



**New Partnership for
Africa's Development (NEPAD)
Comprehensive Africa Agriculture
Development Programme (CAADP)**



**Food and Agriculture Organization
of the United Nations
Investment Centre Division**

GOVERNMENT OF THE REPUBLIC OF MOZAMBIQUE

SUPPORT TO NEPAD–CAADP IMPLEMENTATION

**TCP/MOZ/2905 (I)
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Volume IV of V

BANKABLE INVESTMENT PROJECT PROFILE

Improving Small–Scale Fish Farms Production

August 2005

MOZAMBIQUE: Support to NEPAD–CAADP Implementation

Volume I: National Medium–Term Investment Programme (NMTIP)

Bankable Investment Project Profiles (BIPPs)

Volume II: Small–Scale Irrigation Project II

Volume III: Small Dams Rehabilitation and Construction

Volume IV: Improving Small–Scale Fish Farms Production

Volume V: Livestock Development Project

NEPAD–CAADP BANKABLE INVESTMENT PROJECT PROFILE

Country: Mozambique

Sector of Activities: Fisheries – Aquaculture

Proposed Project Name: Improving Small–Scale Fish Farms Production

Project Area: Country–wide

Duration of Project: 12 years

Estimated Cost: Total US\$13.40 million

Suggested Financing:

<i>Source</i>	<i>US\$ million</i>	<i>% of total</i>
<i>Government</i>	0.92	7
<i>Financing institution(s):</i>		
<i>– Grants</i>	1.42	10
<i>– Loans</i>	6.44	48
<i>Beneficiaries</i>	0.26	2
<i>Private Sector</i>	4.36	33
<i>Total</i>	13.40	100

MOZAMBIQUE:
NEPAD–CAADP Bankable Investment Project Profile
“Improving Small–Scale Fish Farms Production”

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Abbreviations

ADB	African Development Bank
BADEA	<i>Banque arabe pour le développement économique en Afrique</i>
CAADP	Comprehensive Africa Agriculture Programme
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GOE	General Operating Expenses
IFAD	International Fund for Agricultural Development
IRAD	<i>Institut pour la recherche agronomique et le développement</i>
MADER	Ministry of Agriculture and Rural Development
MINPE	Ministry of Fisheries
NEPAD	New Partnership for Africa’s Development
NGO	Non–Governmental Organization
NORAD	Norwegian Aid Development Agency
SADC	Southern African Development Community
TA	Technical assistance

I. BACKGROUND

A. Project Origin

I.1. This project idea was already prepared by the Aquaculture Department and formulated on the basis of a detailed field survey carried out during 2002 and April 2004. The survey was conducted by a team comprising representatives from the *Ministry of Fisheries* (MINPE), *Aquaculture Department*, *Fisheries Research Institute* and the Provincial Offices of MINPE and of the *Ministry of Agriculture and Rural Development* (MADER). It focused on water availability (natural water bodies including springs and groundwater), type of soils, socio–economic, agriculture and livestock conditions, and involved the full participation of the people’s assembly as representative of the community, and the MIPE, the MADER, the Ministry of Education, women’s associations and national NGOs.

B. Background Information

I.2. Mozambique has a coastline of 2,780 km on Indian Ocean with access to a vast fishing area with considerable resources. Fisheries are therefore an important sector of the national economy and contribute significantly to the diet of the population. Direct employment in the sector is estimated to be 80,000, of which 90% is in the artisanal sector. The annual value of exported fish products was US\$93.5m in 2002. Fisheries play an important role in the country economy. The shrimp fisheries are the most important commercial fisheries in the country, and the main fishing grounds are the Sofala Bank and the continental slope to a depth of about 600 meters. There are no exact registers of the artisanal production but it is estimated in about 80,000 tons. In 2003 registered total catch was reported as 31,010 metric tons representing 3.3% of GDP and contributing 10% of the country’s total exports.

I.3. The following table gives an overview of the ongoing assistance to the fisheries sector.

Agency	Area of intervention	Amount ('000)	Type of assistance	Current period
NORAD	Ministry of Fisheries	US\$1,443.6	Grant	2003–2004
	Artisanal fisheries	US\$5,838.0	Grant	2003–2008
Belgian	Artisanal fisheries	US\$3,300.0	Grant	2003–2008
ICEIDA	Quality control & ITC (*)	US\$1,176.2	Grant	2002–2005
OFCF Japan	Infra–structures	US\$400.0	Grant	2003–2004
EU	Ministry of fisheries	€12,270.0	Compensation	2004–2006
EU (SADC)	Fisheries administration	€2,200.0	Grant	2001–2006
IFAD	Artisanal fisheries	US\$17,983.0	Credit	2003–2008
BAD	Artisanal fisheries	US\$23,000.0	Credit	2003–2008
IDB	Infra–structures	US\$9,000.0	Credit	2004–2007
BADEA	Infra–structures	US\$9,000.0	Credit	2004–2007
(*) Information and Training Centre				

I.4. The Mozambique aquaculture industry is extremely young. While the culture of freshwater species such as tilapia existed for many decades (since 50’s), the cultivation of marine species has emerged only over the last five years. Coastal aquaculture begun in 1970’s with a research programme on farming the brown marine mussel *Perna perna*. The studies included resource distribution, life cycle recruitment and stock assessment, evaluation of sites for farming and farming systems.

I.5. Early work on prawn culture and development begun in mid 1980’s with site surveying and promotion of overseas investment and execution of an UNDP funded pilot project near Maputo City. The pilot project comprised a 10 ha farm and was established with the aim to obtain technical indicators on prawn culture under different systems, and to evaluate its economical viability. Yet, project implementation faced several constraints and in early 1990’s the farm was privatised. It is currently farming hatchery–reared *P. indicus* and yields of 2.5 t/ha/year have been achieved. Short–term plans included a hatchery and extension of farm up to 70 ha.

I.6. Presently, the aquaculture industry consists of three commercial farms of marine shrimp (*Penaeus* spp.) and one seaweed (*Kappaphycus* spp.) farm and several thousand subsistence tilapia (*Tilapia* spp.) farms. Current (2003) total production of shrimp is around 400 ton/year, but the perspective is a production of 2,500 ton/year with all projects fully implemented. Regarding seaweed production current (2003) production is about 500 ton/year and it is estimated that by 2005 it will rise to 2,500 ton/year. Aquaculture practice ranges from extensive (tilapia and seaweeds farming), with few inputs and modest output, to semi–intensive (shrimp farming) with high inputs and output.

I.7. The potential for aquaculture development in Mozambique is enormous: a favourable environment for investments, favourable climatic conditions (tropical and sub–tropical climate); unpolluted environment, low population pressure and extensive resources: a potential of 33,000 ha of land suitable for coastal aquaculture; the existence of wild species with potential for culture such as black tiger *Penaeus monodon*, white prawn *P. indicus*, the giant prawn *Macrobrachium rosenbergii*, tilapia *Tilapia* spp., etc. Development of the potential is being severely limited by several factors, including lack of experience and technology, economic difficulties resulting from high establishment and operation cost. At present, only 3,500 ha of identified sites are being exploited in shrimp farming.

I.8. There is a specific legislation that regulates all rights and obligations of all stakeholders. The legislation defines specifically norms and requisites for aquaculture farms; establishment procedures for licensing and parameters for each farming type; establishment restrictions on importation of live animals and conversion of mangrove into aquaculture ponds, and establishment of other environmental and consumer protection measures.

I.9. Serious and consistent work has to be done to meet all the necessary conditions to make inland aquaculture a self–sufficient productive sector that will be competitive enough to secure its long–term sustainability and responsibility as for its environmental performances.

II. PROJECT AREA

II.1. The proposed project area is nation–wide. Current develop tactics have taken heed of lessons learnt and realised that, to a large extent, successful aquaculture development is based on density dependent factors. Spreading resources too thinly is a proven recipe for failure. Moreover, given the particular bio–physical and socio–economic requirements for profitable and sustainable aquaculture, not all sites are equal. A number of recent national aquaculture development strategies, as well as the *NEPAD Action Plan for the Development African Fisheries and Aquaculture*, acknowledge the need to concentrate effort. This latter Plan (August 2005) calls for, among others, the following action with respect to aquaculture in Africa:

- Developing sector–wide strategies at national level for expansion and intensification of aquaculture
- Supporting priority aquaculture zones

- Encouraging private sector investment across the sector
- Applying proven technologies to increase production
- Maintaining the competitive advantage that Africa’s environment provides for aquaculture production
- Harnessing the opportunities for small and medium enterprise development provided by expanding domestic markets for fish, including growing urban demand
- Supporting the emerging regional trade in aquaculture products

II.2. Careful selection of development sites combined with a concentration of investment (i.e., from multiple investors) can minimise cost, optimise service and market access and promote collective management. Such sites of concentrated aquaculture development could be considered as “parks”¹ where the optimal set of conditions exists to facilitate profitable and sustainable production. Parks serve not only as important demonstration sites for replication and as major producers of aquatic products, but they also concentrate those elements which promote aquaculture with indirect effects for the small–scale farmers with fishponds. Annexes 3 and 4 present a schema for a prototypical aquaculture park as well as an input/output analysis for a typical farm which could occupy such a park.

II.3. Park sites will be selected at the convergence of optimal bio–physical and socio–economic parameters with special consideration to input availability (e.g., feed and seed) and access to markets. Identification and monitoring of parks will be facilitated by developing a national GIS which defines and distinguishes the key parameters.

II.4. Parks will initially receive direct technical support from the *Department of Aquaculture*, backed by specific technical assistance provided through the project. As sites are established and enter into profitable production, public sector support will taper off in favour of private assistance from specialized Service Providers as well as from the farmers/operators themselves.

III. PROJECT RATIONALE

III.1. The aforementioned NEPAD Action Plan calls for private sector investment. Conventional wisdom, based on three decades of experience, indicates that sustainability is intrinsically linked with profitability; the latter promoting the former. As these strategic approaches transform from theory to implementable technology, the practical result is a focus on “for profit” aquaculture. The Cameroon National Strategy, a key discussion document for the FAO–Worldfish *Workshop on Small–scale Aquaculture in Sub–Saharan Africa: revisiting the aquaculture target group paradigm* (CIFA/OP25, March 2004), elaborated an approach to aquaculture development focusing on “commercial” producers (Annex 5). In this context, “commercial” refers to the profit motivation. Other countries, adopting this same philosophy, have termed these profit–orientated farmers as “emergent”

¹ The terms “parks” is more conceptual, referring to a geographic concentration or clustering of producers and production at sites that offer the best opportunities for success. This means selecting optimal social, economic and physical production environments to achieve profitability and hence sustainability. There are many permutations on this theme. In one scenario, Government could put in place the necessary infrastructure (e.g., roads, canals, electrification, etc.), subdivide the park in plots of an economically viable size and lease these to small– and/or medium–size entrepreneurs. A variation on this idea is that the basic infrastructure could be put in place by a group of producers themselves (i.e., working collaboratively on shared resources such as water delivery systems).

aquaculturists. Regardless of the terminology, the concept is valid and dictates that resources be devoted to those who represent a sustainable target group — i.e., those who are willing to invest themselves in the enterprise. Implicit in this approach is the distinction between “emergent” farmers as small- and medium-scale operators’ vis-à-vis “industrial” large-scale operations.

III.2. “Emergent” farmers are the catalysts for aquaculture development in the country. Larger entrepreneurs with access to resources will continue to invest in commercial aquaculture and make significant contributions to the national production of cultured aquatic products; but the entry requirements for such larger operations will dictate that this number is relatively limited. However, smaller- and medium-scale enterprises potentially have a much broader constituency given their more modest resource requirements, assuming the enterprises themselves can be demonstrated to be worthy investments (i.e., profitable).

III.3. The project will, therefore, focus effort in high potential zones, promoting “clusters” of small- and medium-scale emergent aquatic producers. It is further understood that there will be in these target zones other more indirect beneficiaries including non-commercial (subsistence) fish farmers as well as others who have, in one way or another, integrated aquatic systems into their overall livelihood schemes.

IV. PROJECT OBJECTIVES

IV.1. The overall objective of the project, in line with Government of Mozambique priorities as well as those of NEPAD, is to increase income and nutritional status through increased production of farmed fish, or other aquatic products, for domestic and export markets, in a sustainable manner. The specific objectives of the project are to:

- Identify sustainable and profitable aquaculture production systems including the requirements for these to be successful.
- Develop private sector support services including, but not limited to, private suppliers of seed and feed.
- Establish 10–15 functioning and profitable fish “parks” (i.e. geographical concentrations of aquaculture production in pre-selected high potential zones).
- Improve the marketing of fish through addressing pertinent issues like product quality, shelf life, post-harvest handling, small-scale processing, packaging and improving market information.
- Strengthen the fish farmers’ organizations.

V. PROJECT DESCRIPTION

V.1. The project is more properly classified as a programme which will run for 12 years and comprise 4 phases — i.e., pre-investment, institutional development, pilot (investment – stage 1) and expansion (investment – stage 2) phases.

Table 1: Proposed chronology for implementation of the four programme phases

Years	1	2	3	4	5	6	7	8	9	10	11	12
Pre–investment												
Institutional												
Investment–Stage 1												
Investment–Stage 2												

Phase 1: Pre–investment (year 1)

V.2. The *objective* of this phase is to validate the technology and establish the overall operational framework for the sub–sector including definition of profitable production systems and establishment of baseline date against which to measure progress.

V.3. *Indicative activities* during this phase include: (a) objectively and scientifically selecting profitable systems and identifying requirements for each (b) educating participants in the sub–sector as to realistic potentials for aquaculture production and the requirements to obtain these potentials; (c) sensitizing central investors in the sub–sector including banks, donors, private industry, private–public joint ventures, etc.; (d) defining, reviewing and adopting a national aquaculture strategy with full participation of key stakeholders; and, (e) developing a national aquaculture database (with GIS) to monitor growth in the sub–sector as well as serve as a planning tool in their selection of high potential zones.

Phase 2: Institutional Strengthening (years 2–4)

V.4. The *objective* of this phase is to organise and strengthen institutions (public and private), including methods for delivery of capital (credit) and information (extension) inputs, marketing and processing.

V.5. *Indicative activities* during this phase include: (a) continued education concerning the application of the national strategy including a focus on educating lending institutions; (b) operationalizing the national database including tools to assist in the identification of high potential zones; (c) selection of high potential zones corresponding to priority production systems; (d) selection and training of input providers in these zones; (e) training of producers, would–be producer and service providers in business planning, record keeping and financial management; (f) identification and reinforcement of market channels including identification of opportunities for improved value added and quality control; (g) training of extension and outreach staff including development of appropriate training materials; (h) improvement of input delivery systems; (i) assessment of alternative production systems including Small Water Bodies, minor lakes, etc.; (j) strengthening of national producer groups; and (k) establishment of “one stop shop” for investors in the sub–sector including standardization and harmonization of such critical entry issues as environmental impact, access and land tenure.

Phase 3: Investment – Stage I (year 3–6)

V.6. The *objective* of promoting and facilitating economically–viable pilot systems. During this stage 3–5 pilot aquaculture “parks” (Annex 4) will be developed in high potential zones, using high priority profitable production systems.

V.7. **Indicative activities** during this phase include: (a) identification of specific “parks”, the installation of needed infrastructure and subdividing into economically viable farm plots to be leased to private investors; (b) assist with and ensure the supply of essential production inputs at selected sites; (c) assist with ensure necessary market channels are in place for the produce coming from these sites; (d) provide technical and business training and backstopping to operators of farms at pilot parks; (e) evaluate level of outreach/extension support necessary and ensure that this level is viable from qualified change agents; (f) ensure appropriate record keeping and the inputting of date into national database; (g) assess market opinions and new markets; (h) assess and develop as appropriate complementary production systems including Small Water Bodies or related aquatic resources; and, (i) continue to support national producer organisation(s).

Phase 4: Investment – Stage II (years 6–12)

V.8. The **objective** of undertaking wider adoption and implementation of pilot systems. The number of aquaculture parks will be expanded from the 3–5 pilot sites to a total of 10–15 sites country–wide.

V.9. **Indicative activities** during this phase will be very much the same as in Phase 3. However, the focus will shift to the new sites will diminish support to the initially and now well–functioning pilot parks.

V.10. Monitoring and evaluation activities will begin in Year 1 and continue throughout the life of the programme.

VI. INDICATIVE COSTS

VI.1. The programme’s financial resources are employed in two ways: to provide technical assistance (TA) and related budgetary support and to provide “facilitated: loans”. TA requirements also fall in two categories; close long–term assistance during the first years and then reduced periodic support in subsequent years.

VI.2. The programme’s financial resources are employed in two ways: to provide technical assistance and related budgetary support (TA) and to provide “facilitated: loans (L). TA requirements also fall in two categories; close long–term assistance during the first years and then reduced periodic support in subsequent years.

Item	Estimated Cost (US\$)
International Staff	310,000
National Staff	82,000
FAO Assistance	48,000
Travel/GOE	97,000
Training	59,000
Supplies/Equipment	41,000
Contingency (10%)	63,000
Overhead (13%)	91,000
Total	791,000

NEPAD – Comprehensive Africa Agriculture Development Programme
Mozambique: Investment Project Profile “Improving Small-Scale Fish Farms Production”

Item	Estimated Cost (US\$)
International Staff	–
National Staff	94,000
FAO Assistance	68,000
Travel/GOE	54,000
Training	22,000
Supplies/Equipment	5,000
Contingency (10%)	28,000
Overhead (13%)	35,000
Total	306,000

VI.3. Using the above indicative budgets, the overall programme budget can be derived as in Table 4. Using the per cent distribution of source of funds as indicated in Table 5, the financial contribution for different partners to the programme can be seen in Table 6. Support from the financing institutions is divided into grants and loans; 18% for the former and 82% for the latter. Grant inputs are foreseen chiefly for Phases 1 and 2 when the groundwork is being laid for important private sector investment; both in terms of investing their own capital as well as assuming a significant portion of the loan responsibilities. It is assumed that part of the funds recovered from loan repayment by the private sector will be re-invested in additional production through some form of revolving account arrangements.

Phase	Year												Total	TA/L	
	1	2	3	4	5	6	7	8	9	10	11	12			
1	395													395	TA
2		791	791	791										2,373	TA
3			890	670	550	400								2,510	TA
					791	791								1,582	TA
4							306	306	306	306	306	306		1,836	TA
						950	750	600	500					2,800	TA
									800	500	400	200		1,900	TA
Total														13,396	

Phase	Government	Grant	Loans	Beneficiaries	Private Sector	Total
Pre-investment	10	75		5	10	100
Institutional	20	30	20	10	20	100
Investment – Stage 1	10	10	50		30	100
Investment – Stage 2			60		40	100

Phase	Government	Grant	Loans	Beneficiaries	Private Sector	Total
Pre-investment	39.5	296.25		19.75	39.5	395.0
Institutional	474.6	711.9	474.6	237.3	474.6	2,373.0
Investment – Stage 1	409.2	409.2	2,046.0		1,227.6	4,092.0
Investment – Stage 2			3,921.6		2,614.4	6,536.0
Total	923.3	1,417.0	6,442.2	257.05	4,356.1	13,396.0

VII. PROPOSED SOURCING OF FUNDS

VII.1. To support implementation of the proposed project, it is expected that funding will come from various sources, namely, government, international financing institution(s), beneficiaries and the private sector. Government contribution will be in cash and kind i.e. in terms of staff, supplying offices/buildings for research and extension staff as well as taxes and fiscal revenues foregone. Through yearly budgetary provision, direct financial support would be availed to the *Department of Aquaculture* in the Project implementation area. The bulk of the funding for actual project implementation will come from co–operating partners. Beneficiaries’ contribution would be in kind in terms of labour such as digging of fish ponds, provision of materials such as fish feed, and cash for other requisites. The private sector will be key in the provision of fish seed, feed, nets, ice, and other materials which can be sold to fish farmers.

VII.2. The MINPE, as the national counterpart, will secure taxes and other fiscal revenues, contributing up to 10% of the total budget in cash as well as making in kind contributions including premises and staff.

VIII. PROJECT BENEFITS

VIII.1. The main benefits of the project will be a contribution towards poverty reduction by improving the incomes of fish farmers, boosting employment opportunities in fishery and fish–related activities and enhancing food security and nutrition. There could also be foreign exchange benefits arising from increased fish exports and increased local and national government tax revenues arising from fish activities.

VIII.2. The specific benefits would be:

- Increased national fish supply.
- Potential fish supply to local processors for export products.
- Increased incomes among farmers operating for–profit fish farms at the 10–15 “parks” developed through the programme.
- Improved services for all fish farmers including increased availability and quality of fish seed and feeds.
- Improved aquaculture extension services and overall public sector support achieved through geographic concentration in high potential areas.
- Improved marketing channels for aquaculture products and production inputs, included expanded intra–regional markets.
- Improved quality control of aquaculture products and inputs.
- Improved monitoring of aquaculture sub–sector.
- Improved national aquaculture producer organisations.

IX. IMPLEMENTATION ARRANGEMENTS

IX.1. The MINPE, through the Aquaculture Department, would have overall responsibility for implementation of the project. This responsibility would include central planning, procurement, technical support and coordination. An *Aquaculture Technical Advisory Committee* (ATAC) will be formed to advise on project implementation and will be comprised of representatives from various stakeholder institutions. It will report to the Permanent Secretary and will be headed by the Director of Fisheries or his/her representative. It will be responsible for project level planning, coordination, monitoring and evaluation, sensitization and accountability. The ATAC will be assisted by a National Project Coordinator who will be responsible for the day-to-day running of the project.

IX.2. The private sector will be involved in all the project implementation aspects ranging from financing, production, marketing to training. It will also supply fish fry and fish feeds to farmers.

IX.3. FAO will provide technical assistance in the form of direct technical assistance as well as technical and operational backstopping.

IX.4. The Civil society, comprised of NGOs, CBOs, professional bodies and associations, will be involved in the process of designing and management of the project, execution of project activities like capacity building and delivery of services based on their field experiences, sensitization and identification of supplementary funding.

IX.5. The project will potentially incorporate all aquatic production systems from Small Water Bodies to cages or raceways as long as these can be developed in line with the objective of having profitable and sustainable production systems.

X. TECHNICAL ASSISTANCE REQUIREMENTS

X.1. Technical assistance (TA) will come from a variety of national and international sources. International long- and short-term assistance will be complemented by appropriate South/South co-operation (TCDC) as well as by direct support from FAO. Specific technical inputs are foreseen in the following areas.

- Aquaculture production technology;
- Fish feed formulation;
- Fish breeding and hatchery operations;
- Post-harvest handling, packaging and processing techniques;
- Database and GIS development;
- Site selection and farm construction;
- Cage Culture;
- Enhancements of Small Water Bodies (including minor lakes);
- Land use and land tenure;
- Record keeping and business planning including financial management.

XI. ISSUES AND PROPOSED ACTIONS

XI.1. Below are some outstanding issues, as well as proposed actions that could be taken.

XI.2. **Environmental Issues.** The types of impact envisioned in this project by component are: (i) breed contamination through cross–breeding and loss of indigenous breed biodiversity through over–emphasis on superior breeds, (ii) the main risk of water points (dams, ponds) for aquaculture is over–supply at the new site, leading to excessive concentrations of animals with implications to land degradation and soil erosion. There are also risks of new permanent water sources encouraging new human settlements, with the associated problems of land clearing for cultivation, tree cutting for building and firewood (for processing of fish) and setting deliberate bush fires, as well as associated water–borne diseases such as bilharzia and malaria. (iii) effluents (solid, liquid and gaseous) from processing plants that are released into the environment may be toxic to aquatic life, (iv) the construction of dams and ponds in swamps and cutting of trees and vegetation in the process of preparing the sites will lead to localized soil and vegetation disturbances. Therefore it is important to formulate mitigation and monitoring measures at an early stage of project planning.

XI.3. **Capacity at the Department.** The Aquaculture Department headquarters is not adequately staffed. At the district and lower levels, there is inadequate managerial, technical and logistical capability. Development project implementation and monitoring capacity is therefore constrained. Training and temporary technical assistance can help mitigate this problem.

XI.4. **Institutions.** In aquaculture development involves several other key institutions including agencies responsible for energy, water, natural resources, environment, etc. Development activities must take this multiplicity of actors into account and make sure that all the key agencies/individuals are on–board in a timely and effective way.

XII. POSSIBLE RISKS

XII.1. There are risks which can identified at this stage:

- **Implementation delays:** The previous aquaculture projects experienced considerable delays in implementation. Whilst some of the delays were due to the unstable political and economic situation at the time, many were merely bureaucratic and might similarly jeopardise the implementation schedule of a new project. The project proposal for a more autonomous and decentralised decision–making and management structure should help to reduce such risks.
- **Farmer interest in fish farming:** Part of the poor performance of the previous small–scale fish farms has been because the farmers themselves were not interested in management. Whilst some of the barriers to willing farmer participation have been removed, such as controlled prices, there are still unresolved questions of land tenure rights and scheme organisational structure, which might still act as a disincentive. The only solution to this problem is to ensure that from the beginning, farmers are fully involved in the planning and design of the schemes, especially in deciding on organisational issues.
- **Environmental impact:** A variety of negative impacts frequently associated with aquaculture projects such as spread of disease to wild population, eutrophication of water bodies due to discharge of effluents with high nutrient content, release of therapants and

other chemicals into the environment, impact on biodiversity where culture is undertaken in natural environment. Transboundary impacts resulting from the spread of alien species introduced in the project area.

- **Markets:** Farmer interest in small–scale fish farming will reflect in large measure, the comparative financial attractiveness of farmed fish versus wild fish. If partial or full cost recovery is demanded, farmers will want to be fully satisfied as to the opportunities for marketing farmed fish before they sign an agreement to pay for the costs of the fish farm.

XII.2. It is clear that implementation of this project is not without risk. However, the level of risk associated with the proposed project is considered “acceptable” in the context of the clear need to reduced pressure on renewable natural resources in the Sub–Saharan Africa and the stated commitment to this project.

ANNEXES

- Annex 1: Map of Project Area**
- Annex 2: Relationships to CAADP Pillars**
- Annex 3: Diagram of Pond “Cluster”**
- Annex 4: Indicative inputs/outputs for a typical farm**
- Annex 5: Extracts from the Endorsed Cameroon National Aquaculture Development Strategic Framework**

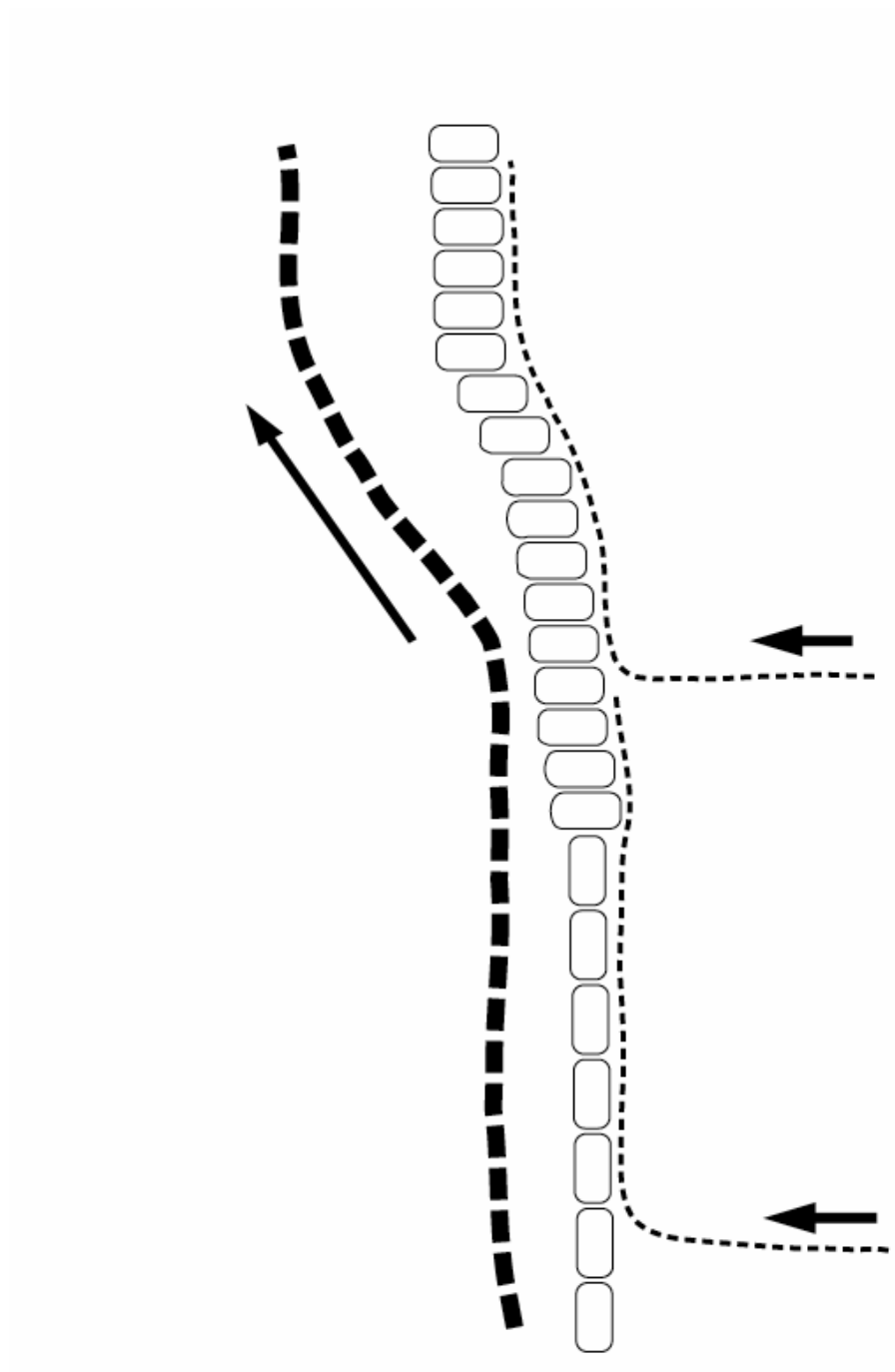
Annex 2: Relationships to CAADP Pillars

Project Component	Pillars*
Inventory of potential areas	1 & 5
Small-scale integrated commercial fish farm	3 & 5
Environment protection	1
Water development	1
Afforestation	5
Market assessment	2
Training and trials	4
Project management	4
* see Table 2, below.	

1	Expansion of area under sustainable land management and reliable water control systems
2	Improvement of rural infrastructure and trade-related capacities for improved market access
3	Enhancement of food supply and reduction of hunger (including emphasis on emergencies and disasters that require food and agricultural responses)
4	Development of agricultural research, technological dissemination and adoption to sustain long-term productivity growth
5	Livestock, fisheries and forestry

Annex 3: Diagram of Pond “Cluster”

Diagram of pond “cluster” integrated in a large irrigation scheme which could serve as a template for an aquaculture “park” (Nugent 2003).



Annex 4: Indicative inputs/outputs for a typical farm

Pond dimensions:	150 m x 40 m
Number of ponds:.....	8
Total water surface area:	4.8 ha
Yield:.....	6 t/ha/yr
Total harvest:.....	28,800 kg
Average fish size:	3 fish/kg
Sales price:	2.00 US\$/kg
Feed price:.....	0.50 US\$/kg
Feed conversion:	1.3 kg feed to 1 kg fish (1.3:1)
Fingerling price:	US\$0.05 each
Survival:	90%
Labour:	1 farm manager and 1 full–time labourer + casual labour

Construction Costs:

2,000 m of levee@6 m ² /linear m and 2.00 US\$/m ³	US\$24,000
<u>Other facilities/structures/drains</u>	<u>US\$10,000</u>
Total construction costs.....	US\$34,000

Revenue:..... US\$57,600

Operational Costs:

Feed	US\$18,720
Seed	US\$4,800
Labour	US\$9,000
Miscellaneous.....	US\$4,000
<u>Depreciation</u>	<u>US\$3,400</u>
Total operational costs	US\$39,920

Profit..... US\$17,680

Annex 5: Extracts from the Endorsed Cameroon National Aquaculture Development Strategic Framework

Identification of High Potential Aquaculture Zones

In most countries, the biophysical² and socio–economic³ potential for aquaculture is not uniform, with some zones having greater intrinsic capacity for aquaculture growth than others. A first step in determining where resources to develop aquaculture could be efficaciously used is the identification of those areas with highest potential. This screening should be supplemented with a comparison of existing aquaculture activities, including the concentration of existing producers and the presence of government and other infrastructure⁴.

Zones based on biophysical and socio–economic potential may well be subdivided into areas that correspond to input supply/delivery. For example, to the extent that private seed supply comes from specialised private hatcheries, these hatcheries will operate within areas circumscribed by the economic ability to deliver seed to producers.

Definition of Types of Aquaculture

Categorising fish farmers and farms according to relative sizes, degree of capitalisation and profit motivation is always difficult. In the aggregate, these categories are part of a spectrum that covers the full scope of production systems⁵. If this spectrum reflects production intensity and investment level, individuals at the low end will likely internalise their aquaculture activities with little contribution to the public purse and little benefit from public services. Conversely, individuals at the high end of the scale may make important contributions to national aquaculture production but have relatively little need of public support.

For the purposes of this framework, producers have been divided into two categories: commercial and non–commercial. Commercial producers can be small medium or large–scale, and are active participants in the market. They purchase inputs (including capital and labour) and engage in off–farm sales of the fish produced. For these individuals, aquaculture is a principal economic activity⁶. Non–commercial producers may also purchase inputs, mainly seed and feed, but rely chiefly on family labour and on–farm sales of the produce. An additional feature of non–commercial aquaculture is that it is but one of the variety of enterprises comprising the farming system; it is undertaken to diversify production, improve resource use and reduce risks of such events as crop or market failure.

² Biophysical criteria include water quantity and quality, ambient temperature, soil quality and water holding capacity, etc.

³ Socio–economic criteria to evaluate include cultural aspects, availability of inputs (fingerlings, feeds, fertilizers), access to markets, range of partners, production technologies, etc.

⁴ Aguilar–Manjarrez, J. & S. S. Nath. 1998. A strategic reassessment of fish farming potential in Africa. CIFA Technical Paper 32. FAO, Rome.

⁵ An aquaculture system is a combination of: type of culture unit, level of intensity, culture species and scale or size of exploitation.

⁶ In addition to these characteristics, commercial aquaculture can be defined as the farming of aquatic organisms, including fish, molluscs and crustaceans and aquatic plants with the goal of maximizing profits. Thus, the distinction between commercial and non–commercial aquaculture operations relies primarily on the existence or absence of a business orientation and on how factors of production such as labour will be paid.

Definition of Appropriate Framework for Aquaculture Outreach

Some level of technical information dissemination is generally considered as necessary to support the aquaculture sub–sector. This is achieved through public–sector–supported outreach. Drawing upon a wide range of published experiences, a general approach to supporting the development of aquaculture can be suggested. This is based on the premises that:

- some long–term technical assistance for producers is necessary;
- generalist/unified extension services often lack the specific technical expertise to assist aquaculture producers; and,
- extension services dedicated to aquaculture assistance must be limited in scope due to corresponding limitations in human and financial resources.

In this light, high quality technical support⁷ needs to be carefully assembled and targeted. This can best be achieved by “mobile mixed teams” providing punctual, periodic support to a relatively large geographic area. These teams, each composed of at least one technician from MINPE and one from IRAD should work exclusively in high priority zones and give priority to assisting effective producer groups in partnership with NGOs and other outreach agencies as feasible. Besides, they should be complemented by a series of private seed producers, or other service providers, who are also providing technical support to farmers.

Thus, the mode of operation of these mobile teams should be one that brings research and extension together and into direct contact with farmers.

Elements of the Strategic Framework and the Role of Public and Private Sectors

Sustainable aquaculture development relies on a number of conditions that must be met and addressed in any strategy in a flexible way. The most prominent of these are: (1) suitable production systems; (2) availability and access to inputs (feeds, seed, capital, etc.); (3) outreach; (4) research; (5) education and training; (6) marketing; (7) producer organisations; (8) regulation; (9) control, monitoring and evaluation. For each of the two types of aquaculture defined in this document (commercial and non–commercial), the following sections define the role of the public⁸ and private⁹ sectors in meeting each condition. Unless otherwise specified, the role discussed applies to both commercial and non–commercial aquaculture.

In light of limited human and financial resources, Government is, in general, shifting, and should shift, from its role as a direct investor and development promoter to one as a facilitator of an independent and commercially viable aquaculture sub–sector. The private sector is composed of two general groups of actors: direct investors, including producers along with service providers, and partners, principally producer organisations and Civil Society Organisations.

⁷ That is, well trained and well–equipped.

⁸ Includes the ministry in charge of aquaculture, the national research institute, and the government extension service.

⁹ Includes producers, investors (in both fish farming and related sectors), non–governmental organizations (NGOs), commercial banks, universities and development agencies.

Suitable Production Systems

Government should:

- identify general production technologies appropriate to relevant aquaculture zones;
- inform investors in regard to these technologies; and,
- concentrated its outreach activities in these zones.

The private sector should:

- be aware of the government strategy regarding different production systems within aquaculture zones.

Availability and Access to Inputs

a) Feeds¹⁰:

Government should:

- stimulate domestic feed industries by reducing or removing taxes on imported feed milling machinery and basic feed ingredients;
- make information on feed and feed materials, especially prices, regularly available to producers through all means of information transmission;
- within its means, ensure feed quality through inspections and feed certification;
- promote the adoption of appropriate feed manufacturing guidelines such as the *FAO Technical Guidelines for Good Aquaculture Feed Manufacturing Practice*; and,
- encourage commercial farmers and millers to facilitate access to quality feed for the entire sub–sector.

Direct investors (feed mills) should:

- produce and market necessary feedstuffs to growers;
- provide a uniform quality products at a fair price;
- find mechanisms to facilitate access to high quality feed throughout the sub–sector;
- make proximate analyses available to clients;
- provide information on feed availability and efficacy to the public sector;
- as appropriate, assist outreach programme in promoting good feeding practices/fish management; and,
- monitor results.

Producer organisations should:

- serve as a forum for information sharing among stakeholders;
- lobby for collective bargaining and appropriate public sector intervention; and,
- link with research organisations.

¹⁰ Including commercial and tradable feeds, feed materials and other nutrient inputs.

b) Seed:

Government should restrict itself to:

- providing regular information on sources and prices of good quality seed to producers;
- providing guidelines in producing/ensuring good quality seed through such measures as seed certification;
- maintaining broodstock of selected culture organisms corresponding to the identified production systems; and,
- encourage commercial farmers and hatcheries to facilitate access to quality seed for the entire sub–sector.

Direct investors (seed producers) should:

- produce and distribute quality seed;
- sell products at a fair price;
- find mechanisms to facilitate access to high quality seed throughout the sub–sector;
- as appropriate, assist outreach programme in promoting good management practices favouring improved yields; and
- monitor results.

Producer organisations should:

- serve as a forum for information sharing among stakeholders;
- lobby for collective bargaining and appropriate public sector intervention; and,
- link with research organisations

c) Capital:

Providing and managing credit by the Government often leads to conflicts. Thus, in terms of investment capital for commercial aquaculture¹¹, Government should restrict itself to creating an enabling environment, through, for example:

- the provision of information to lending agencies on the profitability of aquaculture¹²;
- evaluating the technical merits of investment proposals submitted to lending agencies for funding;
- advising farmers on where and how to access funding from specialised institutions; and.
- interacting with these funding institutions to negotiate preferential interest rates for aquaculture development as appropriate.

The private sector should:

- in addition to their own equity, commercial producers should rely on private sector funding institutions for capital;

¹¹ Credit is not generally considered appropriate for non–commercial aquaculture (FAO 1999).

¹² Relevant information from a variety of sources should be collated by research agencies for this purpose.

- lending institutions should consider preferential interest rates for aquaculture enterprises when applicable;
- investors requesting credit support should prepare clear and precise business plans;
- formal lending institutions should finance viable aquaculture businesses;
- small investors should ensure that they have appropriate business and financial management skills before requesting external financial support; and,
- NGOs should work with non–commercial producers to develop financing options;
- collect information on other funding mechanisms and make it available to farmers;
- sensitise farmers on the savings and solidarity funds for use in aquaculture development;
- examine the possibility of creating an aquaculture guarantee fund;
- examine the possibility of providing temporary direct assistance to aquaculture producer organisations.

Outreach

Government should:

- provide quality technical assistance through an efficient aquaculture outreach program;
- seek partners as necessary to meet information shortfalls that cannot be met with public resources;
- establish national and international aquaculture information networks which are accessible at local hubs;
- play a co–ordinating role in the outreach programme;
- put emphasis on participatory approaches when providing services to farmers;
- encourage group formation for purposes of rationalising marketing and purchase of inputs, as well as increasing outreach–farmer contact;
- encourage commercial investors to provide outreach support to smaller operators;
- facilitate the creation of discussion channels amongst different aquaculture stakeholders; and
- require larger investors to pay for the technical assistance on a contract basis, negotiated with the institution providing assistance.

The private sector should:

- assist and reinforce public sector outreach programmes, particularly with regard to outreach contributions by feed and/or seed suppliers;
- evaluate outreach efficacy and advise as to outreach needs;
- feedback to public sector as to available information sources;
- commercial producers should pay for technical assistance; and,
- commercial producers should assess their opportunities in serving as information providers.