

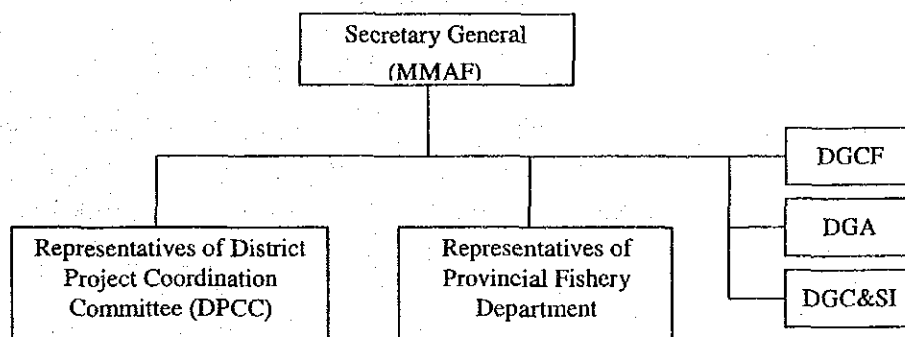
6. Project Implementation Plan

6.1 Executing Agency

The executing agency of this project is the Ministry of Marine Affairs and Fisheries, but under the regional decentralization policy, the district government will be responsible for overseeing the actual implementation of the project. However, due to the resources management programme, infrastructure improvement, the introduction of improved technology in fisheries, marketing, and processing, improvements in the social environment of the village communities, and various other programmes, that will require uniform measures by the central, provincial and district administrative levels in the area of fisheries resources, the Ministry of Marine Affairs and Fisheries must establish a system of cooperation between each respective department and office and to coordinate the activities of the provincial and district Fisheries Offices. In view of these circumstances, an organizational system of equal and mutual coordination and cooperation between the Ministry of Marine Affairs and Fisheries and the district governments is demanded. As shown in the figure below, the cooperation between the Ministry of Marine Affairs and Fisheries and each district government body will be sufficient, but in future an organization that represents neighboring district governments will be needed in future to coordinate the interests of both local governments. A project implementation committee to provide concrete support of the operations of the project and a project coordination committee that will coordinate the roles of the relevant bodies in the district government, which will actually implement the project, will be needed.

6.1.1 Programme Coordination Committee

An organizational chart of the committee that will be responsible for coordinating the various project programmes between the central and district governments is shown below.



Organizational Structure of the Programme Coordination Committee (PCC)

Legend: MMAF = Ministry of Marine Affairs and Fisheries
DGCF = Director General of Capture Fisheries
DGA = Director General of Aquaculture
DGC&SI = Director General of Coastal and Small Islands

6.1.2 District Project Coordination Committee (DPCC)

A District Project Coordination Committee (DPCC) will be established at the start of the project to coordinate the relevant parties and institutions that are relevant to the operations of the project. This committee will be comprised of representatives from the district governor's office (Bupati Office), the district fisheries office (Dinas Perikanan Kabupaten), the district cooperatives office (Dinas Koperasi Kabupaten), the district planning office (Bappeda), the provincial fisheries office (Dinas Perikanan Propinsi), and others. The representative from the district governor's office will chair the committee and it will be responsible for carrying out the administrative coordination and basic policies with regard to the project's implementation. Other related duties are as follows.

6.1.3 Project Implementation Committee

A Project Implementation Committee (PIC) will be created within the district fisheries office and will be chaired by the fisheries office director. The committee will be comprised of the officer in charge of the project, the fisheries extension officer, and representatives of the fishermen cooperatives. It will be responsible for the concrete preparations and implementation of the project in accordance with the basic policy set by the DPCC; and it will mobilize, organize, and strengthen the fishermen cooperatives and kelompok to coordinate the project activities, and it will take responsibility for providing the needed capital and technical assistance to implement the project. It will also be responsible for the following tasks.

6.1.4 Project Management Office

A Project Management Office (PMO) will be set up in the fishermen's cooperative office that will operate the project. With the assistance and guidance of the PIC, it will be responsible for providing guidance on the organizational system, technical aspects, and loan services. The PMO staff members will be appointed by the PIC.

6.1.5 Fishermen Organizations That Will Manage the Project (Model Site)

Fishermen organizations that will be in charge of the operations of the project facilities will be established at each model site. These fishermen organizations will also represent the existing fishing village cooperatives and fishermen cooperatives. (For details about the organization's functions, refer to section 5.1.5, 5.2.5, 5.3.5, and 5.4.5.)

6.2 Implementation Schedule

6.2.1 Implementation Schedule of the Priority Zones

Implementation priority will be given to priority zones with a high EIRR that also show a financial plus. The implementation priority ranking based on project evaluation findings is shown in the table below.

| Province | Priority I | Priority II |
|----------|---|--|
| NTB | Waworada | Kemppo, Hu'u |
| NTT | Larantuka (Oka), Lamahala Jaya, Balauring, Lewoleba, Ende, Paga | Maumere (Kalimati, Wuring), Sagu, Lamalera |

6.2.2 Priority Projects in Each Programme

The projects that will raise fishermen incomes and directly eliminate the regional disparity in fish consumption were prioritized. The priority ranking of each project was determined according to the criteria shown in the table below.

| Programme | Project | Year | | | | | | | | | | |
|---|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| Coastal resource management | Data collection system | ————— | | | | | | | | | | |
| | Expansion fishing licensing system | | ————— | | | | | | | | | |
| | Diversification of fishing grounds |  |  | ————— |  | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | Coastal fishing surveillance |  |  |  |  | ————— |  | ..... | ..... | ..... | ..... | ..... |
| Fish landing, marketing and processing | Fish landing & handling improvement | ————— | | | | | | | | | | |
| | Fresh fish shipment improvement | ————— | | | | | | | | | | |
| | Fresh fish handling extension | | | ————— | | | | | | | | |
| | Fish processing improvement | | | ————— | | | | | | | | |
| | Bima retail market | | | ————— | | | | | | | | |
| Fishing Activity Support Facilities | Support facilities | ————— | | | | | | | | | | |
| Aquaculture | Model project | | | ————— | | | | | | | | |
| | Spatial Plan | | | ————— | | | | | | | | |
| Fishing village environment | Fishing village infrastructure | | | | | ————— | | | | | | |
| | Social environment improvement |  |  | ————— |  | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Strengthening of fishermen organization/Fisheries Extension | Establish fishermen organization | ————— | | | | | | | | | | |
| | Monitoring and evaluation |  | ————— |  | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Fishermen Education/Training | Education/training of fishermen leaders, govt. officers | ..... |  |  |  |  |  |  |  |  |  |  |

Note: Bold line indicates project period and dotted bold line indicates support by local government.

6.3 Capital Procurement Plan

6.3.1 Initial Input Capital

Of the 12 model sites, the EIRR of three sites was 8~9 percent and for the other remaining sites it ranged from 10 percent to 42 percent. Due to the a large amount of initial cost for the provision of infrastructure, only one site indicated a FIRR of 7 percent; eight sites showed 0~4 percent, three sites showed minus one to minus 3 percent, and the FIRR for one remaining site could not be computed. In order to enable the project to be implemented under sound financial conditions, the Indonesian government must pursue to secure grant fund to cover the initial input costs.

In addition, since the project contains elements that may transform the coastal resources management programme and other aspects of Indonesia's fisheries administrative system, it is recommended that the technical cooperation projects of JICA or other similar assistance programmes are implemented in order to reduce the initial input.

For the fishing village environmental improvement programme, it is possible to obtain the assistance of the JOCV and other grass roots assistance to provide technical support and the equipment and materials needed to implement traveling extension activities in the zones and to produce supplementary audiovisual materials aimed at raising the motivation of the local communities to improve the social environment of the fishing villages.

6.3.2 Operating Capital

In this project, the operating capital for the facilities and equipment have been planned to revolve on independent funds. However, in order to achieve this goal, OJT and regulated extension, educational, and training activities are needed. The estimated costs of these activities are 30 to 70 percent of the district fisheries office budget. Therefore, the *district fisheries office should explain the content of the project and its benefits and secure budgetary support from the district government.*

6.4 Technical Assistance

Much of the technology required by each project is available in Indonesia. Providing appropriate guidance measures can effectively raise the operations of fishermen organizations. Although activities to raise the organizational and operational capabilities of the fishermen organizations will be implemented by the district Fisheries Office, its manpower capacity is limited and there is a need to strengthen its extensions personnel by establishing an extensions division. Moreover, the management and operations of the project will be effectively raised, if an expert or JOCV member can be dispatched to provide technical guidance prior to the start of the project.

Furthermore, the Indonesian government has minimal experience in establishing a coastal resources management system implemented by community residents. Therefore, it is recommended that it dispatch fisheries officers at the central or provincial government levels to undergo the training programme provided by SEAFDEC, which has implemented similar projects in the Philippines or Thailand. Moreover, the cost of the programme is only 50 percent for beneficiaries and the course is conducted in English. The fisheries officers who undergo this training programme will disseminate their newly acquired knowledge to the staff members of the district Fisheries Office and to fishermen.

7. Recommendation

(1) Improving Fishermen Income and Swift Project Implementation

The per capita GDP of NTT and NTB provinces that were targeted in this study is the third lowest among the country's 30 provinces. In particular, the fishermen income level of nine of the fishing villages out of the 33 village communities that were surveyed in this study were at the poverty line level, and the income of 25 villages was under the income earned by farmers working on less than 0.5ha of land.

Due to the difficulty accessing financial institutions, input in fisheries has been minimal. But additionally, fish prices have been kept low mainly due to undeveloped technology in fish processing and fresh fish maintenance.

One of the objectives of this study was to improve fishermen incomes in order to rectify the economic losses. This was a common problem for all the fishing communities in the study area; and since the problem does not require advance technology to resolve, the implementation of the project in the priority zones is anticipated to produce a large ripple effect. Therefore, it is recommended that the Indonesian government implement the projects as quickly as possible at least in the priority zones with an EIRR of higher than 10 percent and a plus FIRR. Appropriate budgetary measures should be enacted and the assistance of donor institutions for the initial input should be requested; and the preparation for the official request should be implemented as soon as possible.

(2) Coastal Resources Management and Government Action

Open access to fisheries resources is presently based on the consensus of the Indonesian people. Conversely, this has also been the underlying cause of the low awareness about local resource conservation by the local residents and their insensitivity to the adverse impact of illegal fishing methods used to exploit resources.

Under the decentralization policy, the local governments have begun to see the fisheries resources in their region as a source of financial revenue. However, this perspective is not based on sustained use of resources, but simply a shortsighted aim to collect fishing

revenues. This may lead to abuse of the fisheries licensing system. Therefore, in this project, independent management of coastal resources by the local fishermen has been proposed. The central government should work closely with the provincial and district governments to establish a self-reliant and basic management and surveillance system by the coastal communities to achieve sustained use of the coastal resources.

(3) Establish a Fisheries Coordination Institution in Saleh Bay

Saleh Bay in Sumbawa Island encompasses a wide area where coastal fisheries have flourished. It is an enclosed water area due to an island that obstructs the mouth of the bay. According to the statistics, the fish catch volume has stagnated these past few years and there is a need to closely manage the resources. Private companies have also expressed interest in conducting mariculture activities, and there is a need to separate the water areas for fisheries and mariculture activities based on the mutual consensus of the coastal community. In addition, the boundary between Sumbawa and Dompu districts runs through the middle of the bay, and there is a need to establish an institution that will coordinate the fishery activities of both districts with the aim of achieving sustained use of the fisheries resources.

(4) Assistance to Foster Self-reliant Fishermen Organizations

In principle, the management and operations of the facilities will be carried out by fishermen organizations whose capabilities will be strengthened with the assistance of the district fisheries office and village administrative bodies. As a result, the administrative side plays an extremely important role. Generally, the capabilities of the district level officers are low and it will be difficult for these officers to supervise the fishermen who will be in charge of the operations and maintenance of the facilities. However, based on discussions with district officers about the project during the study, it was concluded that they possess adequate basic capabilities to manage the operations of the facilities under an appropriate plan. To foster self-reliant fishermen organizations, the district government will monitor and evaluate the project's implementation and will provide technical, financial, and administrative support during the initial stages of the facilities' operations to raise the management capabilities of the fishermen organizations.

(5) Review a Financial System for Fishermen

To promote sustainable fisheries in the study area, it is important that fisheries activities are extended to offshore waters. The provision of a model fishing boat in the project will be used to train the younger generation of fishermen in offshore fisheries, which requires the use of large fishing boats. The construction cost of a large fishing boat averages Rp.3,000 million to Rp. 4,000 million, but generally, it is difficult to obtain loans from the

existing financial system, despite special loans of Rp.4000 million to women kelompok as part of a programme by the department of outlying islands to improve their capabilities. There is a need to combine a training programme for fishermen with a financial system that will help them to purchase large fishing boats for offshore operations. The Ministry of Marine Affairs and Fisheries should endeavor to quickly establish such a financial system.

Following points should be considered when a financial system is to be established.

- (a) The modernization of fishing boats should be clarified within the policy framework.
- (b) The credit fund, both from the government and the donor, should clearly be divided for the existing small-scale fishing activities and for the modernization of fishing boats.
- (c) The financial system for small-scale fishermen which is currently provided by the local development bank should be utilized.
- (d) The upper limit of the loan amount by each water body should be set up based on the economic viability of off-shore fishing activities within 12 nautical miles evaluated by DGCF of MOMAF.
- (e) Minimum criteria for individuals who can access the loan are to be set up. Those individuals should have enough experiences in off-shore fishing or be acquired trainings from formal training centres (ex. Semarang Fishery Training Centre, etc.).
- (f) Those centres should establish training programmes for fishermen based on the policy for the modernization of fishing boats and corresponding credit system.

(6) Factors to Consider in Mariculture Development

There is strong interest to develop mariculture at the central, provincial, and district government levels, but the targeted fish species are groupers, lobsters, and other high priced species. However, these species require a long rearing period, in terms of feed and monitoring activities, which makes it difficult for small-scale fishermen with limited capital to participate. Similarly, only private companies with capital are able to engage in high density and intensive brackish water pond culture of prawns. Presently, government supervised cage culture of groupers is underway in three to four locations in the study area. But due to the inadequate preliminary training of the fishermen, the lack of financial assistance to meet the operating costs until shipment, and the lack of a shipping system for live fish, the project will inevitably fail. If the government plans to promote mariculture among the small-scale fishermen, it must first address these issues and provide complete technical and financial support.

(7) Foster Fisheries Extension Officers

Since the fisheries sector was under the jurisdiction of the Ministry of Agriculture, the fisheries extension activities tended to be concentrated in inland fisheries. In addition, since the district extension officers are mainly centered in agriculture, the educational and training activities in marine fisheries have been inadequate and have produced very minimal results. The operations and management of the project will initially be conducted with the participation of the district fisheries and village administrative organization to strengthen the capabilities of the fishermen organization. Subsequently, it is important to raise the capabilities of the district fisheries officers. It is also important that extension activities in marine fisheries are given institutional support in the new ministry and the capabilities of the district level fisheries personnel are improved as quickly as possible.

(8) Assistance to Improve the Village Environment

Under the regional decentralization policy, the local communities must shift from an attitude of waiting to an attitude of self-help to resolve the problems in each fishing community. However, the fishing communities have grown to depend on third parties to resolve their problems, and their motivation to take action among themselves is low. The fishing villages face a variety of problems in their social environment such as the excessive labor of women, the lack of basic education for children, the lack of recreational facilities, and others. There is a need to raise the community's motivation to improve the social environment of the fishing village, and the strong assistance of the district extensions officer is vital in this area. Therefore, it is recommended that the district fisheries office formulate and implement support programmes.

FINAL REPORT

Master Plan

Table of Contents

| |
|----------------------------|
| Preface |
| Letter of Transmittal |
| Location Map |
| Photographs |
| Summary |
| Acronyms and Abbreviations |
| Exchange Rate |

PART I INTRODUCTION

| | | |
|------------------|--------------------------------------|------------|
| Chapter 1 | Background of the Study | I-1 |
| Chapter 2 | Outline of the Study | I-1 |

PART II PRESENT CONDITIONS

| | | |
|------------------|--|--------------|
| Chapter 1 | National Plan | II-1 |
| 1.1 | Macro Economy of Indonesia | II-1 |
| 1.2 | Decentralization Policy | II-1 |
| 1.3 | Economic Development Policies | II-3 |
| 1.4 | Proposed National Budget in 2002..... | II-6 |
| 1.5 | Outline of Fishery Sector and Its Development Prospect | II-8 |
| 1.5.1 | Fishery Products Trends of Indonesia and Fishery Development Potential..... | II-8 |
| 1.5.2 | Fishery Administration..... | II-9 |
| 1.5.3 | Fishery Laws | II-9 |
| 1.5.4 | National Fishery Development Policies | II-10 |
| Chapter 2 | Fishery Activities and Fishery villages in NTB and NTT | II-15 |
| 2.1 | Natural Conditions and Social Infrastructure..... | II-15 |
| 2.1.1 | Natural Conditions | II-15 |
| 2.1.2 | Social Infrastructure | II-18 |
| 2.2 | Outline of Fishing activity and Fishing villages | II-19 |
| 2.3 | Development Policies and Fishery Development policies | II-20 |
| 2.3.1 | Provincial Development Policies | II-20 |
| 2.3.2 | Provincial Fishery Development Policies | II-21 |
| 2.4 | Capture Fishery Production and Its Development Potential | II-21 |
| 2.4.1 | Fishery Production and Fishing Technology..... | II-21 |

| | | |
|--------|---|-------|
| 2.4.2 | Fishery Resources and Its Development Potential | II-27 |
| 2.4.3 | Development Issues | II-31 |
| 2.5 | Aquaculture Technology and Its Development Potential..... | II-33 |
| 2.5.1 | State of Mariculture in Indonesia | II-33 |
| 2.5.2 | Existing State of Aquaculture Technology..... | II-34 |
| 2.5.3 | Extension System of Aquaculture Technology | II-38 |
| 2.5.4 | Fish Species Suited for Aquaculture in terms of Cost and Benefit ... | II-39 |
| 2.5.5 | Aquaculture in NTB and NTT..... | II-41 |
| 2.5.6 | Development Potential Area | II-46 |
| 2.5.7 | Development Issues..... | II-48 |
| 2.6 | Fish Marketing and Processing | II-51 |
| 2.6.1 | Fish Marketing | II-51 |
| 2.6.2 | Fish Processing..... | II-54 |
| 2.6.3 | Economic Loss during Stage of Marketing and Processing..... | II-53 |
| 2.6.4 | Consumption Trend of fishery Products..... | II-56 |
| 2.6.5 | Development Issues..... | II-59 |
| 2.7 | Fishery Infrastructure | II-61 |
| 2.7.1 | Current Conditions of Main Fish Landing Infrastructure..... | II-61 |
| 2.7.2 | Current Condition of Fishing Village Infrastructure | II-63 |
| 2.7.3 | Development Issues..... | II-65 |
| 2.8 | Fishing Village Society/Gender | II-66 |
| 2.8.1 | Summary of Fishing Village Society | II-66 |
| 2.8.2 | Summary of Village Women Activities | II-72 |
| 2.8.3 | Development Issues..... | II-77 |
| 2.9 | Fishermen Supporting System/Fishery Extension Activities | II-78 |
| 2.9.1 | Fishermen Organization | II-78 |
| 2.9.2 | Fishery Extension | II-82 |
| 2.9.3 | Fisheries Credit..... | II-84 |
| 2.9.4 | Development Issues..... | II-88 |
| 2.10 | Environmental Consideration..... | II-90 |
| 2.10.1 | Environmental Management Authority..... | II-90 |
| 2.10.2 | Outline of AMDAL | II-91 |
| 2.10.3 | Major Environmental Issues in the Study Area..... | II-92 |
| 2.10.4 | Related Environmental Projects and Activities in Study Area..... | II-93 |
| 2.10.5 | Lessons/Experiences from Related Projects..... | II-95 |
| 2.10.6 | Environmental Consideration Points Relating to Fishing Village Development | II-95 |
| 2.11 | Local Economy and Financial Condition of District Government | II-97 |
| 2.11.1 | Characteristics of Local Economy (to change title) | II-97 |
| 2.11.2 | Financial System of Local Government and Effects of | |

| | | |
|------------------|---|---------------|
| | Decentralization..... | II-98 |
| | 2.11.3 Budget for Local Fishery Sector | II-99 |
| PART III | MASTER PLAN | |
| Chapter 1 | Future Projection | III-1 |
| 1.1 | Per Capita Fish Consumption and Fish Demand in Study Area | III-1 |
| 1.1.1 | Population Projections..... | III-1 |
| 1.1.2 | Projection of Gross Regional Domestic Products (GRDP) and Per Capita Regional Income | III-1 |
| 1.1.3 | Per Capita Fish Consumption and Fish Demand..... | III-2 |
| 1.2 | Supply and Demand of Fish in Study Area | III-3 |
| 1.2.1 | Demand of Fish | III-3 |
| 1.2.2 | Supply of Fish | III-5 |
| 1.2.3 | Expected Fish Flow | III-5 |
| Chapter 2 | Development Frame | III-7 |
| 2.1 | Target Year..... | III-7 |
| 2.2 | Development Issues | III-7 |
| 2.2.1 | Development Issues for Coastal Community Development..... | III-7 |
| 2.2.2 | Development Goals | III-9 |
| 2.3 | Development Strategy | III-10 |
| Chapter 3 | Basic Development Plan | III-11 |
| 3.1 | Approach to Issues | III-11 |
| 3.2 | Viewpoint of Plan Formulation..... | III-13 |
| 3.3 | Overall Plan of the Development Concept..... | III-13 |
| Chapter 4 | Sector Plan..... | III-15 |
| 4.1 | Plan for Improvement of Fishing Technology and Coastal Resources Management | III-14 |
| 4.2 | Plan for Improvement of Aquaculture Technology | III-22 |
| 4.3 | Plan for Improvement of Fish Handling, Marketing and Processing..... | III-34 |
| 4.4 | Plan for Improvement of Fisheries Infrastructure | III-46 |
| 4.5 | Plan for Improvement of Fishing Village Environment..... | III-58 |
| 4.6 | Plan for Improvement of Fishermen Organization System and Fisheries Extension | III-63 |
| 4.7 | Plan for Education and Training | III-66 |
| Chapter 5 | Outline of Project Design by District..... | III-69 |
| 5.1 | Objective Districts..... | III-69 |
| 5.2 | Characteristics of Fisheries and Development Issues | III-69 |
| 5.3 | Development Policy | III-77 |
| 5.4 | Set up of Development Zones and Model Sites | III-77 |
| 5.4.1 | Development Zones..... | III-77 |

| | | | |
|------------------|-------|---|---------------|
| | 5.4.2 | Model sites | III-80 |
| | 5.4.3 | Classification of Model sites | III-81 |
| 5.5 | | Basic Concept for Project Design of Development Zones by District | III-82 |
| | 5.5.1 | Items to be prepared by Indonesian Side for Project Implementation..... | III-82 |
| | 5.5.2 | Basic Concept..... | III-83 |
| 5.6 | | Outline of Project Design | III-87 |
| | 5.6.1 | Design Policy with regard to Hardware | III-87 |
| | 5.6.2 | Outline of Project Design by Model Site | III-87 |
| Chapter 6 | | Selection of Priority Areas..... | III-89 |
| | 6.1 | Selection Criteria..... | III-89 |
| | 6.2 | Priority Areas Based on Selection Criteria..... | III-91 |
| | 6.2.1 | Comparative Analysis of Each Area | III-92 |
| | 6.2.2 | Result of Priority Analysis | III-97 |
| | 6.2.3 | Analysis of Linkage Between Selected Site and Other Areas (Zone Analysis)..... | III-98 |
| | 6.3 | Initial Environmental Examination | III-102 |
| | 6.3.1 | Environmental Conditions of Priority Area | III-102 |
| | 6.3.1 | Results of Screening Checklist..... | III-107 |
| PART IV | | PILOT STUDY ON MARICULTURE IN LEMBATA..... | IV-1 |
| | 1. | Planning of the Pilot Study..... | IV-1 |
| | 1.1 | Selection of Target Species | IV-1 |
| | 1.2 | Selection of the Project Site | IV-1 |
| | 2. | Outline of the Project | IV-4 |
| | 3. | Implementation Stage..... | IV-6 |
| | 3.1 | Modification of the Project Design | IV-6 |
| | 3.2 | Mid-term Monitoring | IV-7 |
| | 3.3 | Result of Rearing Experiment..... | IV-10 |
| | 3.4 | Profitability of the Grouper Cage Culture..... | IV-11 |
| | 3.5 | Development Issue for Mariculture in Tapolangu | IV-11 |
| | 4. | Final Evaluation | IV-13 |
| | 4.1 | Efficiency | IV-13 |
| | 4.2 | Effectiveness | IV-14 |
| | 4.3 | Impact..... | IV-14 |
| | 4.4 | Relevance | IV-15 |
| | 4.5 | Sustainability..... | IV-15 |
| | 4.6 | Participation of Villagers | IV-16 |
| | 4.7 | Conclusion..... | IV-16 |

| | | |
|----------------|---|-------|
| 5. | Recommendation and Lessons Learned..... | IV-16 |
| 5.1 | Recommendation..... | IV-16 |
| 5.2 | Lessons Learned..... | IV-17 |
| 1.4 | Recommendation and Lessons Learned..... | IV-17 |
| 1.5 | Future Subjects for Developing Grouper Cage Culture | IV-19 |
| Attachment - 1 | Management Condition of the Pilot Project..... | IV-29 |
| Attachment - 2 | Outline of the PCM | IV-32 |

[Figures and Tables and Appendices]

PART II PRESENT CONDITIONS

| | | |
|----------------|---|--------|
| Fig. 1.5.1 | Organizational Chart of Ministry of Marine Affairs and Fisheries (MOMAF) | II-103 |
| Fig. 2.1.1 (1) | Wave Observation Points in Indian Ocean | II-104 |
| Fig. 2.1.1 (2) | Wave Direction and Height in Indian Ocean (19) | II-105 |
| Fig. 2.2.2 | Distribution Map of Earthquake in Indonesia (1991-2000) | II-106 |
| Fig. 2.1.3 | Tsunami Height in Sikka District by Tsunami on Dec. 1992 | II-107 |
| Fig. 2.1.4 | Existing Transportation Network | II-108 |
| Fig. 2.4.1 | Seasonal Fluctuation of Marine Fish Catch | II-109 |
| Fig. 2.5.1 | Mariculture Potential Map (West Zone) | II-110 |
| Fig. 2.5.1 | Mariculture Potential Map (East Zone) | II-111 |
| Fig. 2.6.1 | Current Fish Production and Distribution (1/3) | II-112 |
| Fig. 2.6.1 | Current Fish Production and Distribution (2/3) | II-113 |
| Fig. 2.6.1 | Current Fish Production and Distribution (3/3) | II-114 |
| Fig. 2.6.2 | Fish Traders Survey on Their Problems and Needs | II-115 |
| Fig. 2.6.3 | Consumers Survey on Preference of Fish | II-116 |
| Fig. 2.7.1 | Fishing Ports in Indonesia (Class A, B and C) | II-117 |
| Fig. 2.7.2 | Existing Fishing Ports, PPI and Commercial Ports in NTB and NTT | II-118 |
| Fig. 2.7.3 | Existing Living Condition (1/2) | II-119 |
| Fig. 2.7.3 | Existing Living Condition (2/2) | II-120 |
| Fig. 2.7.4 | Toilet Facilities | II-120 |
| Fig. 2.7.5 | Existing Situation of Public Services | II-121 |
| Fig. 2.7.6 | Level of Satisfaction of Public Services | II-122 |
| Fig. 2.7.7 | Environmental Matters | II-122 |
| Fig. 2.7.8 | Technical Problems | II-123 |
| Fig. 2.7.9 | Problems on Fish Landing/Selling | II-123 |
| Fig. 2.7.10 | Utilization of Fish Landing Places | II-123 |
| Table 1.5.1 | Target Production in Aquaculture Sector | II-124 |
| Table 1.5.2 | Target Development Area in Aquaculture Sector | II-124 |
| Table 1.5.3 | Target Export Volume by Species | II-124 |
| Table 1.5.4 | Planned Number of Employee in Aquaculture Sector | II-125 |
| Table 1.5.5 | Potential Area for Aquaculture in NTB and NTT | II-125 |
| Table 2.1.1 | Average Number of Rainy Days in a Month by Districts in NTB (1999) | II-126 |
| Table 2.1.2 | Monthly Average Rainfall by Districts in NTB (1999) | II-126 |
| Table 2.1.3 | Average Number of Rainfall for Five Years by Districts in NTB (1995-1999) | II-126 |
| Table 2.1.4 | Monthly Climatic Condition of Sumbawa Besar in NTB (1999) | II-126 |

| | | |
|--------------|--|--------|
| Table 2.1.5 | Monthly Average Rainfall by Districts in NTT (1999)..... | II-127 |
| Table 2.1.6 | Percentage Sunshine in Kupang by Months (1996-1999)..... | II-127 |
| Table 2.1.7 | Monthly Climatic Condition of Maumere in NTB (1999, 2000)..... | II-127 |
| Table 2.1.8 | Damages in Sikka by Earthquake and Tsunami in December 1992 | II-128 |
| Table 2.1.9 | Data on Victims Who Lost Properties in Earthquake in December 1992 (Sikka)..... | II-129 |
| Table 2.1.10 | Households with Drinking Water by Province and Facility (2000)..... | II-130 |
| Table 2.1.11 | Households with Drinking Water by Province and Source (2000)..... | II-130 |
| Table 2.1.12 | Households with Distance Between Pump/Well/Spring and Cesspool or Toilet (2000)..... | II-131 |
| Table 2.1.13 | Households with Toilet Facilities by Province (1999)..... | II-131 |
| Table 2.1.14 | Households with Lighting by Province and Source (1999)..... | II-132 |
| Table 2.1.15 | Households with Cooking Fuel by Province and Source (1999) | II-132 |
| Table 2.4.1 | Marine Fish Production by Districts (1990-1999) | II-133 |
| Table 2.4.2 | Fishermen's Problems and Needs | II-134 |
| Table 2.4.3 | Data on Fishing Capacity by Districts (1999)..... | II-135 |
| Table 2.4.4 | Sustainable Potential of Marine Fish by Water Zone, Fish Type and District (NTB) | II-136 |
| Table 2.4.5 | Coastal Fisheries Resource Potential in NTT..... | II-137 |
| Table 2.4.6 | Current Resource Exploitation Level Based on Total Allowable Catch (TAC) | II-138 |
| Table 2.5.1 | Production Volume of Brackish Water Pond Culture by Species and Province (1998) | II-139 |
| Table 2.5.2 | Number of Brackish Water Culture Households by Species of Fish Seeded and Province (1998) | II-140 |
| Table 2.5.3 | Brackish Water Culture Pond Area and Unit of production (1998) | II-141 |
| Table 2.5.4 | Cultivable Species and Aquaculture Situation in Indonesia | II-142 |
| Table 2.5.5 | Production Volume of Grouper Seeds in Bali (2001) | II-142 |
| Table 2.5.6 | Initial Investment for Cage Culture..... | II-143 |
| Table 2.5.7 | Depreciation Reserve per Production by Each Species..... | II-143 |
| Table 2.5.8 | Balance of Unit Cost and Unit Price of Cultivable Species | II-143 |
| Table 2.5.9 | Estimates of Live Marine Fish Exported to Hong Kong by Air and Foreign Vessels in 1999 | II-144 |
| Table 2.5.10 | Estimates of Live Marine Fish Imported into Hong Kong by HK Fishing Vessels in 1999 | II-144 |
| Table 2.5.11 | Balance of Unit Cost and Unit Price of Groupers in Case of 50 Percent of Market Price | II-144 |
| Table 2.5.12 | Operation Cost for Seaweed Culture..... | II-145 |
| Table 2.5.13 | Production Volume of Brackish Water Pond by Districts (1990-1999)..... | II-145 |

| | | |
|--------------|--|--------|
| Table 2.5.14 | Production Volume of Finfish in Brackish Water Pond by Districts (1990-1999)..... | II-146 |
| Table 2.5.15 | Production Volume of Shrimps in Brackish Water Pond by Districts (1990-1999)..... | II-146 |
| Table 2.5.16 | Pond Area by Districts (1990-1999) | II-147 |
| Table 2.5.17 | Unit Production Volume of Pond by Districts (1990-1999) | II-147 |
| Table 2.5.18 | Seaweed Production by Districts (1990-1999)..... | II-148 |
| Table 2.5.19 | Production of Pearl Oysters by Districts (1990-1999) | II-148 |
| Table 2.5.20 | Production Volume of Brackish Water Pond by Districts and Species (1999) (1/2)..... | II-149 |
| Table 2.5.20 | Production Volume of Brackish Water Pond by Districts and Species (1999) (2/2)..... | II-149 |
| Table 2.5.21 | Number of Fish Farmer's Households by Districts and Pond Size..... | II-150 |
| Table 2.5.22 | Number of Fish Farmer's Households by Districts and Species | II-150 |
| Table 2.5.23 | Quarterly Production Volume of Pond Culture by Districts | II-151 |
| Table 2.5.24 | Aquaculture Potential Area in NTB and NTT by Districts | II-151 |
| Table 2.6.1 | Existing Fish Marketing Activities at Fish Landings Sites in Study Area... | II-152 |
| Table 2.6.2 | Existing Fish Collectors and Fishing Firms in Study Area | II-153 |
| Table 2.6.3 | Estimated Per Capita Consumption by Districts | II-154 |
| Table 2.6.4 | Fish Prices During the Field Survey (June-July 2001)..... | II-155 |
| Table 2.6.5 | Main Transport Methods and Required Time | II-158 |
| Table 2.6.6 | Existing Condition of Ice Supply in Study Area | II-159 |
| Table 2.6.7 | Existing Main Fish Retail Markets in Study Area | II-160 |
| Table 2.7.1 | Number of Fishing Ports by Type and Districts..... | II-161 |
| Table 2.7.2 | List of Existing Fishing Ports, PPIs and TPIs in NTB and NTT..... | II-162 |
| Table 2.8.1 | Religion by Districts | II-163 |
| Table 2.8.2 | Main Water Supply | II-163 |
| Table 2.8.3 | Average Fishing Household Income, Per Capita Annual Income and Monthly Income | II-164 |
| Table 2.8.4 | Average Annual Operation Days and Gross Sales and Operation Cost by Fishing Village | II-165 |
| Table 2.8.5 | Income Gap Between Motorized and Non-motorized Boats by Fishing Village..... | II-166 |
| Table 2.8.6 | Some Examples of Financial Assistance for Women in NTB and NTT..... | II-167 |
| Table 2.9.1 | Number and Status of KUD Mina in Study Area..... | II-168 |
| Table 2.9.2 | Status of Fishermen Cooperatives Visited in Study Area | II-169 |
| Table 2.9.3 | Number and Type of Kelompoks in Study Area..... | II-170 |
| Table 2.11.1 | Economic Indicators of Study Area | II-171 |

| | | |
|-----------------|--|---------|
| PART III | MASTER PLAN | |
| Fig. 1.1.1 | Co-relation Between Per Capita Expenditure for Fish and Annual Expenditure by Different Income Groups | III-109 |
| Fig. 1.1.2 | Co-relation Between Fish Consumption and Per Capita Regional Income and Fish Price..... | III-110 |
| Fig. 1.1.3 | Projection of Fish Demand and Supply (2012) | III-111 |
| Fig. 4.3.1 | Fish Distribution Plan (2012)..... | III-112 |
| Fig. 4.4.1 | Network of Fishery Infrastructure (2012) | III-113 |
| Fig. 4.6.1 | Collaborative Management System for Self-Reliance of Fishermen Organization | III-114 |
| Fig. 4.6.2 | Expected Roles and Tasks of Relevant Institutions for Strengthening of A Fishing Community..... | III-115 |
| Fig. 5.4.1 | Designation of District-wise Development Area | III-116 |
| Table 1.1.1 | Projection of Population in 2007 and 2012..... | III-117 |
| Table 1.1.2 | Projection of GRDP and Per Capita Regional Income (Based on 1993 constant price) | III-118 |
| Table 1.1.3 | Forecast of Local Fish Demand in 2007 and 2012 | III-119 |
| Table 1.1.4 | Comparison Between Expected Local Fish Demand and Fish Catch in 2007 and 2012..... | III-120 |
| Table 4.2.1 | Role of Public and Private Sector in Aquaculture Development | III-121 |
| Table 4.2.2 | Necessary Projects for Mariculture and Brackishwater Pond Culture in NTB and NTT (1/2) | III-122 |
| Table 4.2.2 | Necessary Projects for Mariculture and Brackishwater Pond Culture in NTB and NTT (2/2) | III-123 |
| Table 4.6.1 | Strengthening Approach and Achievement Target for Fishermen Organization (1/3) | III-124 |
| Table 4.6.1 | Strengthening Approach and Achievement Target for Fishermen Organization (1/3) | III-125 |
| Table 4.6.1 | Strengthening Approach and Achievement Target for Fishermen Organization (1/3) | III-126 |
| Table 4.6.2 | Expected Roles and Recommendation of Relevant Institutions for Strengthening of Fishermen Organization (1/2) | III-127 |
| Table 4.6.2 | Expected Roles and Recommendation of Relevant Institutions for Strengthening of Fishermen Organization (2/2)..... | III-128 |
| Table 4.7.1 | Education and Training Plan for the Proposed Master Plan (1/3)..... | III-129 |
| Table 4.7.1 | Education and Training Plan for the Proposed Master Plan (2/3)..... | III-130 |
| Table 4.7.1 | Education and Training Plan for the Proposed Master Plan (3/3)..... | III-131 |
| Table 6.3.1 | Screening Checksheet | III-132 |

PART IV PILOT STUDY ON MARICULTURE IN LEMBATA

| | | |
|--------------|---|-------|
| Table 2.1 | PDM of the Pilot Project | IV-21 |
| Table 4.1 | Evaluation Grid of the Pilot Project | IV-22 |
| Attachment-1 | Management Condition of the Pilot Project | IV-30 |
| Attachment-2 | Outline of the PCM | IV-34 |

Appendix-1

| | | |
|----------|---|-------|
| | Outline of Project Design of Each Model Site | A-1 |
| 1. | Sumbawa District | A-1 |
| 2. | Dompu District | A-8 |
| 3. | Bima District | A-15 |
| 4. | Manggarai District | A-22 |
| 5. | Ngada District | A-27 |
| 6. | Ende District | A-32 |
| 7. | Sikka District | A-37 |
| 8. | Flores Timur District | A-44 |
| 9. | Lembata District | A-51 |
| Table 1. | Justification of Scale of Equipment for Fishing Area Expansion and Surveillance | A-58 |
| Table 2. | Justification of Scale of Equipment for Fish Marketing and Processing | A-60 |
| Table 3. | Cost Breakdown of Equipment | A-63 |
| Table 4. | Scale of Main Facilities for Project Design | A-58 |
| Table 5. | Scale of Facilities by Each Model Site | A-74 |
| Table 6. | Construction Cost of Each Model Site | A-87 |
| Table 7. | List of Project Cost of Model Sites | A-100 |

Appendix-2

| | | |
|----|---|-------|
| 1. | Advisory Committee, Study Team and Counterparts Members | A-101 |
| 2. | List of Persons Contacted | A-104 |
| 2. | List of Data Collected | A-107 |
| 3. | Scope of Work (S/W) and Minutes of Meeting on Scope of Work (S/W) | A-113 |
| 4. | Minutes of Meeting of Inception Report | A-125 |
| 5. | Minutes of Meeting of Interim Report | A-134 |
| 6. | Minutes of Meeting of Draft Final Report | A-139 |

Acronyms and Abbreviations

| | |
|-----------|--|
| ADB | Asian Development Bank |
| AMDAL | Analysis of Environmental Impact Process |
| Bapedal | Environmental Impact Management Agency |
| Bapedalda | District Environmental Impact Management Agency |
| BAPPEDA | Regional Development Planning Agency |
| BAPPENAS | National Development Planning Agency |
| BIPP | Centre for Agriculture Information and Extension |
| BPD | District Development Bank |
| BPLLP | Agency for Agricultural Extension Services |
| BPSDM | Agency for Human Resource Development in Agriculture |
| BRI | Bank Rakyat Indonesia |
| Bupati | District Administrator |
| COREMAP | Coral Reef Rehabilitation and Management Project |
| CPUE | Catch Per Unit Effort |
| DGA | Directorate General of Aquaculture |
| DGCF | Directorate General of Capture Fisheries |
| DIKLAT | Centre for Education and Training |
| EIA | Environmental Impact Assessment |
| FAD | Fish Aggregating Device |
| GPS | Global Positioning System |
| GRDP | Gross Regional Domestic Product |
| GTZ | German Technical Cooperation |
| IEE | Initial Environmental Examination |
| IFAD | International Fund for Agricultural Development |
| IPPTP | Centre for Agriculture Technology Research and Study |
| JBIC | Japan Bank for International Cooperation |
| JICA | Japan International Cooperation Agency |
| JOCV | Japan Overseas Cooperation Volunteers |
| Kabupaten | District |
| Kecamatan | Sub-District |
| Kelompok | Group |
| KUD | Village Units Cooperative |
| KUD Mina | Fisheries related cooperative |
| MMAF | Ministry of Marine Affairs and Fisheries |
| MOA | Ministry of Agriculture |
| MSY | Maximum Sustainable Yield |
| NGO | Non Government Organization |
| NTB | West Nusa Tenggara Province |
| NTT | East Nusa Tenggara Province |
| PKK | Family Welfare Development |
| PPI | Fish Landing Place |
| PPL | Extension worker |
| PPS | Extension subject matter specialist |
| PROPEDA | District Development Program |
| PROPENA | National Development Program |
| PROTEKAN | Fisheries Development Program |
| TAC | Total Allowable Catch |
| TNC | The Nature Conservancy |
| TOR | Terms of Reference |
| TPI | Fish Auction Place |
| UNDP | United Nations Development Programme |
| VHF | Very High Frequency |
| WB | World Bank |

Exchange Rate

1US\$=Rp 8,829

100 yen = Rp 7,089

Source: Bank of Indonesia May 30, 2002