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COUNTRY STATEMENT - TUVALU

DEVELOPMENT OF THE INSHORE FISHERY RESOURCES OF TUVALU

BY

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COUNTRY STATEMENT

1. BACKGROUND.

Tuvalu is composed of nine inhabited atolls with a total land area of 25.9 square kilometres and sea area of 1.3 million square kilometres (700 square kilometres, of which is declared an Exclusive Economic Zone (EEZ)). The nine islands lie on a chain in the South Pacific, stretching between 5 and 11 degrees South Latitude and 176 and 150 degree E longitude. With a tropical oceanic climate with uniform temperature, high humidity and annual rainfall of 3,500 mm without clearly defined wet and dry season, the country occasionally suffer shortage of water following prolonged dry period. The population in 1985 was 8200 with an average growth rate of 1.9 percentage since 1979.

The pelagic finfish resources of the country's EEZ represents a considerable potential for development, and provides the best prospect of the country achieving economic self sufficiency. This resources is currently being exploited by licensed as well as non-licensed foreign fishing vessels. The outer-reefs and off-shore seamounts, have plentiful stocks of deep water fish (snappers etc); the lagoons are limited in area but have the resouces (reef and bottom finfish, as well as other marine shellfish and crustaceans), which are also fished by Island Fishermen for their subsistence diet and local market needs.

2. INTRODUCTION

Marine resources are the country's major natural asset. Their development will provide the country's largely subsistence population with the essential foundation for them to achieve economic and social advancement.

In recent years, particularly during the Plan period 1984-1987, Government had placed high priority on the development of the Fisheries Sector. With the continuous assistance of the Donors communities, Government had made substantial investments to establish the basic infrastructure, thus allowing for the implementation of a development strategy for the development of the sector; such a strategy involved the exploitation of the Fisheries and other marine resources within the country's Exclusive Economic Zone, including off-shore seamounts, outer-reefs and lagoons.

In this paper, the important fisheries including other marine resources are described. In developing these resources, a number of constraints have to be resolved. Such constraints are highlighted and formed the basis for the formulation of the development objectives and strategies which are to be pursued under the development of the sector during the Plan Period 1988-1991. The main part of this paper addresses the major Fisheries Development and research needs of the country, with summaries of the current programmes. The national inshore fishery research priorities for the period (1988-1991), are specifically highlighted, with recommended specific areas to be addressed by the workshop.

3. THE RESOURCES : CURRENT SITUATION.

a. OFFSHORE RESOURCES INDUSTRIAL FISHERIES SECTOR.

Tuvalu possesses rich resources of skipjack, yellowfin and bigeye tuna. These are being exploited by distant water tuna fleets of US, Japan, Korea and the Republic of China (Taiwan), under access fishing agreements. In 1985, the access fees paid under the agreements exceeds \$0.5 million and is expected to rise once the US regional Treaty is in force in early 1988.

During the early 1980s the Ika Corporation boats and Japanese Fleets carried out resources assessments and some feasibility fishing, using pole and line vessels. The findings led to the acquisition of the country's only Pole and Line vessel, "Te Tautai" through Japan's grand aid. However, the inadequate bait resources and other factors made the operation of the boat in Tuvalu waters uneconomical. Hence the boat was redeployed to operate in the Solomon Islands, following an unsuccessful two seasons in Fiji waters in 1984 and 1985 respectively.

In the past, Tuvaluans fished the off-shore oceanic waters for skipjack in canoes using pearl shell lures. Nowadays, Tuvaluans use motorised skiffs and diesel launches and fished the tunas mainly by trolling and deep-sea handling. Small scale commercial tuna polling has been tried and proved to be feasible. Although Purse Seining is the most promising system for Tuvalu, its economic viability remains doubtful in view of the constraints facing its development.

Following a joint resources survey undertaken by JICA (1984-1986) in Tuvalu and Fiji waters, deep-water snapper was confirmed as the other major potential industrial resources in Tuvalu waters. High catch rates, using the droplining technique, was achieved in the unexploited seamounts which are

which are located in the northern and southern sectors of the country's EEZ. The potential size of this resource was not quantified, during the survey, but the sustainable yield is believed to be of the order of 1000 tonnes. Such yield could lead to an export industry.

b. INSHORE FISHERY RESOURCES : COMMERCIAL FISHERIES SECTOR.

The resources of the nearshore waters and lagoons comprised mainly of the tunas, deep-water snapper, small pelagics, reef fishes, shellfish, crustaceans and other marine resources: beche-der-mer, and clams. The size of these resources are unquantified, thus limiting the development of commercial fishing in Tuvalu. Artisanal Fishermen currently exploit the oceanic pelagic resources by trolling with some gill-netting for the small pelagics in the lagoons and shallow water/outer-reefs: reef fish species are harvested mainly by handline using canoes and small skiffs. Recently fishermen are exploiting the outer-reef deep-water fish resources using droplinning. The lagoons are few and hence limited hand collection of shellfish and delicacies, and such resources is currently over exploited, through subsistence fishing.

Fisheries Division is currently evaluating suitable new vessels with the intention to provide vessels which are economical for commercial fishermen to operate and harvest the nearshore resources.

c. SUBSISTENCE FISHERIES RESOURCES:- TRADITIONAL FISHERIES SECTOR

The resources available to the subsistence fishermen are those described under the commercial sector (3b above). However, this section is characterised by non-motorised vessels and small-scale fishing gear, including the use of traditional fishing techniques. Naturally, menfolk fish a few days a week, tend their plantations, as well as taking part in community work or feasts. Women and children forage for shellfish on the reef flats and fish with a light pole and line in the rock pools or edges of the reefs. The catches are normally consumed and the surplus shared with families or neighbours.

It is important to note here that the islands differ in shapes and sizes. Some are coral atolls, circular with enclosed lagoons (Funafuti and Nukufetau); small irregular-shaped enclosing a lagoon (Nui, Nanumea) and very small circular elevated islands (Nanumaga, Niutao). The reef platforms are impoverished in Corals and other invertebrates and finned fish; in the smaller circular islands these resources are lacking and fisheries is based mainly on the outer reef slope and pelagic waters. With the differences in marine Biology between the islands, Fishermen on the individual islands

developed and are still using different gear and techniques. Such differences could be a constraint in the development of the commercial Fisheries Sector in Tuvalu.

4. FISHERIES DEVELOPMENT PLAN (1988-1991).

a. SECTORAL OBJECTIVES.

Since 1976, Fisheries Division has been responsible for the overall development of fisheries resources. In carrying out the tasks, assistance has been provided by other government Departments such as Planning Division, Public works, Island Councils, and since, 1982 responsibility for the development of the Commercial Fisheries has been shouldered by the National Fishing Corporation of Tuvalu (NAFICOT), in consultation with Fisheries Division. During the period of the three National Development Plans, priorities has been given to:

- upgrading the subsistence fisheries to artisanal level, in an endeavour to satisfy the demand for fish on the domestic market;

- negotiating access agreements with foreign fishing nations,

- developing a localised commercial fishery based on seafood products to the local markets and the export of surplus to nearby overseas markets.

Under the Fourth National Development, (1988-1991) these objectives have changed based on the progress achieved in meeting the earlier objectives, as well as the need to prioritise the development programmes, based on the experiences in the past in attempting to develop the sector. The following are government specific aims for the Fisheries sector over the Plan period:

- develop a commercial fishing industry based on the sustainable exploitation of all the country's marine resources, involving artisanal, small-scale commercial and industrial fisheries,

- maximise the export-earnings potential of fisheries while meeting local demand for finfish and fish products.

- encourage participation in this development by Fishermen on all islands in the country.

- promote fisheries related activities such as fish processing etc.

promote the development of aquaculture and other miscellaneous marine resources as a small-scale fisheries industry.

maximise the returns available from foreign fishing vessels fishing in Tuvaluan waters.

B. DEVELOPMENT CONSTRAINTS

In attempting to achieve the sectoral objectives, a number of constraints and issues had to be considered or resolved. Such constraints include:

There is a lack of physical infrastructure on the outer islands for storage and transport of fish products as well as for maintenance services to fishing vessel and equipment. On Funafuti facilities for handling and processing of fish and fish products to standards required by export markets are limited. Shipping and docking facilities are inadequate to support industrial fishing activities by large fishing vessels

Internal shipping is too infrequent to allow for the transport of perishable fish products; there are no refrigerated transport, thus limiting the development of the fishing industry in the outer islands. International shipping services from Tuvalu are infrequent and inadequate to allow for the transport of high quality fish products such as fresh or chilled products.

The local demand for fish is relatively small. Any expansion of fishing efforts can only be sustained long-term with the development of export markets.

Fishing to date has not been consistent to allow for a stable supply to the domestic market. During peak fishing seasons, the domestic market can be oversupplied. Production levels are critical in any attempt to develop export markets.

Many village fishermen lack the capital needed for equipment (boats and gear) and operating costs (maintenance, fuel, etc) for commercial fishing. If a larger capital investment programme is introduced, this would have high financial implications on Government's recurrent budget.

Tuvaluans are less skilled in the maintenance of gear and equipment and in the management of commercial operations. The country

lacks the specialists and technicians in a number of areas of fishing and fish processing to support local fishermen.

The availability of fish is variable. Pelagic fish are migratory seasonal and as such, production for the domestic market fluctuates and unstable.

Management of data on the fish resources and catch and landing rates needs to be improved. Proper planning for a data base to catch for artisanal and commercial catches is necessary. Management is under resourced, particularly in the area of commercial fisheries.

Government lacks the surveillance and enforcement capability to ensure foreign fishing vessels adhere to their licensing agreements.

c. DEVELOPMENT STRATEGIES.

Considering the various constraints, Government had agreed to pursue the following strategies during the Plan period:

Invest in infrastructure, shipping and vessels to expand and support production by artisanal and commercial fishermen on the outer islands and to integrate these into a national and export marketing structure.

Investigate and negotiate export market opportunities for fish and fish products, including organising international shipping services to transport products to these markets.

Facilitate the development of commercial fisheries through support in terms of extension, advisory and financial services by appropriate commercial organisations.

Improve the resources and capacity of Government's management of fisheries development and its dealings with foreign fishing nations and,

To encourage foreign investment in joint-venture arrangements in industrial fisheries.

J DEVELOPMENT PROGRAMMES.

In the Fourth National Development Plan, a systematic approach has been adopted in planning the Fisheries development activities, under the Fisheries Chapter. In the Plan, the individual fisheries projects which are related with similar objectives involving common implementation agencies, have been grouped into separate Fisheries programmes. Such programmes have their own specific objectives to achieve during the Plan period.

The current Plan has identified five major programmes, but as more fisheries activities are identified, additional programmes may be incorporated.

In this paper, a summary of the major programmes is provided with particular emphasis being given to discussing in details, one of the programmes, which is specifically related to the aims of the inshore fishery workshop.

In summary, the following programmes have been identified:

PROGRAMME ONE: COMMERCIAL FISHERIES

OBJECTIVES

- a. increase total production of fish and fish products to meet the needs of the local market and to provide for the development of a viable export industry.
- b. create new full-time jobs in fishing and fish processing and to upgrade existing part-time fishermen to full-time employment.
- c. provide development opportunities in Fisheries on all islands.
- d. provide access to financial and other services to adequately support commercial fisheries.
- e. ensure that the infrastructure and technology to be employed are appropriate and of the right scale, thus allowing Fishermen on the islands to take over the management.
- f. enable fishermen to develop methods of operation and cooperation, which are best suited to their local location, fishing

efforts and commercial interest and to form their own member organisations to represent their interest to Government.

g ensure the profitable operations of the National Fishing Corporation and to expand locally based commercial activities of the corporation.

h pursue joint ventures with foreign companies in tuna purse seining and other deep-water fisheries.

To date, the individual projects identified, some of which are currently being implemented, under this programmes includes:

PROJECT 1: COMMERCIAL FISHERIES MANAGEMENT PROJECT.

Recruitment of Commercial Manager for the corporation to oversee the operation of the Pole and Line vessel and the Fish Market.

Recruitment of Principal Fisheries Officer for Fisheries Division, to oversee the research, extension and project planning monitoring sections of the Division.

Export appraisal study
-covers fish and other marine products.

Options for commercial operation of "Te Tautai" will be identified.

acquisition of medium sized multipurpose fishing vessels to operate in Tuvalu water.

Possible Joint-Venture in Purse seining is under consideration.

PROJECT 2 FISH MARKETING AND PROCESSING CENTRE.

upgrading of the present facilities.

proper storage for fuel and oil and equipment are needed as supporting facilities to the Fish Market.

PROJECT 3 IMPROVEMENT TO JETTY AND SLIPWAY

Construction of the upgraded facilities is scheduled for 1989.

PROJECT 4 COMMUNITY FISHING CENTRES

Intended to cover all islands. The pilot phase will cover 3 outer islands under Japanese and Australian Governments assistance. Each centre will be equipped with the basic facilities for storage, maintenance and repairs, processing, training etc.

PROJECT 5 EXTENSION/COLLECTION/RESEARCH VESSEL

A multi-purpose boat to provide the linkage to outer islands for fisheries activities, as well as providing extension and services to outer island Fishermen. The vessel is expected in Tuvalu in late 1989.

PROJECT 6 TRAINING VESSELS

To increase production, better and well equipped vessels are needed to provide training for Fishermen. The vessels would allow the Fisheries division to undertake research work on the reefs, lagoons and off shore waters.

PROJECT 7 ARTISANAL FISHING LOAN SCHEME

Under the scheme, fishermen will be able take out loans following lending guide lines such a special loan fund will be established with the NATIONAL Bank of Tuvalu.

PROJECT 8 EXTENSION SERVICES

Fisheries Division will undertake a number of extension activities:

.training service on
maintenance and repairs of engines.

.incountry training workshops for fishermen, fish processors and mechanics.

.deployment of Fish Aggregation devices on Funafuti and the outer islands.

PROJECT 9 IMPROVEMENT OF CHANNEL: VAITUPU.

The project would allow easier access to fishing grounds as well as meeting other general activities eg unloading of cargoes. etc.

PROJECT 10 SURVEY OF CIGUOTOXIC FISH POISONING

The emphasis here is to identify species which are ciguotoxic, particularly reef fishes from the point of view of future exports of seafoods to overseas markets.

PROGRAMME TWO: FOREIGN FISHING VESSEL LICENSING

In brief, the objectives are to:

- * increase revenue from access fees
- * seek additional benefits ie scientific and technical cooperation, employment and goods and services.
- * strengthen cooperation with other Pacific island countries in monitoring DWFN's vessels activity and in surveillance and enforcement programmes.
- * seek improvement of access to catch data
- * seek management and conservation procedures
- * delineate the boundaries of the EEZ.

PROJECTS;

1. Foreign Fishing Agreements
2. EEZ Delineation
3. Surveillance and enforcement.

- Observer programme
- Patrol Vessel
 - under consideration
- Shore-base surveillance centre.

PROGRAMME THREE: DEVELOPMENT OF AQUACULTURE AND MISCELLANEOUS SPECIES.

This programme is directly relevant to the objectives of the workshop; it covers the inshore resources which offer potentials for income generating activities for the Fishermen and Farmers. The resources covered in this programme are limited and some had to be transplanted from neighbouring countries in the region. This paper therefore provides more details about this programme and the projects involved.

I. OBJECTIVES

The objectives of the programme is to encourage the rural population to recognise aquaculture and the production of miscellaneous fish species and other marine invertebrates as a viable means of employment.

As aquaculture is new to Tuvaluans, introducing aquaculture activities in the islands needs extensive support from the Fisheries Division. Feasibility studies are required before development projects are implemented. Such studies would address the potentials for exports and the available markets for the products.

II. PILOT PROJECTS.

During the Plan period, several pilot projects are planned for implementation in selected areas in the country. These projects are in fact applied research work, and are being implemented by the Research and Extension Sections within the Fisheries Division, with assistance being provided by the regional Fisheries Organisations (SPC, FFA, USP & UNDP/FAO).

PROJECT 1 - TROCHUS PRODUCTION.

In early 1985, the UNDP Regional support Programme provided seeds of *Trochus* (*T. niloticus*) for culture trials in suitable sites in Funafuti lagoon. This was followed by a feasibility study in early 1987, which identified suitable sites in three islands of Tuvalu: Nukufetau, Nukulaelae and Funafuti. Following the study which was funded by UNDP support programme, more seeds were air freighted and transplanted in the selected sites on Funafuti. Another bigger shipment is expected in April/May from the Cook Islands with the assistance of the Royal New Zealand Airforce. Coordination of the

project is being provided through FAO, Suva, which provided the Services of a (Fisheries Development Adviser). The current project is being funded by the New Zealand Government.

As the commercial trochus species (*T.Niloticus*) is naturally not found in Tuvalu, priority at the stage is to transplant seeds for stocking of the reefs. This would be followed by assessments of markets and business development opportunities for the resource. The success of the project would lead to additional foreign exchange being generated.

PROJECT 2 GIANT CLAM CULTURE

The possibility of introducing Giant Clams (*Tridacna gigas*) into Tuvalu has been considered. In the long term, it would provide additional food source to supplement the subsistence diet. However, there are possibilities for culturing the clams for exports, priority, however, is given to restocking the reefs for domestic use.

A short-term consultancy with the UNDP has been organised to undertake a stock assessment survey of the resources, including identifying possible sites for culturing the species. The study would take place in mid 1988, under a UNDP funded consultancy.

The Fisheries Research Officer is also attending the MMDC Clam Course in Palau in March in preparation for a possible pilot project for the production of clams, based on the recommendations of the study. Before the stock assessment is carried out, the Division would begin culture trials in selected sites on Funafuti, using the Clam seeds, which would be purchased from the MMDC at the end of Course. USAID provided funds to meet the course fees and costs of the young clams.

Future work under the project will include identifying the sites in all islands of Tuvalu; more culture trials and the formulation of marketing study for the resources.

PROJECT 3. FEASIBILITY OF MILKFISH FARMING

Fish cultured is not a tradition in Tuvalu. However, the possibility of culturing milkfish (*Chanos chanos*) and other food fishes (mullet), with the objective to supplement the subsistence diet (particularly during adverse weather conditions) has been considered and requested by island communities. As the islands have different marine biology as described

earlier, the fisheries resources in the individual islands differ in terms of abundance of fish species.

Consequently the communities had requested for the possibility of utilising the internal lagoons and nearby bays for the culture of marine species, in particular milkfish. The use of such species to supplement bait for fishing is a secondary objective.

Currently, a project has been formulated and submitted to a donor for consideration. It is intended to undertake the work in conjunction with the regional Fisheries institutions or organisations.(USP,FAO,SPC) and UNDP/FAO Regional Aquaculture project.

The economics of embarking on such a project is a critical issue to be considered, taking into account the progress currently been achieved under similar projects in the region eg Kiribati, Fiji.

PROJECT 4: SEAWEED PRODUCTION

The production of seaweed offers another activity for generating additional income for Fishermen and Farmers, in addition to income from Copra production. However, caution needs to be taken to ensure the markets are identified, and the species to be cultured is marketable and of high quality. The strategy therefore is to implement this project cautiously, taking into accounts the currents problems in production, processing, transport and marketing.

To date, a pilot feasibility culture trial is being implemented, with assistance from the UNDP/FAO. Regional aquaculture Project. Potential/suitable sites have been identified with assistance from a UNDP consultant and samples of seaweeds have been planted in selected sites. More samples are expected to be airfreighted later this year from Kiribati and Fiji thus allowing more planting trials. to the undertaken.

Based on future market studies for seaweed products, any potential for Tuvalu to become a small producer will be determined.

PROJECT 5: BEECHE-DER-MER PRODUCTION

The objective under the project is to encourage entrepreneurs to develop an export trade in beche-de-mer products.

The Beche-de-mer resources in Tuvalu have already been surveyed and identified. In the past, the Division had implemented this project covering the harvesting, processing and marketing procedures. Fishermen had been instructed on the techniques for harvesting and processing the products. The project would reestablish the Fishery and emphasis would be given, through extension, to provide additional instructions on the procedures. A marketing link with the buyers would be established with the marketing role being the responsibility of entrepreneurs in future. However, the National Marketing Authority (or Fish Market Management)-NAFICOT is being given the marketing role for all fish products.

The reestablishment of the Fishery would provide direct benefits to Fishermen in terms of additional income, particularly with the current prices for the products being in excess of what is currently offered for copra products.

PROGRAMME FOUR: INSTITUTIONAL DEVELOPMENT.

Fisheries division is currently inadequately staffed and resourced to carry out its functions as well as to managed the proposed investment programmes. Staffing at management, technical and planning levels needs to be increased. There is a need for staff presently working to upgrade their skills with new recruits to undergo specialised training. To resolve this problem, short-term technical assistance is needed, especially in technical and marketing areas. Priority is therefore given under this programme to ensure the staffing of the division is strengthened and resourced.

To achieve this objective, a number of projects will be implemented during the Plan period.

PROJECT (1) RESTRUCTURING OF THE FISHERIES DIVISION.

The project will include an expansion of staff and an upgrading of staff positions. This restructuring will be done in phases in accordance with the implementation of new projects and training programmes.

The new positions proposed to date include:

- the recruitment of a Principal Fisheries Officer as described under the Commercial Fisheries programme (programme one). Australia has been asked to provide institutional support in this area. A counterpart would be provided to understudy the position.

- Skipper and Chief Engineer for the Extension Vessel (which is expected to be delivered in Tuvalu in late 1989.

- Technical assistance in the form of short term expertise on technical and marketing areas.

PROJECT 2 TRAINING

A training schedule will be drawn and implemented. Training in various aspects of fisheries: fish handling, marine engineering, fisheries management, fishing technology navigation, and data processing (computers operation etc) is a priority although a training programme is currently being implemented. There is still a need to supplement formal overseas courses with in-country and training workshops. The ultimate aim would be to ensure staff and new recruits acquire the skills and experience, in their jobs thus improving their performances. An incentive scheme would be incorporated to ensure the Division is strengthened due to improved performances; individuals would be given the opportunities to perform and be considered for senior positions.

PROGRAMME FIVE: RESOURCES ASSESSMENT.

This project is another development area which needs to be addressed. It involves:

- the collection of data on catches by domestic fishermen,
- an analysis of catch composition,
- an evaluation of deep bottom finfish and pelagic resources,
- monitoring of baitfish resources.

In total, such a programme would provide the data base for the planning of commercial and industrial fisheries. Assistance is necessary to ensure the objectives of the programme are achieved. Projects under this programme needs to be reviewed and assistance provided accordingly.

The following projects are being considered under the current Development Plan.

PROJECT 1 FISHERIES STATISTICAL PROJECT.

This project has been implemented with assistance from the SPC Tuna Programme. Under Phase I of the project, the catches by subsistence and commercial fishermen are monitored using a six days per month landings surveys for Funafuti and extrapolated to outer islands. Phase II will cover an assessment of the progress to date by an SPC Statistician, training of existing statistical staff, recruitment of addition field staff and an extension of the project to fishing activities on the outer islands. The use of computers for monitoring these catches is currently being considered; training in computer operations is an area where assistance is needed.

PROJECT 2 RESOURCES SURVEYS.

A number of resources surveys were carried out in recent years. The two year (1984-1986) joint resources survey under Japanese funding had provided significant results:-

- the level of baitfish resources to support a pole and line fishery was insignificant.
- significant resources of snapper are found in the unexploited seamounts located in the northern and shorthorn sectors of Tuvalu's EEZ.

With these results, the following project has been identified for implementation during the Plan period:

A detailed research project, covering the deep bottom fish resources, would provide support to the Commercial Fisheries Development the Fish Market, and the artisanal Fisheries. The project would be wide in scope and would include:

- seamount exploratory research/surveys to determine the catch rates, species composition, and sustainable yields estimates.
- determining the suitable fishing techniques
- market surveys to identify the marketable products, transport problems and possible markets for the products.
- determine viable management criteria for the resources.

This project would supplement the current programme by the SPC Deep Sea Fisheries Project and would follow up the results of the recent joint resources survey.

With the provision of vessels under the Japanese funded Fishing Community Project, the Division would be in a position to implement the project. Another option would be for NAFICOT to undertake the research project using medium sized vessels.

The assistance of the SPC programmes will be sought in implementing this project.

PROJECT 3. ESTABLISHMENT OF A DATA BASE.

The establishment of a data base on catch landings of fish caught inside the country's 200 miles EEZ is another priority. Funding is currently being sought to establish the necessary computer system to manage this data base. The objectives of the data base include:

- To monitor the catches by foreign Fishing vessels.
- to monitor the artisanal landings
- to assess development potentials based on the available resources.
- to monitor movements of Fishing vessels within the EEZ.

With the establishment of a statistical programme (under the artisanal Fisheries) and the establishment of a computerised data base, a number of benefits would be realised:

- Fisheries Planning would be supported
- Coordination of data with the regional data base would be possible
- Negotiation of fishing agreements would be supported.

To implement the project successfully, it is necessary for a phase training programme for staff involved with the project to be prepared. Computer training (on the job or through attachments with FFA or SPC) is important. In-Country training programmes are also recommended.

Other research projects have also been identified and could be incorporated under programme five.

I. FISH AGGREGATING PATTERNS AROUND FISH AGGREGATING DEVICES (FAD).

The deployment of FAD's have proven to be very effective in increasing the fishermen's catches as well as decreasing the fishing time and fuel costs. With future deployment of FAD's under the FAD programme, it is important to understand the patterns of distribution of tuna schools in the vicinity of the FAD's. Such information would be useful to Fishermen in their attempts to maximise their catch rates around the devices.

The objectives of the project include:

- determine and establish the pattern of fish aggregation in relation to depth (vertical distribution) and distance from other FADs. (horizontal distribution)
- determine how far should the device be deployed from the outer-reefs/islands.
- determine the distribution of other pelagic fish species in relation to depth and distance from other devices.

The above project could be incorporated into the modified SPC Deepsea Fishing Project or the on-going SPC Tuna and Billfishes assessment Programme. A suitable survey vessel is needed, and would be equipped with the acoustic equipment necessary for monitoring work. During the field survey, new FADs would be deployed, and monitored for effective aggregation of tuna schools.

The current SPC tuna and billfish assessment programme would be asked to provide assistance in implementing the proposed research project.

II. OTHER RESOURCES.

There is a need to investigate other resources such as

- Black corals
- Shells
- Shellfish

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Work is continuing in the region on these resources. Limited knowledge, however on those resources is available in Tuvalu, although some studies were carried out investigating the stocks.

The possibilities of establishing cottage industries based on these resources would be considered. Possible projects could be incorporated under Programme three.

5. FUTURE DEVELOPMENT AND RESEARCH NEEDS.

The development of the Fisheries Sector is a difficult task for Government, particularly for a small country with limited resources such as Tuvalu. However, with the successful implementation of the current Fisheries Development Plan, it is expected that substantial impact would accrue on the future economy of the country in terms of additional income, employment opportunities and the establishment of the infrastructure necessary for the development of Fisheries as well as other sectors.

The current Plan is flexible, and as such, additional programmes and projects would be incorporated during the Plan period, but these depend on the success of the major programmes.

The following areas needs to be given priorities and would be considered as some of the possible future development and research needs:

a. RESOURCES SURVEYS.

As described in programme five, in this paper, this programme is a priority as it provides the data and the justification for other commercial programmes. A few projects, as described earlier, have been identified. However, there is a continuous need for assistance by the Donor Communities and the Fisheries Organisations. Assistance is needed in:-

- Planning of surveys and research programmes, which are relevant to the utilisation of the resources: survey techniques, stock assessment methodologies and techniques.
- Specifying the equipment and vessels needed for surveys etc.
- Processing and programming of data.
- Inshore fishery management and regulations

- preparation of guidelines for the specific resources for policy formulation.
- Technical expertise.

b. IMPROVED MARKETING.

The development of markets for the local fish and marine products is important assistance will be required, specifically for:

- market studies
- handling and processing techniques

c. ESTABLISHMENT OF SMALL-SCALE COTTAGE INDUSTRIES.

Based on the success of the pilot research projects (described earlier) the ultimate benefit would be to establish small cottage industries in marketing, coral jewelry, button manufacturing etc. The private Sector would be expected to benefit from such extension of the current research projects.

Assistant is needed in establishing the industries.

d. INSTITUTIONAL SUPPORT.

As described earlier, the country lacks the expertise and manpower to undertake long-term research programmes which are vital for the establishment of the industry. Short-term assistance, particularly in the area of Fisheries research (described earlier) will provide the know-how to get these programmes started. These would be supplemented by short-term specialised courses or attachments by local staff to relevant research institutions. With a core staff of National specialists, this would have an impact on the country's ability to undertake long-term research programmes.

e. MANAGEMENT AND CONSERVATION.

Priority is now being placed on utilising the resources. However, it is equally important to start working on a management Plan for the resources. This would need the assistance of the countries in the region. Criteria for coastal Zone management should be considered to ensure, that the development of the small scale industries are not hindered by the over exploitation of the resources through the Fisheries activities.

6. CONCLUSIONS.

In developing the fishery resources, the various programmes described under the Fisheries Development Plan (section 3) provides a guideline for the implementation of the Fisheries Development strategy. The components of the various programmes are inter-related, with each programme depending on the successful implementation of other programmes within the Plan.

In order to achieve the objectives of the Fisheries Sector, these issues needs serious consideration:

- the country should ensure the implementing agencies (Fisheries Division, PWD Island Councils) are strengthened and staffed, as well as trained with the appropriate skills to allow for the successful implementation of projects. This would enable the country to absorb future funding which are needed for development.
- Financial implications under the programmes must be considered prior to accepting any of the programmes.
- Programmes funded by the Donor communities should be discussed with all donors before funding is sought. This would avoid duplication of aid funds for any one programme.
- The monitoring of the problems and progress of the programmes is a joint effort between the recipient country and Donors. This would avoid any delays in projects implementation.

Over-rail, the development of the Inshore Fishery resources in Tuvalu is a priority and would provide the foundation for Tuvaluans to achieve advancement in its economy. The current Fisheries Development Plan, if implemented successfully, would provide long term benefits to the people and the Government of Tuvalu. In this development objective, however, numerous problems would be faced and high risks would be taken. There is a dedicated need for the parties involved in this undertaking to consult, review and monitor the progress of the programmes; such cooperation is needed to achieve a successful Fisheries Plan.