAO, Rome, Italy. 84 p.

ALCOM. 1988b.
Formulation Mission: Southern African Region (November-December 1987). FI:GCP/INT/436/SWE.3, FAO Rome, Italy. 50 p.

Anon. 1984a.
Les aliments du poisson: une intervention du project dans leur preparation et leur distribution. IVC/84/001. Bouake.

Anon. 1984b.
Production de Tilapia nilotica: methodes d'elevage adaptees au mileu rural. IVC/84/001. Rep. de Cote d'Ivoire, Ministere du Developpement Rural, Developpement de la pisciculture en mileu rural. Bouake.

Anon. 1984c.
Production de Tilapia nilotica: comment concevoir et presenter un projet de pisciculture en etang. IVC/84/001. Rep. de Cote d'Ivoire, Ministere du Developpement Rural, Developpement de la pisciculture en milieu rural. Bouake.

Anon. 1984d.
Production de Tilapia nilotica: vulgarisation de methodes: le programme des pisciculteurs temoins. IVC/84/001. Rep. de Cote d'Ivoire, Ministere du Developpement Rural, Developpement de la pisciculture en mileu rural. Bouake.

Anon. 1985. 14-20 February.
Proceedings of the Commonwealth Secretariat Consultative Workshop on Village Level Aquaculture Development in Africa.

Anon. 1986.
Aquaculture and Rural Development: 19th FAO Regional Conference for Latin America and the Caribbean. LARC/86/7.

Balarin, J.D. 1979.
Tilapia: A Guide to Their Biology and Culture in Africa. University of Stirling, Scotland.

Balarin, J.D. 1986a.
Aquaculture Practices in Africa: An Overview. In Report of the SADCC Aquaculture Workshop held in Kariba, Zimbabwe, 29 Sept to 3 Oct 1986.

Balarin, J.D. 1986b.
The Role of Aquaculture and Potential for Development in the SADCC Region. In Report of the SADCC Aquaculture Workshop held in Kariba, Zimbabwe, 29 Sept to 3 Oct 1986.

Barbier, P., Kalimanzira, C., Micha, J.-Cl. 1985.
L'Amenagement de zones marecageuses en ecosystemes agro-piscicoles. Le projet de Kirarambogo au Rwanda. Rapport de syntheses 1980-1985. Ed. F.U.C.I.D., Namur, Belgium. 35 pp.

Ben-Yami, M. 1986.
Aquaculture: the importance of knowing its limitations. Ceres 19(4): 15-19.

Bernacsek, G.M. 1987.
Fisheries in small water bodies: an overview of their potential for supplying animal protein to rural populations in Africa. CIFA/87/SYMP/7 at CIFA 7th Session, Symposium on the Development and Management of Fisheries in Small Water Bodies, Accra, Ghana, 7-11 December 1987.

British Government. 1979. May
Project Memorandum: Lesotho Rural Fish Ponds Project. British Government Triennium 1979-1982. Mimeograph.

Chervinski, J. 1982.
Environmental physiology of tilapias. In Pullin, R.S.V. and R.H. Lowe-McConnell, eds. The Biology and Culture of Tilpias. ICLARM Conf. Proc. No. 7. pp. 119-128.

Chimbuya, S. 1985. 7-11 October
The status and development prospects of aquaculture in Zimbabwe. SADCC Workshop on Aquaculture Planning, Lusaka. 20pp.

Chondoma, E.C. 1985. 7-11 October
Aquaculture Planning and Development in Lesotho. SADCC Workshop on Aquaculture Planning, Lusaka. 9 pp.

Coche, A.G. and F. Demoulin, (eds). 1986.
Report of the Workshop on Aquaculture Planning in the SADCC Countries. CIFA Tech. Pap.,(15):22p.

Cross, D.W., Pecker, D., Insull, A.D. 1983.
Central and Northern Regions (Malawi) Fish Farming Development, Extension, Training, and Research Project. Final Project Preparation Report. Landell Mills Associates Ltd, contract no. ET II. 123 pp.

Cruz, E.M., Shehadeh, Z.H. 1980.
Preliminary results of integrated pig-fish and duck-fish production tests. In ICLARM Conf. Proc. No. 4.

dela Cruz, C.R. 1980.
Integrated agriculture-aquaculture farming systems in the Philippines, with two case studies on simultaneous and rotational rice-fish culture. In ICLARM Conf. Proc. No. 4.

Delmendo, M.N. 1980.
A review of integrated livestock-fowl-fish farming systems. In ICLARM Conf. Proc. No. 4.

Demoulin, F. 1985. 7-11 October
The aquaculture systems. SADCC Workshop on Aquaculture Planning, Lusaka.

ECA/FAO. 1985.
Rural Fishculture Development and Technology Transfer in Eastern and Southern Africa. A proposal for subregional cooperation. ECA/FAO. (W.H. Allsopp) vol. 1,2.

Edwards, P. 1980.
A review of recycling organic wastes into fish, with emphasis on the tropics. Aquaculture, 21: 261-279.

Edwards, P., et al. 1983.
Final Report on Small-Scale Fishery Project in Pathumthani Province, Central Thailand: A Socio-economic and Technological Assessment of Status and Potential. A.I.T. Research Report No. 158.

Edwards, P., Kaewpaitoon, K., McCoy, E.W., Chantachaeng, C. 1986.
Final Report on Pilot Small-Scale Crop/Livestock/Fish Integrated Farm. A.I.T. Research Report No. 184.

FAO. 1984.
A study of methodologies for forecasting aquaculture development. FAO Fish. Tech. Pap. No. 248. 47 pp.

FAO. 1985.
A new ZIBA programme for the rural sector. FAO/UNDP/GRZ Project ZAM/79/005. 2 pp.

FAO. 1987.
Thematic Evaluation of Aquaculture. FAO, Rome.

FAO/ADCP. 1978.
Aquaculture Development in Zambia: report of a mission to study the feasibility of commercial fish farming. ADCP/MR/80/6. 67pp.

FAO/SADCC. 1984.
SADCC Agriculture: Toward 2000. FAO/SADCC.

Gopalakrishnan, V. 1984.
Fish culture development in Zambia. UNDP/FAO Project ZAM/79/005. 55 pp. + 13 app.

Gopalakrishnan, V. 1985. 7-11 October.
Development of commercial fish culture in Zambia. SADCC Workshop on Aquaculture Planning, Lusaka.

Gopalakrishnan, V. 1986. October.
Systems of Aquaculture. In Report of the SADCC Aquaculture Workshop held in Kariba, Zimbabwe, 29 Sept to 3 Oct 1986.

Haight, B.A. 1985. 7-11 October.
Criteria for effective planning, implementation, and evaluation of aquaculture training and extension programmes in Africa, with examples. SADCC Workshop on Aquaculture Planning, Lusaka. 4 pp. + 2 App.

Haight, B.A. 1987a.
Biotechnical aspects of aquaculture in rural development. In Reports prepared for ALCOM. FAO/GCP/INT/436/SWE.1. p. 42-51.

Haight, B.A. 1987b. 27-30 October
Choosing a fish farming system: technical innovation and intensification. Paper ARD/CON/5 at ALCOM Technical Consultation on Aquaculture in Rural Development, Lusaka, Zambia. 4 pp.

Haight, B.A. 1987c. 27-30 October.
Issues in rural fish farming extension. Paper ARD/CON/8 at ALCOM Technical Consultation on Aquaculture in Rural Development, Lusaka, Zambia. 6 pp.

Hayward, P.B. 1987.
Sociocultural aspects of aquaculture in rural development. In Reports prepared for ALCOM. FAO/GCP/INT/436/SWE.1. p. 42-51.

Hopkins, K.D., Cruz, E.M. 1982.
The ICLARM-CLSU integrated animal-fish farming project: final report. ICLARM Technical Report No. 5.

L'Heureux, Richard. 1985.
Economic feasibility of fish culture in Zambia. FAO Project TCP/ZAM/4405(A). 99 pp. + 10 app.

Msiska, O.V. 1981.
Aspects of fish culture development in Malawi and its potential economic impact on a rural economy. FAO. CIFA Tech. Pap. no. 8.

Nongwa, G.M. 1985. 7-11 October
A review of the status and development of aquaculture in Malawi. SADCC Workshop on Aquaculture Planning, Lusaka.

Peleg, I. 1980.
A Report on the Inland Fisheries Development of Lesotho. Project TCP/LES/8905(M). 22 pp.

Pruginin, Y. 1975.
Fish Farming in Malawi. FAO. FI:DP MLW/71/516/5. 4 pp.

Pruginin, Y. 1976.
Fish Farming in Malawi. FAO. FI:DP MLW/71/516/8. 12 pp.

Pruginin, Y., Arad, A. 1977.
Fish Farming in Malawi. FAO. FI:DP MLW/71/516/10. 22 pp.

Pullin, R.S., Shehadeh, Z.H., eds. 1980.
Integrated Agriculture-Aquaculture Farming Systems. ICLARM Conf. Proc. No. 4.

Pullin, R.S.V. 1986.
Research for the Development of Tropical Aquaculture Technology Appropriate for Implementation in Rural Africa. ICLARM. Report to GTZ.

Satia, B.P., Carleton, C., Holm, M. 1985.
Country Report: Zambia. UNDP/FAO/Norway Aquaculture Thematic Evaluation Study.

Soulsby, . 1982.
Aquaculture Development Project Proposal: Zimbabwe. In Reconnaissance Mission of Zimbabwe. FAO/DDC. 18 pp.

UNDP/FAO. 1985.
Zambia Fish Culture Development: Report of the Evaluation Mission. Project ZAM/79/005. 53 pp.

Vincke, M.M.J. 1975.
La Rizipisciculture et les Elevages Associes en Afrique. FAO. CIFA/75/SR 11 in CIFA Tech. Pap. No. 4, Supp. 1. 48 pp.

Vincke, M.M.J. 1981.
Aquaculture Development in Malawi: Report of an FAO Programming Mission FAO. ADCP/MR/81.

van der Mheen, J. and H. van der Mheen. 1988 (in preparation)
Field testing of aquaculture in rural development, Pilot Project, Eastern Province, Zambia. ALCOM Working Paper, Lusaka, Zambia.

Weber, K.L., Allou, K. 1986.
L'examen de la contribution de la pisciculture dans le developpement agro-industriel d'un pays en developpment: le cas de la Cote d'Ivoire. World Bank, Institute of Economic Development, Washington, D.C. 72 pp.

Wijkstrom, U., Jul-Larsen, E. 1986.
Aquaculture: tackling the major constraints. Ceres 19(4):19-23.

APPENDIX: SMALL-SCALE RURAL AQUACULTURE SYSTEMS

1. Extensive System: Stocking/Fishing of Reservoirs

Land/Structure:
- -Existing impoundments of any size and use which is not incompatible with fisheries.
- -Minimum depth one meter except along shoreline, no maximum.
- -Restricted access to prevent poaching.

Water/Control:
- -Year around supply enough to keep fish alive in reservoir; otherwise periodic supply with replenishment of stock from outside source.
- -Prevention of excessive loss of fish at inlet and overflow, otherwise no water control necessary.

Fish:
- -Species adapted to still water and feeding on naturally occurring surface, suspended, or benthic food sources (insect, plant, animal, detritus). These include tilapias, carps, catfishes in tropical waters, and system is amenable to use with other locally occurring species.
- -Species able to reproduce naturally in non-fluctuating body of water.
- -Choice of particular species within above criteria determined by water temperature variation and limits, natural productivity of water, intended harvesting method and end use.
- -Stock assessment to determine productivity of existing fish and compatibility with chosen species, or need to eliminate.
- -Polyculture improves exploitation and production by using species occupying exclusive niche, such as microphages, macrophages, and benthic feeders. Use of predators must be balanced against loss of reproductive success of preyfish unless reliable outside source of prey seed is available.

Assoc. Animals:
- -None in direct association, but reservoir may be used as watering point for livestock; turbidity caused by livestock in water may reduce algal growth.

Fertilization:
- -In smaller reservoirs (< 1 ha) can improve plankton production by application of organic or inorganic fertilizers; this improves food source for plankton grazing fish.

Feed:
- -Not practical in this low density system, although increasing number of prey fish will provide more food for predators.

Management:
- -Onetime stocking of any age class and at low density; thereafter management of fish as a naturally reproducing population with controlled

partial harvesting using lines, gill nets, cast nets, seines, or traps.
-Harvest on continuous or periodic basis.
-Control of size and number of fish taken will improve fishery; in polyculture may have to control species taken.
-Protection of breeding areas and times.
-Risk that quality of fish will decline over time due to stunting.

Labour: -Unskilled for building impoundment, clearing of shoreline weeds, patrolling against theft.
-Basic fishing skills for harvesting.

Capital: -Fishing gear of choice for harvesting.

Result: -Yields up to 0.5 ton/ha/yr with product available as suits the user on periodic or continuous basis.

-Only very large (› 5 ha) reservoirs could produce catches (› 50 kg per week) with potential need for processing equipment.

Examples: -Small to large reservoirs are common in rural areas of many southern African countries. In Kenya and Zambia reservoirs on the order of 1 to 5 hectares have been built in rural areas for irrigation and cattle watering use. Many of these reservoirs have been stocked with fish but no data on exploitation exist.

2. Extensive System: Stocking/Fertilization/Harvesting of Ponds

Land/Structure: -Gently sloping land, water-holding soil quality, with site situated between upper water source and lower drainage.
-Diked impoundments built specifically for fish farming, from 0.01 hectare in size, usually in range 100 to 1000 square meters, depth range 0.3 to 2.0 meters; some rice paddy impoundments also suitable.
-Pond completely drainable by gravity (including siphons).

Water/Control: -Sufficient to fill pond and replace evaporation/seepage over at least one production period.
-Means of controlling water inflow and overflow/drainage; prevention of fish loss at these control points.

Fish: -Species adapted to still water and feeding on naturally occurring surface, suspended, or benthic food sources (insect, plant, animal, detritus). These include tilapias, carps, catfishes in

tropical waters, and system is amenable to use with other locally occurring species.
-Species with rapid rate of growth, robustness, toleration of high stocking density, able to reproduce naturally in non-fluctuating body of water.
-Choice of particular species within above criteria determined by water temperature/oxygen/pH variation and limits, natural productivity of water, intended harvesting method and end use.
-Polyculture improves exploitation and production by using species occupying exclusive niches, such as macrophages, microphages, and benthic feeders. Use of predators must be balanced against loss of reproductive success of prey fish unless reliable outside source of prey seed is available.

Assoc. Animals: -None in direct association, although manure fertilizers may be derived from on-farm animals.

Fertilization: -Composted organic matter, manures, or inorganic NPK to promote heavy plankton production for microphages and benthic decomposition for benthic feeders.
-High plankton growth and bacterial decomposition can cause periods of limiting oxygen concentrations for fish.

Feed: -None applied directly, but some species will feed on organic matter applied as fertilizer, especially non-liquid manures.

Management: -Stocking of fingerling at fixed density and growth for fixed period of time with complete periodic harvesting by draining of pond, culling of adult fish and restocking at fixed density with fingerling produced in unit.
-Continuous partial harvesting of original stock or new fingerling with line, nets, or traps can reduce density pressure near end of cycle.
-Theft prevention measures.

Labour: -Unskilled for building impoundment, cleaning/inspecting dikes, applying fertilizer.
-Required on a daily basis for very short (< 1hour) time.
-Learning of complete harvest method, fingerling handling.
-Basic fishing skills for partial harvesting.

Capital: -Basic pond construction/maintenance tools (shovel, pickax, wheelbarrow, machete) similar to those used in farming.
-Buckets, baskets, weighing scale for complete harvest.
-Fishing gear or choice for partial harvesting.

Result:
-Yields 0.5 to 2 ton/ha/yr with product mainly available on periodic basis.
-Ponds greater than 500 square meters could produce harvests (› 50 kg) with potential need for processing equipment.
-Pond bottom mud useable as fertilizer in gardens.

Examples:
-Lesotho: yields range 0.7 to 1 ton/ha/yr for tilapia monoculture and in some cases tilapias and common carp in polyculture.
-Malawi: 300 farmers have obtained yields ranging 0.5 to 3 ton/ha/yr in rural areas; experiments with Oreochromis mossambicus and predator Clarias lazera in ponds fertilized with poultry manure yielded 1.2 ton/ha/yr.
-Zambia: experiments with O. andersonii in manured ponds consistently yielded 3 ton/ha/yr, but no evidence that this has been attained by rural farmers.
-Cote d'Ivoire: using O. niloticus established highly managed manuring regime with continuous removal of fingerling yielding 3 ton/ha/yr in trials and in rural practice.
-Rwanda: pilot project built ponds on swampland with gardens on dikes, stocked Tilapia rendalli and O. macrochir, ponds fertilized with garden waste yielded 1 - 2.5 ton/ha/yr.
-Central African Republic: long term rural promotion of extensive fish culture using O. niloticus has resulted in some farmers who consistently produce 2 - 3 ton/ha/yr in small ponds, but the majority of farmers do not produce at this level.

3. Semi-intensive System: Stocking/Fertilization/Feeding/Harvesting of Ponds

Land/Structure: -Same as (2) above except not done in rice paddies.

Water/Control: -Same as (2) above.

Fish:
-Species adapted to still water and feeding on naturally occurring or introduced surface, suspended, or benthic food sources (insect, plant, animal, detritus). These include tilapias, carps, catfishes in tropical waters.
-Species with rapid rate of growth, low food:flesh conversion, simple feeding regime, robustness, toleration of high stocking density, able to reproduce naturally in non-fluctuating body of water.
-Choice of particular species within above criteria determined by water temperature/oxygen/pH/ammonia

variation and limits, natural productivity of water, available feed composition, intended harvesting method and end use.
-Polyculture improves exploitation and production by using species occupying exclusive niches, such as macrophages, microphages, and benthic feeders, or feeding selectively on introduced feeds. Use of predators must be balanced against loss of reproductive success of prey fish unless reliable outside source of prey seed is available.

Assoc. Animals: -None in direct association, although manure fertilizers may be derived from on-farm animals.

Fertilization: -Same as (2) above except that decomposing uneaten feed can act as fertilizer.

Feed: -Application of a feed acceptable and nutritionally useful to the fish on a daily or other schedule and in a form which is compatible with its feeding habits.
-Simple feeds (uncompounded agricultural byproducts) are likely to have high conversion ratios but be easy to procure and prepare on-farm; complex feeds must be carefully formulated to meet the dietary needs of the fish species and will produce low conversion ratios.
-Prepared feeds must be properly stored to prevent formation of aflatoxins.

Management: -Same as (2) above except that fish densities may be increased under feeding regimes.

Labour: -Same as (2) above except that a regular schedule of feed preparation and feeding must be maintained.

Capital: -Same as (2) above with addition of operating capital to procure feed ingredients.

Result: -Yields 2 to 5 ton/ha/yr with product mainly available on periodic basis.
-Ponds greater than 100 square meters could produce harvests (> 50 kg) with potential need for processing equipment.
-Pond bottom mud useable as fertilizer in gardens.

Examples: -Lestho: yields less than 2 ton/ha/yr with artificially fed common carp.
-Malawi: found O. mossambicus superior to a local tilapia species and yielded from 2 to 5 ton/ha/yr with various combinations of local byproduct feeds; polyculture of tilapias + clarias + carp yielded 2 - 4 ton/ha/yr fed on rice bran + bagasse + molasses.

-Zambia: experiments with O. andersonii fed 50% maize bran and 50% sunflower oil cake yielded 3.6 ton/ha/yr, but no evidence that this has been attained by rural farmers.
-Cote d'Ivoire: using O. niloticus established highly managed feeding regime with continuous removal of fingerling yielding 4 ton/ha/yr on rice bran and 5 ton/ha/yr on locally formulated feed in trials and in rural areas; using O. niloticus all-male attained 6 ton/ha/yr.

4. Semi-intensive System:Stocking/Fertilization/Feeding/Harvesting of Ponds in Association with Animals

Land/Structure: -Same as (3) above.
-Structure over or adjacent to pond to accommodate animals, may be of semi-permanent or permanent construction.

Water/Control: -Same as (2) above.
-Quantity and quality enough to provide drinking and washing water for animals.

Fish: -Same as (3) above.

Assoc. Animals: -Chickens, ducks, or pigs may be housed over or adjacent to ponds in normal animal husbandry conditions; the manure and excess feed from these animals is applied directly to the fish pond to serve as fertilizer/feed to the exclusion of all other consumable pond inputs.
-Animal stock may be procurred from outside breeders; on-farm breeding requires additional facilities with no additional input into ponds.
-Animal stocking rates are maximum 100 pigs per hectare, 1500 ducks per hectare, but can vary.
-These animals require a daily feed ration normally prepared from a number of ingredients and often purchased off-farm, although pigs may be fed farm by-products if carefully formulated.
-Feeds prepared on-farm must contain the appropriate vitamins and minerals to promote good animal growth.
-Attention must be paid to preventing the normal chicken, swine, and duck diseases.

Fertilization: -Manure from the associated animals provides all fertilizing effects described in (2) above.

Feed: -Manure and excess feed from the associated animals may be eaten by the fish.
-Some fish species may still benefit from direct application of fish feeds in limited quantities as described in (3) above.

Management: -For fish, same as in (2) above except that fish densities may be increased.
-For animals, farmer must follow standard animal husbandry practices, with daily disposal of animal wastes directly into fish pond.

Labour: -For fish, same as in (2) above, with attention paid to evaluating fertility of pond water and taking action to prevent oxygen deficit due to excessive organic buildup in pond.
-For animals, requires daily supervision, feeding, and cleaning of compounds; also knowledge of animal husbandry practices.

Capital: -For fish, same as in (3) above.
-For animals, initial capital to construct animal enclosures and procure necessary equipment; operating capital to procure animal feeds.

Result: -Yields 2 to 5 ton/ha/yr fish plus animals on a periodic basis.
-Otherwise same as (3) above.

Examples: -Lesotho: experiments with ducks on tilapia ponds yielded 8.8 ton/ha/yr fish.
-Zambia: experiments with O. andersonii and ducks yielded 5 ton/ha/yr fish, with pigs yielded 7 t/ha/yr fish, but no evidence that this has been attained by rural farmers.
-Thailand: experiments with 1500 ducks per hectare of O. niloticus ponds yielded 7 ton/ha/yr fish in rural areas.
-Philippines: pigs and chickens over O. niloticus - predator ponds yielded 6.8 ton/ha/yr fish in rural areas.