

rate for aquaculture species, selective breeding and mono-sex culture of Tilapia for the later half of the project period.

It is recommended that the Project puts its limited human and financial resource into a specific target group with appropriate technique in line with the government development strategy. There is need to develop appropriate fish species with great potential for aquaculture. Similarly, aquaculture techniques should be developed for fish farmers at every scale to facilitate easy aquaculture adoption. To achieve this, the project should seriously consider the biological characteristics of species as well as the socio-economic conditions of farmers. In this context, on-farm research as a new area of study, should be encouraged and supported continuously.

The Department of Fisheries should take an important role of coordination among various stakeholders in the fisheries sector to prevent overlapping of activities.

Based on the comprehensive discussion and evaluation on the project activities, the joint evaluation team and project team agreed to update PDM as PDM-1 of October 11, 2001 and revise the PO for the later half of the project period.

Annex I	PDM _E
Annex II	PDM-1
Annex III	Plan of Operation
Annex IV	Progress Report

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p>Overall Goal To establish appropriate fish-farming techniques in Malawi</p>			<p>Government policy to aquaculture development is not changed.</p> <ul style="list-style-type: none"> • Budget and personnel are adequately allocated. • Needs for aquaculture techniques and extension services for fish farmer does not change.
<p>Project Purpose 1. To establish seed production techniques for new aquaculture species 2. To establish appropriate fish-farming techniques for existing aquaculture fish species</p>	<p>1. Seed production with at least 30% of survival rate is achieved for at least two new aquaculture species. 2. Production at selected farms is increased</p>	<p>1. NAC report Project documents 2. NAC report Interview to fish farmers</p>	
<p>Outputs 1.1 Reproductive ecology and spawning habits of new aquaculture species are clarified. 1.2 Broodstock rearing techniques of new aquaculture species are established. 1.3 Induced spawning and larval/fry rearing techniques for new aquaculture species are established.</p>	<p>1.1 Peaks of spawning season and induced breeding factors are understood for at least two new aquaculture species. 1.2 Spawners of at least two new aquaculture species are produced from wild adults. 1.3 Seed production manuals are completed and seed production is conducted based on the manuals for at least two new aquaculture species. 2.1 Criteria for determination of appropriate fish-farming method and a production target for each farming operations are clarified. 2.2 (1) Seed production facilities are established by 2004. (2) Seed production manual is completed and Clariid catfish seed production is conducted based on the manual. 2.3 Production targets set in 2-1 are achieved at selected farms. 2.4 Number of participants in workshops, seminars and number of inquiry from farmers to NAC and selected farmers are increased. 3. (1) Further research programme on their own is initiated. (2) Share of revolving fund to the counter-value fund is increased from 25% to 75%. (3) Share of fish sales in the revolving fund is increased from 20% to 50%.</p>	<p>1.1 Project documents 1.2 Project documents Technical manuals 1.3 Project documents 2.1 Project documents 2.2 Project documents 2.3 Project documents Interview to fish farmers 2.4 Report of workshop and seminar NAC report 3. NAC report Interview to fish farmers and counterparts</p>	<ul style="list-style-type: none"> • Input from both sides are timely and adequately provided. • Natural condition such as rain fall pattern does not greatly change.
<p>2.1 Appropriate fish species and farming methods for variable physical, technical and socio-economic conditions are clarified. 2.2 Constant seed production of Clariid catfish is achieved. 2.3 Techniques developed at NAC are verified at selected fish farms. 2.4 Farmers' willingness and interest in fish-farming is promoted.</p>			
<p>3. Mechanism to continue activities that are initiated by the project is established.</p>			

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p>Overall Goal To establish appropriate fish-farming techniques in Malawi</p>	<p>Number of fish species cultured with established technique is increased.</p>	<p>NAC reports</p>	<p>Government policy to aquaculture development is not changed.</p>
<p>Project Purpose 1. To establish seed production techniques for new aquaculture species 2. To establish appropriate fish-farming techniques for existing aquaculture fish species</p>	<p>1. Seed production with at least 30% of survival rate is achieved for at least two new aquaculture species. 2. Production at selected farms is increased</p>	<p>1. NAC report Project documents 2. NAC report Interview to fish farmers</p>	<ul style="list-style-type: none"> Budget and personnel are adequately allocated. Needs for aquaculture techniques and extension services for fish farmer does not change.
<p>Outputs 1.1 Reproductive ecology and spawning habits of new aquaculture species are clarified. 1.2 Broodstock rearing techniques of new aquaculture species are established. 1.3 Induced spawning and larval rearing techniques for new aquaculture species are established. 2.1 Appropriate fish species and farming methods for variable physical, technical and socio-economic conditions are clarified. 2.2 Constant seed production of Clariid catfish is achieved. 2.3 Techniques developed at NAC are verified at selected fish farms. 2.4 Farmers' willingness and interest in fish-farming is promoted. 3. Mechanism to continue activities that are initiated by the project is established.</p>	<p>1.1 Peaks of spawning season and induced breeding factors are understood for at least two new aquaculture species. 1.2 Spawners of at least two new aquaculture species are produced from wild adults. 1.3 Seed production manuals are completed and seed production is conducted based on the manuals for at least two new aquaculture species. 2.1 Criteria for determination of appropriate fish-farming method and a production target for each farming operations are clarified. 2.2 (1) At least 100,000 fingerlings are produced annually. (2) Seed production manual is completed and Clariid catfish seed production is conducted based on the manual. 2.3 Production targets set in 2-1 are achieved at selected farms. 2.4 Number of participants in workshops, seminars and number of inquiry from farmers to NAC and selected farmers are increased. 3. (1) At least four research programmes are initiated by Malawian counterparts on their own by 2004 (2) Share of revolving fund to the counter-value fund is increased from 25% to 75%. (3) Share of fish sales in the revolving fund is increased from 20% to 50%.</p>	<p>1.1 Project documents 1.2 Project documents Technical manuals 1.3 Project documents 2.1 Project documents 2.2 Project documents 2.3 Project documents Interview to fish farmers 2.4 Report of workshop and seminar NAC report 3. NAC report Interview to fish farmers and counterparts</p>	<ul style="list-style-type: none"> Input from both sides are timely and adequately provided. Natural condition such as rain fall pattern does not greatly change.

Activities	Inputs	
<p>1.1.1 Research on nutrition process under natural/rearing conditions.</p> <p>1.2.1 Research on rearing conditions for broodstock.</p> <p>1.2.2 Development of artificial food for broodstock.</p> <p>1.3.1 Research on spawning inducement by hormone treatment.</p> <p>1.3.2 Research on spawning inducement by environmental manipulation.</p> <p>1.3.3 Research on early life history.</p> <p>1.3.4 Research on rearing conditions for larva/fry.</p> <p>1.3.5 Development of natural feed cultivation and artificial food production techniques.</p> <p>2.1.1 Research on fertilisation techniques including tests of mature and integration of livestock.</p> <p>2.1.2 Development of artificial food for existing aquaculture species.</p> <p>2.1.3 Investigation on suitability of organic waste materials as fish food.</p> <p>2.1.4 Study of production cycle.</p> <p>2.1.5 Examination on species combination, stocking density, feeding rate, and others necessary for establishment of rearing techniques.</p> <p>2.1.6 Improvement of techniques to prevent predation.</p> <p>2.1.7 Examination on harvesting techniques including method, time and frequency.</p> <p>2.2.1 Expansion of facilities for Clariid catfish seed production at NAC.</p> <p>2.2.2 Trials on induced spawning by hormone treatment.</p> <p>2.2.3 Establishment of mass seed production techniques of Clariid catfish.</p> <p>2.3.1 Selection of farms/farmers for on-farm research</p> <p>2.3.2 Selection of appropriate mode of fish-farming for each farm.</p> <p>2.3.3 Implementation of on-farm research.</p> <p>2.4.1 Holding Open Field Day</p> <p>2.4.2 Publishing aquaculture manuals in local language and English.</p> <p>2.4.3 Holding workshops for researchers/extensionists/farmers.</p> <p>3.1 Establishment of a fund for aquaculture development at NAC</p> <p>3.2 Production and sale of fish through research activities at NAC</p> <p>3.3 Designing and planning of training for Malawian counterparts (actual training is implemented under each activity).</p> <p>3.4 Publication of periodical or occasional reports to disseminate specific information obtained through the research activities.</p>	<p>Human resources:</p> <ul style="list-style-type: none"> Japanese long-term experts in four fields (seed production, food and feeding, rearing technique, on-farm research), chief advisor, project co-ordinator. Japanese short-term experts (aquaculture management, Billharzia protection, reproductive physiology, etc.) Malawian 12 counterparts (P.O., T.O., one each for each of the technical field of Japanese long-term expert) One executive officer for fund management and financial management of the project (Malawi) <p>Facilities and equipment:</p> <ul style="list-style-type: none"> Facilities and equipment for seed production at NAC and Kasinthula (Japan, Malawi) Staff accommodation at Kasinthula (Malawi) Vehicles (Japan, Malawi) Initial input for on-farm research such as pipes, nets, etc. (Japan, Malawi) <p>Consumables, spare parts and allowances:</p> <ul style="list-style-type: none"> Spare parts of equipment (Japan, Malawi) Fuel (Japan, Malawi) Materials for fish food for NAC and Kasinthula (Japan, Malawi) Fish food for on-farm research (Japan, Malawi) Allowances for seminars, meeting and others (Malawi) <p>Others:</p> <ul style="list-style-type: none"> Counterpart training in Japan (two persons per year for five years: 10 persons in total) 	<ul style="list-style-type: none"> Serious drought/flooding do not occur. Devaluation of MK does not occur. Malawian government's commitment continues. Willingness of other stake holders to have collaboration continues. The fund for aquaculture is permitted by Ministry of Finance. The fund for aquaculture is managed properly. <p>Pre-conditions</p> <ul style="list-style-type: none"> Malawian government commitment exists. Malawian government assigns necessary personnel to the project. Water supply for aquaculture research at NAC is ensured.

for