



MINISTRY OF FOOD AND AGRICULTURE FISHERIES COMMISSION



Ghana National Aquaculture Development Plan (GNADP)

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Development Plan
(GNADP)**

March, 2012

Ghana National Aquaculture Development Plan

FOREWORD

I deem it an honour and great pleasure to present the Ghana National Aquaculture Development Plan (GNADP), 2012 – 2016, on behalf of the Ministry of Food and Agriculture (MoFA).

As the nation puts in policies and strategies to avert the declining stocks in its capture fisheries, the GNADP could not have come at a better time than now. It is a bold initiative to increase the nation's annual fish output by revitalizing the fisheries subsector to establish a strong base for a sustained and accelerated growth of the aquaculture subsector.

The GNADP seeks to be a guide to improvements in production, marketing, environmental sustainability and social acceptability of Ghana's commercial fish farm enterprises and related aquaculture value chain.

The GNADP is an output of a Technical Cooperation Programme (TCP) by the Food and Agriculture Organisation (FAO) of the United Nations and the Ministry of Food and Agriculture (MoFA). It fits into the Food and Agriculture Sector Development Policy (FASDEP II) and the Medium Term Agriculture Sector Investment Plan (METASIP) of MoFA, which is aligned to the Ghana Shared Growth and Development Agenda (GSGDA). The main purpose of preparing this plan is to facilitate the targeted implementation of the National Aquaculture Strategic Framework (2006).

The GNADP is divided into three sections; an introductory section, the aquaculture strategic framework and the development plan. The Development plan section has in its outline; the mission, vision, goal, objectives and activities to be carried out. Each activity is broadly stated and further detailed out into sub-activities. Costs and Time-frame for the activities are outlined. The information contained in this document will serve as a road map to the Government, the Private Sector, the Development Partners for the development of Aquaculture in Ghana.

It is hoped that with the implementation of the plan, Aquaculture Development in the country will see a quantum jump that will bridge the gap between fish demand and supply.



KWESI AHWOI
MINISTER FOR FOOD AND AGRICULTURE

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Special thanks go to the Aquaculture Advisory Group and FAO's National Programme Assistants for facilitating the work of the consultants that has culminated into this plan. It is worthy of note to mention the invaluable time spent and commitment of Dr. John Moehl in the development of this plan.

Finally, we would like to thank everybody who in diverse ways, contributed to the successful development of this plan.

CONTENTS

<i>FOREWORD</i>	v
<i>ACKNOWLEDGEMENT</i>	vi
<i>EXECUTIVESUMMARY</i>	viii
<i>1. PART 1 - INTRODUCTION</i>	1
<i>1.1. Overview of the Aquaculture Sector in Ghana</i>	1
<i>PART TWO - NATIONAL AQUACULTURE STRATEGIC FRAMEWORK (NASF)</i>	4
<i>2.1. Availability of and access to inputs for aquaculture operations</i>	4
<i>2.2. Complementary roles of the public and private sectors in aquaculture development</i>	5
<i>2.3. Education and Training in Aquaculture</i>	5
<i>2.4. Extension</i>	6
<i>2.5. Research</i>	6
<i>2.6. Partnerships</i>	6
<i>2.7. Production Systems</i>	7
<i>2.8. Value Addition and Marketing</i>	7
<i>2.9. Environmental and Social Concerns</i>	8
<i>PART 3 - AQUACULTURE DEVELOPMENT PLAN</i>	9
<i>3.1. Vision</i>	9
<i>3.2. Mission</i>	9
<i>3.3. Goal</i>	10
<i>3.4. Long Term Objective</i>	10
<i>3.5. Medium Term Objectives</i>	10
<i>3.6. Expected Results</i>	10
<i>3.7. Activities</i>	11
<i>3.7.1. Result 1- Increased quantities of commercial farmed fish produced in high priority aquaculture-zones</i>	11
<i>3.7.2. Result 2 - Increased quantities of high quality commercial farmed fish products sold at more competitive prices</i>	18
<i>3.7.3. Result 3 - Increased productivity and profitability of large, medium and small scale, existing and start-up, commercial fish farms in high priority aquaculture-zones and related aquaculture value chain enterprises</i>	20
<i>3.7.4. Result 4 - Increased compliance of (large, medium and small scale, existing and start-up) commercial fish farms in high priority aquaculture-zones with national environmental, fish health and food safety guidelines and regulations</i>	23
<i>Annex 1 - Table 1: Ghana National Aquaculture Development Plan (GNADP) Results and Implementation Matrix</i>	31

EXECUTIVE SUMMARY

The Ghana National Aquaculture Development Plan (GNADP) has been designed to enable Ghana take advantage of its biophysical and socio-economic environment; strong research capacity; and rising fish prices locally and globally, to significantly bridge the huge gap between national fish demand and supply in the medium term. This medium term plan is one of the bold initiatives by the Government of Ghana to arrest the decline in the nation's annual fish output and revitalize the fisheries sector, by establishing a strong basis for the sustained and accelerated growth of the aquaculture subsector.

The GNADP follows upon the nation's aquaculture strategic framework of 2006, meant to facilitate the promotion of aquaculture as a business under the principle that:

- The best investments come from matching the appropriate aquaculture system and the prerequisite bio-physical and socio-economic requirements (i.e., high priority zones); and
- Support mechanisms or services for these aquaculture businesses should be private sector-led thereby requiring a shift in Government's roles and responsibilities more to one of facilitation, monitoring and control.

Though crafted essentially to facilitate targeted implementation of the National Aquaculture Strategic Framework (2006), due diligence has been exercised to: ensure stakeholder participation; take on board emerging issues; and place the GNADP within the scope of current relevant national and international development frameworks such as the Food and Agriculture Organization's Code of Conduct for Responsible Fisheries; West African Regional Fisheries Program; National Medium Term Development Policy Framework (2010); Medium Term Agriculture Sector Improvement Program (2010); Fisheries and Aquaculture Policy (2008); Fisheries Act, 2002 Act 625; Fisheries Regulations 2010 L.I. 1968.

The vision of the GNADP is a strong basis for the accelerated development of a private sector-led aquaculture that enables this subsector to contribute significantly to fish food and nutritional security, employment generation, increased incomes, economic growth and poverty reduction, on a sustained basis. The mission is to create an enabling environment that would facilitate and attract public and private investments into aquaculture, on a sustained basis. The goal is to improve the practice, management and development of aquaculture as a viable business. In furtherance of the aforementioned vision, mission and goal, the long term objective is to contribute significantly to improvements in production, marketing, environmental sustainability and social acceptability of Ghana's commercial fish farm enterprises and related aquaculture value chain.

The interrelated medium term objectives are that: i) Ghana's commercially farmed fish output would increase from 10,200 tons in 2010 to 100,000 tons by the end of 2016; ii) the market share of commercially farmed fish would increase from 3% in 2010 to 30% in 2016 and the value of farmed fish output from US\$ 28,440,000 per annum in 2010 to US\$ 362,000,000 per annum in 2016; iii) the performance of 80% of large, medium and small commercial fish farms in high priority aquaculture business zones and related aquaculture value chain enterprises would increase by at least 100% within the

Ghana National Aquaculture Development Plan

plan period of 5 years; iv) the environmental sustainability of aquaculture-production, fish health and fish food safety would be improved and assured; and v) the effectiveness and efficiency of public sector institutions in aquaculture development, policy making and regulation would be significantly enhanced.

To ensure significant increases in the commercial output of Ghana's farmed fish: i) high priority aquaculture-zones would be established; ii) increased private investments would be promoted into establishment of new fish farm, fish seed, and aquaculture-logistics enterprises in high priority aquaculture-zones; iii) increased supply of high quality fish feed, fish seed, and aquaculture-logistics by the private sector would be facilitated to the benefit of fish farmers in high priority aquaculture-zones; iv) follow-up activities for the TIVO project would be implemented to further enhance the genetic quality of Tilapia and also that of Catfish; v) fish farmers would be enabled to access funds more easily on competitive terms for investment in aquaculture business; and vi) the feasibility of aquaculture business in new/other species and environments with perceived aquaculture potential would be explored. Further, vii) investment forums would be organized for aquaculture; viii) technical and administrative support would be provided to existing and future investors and entrepreneurs to expand, establish new enterprises, or relocate in high priority aquaculture-zones; and ix) a special aquaculture fund and subsidy would be designed and established.

As regards increasing the market share and value of commercially farmed fish i) appropriate farmed fish value addition and marketing infrastructure would be established in high priority aquaculture-zones; ii) the capacity of fish farmers to add value to and market farmed fish more competitively would be strengthened; and iii) innovative farmed fish market products would be researched, developed and disseminated.

To increase the performance of large, medium and small commercial fish farms within high priority aquaculture zones and related enterprises in the aquaculture-value chain: i) increased numbers of appropriately skilled persons would be trained for employment at the different levels of the aquaculture business value chain on a sustained basis, by expanding, reinforcing and better equipping existing training institutions and creating new ones; organizing refresher courses for public and private aquaculture extensionists and their trainers; and sponsoring the training of more trainers. Further, ii) direct training would be provided for existing aquaculture operators in management for improved productivity, profitability and sustainability. iii) Furthermore, the capacity of aquaculture associations to deliver improved services to and advocacy on behalf of member enterprises would be strengthened. In this respect, provision has been made in the GNADP for facilitating the formation of a strong representative national aquaculture-umbrella association, from existing groups across the country and the aquaculture value chain.

Regarding improvements in environmental sustainability of aquaculture-production, fish health and fish food safety, the national capacity for addressing these would be strengthened through: i) environmental assessment studies; ii) formulation of environmental safeguards for each high priority aquaculture-zone; iii) preparation and dissemination of appropriate guidelines and regulations; and iv) sensitization and training of aquaculture associations in high priority aquaculture zones to enhance their environmental sensitivity and capacity to comply with environmental guidelines and regulations. Improvements in environmental sustainability would further be accomplished through: v) formation, training and operation of aquaculture-resource committees in high priority aquaculture-zones; and vi) effective monitoring through the adoption, adaptation and refurbishment of veterinary laboratories located within or close to

Ghana National Aquaculture Development Plan

high priority aquaculture-zones for testing water quality, fish health and fish food safety for purposes of regulation and assuring consumer confidence.

To significantly improve the effectiveness and efficiency of public sector institutions in aquaculture development, policy making and regulation: i) the capacity of the Fisheries Commission would be strengthened through a variety of training courses; ii) support from a private sector-led Aquaculture Advisory Group would be institutionalized; and iii) and provision has been made for Fisheries Commission to acquire more equipment, means of transport and other needed logistics to this end. iv) Provision has also been made for the establishment and harmonization of permit systems for the regulation of aquaculture inputs, products, enterprises and resource use prescribed by Fisheries Regulations L.I. 1968. Further, v) a national aquaculture-website would be established; vi) an aquaculture data base would be established and so organized as to receive inputs consistently from across the entire value chain with provision for continuous data quality assurance, proper data management and annual updates. Furthermore vi) technical assistance would be procured to establish an effective monitoring and evaluation system for GNADP implementation, aquaculture business performance as well as compliance with national aquaculture guidelines and regulations.

Fisheries Commission of the Ministry of Food and Agriculture would be the lead agency responsible for the implementation of the GNADP. In doing so, it would collaborate with a broad spectrum of public and private institutions through a variety of institutional arrangements including subcontracts and public-private partnerships.

It is estimated that this 5-year comprehensive medium term plan would cost US\$84,283,900. Of this amount, US\$ 65,552,650 (about 78%) would be contributed by the Government of Ghana as public investment and US\$18, 731,250 (about 22%) would be mobilized as direct investment from the private sector (local and foreign). About 36% of the total costs equivalent to about 46% of expected public sector input, is earmarked for direct financial support to industry operators (See Annex 3 for GNADP budget summary).

Ghana National Aquaculture Development Plan

GNADP Budget –Summary

No.	Activity	Private/Public Contributions (US\$)		Total Costs (US\$)
		Public	Private	
1.	Establish high priority aquaculture zones	1,390,000	3,750,000	5,140,000
2.	Promote increased private investments into establishment of new fish farm, fish seed, and aquaculture-logistics enterprises in high priority aquaculture-zones	220,000	0	220,000
3	Facilitate increased supply of high quality fish feed by the private sector to fish farmers in high priority aquaculture-zone	680,000	5,000,000	5,680,000
4	Facilitate increased supply of high quality fish seed by the private sector to fish farmers in high priority aquaculture-zones	1,480,000	5,400,000	6,880,000
5	Facilitate increased supply of high quality aquaculture-logistics by the private sector to fish farmers in high priority aquaculture-zones	130,000	4,000,000	4,130,000
6	Assist more fish farmers to access funds more easily on competitive terms for investment in aquaculture business	30,025,000	0	30,025,000
7	Explore the feasibility of aquaculture business in new/other species and environments with perceived aquaculture potential	4,200,00	0	4,200,000
8	Establish appropriate farmed fish value addition and marketing infrastructure in high priority aquaculture-zones	10,351,250	581,250	10,932,500
9	Strengthen the capacity of fish farmers to add value to and market farmed fish more competitively	700,000	0	700,000
10	Supply increased numbers of appropriately skilled persons to be employed at the different levels of the aqua -business value chain on a sustained basis	4,322,000	0	4,322,000
11	Strengthen the capacity of existing fish feed, fish seed and fish farm enterprises to manage their enterprises more professionally and produce and market their products more competitively	360,000	0	360,000
12	Strengthen the capacity of aqua culture associations to deliver improved services to and advocacy on behalf of member aquaculture enterprises	525,000	0	525,000
13	Strengthen the national capacity for ensuring the sustainable use of land and water resources in aquaculture-production	590,000	0	590,000
14	Strengthen the national capacity for ensuring farmed fish health and farmed fish food safety	6,195,000	0	6,195,000
15	Strengthen the capacity of the Fisheries Commission to facilitate aquaculture development, policy making, and regulation more effectively	700,000	0	700,000
16	Establish national aquaculture business database	1080,000	0	1080,000
17	Establish arrangements and mechanisms for improved inter-institutional role sharing, coordination, communication, networking and partnerships among public institutions associated with the development, policy and regulation of aquaculture business	110,000	0	110,000
18	Establish monitoring and evaluation system for GNADP implementation and aquaculture business performance	690,000	0	690,000
19	Monitor GNADP implementation effectively	790,000	0	790,000
20	Monitor the performance of aquaculture businesses	684,400	0	684,400
21	Evaluate GNADP implementation, and Performance of aquaculture businesses	390,000	0	360,000
GRAND TOTAL		65,532,650	18,731,250	84,313,900

1. PART 1 - INTRODUCTION

The Ghana National Aquaculture Development Plan (GNADP) is the culmination of efforts to develop a comprehensive framework, within which Ghana's aquaculture industry can thrive. The GNADP is essentially the product of Fisheries Commission with inputs from the private sector-led Aquaculture Advisory Group and technical support from the Food and Agriculture Organization of the United Nations Regional Office for Africa (FAO).

The GNADP follows upon the nation's aquaculture strategic framework, meant to facilitate the promotion of aquaculture as a business under the principle that: the best investments come from matching the appropriate aquaculture system and the prerequisite bio-physical and socio-economic requirements (i.e., high priority zones); and support mechanisms or services for these aquaculture businesses should also be private sector-led, thereby requiring a shift in Government's roles and responsibilities more to one of facilitation, monitoring and control. The GNADP is elaborated in 3 parts – an introductory section; the aquaculture strategic framework; and the development plan in which mission, vision, goal, objectives and activities are outlined.

1.1. Overview of the Aquaculture Sector in Ghana

Agriculture in Ghana has great potential for enhancing economic growth and reducing poverty and increasing food security. Since 2000, the agricultural sector's contribution to GDP has averaged 35%, with fisheries contributing 3-5%. Fish is an important food product in Ghana, accounting for 60% of the national dietary animal protein. The fishery sector is currently a source of direct or indirect livelihood for 10% of the Ghanaian population. However, fisheries production mainly from capture fisheries has in recent years followed a downward trend and current annual national fish output estimated at about 420,000 metric tons falls short of national requirements by about 460,000 metric tons, equivalent to more than 50% deficit. As much as possible, this deficit is made up for, through fish imports valued at over US\$200 million annually.

Following the downturn in the fortunes of the nation's capture fisheries, the national expectation has been that aquaculture would contribute significantly to bridging the gap between fish demand and supply in the short and medium term; more so as the biophysical and socio-economic environment suggest a high development potential for the subsector. In particular Ghana is endowed with landscapes, soils with high water-holding capacity, climatic conditions, marine, as well as brackish and fresh water bodies, which provide prospects for aquaculture development. Moreover the huge national deficit, a rapidly growing national population and rising fish prices provide immense marketing opportunities for the expansion of the subsector. Further, Ghana has a strong research capacity and can also take advantage of cutting edge technologies that abound globally to develop and sustain commercial aquaculture.

However the aforementioned prospects have to be juxtaposed against the reality of previous experience, the current state of development of aquaculture in the country, and therefore the challenges of developing and managing the subsector. Currently, Ghana's aquaculture output is estimated at 10,200 tons (Fisheries Commission, 2010).

Ghana National Aquaculture Development Plan

Though this output may appear low relative to the overall national fish output, current data reveals an impressive positive trend in culture fish output trends in recent years, suggesting a high potential for the future development and growth of the subsector. Nevertheless the subsector is dominated by very low performing non-commercial systems (extensive, small scale and subsistence) often using earthenware ponds, though some high performing commercial initiatives have emerged recently. In this respect, there are about 7 main relatively high performing commercial farmers and 2,869 small scale farmers; 180 cages of 5,266 m³; and 76 pens of 6.73hectares (Fisheries Commission, 2009). Furthermore, the subsector is notably characterized by low uptake of aquaculture as a business; low investments from both the private and public sector; high rate of attrition; and asymmetrical growth in fish output and value, leaning heavily on the larger scale commercialized cage subsector, leaving the extensive, small scale pond subsector far behind. Despite the asymmetrical growth, the small scale sub-sector remains very important for attaining national socio-economic goals of employment generation and poverty reduction.

More specifically, the following factors have been identified as the main constraints to the development and desirable performance of the aquaculture subsector:

- Insufficient availability of fish feed and seed;
- Lack of financial resources for bringing about profitability of aquaculture operations;
- Inadequate involvement of private sector in the development of the aquaculture industry;
- Insufficient public sector institutional arrangements to provide organized and effective institutional support to aquaculture development;
- Weak human resource base reflected in the lack of appropriate skills or trained persons at the different levels of the aquaculture subsector;
- Lack of effective extension systems including personnel, tools, and mechanisms for technology transfer;
- Absence of an in-country research agenda that is responsive to the needs of the aquaculture subsector even in the face of duplication of research efforts and sparse resources;
- Weak public-private sector institutional linkages and national networks of fish farmers;
- The country has not been appropriately zoned on the basis of comprehensive aquaculture related characteristics to rank potentials of production systems for each zone, as would guide investment and enable optimization of technical and economic efficiency; and
- Weak marketing systems for especially the small scale subsector; and
- Environmental sustainability challenges.

In response to challenges and prospects of developing Ghana's fisheries, the Government of Ghana has provided over the last few years substantive support to and developed technical frameworks for the

Ghana National Aquaculture Development Plan

effective planning, development and regulation of the fisheries and aquaculture subsector. Particularly noteworthy are the TIVO Project; West African Regional Fisheries Program in Ghana Project (2011); National Medium Term Policy Framework (2010); Medium Term Agriculture Sector Improvement Program (2010); Fisheries and Aquaculture Policy (2008); Fisheries Act, 2002 Act 625; Fisheries Regulations L.I. 1968; and the Aquaculture Strategic Framework (2006). These have been important reference material in the preparation of the Ghana National Aquaculture Development Plan.

PART TWO - NATIONAL AQUACULTURE STRATEGIC FRAMEWORK (NASF)

Given that the main purpose for preparing the Ghana National Aquaculture Development Plan is to facilitate the targeted implementation of the National Aquaculture Strategic Framework (2006), key elements of the strategic framework are outlined in this section. The NASF was the product of broad national consultations in which the strengths, weaknesses, opportunities and threats to the development of the nation's aquaculture subsector were identified and analyzed. As already indicated, the NASF is essentially based on the principle that the best investments come from matching the appropriate aquaculture systems and prerequisite bio-physical and socio-economic requirements (i.e., high priority zones); and that support mechanisms or services for these aquaculture businesses should be private sector-led thereby requiring a shift in Government's roles and responsibilities more to one of facilitation, monitoring and control.

The thematic scope of the NASF covers: availability of and access to inputs for aquaculture operations; complementary roles of public and private sectors in aquaculture; education and training; extension and outreach; research; partnerships; and production systems. Considering that the NASF is 5 years old and new issues have emerged since its development, the private sector-led National Aquaculture Advisory Group (AAG) elaborated additional themes to ensure currency with emerging issues. These themes cover post harvest, marketing as well as environmental and social issues.

2.1. Availability of and access to inputs for aquaculture operations

Government would:

- Compile information on fish seed producers and intended producers;
- Establish guidelines on brood stock management and fish seed production as quality control for operators;
- Establish an evaluation procedure for feed produced by industry in collaboration with appropriate institutions;
- Create incentives for relevant inputs for fish feed producers for some years;

Further, Government, NGOs and private aquaculture/fish farmers associations would:

- Create awareness of commercial fish feed industry;
- Encourage and assist private sector to play major role in fish seed production;
- Encourage partnerships and collaborative investments between public institutions with tested fish feed formulations mainly from agro-industrial by-products with the fish farming industry; and
- Sensitize financial institutions about potential profitability of aquaculture;
- Continuously seek avenues for farmers' credit facilities;
- Educate fish farmers on what is required of them to obtain credit;
- Establish revolving funds for aquaculture operators; and

- Establish community-based capital generation systems among community members to support aquaculture activities.

Furthermore, private entrepreneurs would produce and market fish feed and seed.

2.2. Complementary roles of the public and private sectors in aquaculture development

Government would:

- Strengthen the capacity of the Fisheries Commission for policy and regulation development;
- Develop and disseminate regulations and standards (codes of practice) regarding aquaculture operations and products;
- Identify public and private sector institutions that perform or could perform roles in aquaculture development and invite them to do so;
- Encourage public sector institutions to limit their role to monitoring and evaluation
- Establish formal arrangements and encourage specialization among aquaculture-related public institutions;
- Review public sector owned aquaculture facilities including demonstration stations to allow for better definition of function, shared private and public sectors or complete private ownership; and
- Encourage entrepreneurs to supply aquaculture inputs.

Further, private entrepreneurs would produce and market fish feed; seed; and cultured fish.

2.3. Education and Training in Aquaculture

Government, NGOs and aquaculture/fish farmer associations would:

- Conduct training needs assessment for members of existing fish farmers' associations and request responses to identified needs through the public sector;
- Formalize collaborations between public sector training institutions to assure complementarities of their programs;
- Establish collaborative relationships between public and private sector institutions (eg fish farmers' associations) to facilitate training;
- Develop basic and comprehensive curricula for aquaculture education and training at all levels;
- Involve private and other public sector institutions and experienced personnel including farmers in the training programs of existing public training institutions;
- Establish specialized practical/applied programs to produce urgently needed aquaculture extension agents; and
- Institute a monitoring and evaluation system on all aspects of aquaculture to generate information for entrepreneurs and decision makers; and
- Initiate educational campaign on aquaculture as an enterprise.

2.4. Extension

Government would:

- Establish formal linkages between aquaculture training and technical institutions offering agricultural extension courses on the one hand and fish farmers and other related institutions on the other hand, in order to incorporate the latter's facilities and personnel in the former's training programs;
- Develop trainers in aquaculture extension in appropriate institutions;
- Establish mechanisms that would ensure higher interaction between extension agents and farmers, sufficient to improve upon farmers' operations;
- Institute a crash program to train aquaculture change agents;
- Involve private sector personnel in technology transfer;
- Institute refresher courses for aquaculture change agents;
- Establish information support unit to facilitate reporting and information dissemination on aquaculture; and
- Establish strong research - extension linkages to ensure timely dissemination of research findings.

2.5. Research

Government would:

- Establish a national body to determine demand driven aquaculture research agenda;
- Identify sustained sources of research funding to support local aquaculture research; and
- Mainstream social and economic research into the national aquaculture research agenda.

2.6. Partnerships

Government would:

- Encourage aquaculture-related public institutions to formalize linkages and networks;
- Encourage public sector institutions to adopt areas of specialization with respect to aquaculture; and
- Encourage budding fish farmer groups to affiliate with a national aquaculture association.

Stakeholders in aquaculture including Government, NGOs and private aquaculture/fish farmer associations would:

- Train members of fish farmers' associations in group formation and group dynamics;
- Bring private sector institutions into partnerships in aquaculture; and
- Encourage Aquaculture/Fish farmer Associations to seek partnerships with other sector institutions.

2.7. Production Systems

Government would:

- Seek development partner support for the characterization of high aquaculture potential zones;
- Map out high aquaculture potential zones with their characteristics as public sector support to potential aqua culturists;
- Promote fish culture production systems other than pond culture in appropriate areas;
- Identify suitable coastal areas for aquaculture; and
- Sensitize local authorities on land and water conflicts as well as potential impacts of aquaculture on their local livelihoods and environment.

Government and private entrepreneurs or investors in aquaculture would involve local and traditional authorities in the acquisition of land or water body for aquaculture.

2.8. Value Addition and Marketing

Government would:

- Provide basic marketing infrastructure such as roads, electricity, and water ;
- Promote aquaculture products through agricultural fairs;
- Encourage and enable commercial producers to develop marketing channels which can be accessed by smaller producers;
- Encourage and support research into tastes and preferences of the different segments of the local and export markets;
- Disseminate aquaculture value chain information to the different value chain operators;
- Establish and enforce aquaculture certification and standards across the entire value chain;
- Prepare, publish and regularly monitor guidelines on the implementation of quality standards of aquatic products to protect the public health as well as improve acceptability of aquaculture products;
- Protect fish farmers from unfair practices by middlemen;
- Negotiate favorable bilateral and multilateral trade agreements;
- Protect local fish farmers from unfair foreign competition, provided that protective measures used conform to international trade conventions/agreements; and
- Encourage research institutes to disseminate market and value addition information to fish farmers (on fish retail prices, preservation and processing, packaging, consumer tastes and preferences in different market segments including export markets).

Private sector would:

- Adhere to aquaculture certification and standards;
- Provide uniform quality products according to requirements of different market niches;
- Provide market guarantees for smaller producers; and

- Embrace value addition in processing and packaging.

2.9. Environmental and Social Concerns

Government would:

- Conduct environmental strategic assessment;
- Establish structures for co-management of land and water resources;
- Provide guidelines to prevent environmental degradation;
- Research on climate change and its effects on aquaculture;
- Through its water resources commission to facilitate formation of users association;
- Enforce laws and regulations on water bodies and land use; and
- Through its water resources commission to sensitize relevant institutions and the population on sustainable land and water use and formation of user associations.

Private sector would:

- Comply with laws and regulations regarding land and water resources;
- Adopt sustainable land and water use practices including site selection;
- Facilitate formation of water users association, where applicable;
- Conduct sustainability related feasibility studies during site selection;
- Facilitate formation of water users association where applicable;
- Communicate early warning information to members; and
- Educate and train aquaculture operators on environmental issues.

PART 3 - AQUACULTURE DEVELOPMENT PLAN

Recognizing its current human and financial capacity limitations, the Ministry of Food and Agriculture (MOFA), MOFA has requested for technical assistance from the Food and Agriculture Organization of the United Nations to facilitate targeted implementation of the NASF (2006). The present Ghana National Aquaculture Development Plan (GNADP) is one of the key outputs delivered within the framework of the technical assistance requested by the Ghana Government. The duration of the GNADP would be 5 years (2012-2016).

The purpose of the GNADP) is to flesh out the updated strategic framework and structure it appropriately in order to facilitate its effective implementation. Thus, the main reference material in the planning process has been the NASF (2006). Reference was however also made to the nation's Medium Term Agricultural Sector Improvement Plan (METASIP, 2010); and the National Fisheries and Aquaculture Development Policy (2008), as well as the Fisheries Act, 2002 Act 625 and the Fisheries Regulations 2010 (LI, 1968), which provide overarching national development and legal frameworks under which the aquaculture sub-sector is subsumed. Due diligence was also exercised to ensure that the GNADP is consistent with FAO's Code of Conduct for Responsible Fisheries (CCRF).

Stakeholder participation was an essential feature of the planning process, with particular emphasis on a private sector led process. In this regard, an Aquaculture Advisory Group, made up predominantly of private sector practitioners in Ghana's aquaculture value chain was constituted as a consultative body that came up with industry and environment friendly decisions for growing and enabling a thriving and sustainable aquaculture industry, based on the Aquaculture Strategic Framework. Apart from initial consultations involving the Fisheries Commission, aquaculture-industry associations, the Water Research Institute and the FAO, two 2-day intensive consultative workshops were organized for the Aquaculture Advisory Group to detail out the activities needed to actualize the Aquaculture Strategic Framework; responsibilities and target groups (who); location (where); schedules (when) as well as outputs (specifying how much), outcomes and impacts expected from implementing planned activities.

3.1. Vision

The vision is a strong basis for the accelerated development of a private sector-led aquaculture that enables aquaculture to contribute significantly to fish food and nutritional security, employment generation, increased incomes, economic growth and poverty reduction, on a sustained basis.

3.2. Mission

The mission is to create an enabling environment that would facilitate and attract public and private investments into aquaculture, on a sustained basis.

3.3. Goal

The goal is to improve the practice, management and development of aquaculture as a viable business by all stakeholders.

3.4. Long Term Objective

The GNADP seeks to contribute to improvements in production, marketing, environmental sustainability and social acceptability of Ghana's commercial fish farm enterprises and related aqua value chain.

3.5. Medium Term Objectives

The following interrelated objectives would be accomplished within the medium term:

- Increase the commercial output of farmed fish produced from 10,200 tons in 2010 to 100,000 tons by the end of 2016;
- Increase the market share of commercially farmed fish from 3% in 2010 to 30% in 2016 and the value of farmed fish output per annum from US\$ 28,440,000 per annum in 2010 to US\$ 362,000,000 per annum in 2016;
- Improve the performance of 80% of large, medium and small commercial fish farms located in high priority aquaculture-zones and related aquaculture value chain enterprises by at least 100% within the plan period of 5 years;
- Improve the effectiveness and efficiency of public sector institutions in aquaculture development, policy making and regulation; and
- Improve and assure the environmental sustainability of aquaculture production and fish health as well as the social acceptability of aquaculture-products.

3.6. Expected Results

The following are the results expected from the implementation of the GNADP:

- Increased quantities of commercial farmed fish produced in high priority aquaculture-zones;
- Increased quantities of high quality commercial farmed fish products from high priority aquaculture-zones, sold at more competitive prices;
- Increased productivity and profitability of large, medium and small scale, existing and start-up, commercial cage and pond culture fish farms in high priority aquaculture-zones and related aquaculture value chain enterprises;
- Increased compliance of (large, medium and small scale, existing and start-up) commercial fish farms in high priority aquaculture-zones to national environmental and food safety policies, standards and regulations; and
- Increased efficiency and effectiveness of public institutions in facilitating aquaculture policy making, regulation and development.

3.7. Activities

Given that “public and private sector roles and responsibilities” was a key underlying principle of the National Aquaculture Strategic Framework, activities in this sub-subsection are elaborated with particular attention to institutional roles. Further, the activities are outlined by expected result. Each activity is broadly stated and further detailed out in sub-activities. Overall, Fisheries Commission would be the lead agency in implementing the GNADP. As the lead agency, Fisheries Commission would relate with other public partner institutions under subcontract arrangements. Fisheries Commission would relate to private sector collaborators in plan implementation by subcontract and private public partnership arrangements. Partner institutions of the Fisheries Commission in plan implementation are specified by sub-activity. Further details regarding the GNADP’s activities, institutional roles and estimated budgets are captured in “Annexes 1, 2, and 3.

3.7.1. Result 1- Increased quantities of commercial farmed fish produced in high priority aquaculture-zones

Activity 1 - Establish high priority aquaculture-zones

- i) At least 5% of irrigation sites in Ghana would be allocated for aquaculture development in order to make more resources available to the aquaculture sub-sector.

This activity would entail an inventory of aquaculture related facilities placed in irrigation sites from previous efforts; assessment of the feasibility of using such facilities for aquaculture; services and works for rehabilitating identified facilities needing rehabilitation; and sinking cages in those facilities considered suitable for doing so. Further, technical/consultancy services would be provided on production and management systems for aquaculture enterprises emerging from facilities developed at selected irrigation sites throughout the country. The resulting facilities and enterprises would be managed under a suitable public private partnership arrangement.

This activity would be implemented as collaboration between the Fisheries Commission, Irrigation Development Authority, Water Resources Commission, Water Research Institute, Volta River Authority, Environmental Protection Agency, Ministry of Lands and Forestry as well as Metropolitan, Municipal, and District Assemblies and Traditional Authorities in the nation’s irrigable areas. Private consultancy services would also be procured in implementing aspects of this activity.

- ii) A national aquaculture suitability map would be developed covering the entire geographical space of Ghana, with a focus on aquaculture production systems and prerequisite bio-physical and socio-economic requirements.

Identified suitable areas for the different production systems would be prioritized. High priority aquaculture-zones would be mapped and established, using remote sensing and geographical information and position systems.

Ghana National Aquaculture Development Plan

Appropriate policies and legislation would be formulated enacted and promulgated to facilitate acquisition of suitable sites and to guarantee the security of tenure once such sites have been legally acquired.

Delivery of this activity would entail a collaboration between the Fisheries Commission, Food and Agriculture Organization of the United Nations, Water Resources Commission, Water Research Institute; Ministry of Tourism; Ministry of Lands and Forestry; Volta River Authority; Environmental Protection Agency; and Ministry of Transport; Ministry of Justice and Office of the Attorney General; Metropolitan, Municipal, District Assemblies and Traditional Authorities in the areas being demarcated; and other appropriate institutions.

- iii) Technical assistance would be provided to fish farmers, hatchery operators, fingerling producers, and grow-out operators and their associations, in land and water site selection for aquaculture development, in identified high priority aquaculture-zones. In implementing this activity, the Fisheries Commission would collaborate with the Water Research Institute, Water Resources Commission and Environmental Protection Agency or procure the services of private service providers.
- iv) Sites and enclaves in high priority aquaculture-zones would be acquired by the national aquaculture-umbrella association in collaboration with local aquaculture-associations for use by individual aquaculture-entrepreneurs. This service would be available for start-up entrepreneurs, those willing to relocate in high priority aquaculture-zones, as well as those willing to expand existing enterprises into these zones. Technical assistance would be provided for this activity by the Fisheries Commission, upon request.

Activity 2 - Promote increased private investments into establishment of new fish farm, fish seed, and aquaculture-logistics enterprises in high priority aquaculture-zones

- i) National aquaculture guidelines would be prepared to guide and regulate private investments into production/supply of quality fish feed fries, fingerlings, aquaculture-logistics and farmed fish products. This activity would entail guideline preparation meetings and validation workshops. In doing so, the Fisheries Commission would collaborate with the Ministry of Justice and Attorney General's Department to assure consistency with the nation's fisheries regulations as well as other appropriate institutions.
- ii) At least one sensitization workshop would be organized for not less than 40 existing aquaculture-entrepreneurs and potential investors annually, for at least 2 years, about investment opportunities, guidelines and regulations related to the establishment of private fish feed enterprises; fish hatcheries, as well as grow-out and aquaculture-logistics supply enterprises. During these sensitization sessions, value chain segmentation and specialization would be promoted. In delivering these sensitization sessions, the Fisheries Commission would collaborate with the Ghana Investment Promotion Center (GIPC); and resident financial institutions.

Ghana National Aquaculture Development Plan

- iii) The Fisheries Commission would collaborate with the Attorney General's Department to Work come up with legislation to harmonize and reduce the cost of permits for entry into and remaining in the aquaculture value chain.
- iv) The GNADP would be officially launched to attract investor and public attention. The Lead Agency Fisheries Commission and its oversight ministry – Ministry of Food and Agriculture would be responsible for the launching. The investor and donor community would participate in this sub activity.

Activity 3 – Facilitate increased supply of high quality fish feed by the private sector to fish farmers in high priority aquaculture-zones

- i) With the assistance of the Ministry of Food and Agriculture, some of the laboratory facilities of the Animal Production Directorate would be adopted, adapted and further equipped if necessary, by the Fisheries Commission, for use in testing fish feed for the purposes of certification of fish-feed supply enterprises as well as for fish feed quality assurance.
- ii) Research would be conducted into the feasibility of use of local ingredients in the commercial production of fish feed for use in the production of Tilapia and Catfish, under pond and cage culture in high priority aquaculture-zones. In implementing this activity, the Fisheries Commission would collaborate with the Animal Production Directorate, and Aquaculture Research and Development Center (ARDEC) of the Water Research Institute.
- v) A permit system would be designed, established and operated, for certifying existing fish feed supply/production enterprises and for permitting establishment of start-up fish feed enterprises. This activity would entail permit system design meetings as well as validation and sensitization meetings with stakeholders. In doing so, the Fisheries Commission would collaborate with the Ministry of Justice and Attorney General's Department to assure consistency with the nation's fisheries regulations.
- vi) Technical and administrative assistance would be provided for at least 5 fish feed supply or production firms to expand existing enterprises, establish new enterprises and locate or relocate in high priority aquaculture-zones. Fisheries Commission would collaborate with the Aquaculture Research and Development Center (ARDEC) of Water Research Institute or may procure the services of private consultancy service providers to do so.
- vii) At least one workshop would be organized for up to 40 potential investors and representatives of aquaculture-associations and staff of commercial fish feed production enterprises, to disseminate findings of research into the feasibility of use of local ingredients in fish feed production. This activity would entail collaboration between the Fisheries Commission and Aquaculture Research and Development Center (ARDEC) of Water Research Institute.
- viii) At least 2 private, large-scale commercial fish-feed production units would be established in high priority aquaculture-zones, according to set guidelines and regulations and in response to

Ghana National Aquaculture Development Plan

sensitization received. A public private partnership arrangement would be adopted in the establishment of these units. Fisheries Commission would collaborate with the Ghana Investment Promotion Center to facilitate establishment of these units. Further, private investors including local and international banks and existing aquaculture business entrepreneurs would be invited to participate in this venture.

Activity 4 - Facilitate increased supply of high quality fish seed by the private sector to fish farmers in high priority aquaculture-zones

In response to sensitization received, the conscious encouragement for value chain segmentation and specialization at the level of fish seed production and the technical and administrative assistance from the Fisheries Commission:

- i) At least 2 private, large scale, commercial hatcheries would be established in high priority aquaculture-zones, by private investors including local and international banks and existing aquaculture-entrepreneurs, according to set guidelines and regulations;
- i) At least 2 private, large scale, commercial grow-out enterprises in high priority aquaculture-zones, by private investors including local and international banks and existing aquaculture-entrepreneurs, according to set guidelines and regulations according to set guidelines and regulations.
- ii) Some of the laboratory facilities of the Aquaculture Research and Development Center (ARDEC) of Water Research Institute would be adopted, adapted and further equipped (if necessary), by the Fisheries Commission, for use in testing fries and fingerlings from private sources for quality assurance as well as for certifying hatcheries and nurseries.
- iii) GIFT improved Tilapia strain would be imported to further improve genetic quality of Tilapia fingerlings and brood stock, as a follow-up to the TIVO project. As part of this follow-up, improved strains of catfish would also be developed. Fisheries Commission would collaborate with the Water Research Institute to deliver this sub-activity. West African Regional Fisheries Program collaboration and inputs would also be sourced in this genetic quality improvement follow-up activity.
- iv) At least one dissemination workshop would be organized for at least 50 representatives of fish farmers, hatchery operators and grow-out enterprises on new improvements in the genetic quality of Tilapia and Catfish brood stocks. Fisheries Commission would carry out this activity in collaboration with the Aquaculture Research and Development Center (ARDEC) of Water Research Institute.
- v) At least two training workshops would be organized to equip at most 80 staff of fish farm, hatcheries and grow-out enterprises with skills for managing newly developed stocks of

Ghana National Aquaculture Development Plan

Tilapia and catfish. Fisheries Commission would carry out this activity in collaboration with the Aquaculture Research and Development Center (ARDEC) of Water Research Institute.

- vi) A permit system would be designed, established and operated for certifying existing hatcheries, nurseries and grow-out enterprises and allowing establishment of start-up enterprises. This activity would entail permit system design meetings as well as validation and sensitization meetings with stakeholders. In doing so, the Fisheries Commission would collaborate with the Ministry of Justice and Attorney General's Department to assure consistency with the nation's fisheries regulations.
- vii) Technical and administrative assistance would be provided for at least 5 existing fish hatcheries and/or start-up investors in the hatchery and grow-out industry, to expand existing enterprises, establish new enterprises and/or locate in high priority aquaculture-zones. Fisheries Commission would collaborate with the Aquaculture Research and Development Center (ARDEC) of Water Research Institute to deliver this sub-activity or may procure the services of private service providers for doing so.

Activity 5 - Facilitate increased supply of high quality aquaculture-logistics by the private sector to fish farmers in high priority aquaculture-zones

- i) Technical and administrative assistance would be provided for at least 5 aquaculture-logistics firms to expand existing enterprises, establish new enterprises or relocate in high priority aquaculture-zones. Fisheries Commission would provide this activity directly or procure the services of private consultancy service providers for doing so;
- ii) In response to sensitization received and technical and administrative assistance from the Fisheries Commission, at least 2 private, one stop, large scale, commercial aquaculture-logistics supply enterprises would be established in high priority aquaculture-zones by private investors including local and international banks and existing aquaculture-entrepreneurs, according to set guidelines and regulations; and
- iii) A permit system would be designed and established for certifying existing aquaculture-logistics enterprises and for establishing start-up enterprises. This activity would entail permit system design meetings as well as validation and sensitization meetings with stakeholders. In doing so, the Fisheries Commission would collaborate with the Ministry of Justice and Attorney General's Department to assure consistency with the nation's fisheries regulations.

Activity 6 – Facilitate access of funds to fish farmers on competitive terms for investment in aquaculture business

- i) Dedicated fund and national subsidy would be designed in support of aquaculture business development in Ghana. Fisheries Commission would carry out this sub-activity with technical assistance from the private sector, and in consultation with the Ministry of Finance and Economic Planning;

Ghana National Aquaculture Development Plan

- ii) Dedicated fund would be established and operated for aquaculture business for the benefit of at least 500 small and medium, cage and pond culture commercial aquaculture-enterprises, located in high priority aquaculture-zones. 40% of the fund would be allocated to the small scale subsector and 60% to medium and large scale operators. Fisheries Commission would implement this sub-activity in collaboration with a national or international commercial bank with sufficient outreach in identified high priority aquaculture-zones; and
- iii) National subsidy for aquaculture business would be established and operated for the benefit of 500 small and medium, cage and pond culture, commercial aquaculture-enterprises, located in high priority aquaculture-zones. In implementing the national aquaculture business subsidy, Fisheries Commission would learn from and network with existing agricultural subsidy systems of the Ministry of Food and Agriculture.

Activity 7 – Explore the feasibility of aquaculture business in new/other species and environments with perceived aquaculture potential

- i) Mariculture research would be conducted into the technical and economic feasibility of mariculture of anchovies as baits for Tuna fishing. Further, mariculture research would be conducted into the technical and economic feasibility of shrimps and gray mullet culture. Suitable areas in Ghana's continental shelf for the development of these culture fisheries would be identified as part of the research. Fisheries Commission would collaborate with the Department of Oceanography of the University of Ghana to implement this research activity.
- ii) Research would be conducted into the technical and economic feasibility of clam culture in the Lower Volta Basin. Fisheries Commission would collaborate with the Aquaculture Research and Development Center (ARDEC) of Water Research Institute to carry out this sub-activity.
- iii) Research would be conducted into the aquaculture business potential of Ghana's small fresh water bodies (Lake Bosumtwi, Weija Lake etc). Fisheries Commission would conduct this activity in collaboration with the Aquaculture Research and Development Center (ARDEC) of Water Research Institute to carry out this sub-activity.
- iv) Research would be conducted into the technical and economic feasibility of shrimp culture in the estuary of the Lower Volta Basin. Fisheries Commission would collaborate with the University of Cape - Coast in the conduct of this research sub-activity.
- v) Research would be conducted into the aquaculture business potential of Ghana's lagoons. Fisheries Commission would conduct this sub-activity in collaboration with the University of Cape – Coast.
- vi) A national assessment would be conducted to explore the possibility and feasibility of utilizing or modifying for use, existing aquaculture facilities developed by the Irrigation Development Authority, in the nation's irrigable zones. The possibility of cage culture in such facilities would be explored and implemented in this regard.

Ghana National Aquaculture Development Plan

- vii) Research would be conducted into the aquaculture business potential of the reservoir or lake created by the construction of the Bui-Dam. Fisheries Commission would conduct this sub-activity in collaboration with the Food and Agriculture Organization of the United Nations; Kwame Nkrumah University of Science and Technology; University of Development Studies; the Water Research Institute; and the Water Resource Commission.
- viii) At least one dissemination workshop would be organized for not less than 40 potential investors and representatives of aquaculture-associations, on the technical and economic feasibility of shrimp culture in the estuaries of the Lower Volta Basin. The partners in the shrimp culture research – Fisheries Commission and the University of Cape-Coast would collaborate to deliver the dissemination workshop(s).
- ix) At least one dissemination workshop would be organized, for not less than 40 potential investors and representatives of aquaculture-associations on the technical and economic feasibility of clam culture in the Lower Volta Basin. Fisheries Commission and the Aquaculture Research and Development Center (ARDEC) of Water Research Institute would collaborate to deliver the dissemination workshop (s).
- x) At least one dissemination workshop would be organized, for not less than 40 potential investors and representatives of aquaculture-associations and representatives of the Ghana Tuna Association (GTA), on the technical and economic feasibility of mariculture of anchovies as baits for Tuna fishing, and suitable areas in Ghana’s continental shelf for the development of this industry. Fisheries Commission would collaborate with the University of Ghana’s Department of Oceanography, to run the dissemination workshop (s);
- xi) At least one dissemination workshop would be organized for not less than 40 potential investors and representatives of aquaculture-associations on the aquaculture business potential of Ghana’s lagoons, to create the platform for the dissemination of research results on the aquaculture business potential of Ghana’s lagoons. Fisheries Commission would collaborate with the University of Cape -Coast to run the workshop(s); and
- xii) At least one dissemination workshop would be organized for not less than 40 potential investors and representatives of aquaculture-associations on the aquaculture business potential of Ghana’s small water bodies. Fisheries Commission would run the workshop(s) in collaboration with the Aquaculture Research and Development Center (ARDEC) of Water Research Institute.
- xiii) A national dissemination workshop would be organized on the feasibility of utilizing or modifying for use, existing aquaculture facilities developed by the Irrigation Development Authority, in the nation’s irrigable zones. Fisheries Commission would run the workshop(s) in collaboration with the Aquaculture Research and Development Center (ARDEC) of Water Research Institute and the Irrigation Development Authority.

3.7.2. Result 2 - Increased quantities of high quality commercial farmed fish products sold at more competitive prices

Activity 1 - Establish appropriate farmed fish value addition and marketing infrastructure in high priority aquaculture-zones

- i) Needs and feasibility assessment would be conducted for the provision of value addition and market infrastructure in all identified high priority aqua zones. Fisheries Commission would procure technical assistance from private local or international consultancy firms to conduct this assessment.
- ii) At least one sensitization workshop would be organized for at least 20 relevant staff of infrastructure provision and investor institutions on public and private investment opportunities and options for the supply of value addition and market infrastructure and services to aquaculture-enterprises in high priority aquaculture-zones. Institutions to be sensitized would include Ghana Investment Promotion Center, Volta River Authority, Ministry of Roads and Highways, Ministry of Trade and Industry, VRA, Electricity Company of Ghana, GRIDCO, Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones, Ministry of Water, Works and Housing, Ghana Water Company; Private Telecommunication companies, and Commercial Banks.
- iii) Up to 200 km of year-round motorable road infrastructure would be provided in high priority aquaculture-zones lacking such infrastructure. Fisheries Commission would collaborate with Ministry of Roads and Highways and identified Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones, to deliver this infrastructure.
- iv) Up to 10 water treatment and pumping stations and 100 km of water supply pipelines in high priority aquaculture-zones lacking clean water supply services. Ministry of Water Resources Works and Housing would collaborate with the Fisheries Commission and the relevant Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones to provide this infrastructure.
- v) Up to 100 km of high-tension electricity lines would be extended through high priority aquaculture-zones lacking electricity supply services. Delivery of this infrastructure would involve collaboration between Fisheries Commission (the lead agency), Ministry of Energy, and Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones, where the needed infrastructure would be delivered.
- vi) Up to 10 information communication technology (ICT) masts would be provided in high priority aquaculture-zones, lacking ICT infrastructure. Delivery of this infrastructure would involve collaboration between Ministry of Communication, the Fisheries Commission, private ICT companies and identified Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones.

Ghana National Aquaculture Development Plan

- vii) Up to 10 fish market centers, equipped with water and sanitation facilities would be provided in high priority aquaculture-zones lacking such centers. The lead agency – Fisheries Commission would collaborate with the Ministry of Local Government and Rural Development as well as relevant Metropolitan, Municipal and District Assemblies to provide this infrastructure.
- viii) At least 2 training workshops would be organized for the benefit of 50 Staff of Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones, in fish marketing center management. Fisheries Commission as the lead agency would collaborate with the Institute of Local Government Studies (ILGS) and the Ministry of Local Government and Rural Development to organize these training workshops.
- ix) Up to 10 farmed fish marketing centers in high priority aquaculture-zones would be provided with cold chain services for farmed fish products. Fisheries Commission would collaborate with Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones, private entrepreneurs already providing cold storage services in Ghana or elsewhere and other private investors including local or international banks, to provide such services according to set guidelines. Services to be provided would include operation of cold storage facilities and vans).

Activity 2 - Strengthen the capacity of fish farmers to add value to and market farmed fish more competitively

- i) Feasibility assessment would be conducted for developing new farmed fish market – products for Tilapia and Catfish, targeted at high value market niches. In conducting this assessment, Fisheries Commission would collaborate with the Food Research Institute and fish processors' associations.
- ii) At least 10 sensitization workshops would be organized on feasible value addition and marketing options for farmed fish products. These workshops would target not less than 500 participants drawn from commercial fish processors and cage and pond culture, commercial, small, medium, large scale fish farm enterprises, located in high priority aquaculture-zones. Delivery of these sensitization workshops would involve collaboration between Fisheries Commission and the Food Research Institute.
- iii) At least 3 training workshops would be organized on value addition to and enhanced marketing of farmed fish, targeting high value market niches. These workshops would target not less than 90 enterprises opting to invest in value addition to and enhanced marketing of farmed fish, targeting identified high value market niches.

3.7.3. Result 3 - Increased productivity and profitability of large, medium and small scale, existing and start-up, commercial fish farms in high priority aquaculture-zones and related aquaculture value chain enterprises

Activity 1 - Supply increased numbers of appropriately skilled persons to be employed at the different levels of the aqua -business value chain on a sustained basis

- i) Curricula of aquaculture degree programs in 4 public Universities in Ghana - University of Cape Coast, University of Science and Technology, University of Development Studies and University College of Education at Winneba would be modified and thereby improved to be industry-oriented including entrepreneurial skills. Fisheries Commission would facilitate and support these new establishments in collaboration with the management of the aforementioned institutions.
- ii) Training needs assessment as well as curriculum review would be carried out on the education and training programs of the Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges, as well as the Pong Tamale Animal Health and Production College regarding aquaculture extension. The programs of these institutions would be updated to holistically reflect scientific, business, environmental and social dimensions of aquaculture. Fisheries Commission would collaborate with appropriate research and tertiary educational institutions in the delivery of this sub-activity.
- iii) At least 2 workshops would be organized for up to 20 staff of Ohawu, Kwadaso, Ejura and Damongo agricultural colleges as well as Pong Tamale Animal Health and Production Colleges, to update their knowledge and skills for technological currency; as well as more sensitivity to productivity, profitability environmental sustainability, and fish health and fish food safety issues. Fisheries Commission of MOFA would collaborate with research and tertiary educational institutions to deliver this sub-activity. Some private fish farms would be approached to make their facilities available to facilitate demonstration and supervised practice to enable trainees acquire very current, industry-level hands-on, learning experience.
- iv) Demonstration farms, laboratories and ICT equipment including computers would be provided to the Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges, as well as Pong Tamale Animal Health and Production College. Fisheries Commission would work with Ministry of Food and Agriculture to ensure the effective delivery of this information, education and training capacity enhancing infrastructure, to the target institutions.
- v) At least 10 aquaculture university graduates would be sponsored to undergo post -graduate training to man the Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges as well as Pong Tamale Animal Health and Production College to facilitate the training of more workers in the aquaculture-value chain including aquaculture-extension agents. Fisheries Commission would ensure that these sponsorship arrangements are smoothly delivered.

Ghana National Aquaculture Development Plan

- vi) One new fisheries training institution would be established at Anomabu in the Central Region, to produce fisheries and aquaculture extensionists. Fisheries Commission and appropriate research and tertiary educational institutions would collaborate to establish the new institution.
- vii) A refresher course package would be delivered to the benefit of not less than 40 aquaculture-extension agents of the Fisheries Commission and Non-Governmental Organizations to update their skills and improve their effectiveness and efficiency. This sub-activity would comprise an extension needs assessment; production of extension manuals; and training workshops for extension agents in most current technology, aquaculture economics, management of aquaculture enterprises, on-line research, as well as current environmental, sanitation, and food safety issues of aquaculture in Ghana. Fisheries Commission would work with appropriate research and tertiary educational institutions to design and deliver the refresher course(s). Some private fish farms would be approached to make their facilities available to facilitate demonstration and supervised practice to enable trainees to acquire hands-on learning experience.
- viii) At least one training course would be organized for not less than 10 staff of private aquaculture-logistics supply firms to provide follow-up after sales extension services to fish farmers. Implementation of this activity would involve a collaboration of the Fisheries Commission with the University of Cape-Coast. Some private fish farms would be approached to make their facilities available to facilitate demonstration and supervised practice to enable trainees to acquire hands-on learning experience.
- ix) At least one training course would be organized for not less than 15 staff of private hatchery, and grow-out enterprises to enable them to provide follow-up after sales extension services to fish farmers. Fisheries Commission in collaboration with appropriate research and tertiary educational institutions would design and deliver the course(s). Some private fish farms would be approached to make their facilities available to facilitate demonstration and supervised practice to enable trainees acquire hands-on learning experience.
- x) National guidelines and regulations would be prepared and disseminated by the Fisheries Commission to guide and regulate private participation in aquaculture-extension.

Activity 2 - Strengthen the capacity of existing fish feed, fish seed and fish farm enterprises to manage their enterprises more professionally and produce and market their products more competitively

- i) At least one workshop would be organized for not less than 20 staff of commercial fish feed producers to exchange experiences and ideas on productivity, profitability, quality assurance and sustainability enhancing management and technology – related issues. Implementation of this activity would entail collaboration between the Fisheries Commission, Aquaculture Research and Development Center (ARDEC) of Water Research Institute, and Animal Production Directorate.

Ghana National Aquaculture Development Plan

- ii) At least one training course would be organized for not less than 15 staff of private fish hatchery, nursery, and grow-out enterprises to exchange experiences and ideas on productivity, profitability, quality assurance and sustainability enhancing management and technology – related issues. Fisheries Commission would collaborate with the Aquaculture Research and Development Center (ARDEC) of Water Research Institute, to deliver this sub-activity.
- iii) Up to 10 training courses would be organized for not less than 500 staff of private commercial fish farm enterprises with special attention to the small scale sub sector and start-up firms, on aquaculture business management including preparation of good business plans, credit negotiation, good financial practices; procurement, handling and utilization of quality fish feed, fish seed and aquaculture-logistics, as well as current productivity, profitability, quality assurance, sustainability enhancing management and technology-related issues. Fisheries Commission would collaborate with the Aquaculture Research and Development Center (ARDEC) of Water Research Institute, and Ghana Institute of Management and Public Administration, to deliver this sub-activity.

Activity 3 - Strengthen the capacity of aquaculture associations to deliver improved services to, and advocacy on behalf of member aquaculture–enterprises

- i) Criteria and procedure for registering aquaculture-associations would be formulated and published in national aquaculture-website and local newspapers. Fisheries Commission would determine the criteria and registration procedure in consultation with other relevant institutions.
- ii) At least 3 consultative workshops would be organized for representatives of registered aquaculture-associations, on the formation of national umbrella aquaculture-association from existing associations, encompassing the entire aquaculture value chain. At least 90 participants would participate in these consultative workshops. Fisheries Commission would hire the services of a national NGO to conduct the workshops.
- iii) A new representative national aquaculture umbrella association would be formed. Initial set-up, including office space, furniture, ICT equipment and means of transport would be provided for the national umbrella aquaculture-association. Fisheries Commission would provide this support.
- iv) At least 3 training workshops would be organized for 90 leaders of the national umbrella aquaculture-association and its member associations in group dynamics, leadership, and communication and negotiation skills. Fisheries Commission would hire the services of a national NGO to conduct these workshops.
- v) A national aquaculture-newsletter would be published quarterly. Fisheries Commission would collaborate with the Ghana Institute of Journalism to provide the national umbrella aquaculture-association with needed technical assistance for this publication. Through the aquaculture-newsletter, information on activities and events of different aquaculture-associations and national umbrella aquaculture-association, as well as topical national issues and developments in the nation’s aquaculture business would be disseminated.

3.7.4. Result 4 - Increased compliance of (large, medium and small scale, existing and start-up) commercial fish farms in high priority aquaculture-zones with national environmental, fish health and food safety guidelines and regulations

Activity 1 – Strengthen the national capacity for ensuring sustainable use of land and water resources in aquaculture-production

- i) Strategic environmental assessment would be conducted for all identified high priority aquaculture-zones and environmental safeguards would be formulated for each zone. Fisheries Commission would collaborate with the Environmental Protection Agency and Aquaculture Research and Development Center (ARDEC) of Water Research Institute to deliver this sub-activity.
- ii) Technical assistance would be provided for at least 20 start-up small, medium and large fish farm enterprises in high priority aquaculture-zones, to conduct sustainability-related micro-studies during site selection. This activity would entail collaboration between Fisheries Commission; the Environmental Protection Agency; and Aquaculture Research and Development Center (ARDEC) of Water Research Institute.
- iii) Technical assistance would be provided for at least 10 start-up large scale hatcheries, nurseries, and grow-out enterprises, to conduct sustainability-related micro-environment studies during site selection. Fisheries Commission would collaborate with the Environmental Protection Agency and Aquaculture Research and Development Center (ARDEC) of the Water Research Institute to deliver this sub-activity.
- iv) Existing environmental permit system would be more rigorously enforced for existing and start-up fish farm/hatchery/nurseries/grow-out enterprises in high priority aquaculture-zones (Environmental Assessment Regulations 1999, LI 1652; Fisheries Regulations LI 1968). Fisheries Commission and the Environmental Protection Agency would work together to ensure enforcement.
- v) Up to 10 training workshops would be organized for at least 400 small, medium and large scale fish farm enterprises in high priority aquaculture-zones, to enable them to acquire the skills necessary for effective compliance with national regulations, regarding sustainable land and water resource use in fish farming. In implementing this sub-activity, Fisheries Commission would collaborate with the Environmental Protection Agency and Aquaculture Research and Development Center (ARDEC) of Water Research Institute.
- vi) At least 10 aquaculture-resource management committees would be established in high priority aquaculture-zones as co-management structures, to report non-compliance with guidelines and regulations on land and water resource use in high priority aquaculture-zones. Fisheries Commission would work with a national NGO to facilitate the effective formation, management and operation of these committees.

Ghana National Aquaculture Development Plan

- vii) At least 4 training workshops would be organized for not less than 10 aquaculture-resource management committees in high priority aquaculture-zones to enable them to perform their role creditably. Fisheries Commission and the Environmental Protection Agency would collaborate to deliver the training sub-activities.

- viii) Existing permit systems for regulating water resource use by aquaculture businesses in high priority aquaculture-zones (Fisheries Regulations LI 1968; Water Resources Commission Act, 1996 Act 522) would be more rigorously enforced. Fisheries Commission would collaborate with the Environmental Protection Agency; Water Resources Commission; Volta River Authority; and the Ministry of Justice and Attorney General's Department to ensure compliance.

Activity 2 – Strengthen the national capacity for ensuring farmed fish health and farmed fish food safety

- i) At least 3 diagnostic laboratories of the Veterinary Services Directorate, located in or close to high priority aquaculture-zones would be adopted, adapted and re-equipped (if needed) for testing aquaculture water resource quality, as well as farmed fish health and fish food safety. For effective implementation of this sub-activity, Fisheries Commission would collaborate with Veterinary Services Directorate and the Food and Drugs Board.

- ii) At least one training course would be organized for up to 20 veterinary technicians/doctors in testing farmed fish for fish health, fish food safety and effects of climate change and pollution. Implementation of this sub-activity would entail collaboration between Fisheries Commission and the Veterinary Services Directorate.

- iii) A permit system would be designed, established and operated for enforcing farmed fish health and farmed fish food safety guidelines and regulations in high priority aquaculture-zones (Fisheries Regulations LI 1968; Water Resources Commission Act, 1996 Act 522). This activity would entail permit system design meetings as well as validation meetings with stakeholders. Fisheries Commission would collaborate with the Food and Drugs Board and the Ministry of Justice and Attorney General's Department for the effective implementation of this permit system.

- iv) At least 5 sensitization workshops would be organized for not less than 100 leaders of aquaculture-associations located in high priority aquaculture-zones, on compliance with fish health and fish food safety guidelines and regulations. These workshops would be organized by the Fisheries Commission in collaboration with Food and Drugs Board.

3.7.5. Result 5 – Increased effectiveness and efficiency of public institutions in policy making, regulation and facilitating aquaculture development

Activity 1 - Strengthen the capacity of the Fisheries Commission to facilitate aquaculture development, policy making, and regulation more effectively

- i) Institutional capacity needs assessment would be conducted for the Fisheries Commission in respect of effective aquaculture development, policy making, and regulation. Among others this sub-activity would include assessment of the existing staff strength of the Fisheries Commission relative to the implementation of the GNADP; identify gaps; and recommend recruitment needs. Fisheries Commission would procure technical services of a local consultancy firm with international experience to facilitate the effective delivery of this sub-activity and mobilize the needed funding to address identified gaps in its institutional capacity, including staffing.
- ii) Research and development would be conducted into aquaculture holding systems for example use of local materials to construct cages to reduce cost, sinking cages in ponds etc. This activity would explore, learn from, test, and adapt local and foreign technologies that have higher technical and economic efficiency.
- iii) At least one training course would be organized for 10 Fisheries Commission staff to acquire skills in the development of efficient aquaculture units/systems. Fisheries Commission would collaborate with the Aquaculture Research and Development Center (ARDEC) of Water Research Institute and tertiary educational institutions to deliver this sub-activity.
- iv) At least one training course would be organized for not less than 10 Fisheries Commission staff on the operation of aquaculture-related regulatory systems to be implemented by the Fisheries Commission directly or in collaboration with other agencies. Fisheries Commission would organize this training course as an in-house activity but would collaborate with other state agencies including the Water Resources Commission, Food and Drugs Board, and Environmental Protection Agency and the Volta River Authority (VRA), in doing so.
- v) Institutionalization of the Aquaculture Advisory Group as a sub-committee of the Fisheries Commission would be formalized and funding for their activities would be budgeted and provided to enable this group to provide private sector perspectives into aquaculture business development, policy making, and regulation. Responsibility for this sub-activity would be that of the Fisheries Commission.

Activity 2 - Establish national aquaculture business database

- i) A national aquaculture-data collection system would be designed. In doing so, national aquaculture – data needs would be determined; standard data collection formats would be developed for different segments of the aquaculture business value chain; and mechanisms would be established to ensure effective aquaculture-record keeping and regular collection, transmission, processing, storage, management, update and dissemination of national aquaculture data. Mechanisms would also be established for aquaculture-related data and information sharing among the relevant public institutions such as the Fisheries Commission, Environmental Protection Agency, Volta River Authority, Water Research Institute, Water Resources Commission and the public Universities. Fisheries Commission would procure technical assistance from national or international consultancy firms, to design, establish, operate and manage the national aquaculture-data collections system and the resultant national aquaculture business database.
- ii) At least one training course would be organized for not less than 10 Fisheries Commission staff to acquire the needed knowledge and skills for setting up, managing and regularly updating the national aquaculture-database. Fisheries Commission would collaborate with its aquaculture database service providers to deliver the training course(s).
- iii) At least 4 training workshops would be organized for not less than 100 leaders of aquaculture-associations, located in high priority aquaculture-zones, on aqua record keeping, data capture and transmission, as well as the importance of data-use for enterprise management, policy making, monitoring and evaluation. Fisheries Commission would collaborate with its aquaculture-database service providers to deliver the training workshops.
- iv) At least 10 registered aquaculture-associations in high priority aquaculture-zones would be equipped with basic ICT equipment (computer systems and modems) for aquaculture-data capture, collation and transmission. Fisheries Commission would be responsible for this sub-activity.
- v) Aquaculture- records would be routinely kept at enterprise level and field data would be regularly transmitted to the Fisheries Commission. Through this mechanism, aquaculture-data would be collected, processed, analyzed, stored, and disseminated by the Fisheries Commission. The scope of data in this regard would cover different segments of the aquaculture-value chain including production, value addition and marketing systems. More specifically, the data scope would cover: aqua – input (fish feed, seed, funds, land and water resources) quality, supply and uptake; output and value of farmed fish produced; quantity, value, product type of farmed fish sold and consumed; employment generated by aquaculture business; contribution of farmed fish to agricultural GDP and overall national economic growth; productivity, profitability and sustainability of aquaculture-production and marketing; and effectiveness, efficiency and returns to institutional investments in aquaculture. Fisheries Commission would be responsible for this sub-activity.

Ghana National Aquaculture Development Plan

- vi) Additional ICT equipment would be procured to enable the Fisheries Commission to effectively set up, operate, manage and regularly update the national aquaculture-database. Fisheries Commission would be responsible for this sub-activity.
- vii) Additional means of transport would be procured for use by the Fisheries Commission for field visits for continuous quality assurance of aquaculture-data processes. Fisheries Commission would be responsible for this sub-activity.
- viii) The national aquaculture- business database would be updated annually by the Fisheries Commission.

Activity 3- Establish arrangements and mechanisms for improved inter-institutional role sharing, coordination, communication, networking and partnerships among public institutions associated with the development, policy and regulation of aquaculture business

- i) At least one stakeholder consultative workshop would be organized on institutional roles, arrangements and mechanisms for coordination and networking among aquaculture-related public institutions. Areas of interest in this regard would be aquaculture-related institutional data sharing; networking, resource sharing and collaboration in aquaculture-related, education, training, research and extension; collaboration in enforcement of guidelines and regulation. Fisheries Commission would organize and arrange for the effective facilitation of the workshop.
- ii) A national aquaculture-website would be managed and operated to disseminate national aquaculture business information. Types of information to be disseminated would include: investment opportunities and guidelines on the establishment and operation of private fish feed, fish seed and aquaculture-logistics production/supply enterprises; private service provision in value addition to and marketing of farmed fish products; private service provision in aquaculture-extension; high priority aqua zones; technological developments in aquaculture-production and marketing; fish price changes and variations across the country and at the international market; list and update of recognized aquaculture associations as well as entry requirements and activities of such associations; national environmental, fish health and fish food safety guidelines and regulations; and performance of the nation's aquaculture business subsector. Fisheries Commission would procure technical assistance from private ICT technical consultancy service providers as well as well as additional ICT equipment to set up and manage the national aquaculture-website.
- iii) Two national consultations would be organized for different institutions involved in the administration of the different permit systems and the Aquaculture Advisory Group to harmonize the different permit systems to facilitate and speed up permit delivery to existing and start-up aquaculture entrepreneurs and investors.

Ghana National Aquaculture Development Plan

Activity 4 - Establish monitoring and evaluation system for GNADP implementation and aquaculture business performance

- i) A national aquaculture monitoring and evaluation system would be designed. Fisheries Commission would procure technical assistance from private local or international consultancy service providers for the design of the M&E system.
- ii) At least one training course would be organized for not less than 10 staff of the Fisheries Commission to acquire skills in setting up and managing a national aquaculture business monitoring and evaluation system. Fisheries Commission would run this training course in collaboration with the consultancy firm that designed the M&E system.
- iii) Additional ICT equipment and means of transport would be procured by the Fisheries Commission, to enable the Fisheries Commission to monitor and evaluate the national aquaculture development and associated management, safety and sustainability systems.

Activity 5 – Monitor GNADP implementation effectively

- i) Regular field visits would be conducted to high priority aquaculture-zones to interrogate aquaculture business operators and inspect facilities, equipment and records on the implementation of the different activities of the GNADP. Fisheries Commission staff would carry out this sub-activity.
- ii) Regular reporting would be scheduled by the Fisheries Commission for different segments of the aquaculture business value chain including different levels of the Fisheries Commission and its institutional collaborators, on the quality, processes, sequencing, and timeliness of delivery of inputs and activities of the GNADP. Reporting would be according to approved formats.

Activity 6 – Monitor the performance of aquaculture – businesses

- i) Biannual fora would be organized for representatives of aquaculture business associations, NGOs in aquaculture, and public institutional collaborators (including Fisheries Commission; Aquaculture Advisory Group; Aquaculture-Resource Management Committees; Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones; Aquaculture Research and Development Center (ARDEC) of Water Research Institute; Water Resources Commission; Environmental Protection Agency; Animal Production Directorate; Veterinary Services Directorate; Agriculture and other aquaculture – related training institutions) in the development and regulation of aquaculture business, to receive feed back on aquaculture business performance elements including:
 - Availability, accessibility, prices and quality of fish feed, fish fries, fingerlings and aquaculture-logistics in high priority aquaculture-zones;
 - Availability, accessibility and terms of payment of investment funds for aquaculture business;

Ghana National Aquaculture Development Plan

- Availability, accessibility, quality, reliability, prices of electricity, clean water, ICT services, roads in high priority aquaculture-zones;
 - Sanitation and cost of user and management services in fish marketing centers within high priority aquaculture-zones;
 - Availability of appropriately trained personnel to be employed by different segments of aquaculture businesses most especially fish farmers;
 - Ease of accessing or renewing the different aquaculture business permits and certification by start-up and existing small, medium and large aquaculture business enterprises; and
 - Level of compliance with aquaculture business quality, environmental, fish health and fish food safety standards specified in appropriate national aquaculture-related guidelines and regulations.
- ii) Regular field visits would be made to high priority aquaculture-zones to inspect facilities, equipment and records of hatcheries, nurseries, grow-out enterprises and aquaculture-logistic supply enterprises, and monitor compliance with aquaculture business quality, environmental, fish health and fish food safety standards specified in national guidelines and regulations.

Activity 7 – Evaluate GNADP implementation and performance of aquaculture businesses

- i) A national baseline study would be conducted to establish baseline indicators for the GNADP. Fisheries Commission would procure technical assistance from private local or international consultancy service providers to conduct the national aquaculture baseline study. Indicators would cover aquaculture business elements including:
- Quantities, prices and values of commercial farmed fish feed, fries, fingerlings, and aquaculture-logistics produced/supplied/ consumed by large, medium, and small scale, cage and pond culture, commercial enterprises within high priority aquaculture-zones;
 - Quantities prices and values of commercial farmed fish produced, processed, and sold and the prices at which these were sold by large, medium, and small scale, cage and pond culture, commercial fish farmers, in high priority aquaculture-zones;
 - Productivity and profitability of fish feed, fry, fingerling, and aquaculture-logistics producers/suppliers, as well as large, medium, and small scale, cage and pond culture, commercial fish farm enterprises within high priority aquaculture-zones;

Ghana National Aquaculture Development Plan

- Compliance of (large, medium and small scale, existing and start-up) commercial fish farms, hatcheries and fingerling producers/suppliers, to national environmental, fish health and food safety policies, standards and regulations; and
 - Effectiveness and efficiency of public institutions in facilitating aquaculture development.
- i) Annual reviews would be organized on the implementation of GNADP. Key collaborators in the implementation of the GNADP as well the Ministry of Food and Agriculture and Ministry of Finance and Economic Planning would participate in these reviews.
 - ii) A mid-term evaluation of the GNADP would be conducted. The mid-term evaluation would re-assess the baseline indicators, draw heavily on the nation's aquaculture-database and generate recommendations to help assure the terminal success of the GNADP. Fisheries Commission would procure technical assistance from a private national or international consultancy firm to conduct the mid-term evaluation.
 - iii) A terminal evaluation of the GNADP would be conducted. Baseline indicators would be re-assessed as the GNADP gets to term in its fifth year in order to determine the success or otherwise of the GNADP. Fisheries Commission would procure technical assistance from a private national or international consultancy firm to conduct the terminal evaluation.
 - iv) Annual national dissemination workshops would be organized to disseminate the results of the GNADP.

Annex 1 - Table 1: Ghana National Aquaculture Development Plan (GNADP) Results and Implementation Matrix

No.	RESULTS			Implementation			
	<i>Result One (1) Result 1- Increased quantities of commercial farmed fish produced in high priority aquaculture-zones</i>			Where	When	Cost	Whom
	Activity	Description	Output				
1.	Establish high priority aquaculture zones	<p>j) Provide/allocate at least 5% of irrigation sites for aquaculture development</p> <p>a) Technical /Consultancy Services for inventory and assessing feasibility of aquaculture related facilities</p> <p>b) Services and works for rehabilitation of existing aquaculture facilities at irrigation sites</p> <p>c) Goods services and works for sinking cages in existing facilities at irrigable sites considered suitable for doing so</p>	<p>1) At least 5% of irrigation site water and land resources allocated for use in aquaculture business development</p> <p>2) More resources available for aquaculture development</p>	a) Areas in Ghana, already demarcated and mapped by the Irrigation Development Authority as having high irrigation potential	2012	<p>20,000</p> <p>350,000</p> <p>350,000</p>	<p>Fisheries Commission, Irrigation Development Authority</p> <p>Water Resources Commission,</p> <p>Water Research Institute,</p> <p>Volta River Authority,</p> <p>Ministry of Lands and Forestry,</p> <p>Environmental Protection Agency,</p> <p>Metropolitan, Municipal, and District Assemblies and Traditional Authorities in the nation's irrigable area</p>

Ghana National Aquaculture Development Plan

		d) Technical/ consultancy services establishing production and management systems for facilities at irrigable sites to operate under PPP arrangement	<p>3) Technical/ consultancy services procured for establishing production and management systems for aquaculture facilities at irrigable sites to operate under PPP arrangement</p> <p>4) Management systems for facilities at irrigable sites developed to operate under a PPP arrangement</p>			400,000	
		i) Develop a national aquaculture suitability map and prioritize high potential aquaculture zones (land and water space) by species, culture and market potential (including irrigation sites allocated for aquaculture) development, using remote sensing and geographical information systems	<p>5) High priority aquaculture- zones (land and water space) identified, mapped and demarcated</p> <p>6) Fish farm production systems are easily matched with most suitable sites</p>	<p>a) Mainly along the Lake Volta and Lower Volta Basin, and where there are high concentrations of human populations that provide direct and effective demand for fish uptake</p> <p>b) Areas in Ghana, where soil structures, topography, and climatic conditions provide suitable environments for aquaculture and where high rates of successful aquaculture enterprises are already located</p>	2012	200,000	<p>Fisheries Commission, Water Resources Commission,</p> <p>Aquaculture Research and Development Center (ARDEC) of the Water Research Institute</p> <p>Ministry of Tourism; Ministry of Lands and Forestry; Volta River Authority; Environmental Protection Agency; and Ministry of Transport; and Metropolitan, Municipal, and District Assemblies and Traditional Authorities in the areas being demarcated</p>

Ghana National Aquaculture Development Plan

		ii) Procure technical assistance on legislation to secure property rights of existing and future aquaculture entrepreneurs	<p>7) Technical assistance procured on legislation to secure property rights of existing and future aquaculture entrepreneurs</p> <p>8) Appropriate legislation formulated and promulgated on legislation to secure property rights of existing and future aquaculture entrepreneurs</p>			20,000	
		iii) Provide technical assistance to fish farmers, hatchery operators, and grow-out operators and their associations, in land and water site selection for aquaculture development, in high priority aquaculture-zones	<p>9) Technical assistance provided to fish farmers, hatchery operators, and grow-out operators and their associations, in land and water site selection for aquaculture development, in high priority aquaculture-zones</p> <p>10) Aquaculture-entrepreneurs are more able to select most suitable sites for their chosen production systems.</p>	a) High priority aquaculture-zones	2013 to 2016	400,000	<p>Fisheries Commission</p> <p>Aquaculture Research and Development Center (ARDEC) of the Water Research Institute</p> <p>Water Resources Commission</p> <p>Environmental Protection Agency</p>
		iv) Provide technical and administrative assistance for acquisition of sites, enclaves (land and water space) for use by members of aquaculture-associations, in priority aquaculture-zones	<p>11) Sites, enclaves (land and water space) acquired by aqua –associations for use by aquaculture-entrepreneurs in high priority aquaculture-zones</p> <p>12) Land and water aquaculture-resources more easily accessible to existing and start-up aquaculture investors in high priority aquaculture-zones</p>	a) High priority aquaculture-zones	2013 to 2016	400,000	<p>National aquaculture-umbrella association</p> <p>Area/Local aquaculture associations</p> <p>Individual aquaculture entrepreneurs</p> <p>Fisheries Commission</p>

Ghana National Aquaculture Development Plan

		v) Acquire sites, enclaves (land and water space) for use by members of aquaculture-associations, in priority aquaculture-zones	<p>11) Sites, enclaves (land and water space) acquired by aqua –associations for use by aquaculture-entrepreneurs in high priority aquaculture-zones</p> <p>12) Land and water aquaculture-resources more easily accessible to existing and start-up aquaculture investors in high priority aquaculture-zones</p>	a) High priority aquaculture-zones	2013 to 2016	3,000,000	
2.	Promote increased private investments into establishment of new fish farm, fish seed, and aquaculture-logistics enterprises in high priority aquaculture-zones	i) Prepare national aquaculture guidelines and regulations for private investments into production/supply of quality fish feed, fries, fingerlings aquaculture-logistics and farmed fish products	<p>13) Appropriate guidelines and regulations established for private production/supply of quality fries, fingerlings, aquaculture-logistics and farmed fish products;</p> <p>14) Quality of aqua - products improved;</p> <p>15) Increased confidence in Ghana’s aquaculture-products</p>	a) Accra	2012	60,000	<p>Fisheries Commission</p> <p>Ministry of Justice and Attorney General’s Department</p>
		ii) Organize at least one aquaculture-sensitization workshop for not less than 40 existing aquaculture-entrepreneurs and potential investors, annually for 2 years, about investment opportunities, guidelines and regulations related to the establishment of private fish feed enterprises; fish hatcheries; fingerling	<p>16) At least one aquaculture-sensitization workshop, organized for not less than 40 existing input suppliers, fish farmers and potential investors annually for 2 years, about investment opportunities, guidelines and regulations related to the establishment of private fish feed enterprises; fish hatcheries; fingerling production/supply nurseries/enterprises; and aquaculture-logistics production/supply enterprises.</p> <p>17) Potential investors and existing aquaculture-entrepreneurs enabled to make informed business decisions about investing in fish feed, hatcheries, nurseries/fingerling</p>	a) Accra	2013 and 2015	100,000	<p>Fisheries Commission</p> <p>Ghana Investment Promotion Center</p>

Ghana National Aquaculture Development Plan

		production/supply nurseries; grow-out and aquaculture logistics supply enterprises	production, grow-out, or aquaculture-logistics 18) Potential Aquaculture-investors sensitized about investment opportunities, standards, regulations and policies on establishment of private fish feed enterprises;, fish hatcheries; fingerling production/supply nurseries/enterprises; and aquaculture-logistics enterprises production/supply enterprises 19) Aquaculture-input supplies increased by 1000%				
		iii) Work on legislation to harmonize and reduce the cost of permits for entry into and remaining in the aquaculture value chain.	20) Stakeholder consultations on aquaculture permit harmonization and cost reduction organized 21) Legislation on aquaculture permit harmonization and cost reduction drafted and enacted	Accra	2013	40,000	Fisheries Commission Water Resources Commission, Environmental Protection Agency, Vertinary Services Department, Food and Drugs Board Ghana Investment Promotion Center Ministry of Justice and Attorney General's Department
		iv) Launch the GNADP to attract investor, donor and public attention	22) GNADP launched 23) Investor, donor and public attention attracted to the aquaculture industry	Accra	2013	20,000	Fisheries Commission

Ghana National Aquaculture Development Plan

3.	Facilitate increased supply of high quality fish feed by the private sector to fish farmers in high priority aquaculture-zones	i) Adopt , adapt and further equip part of the laboratory facilities of the Animal Production Directorate of the Ministry of Food and Agriculture for testing of fish feed for quality assurance and certification of fish feed supply/production enterprises	<p>22) One laboratory of the Animal Production Directorate of the Ministry of Food and Agriculture adopted, adapted and further equipped for testing fish feed supplies to fish farm enterprises, for the purposes of quality assurance and certification</p> <p>23) Quality of fish feed supplied for uptake and use by fish farmers assured</p>	Accra	2012	150,000	<p>Fisheries Commission</p> <p>Animal Production Directorate</p>
		ii) Conduct research into the feasibility of use of using local ingredients in the commercial production of fish feed for use in the production of Tilapia and Catfish, under pond and cage culture in high priority aquaculture-zones	<p>24) Research conducted into the feasibility of use of local ingredients in the commercial production of fish feed for use in the production of Tilapia and Catfish, under pond and cage culture in high priority aquaculture-zones</p> <p>25) Feasibility of use of local ingredients in the commercial production of fish feed for use in the production of Tilapia and Catfish, under pond and cage culture in high priority aquaculture-zones assessed</p>	Accra High priority aquaculture-zones	2015 to 2016	400,000	<p>Fisheries Commission</p> <p>Animal Production Directorate</p> <p>Aquaculture Research and Development Center (ARDEC) of the Water Research Institute</p>
		iii) Design, establish and operate permit system for the certification of existing fish feed enterprises and certification of start-up fish-feed	<p>26) Permit system for the certification of existing fish feed enterprises and permitting start-up of fish-feed production/supply enterprises designed and established</p> <p>27) Fish feed supply to fish farmers regulated</p>	Accra	2012	30,000	<p>Fisheries Commission</p> <p>Ministry of Justice and Attorney General's Department</p>

Ghana National Aquaculture Development Plan

		production/supply enterprises					
		iv) Provide technical and administrative assistance for at least 5 fish feed supply or production firms to expand existing enterprises, establish new enterprises and/or locate in high priority aquaculture-zones	<p>28) Technical and administrative assistance for provided for at least 5 fish feed supply or production firms, to expand existing enterprises, establish new enterprises and/or locate in high priority aquaculture-zones</p> <p>29) Investors /entrepreneurs in fish feed supply assisted to establish expand or locate in high priority aquaculture –zones</p>	a) High priority aquaculture-zones	2012 and 2013	50,000	<p>Fisheries Commission</p> <p>Aquaculture Research and Development Center (ARDEC) of the Water Research Institute</p> <p>Private consultancy service providers</p>
		v) Organize at least one workshop for not less than 40 potential investors and representatives of aquaculture-associations and staff of commercial fish feed production enterprises to disseminate findings of research into the use of local ingredients in fish feed production	<p>30) At least one dissemination workshop organized on the feasibility assessment of use of local ingredients in fish feed production for not less than 40 potential investors and representatives of aquaculture-associations and staff of commercial fish feed production enterprises</p> <p>31) Potential investors, commercial fish farmers and fish seed producers and commercial fish feed producers gain awareness about and take informed business decisions on investing in production and/or use of local ingredient-based aquaculture-feed</p>	Accra	2016	50,000	<p>Fisheries Commission</p> <p>Animal Production Directorate</p> <p>Aquaculture Research and Development Center (ARDEC) of the Water Research Institute</p>

Ghana National Aquaculture Development Plan

		vi) Set up at least 2 private, large-scale commercial fish-feed production units, in high priority aquaculture-zones, according to set guidelines and regulations	<p>32) At least 2 private, large-scale commercial fish-feed production units, established in high priority aquaculture-zones, according to set standards and regulations</p> <p>33) Fish-feed availability, accessibility and costs improve in high priority aquaculture-zones due to increased supply and competition</p>	a) High priority aquaculture-zones	2013	5,000,000	<p>Fisheries Commission</p> <p>Private Investors including local and international banks and existing aquaculture business entrepreneurs</p>
4.	Facilitate increased supply of high quality fish seed by the private sector to fish farmers in high priority aquaculture-zones	i) Set up at least 2 private, large scale commercial hatcheries, in high priority aquaculture-zones, according to set guidelines and regulations;	<p>34) At least 2 private, large scale commercial hatcheries, in high priority aquaculture-zones established, according to set guidelines and regulations</p> <p>35) Supplies of high quality fries to fish farmers in high priority aquaculture-zones increased by up to 1000%</p>	a) High priority aquaculture-zones	2013	400,000	<p>Fisheries Commission</p> <p>Private Investors including local and international banks and existing aquaculture business entrepreneurs</p>
		ii) Set up at least 2 private, large scale, commercial grow-out enterprises, in high priority aquaculture-zones, according to set guidelines and regulations	<p>36) At least 2 private, large scale, commercial grow-out enterprises, established in high priority aquaculture-zones, according to set guidelines and regulations</p> <p>37) Supplies of high quality fish to fish farmers in high priority aquaculture-zones for fattening increased by 1000%</p>	a) High priority aquaculture-zones	2013	5,000,000	<p>Fisheries Commission</p> <p>Private Investors including local and international banks and existing aquaculture business entrepreneurs</p> <p>Ghana Investment Promotion Center</p>

Ghana National Aquaculture Development Plan

		<p>iii) Adopt, adapt and further equip part of the laboratory facilities of the Water Research Institute for testing and quality assuring and fries and fingerlings and certifying and regulating fish seed producing enterprises</p>	<p>38) Part of the laboratory facilities of the Water Research Institute adopted, adapted and further equipped for testing and quality assuring fish seed and certifying and regulating fish seed producing enterprises</p> <p>39) National institutional capacity for testing and certifying and regulating fish seed enhanced</p>	a) Akosombo	2012	300,000	<p>Fisheries Commission</p> <p>Aquaculture Research and Development Center (ARDEC) of the Water Research Institute</p>
		<p>iv) Build upon the TIVO project by importing GIFT improved Tilapia strain, to further improve genetic quality of Tilapia fingerlings and brood stock; and also develop improved strains of Catfish</p>	<p>40) GIFT improved Tilapia strain imported to improve genetic quality of Tilapia fingerlings and brood stock</p> <p>41) Genetic quality of Tilapia fingerlings and brood stock further improved for enhanced productivity and profitability</p> <p>42) Improved strains of Catfish developed</p>	a) Akosombo	2012 to 2016	1000,000	<p>Fisheries Commission</p> <p>Aquaculture Research and Development Center (ARDEC) of the Water Research Institute</p>

Ghana National Aquaculture Development Plan

		v)Organize at least one dissemination workshop for not less than 50 representatives of fish farmers, hatchery operators, nursery operators/ fingerling producers and grow-out enterprises on new improvements in the genetic quality of Tilapia and catfish brood stocks	<p>43) At least one dissemination workshop organized for 50 representatives of fish farmers', hatchery operators, nursery operators/ fingerling producers and grow-out enterprises on new improvements in the genetic quality of Tilapia brood stock</p> <p>44) Fish farmers' nursery operators/ fingerling producers and grow-out enterprises make informed business decision on adopting further developed brood stock of Tilapia</p>	Accra	2016	50,000	<p>Fisheries Commission</p> <p>Aquaculture Research and Development Center (ARDEC) of the Water Research Institute</p>
		vi) Organize at least two training workshops to equip not less than 80 staff of fish farm, hatcheries and grow-out enterprises with skills for managing newly developed stocks of Tilapia and Catfish	<p>45) At least 2 training workshops organized, to equip not less than 80 staff of fish farm, nursery/ grow-out enterprises with skills for managing newly developed stocks of Tilapia</p> <p>46) Fish farm, nursery, grow-out enterprises develop the capability to manage newly developed stocks of Tilapia for enhanced productivity, profitability and competitiveness of the entire aquaculture business value chain</p>	Accra	2016	50,000	<p>Fisheries Commission</p> <p>Research and Development Center (ARDEC) of the Water Research Institute</p>
		vii) Design and establish permit system to certify existing hatcheries and grow-out enterprises and allow and establishment of start-up enterprises of these, with provision for renewal	<p>47) Permit system designed and established, for certification of existing hatcheries, nurseries/grow-out enterprises and permission of start-up enterprises</p> <p>48) Fish seed supply industry regulated</p>	a) Accra	2012	30,000	<p>Fisheries Commission</p> <p>Ministry of Justice and Attorney General's Department</p>

Ghana National Aquaculture Development Plan

		viii) Provide technical and administrative assistance for at least 5 existing fish hatcheries and/or start-up investors in the hatchery and grow out industries to expand existing enterprises, establish new enterprises and/or locate in high priority aquaculture-zones	<p>49) Technical and administrative assistance provided for at least 5 existing and/or start-up investors in the hatchery business, to expand existing enterprises, establish new enterprises and/or locate in high priority aquaculture-zones</p> <p>50) Existing fish hatcheries and/or start-up investors in the hatchery industry easily expand, establish and/or locate in high priority aquaculture-zones successfully</p>	<p>a) Accra</p> <p>b) High priority aquaculture-zones</p>	2012	50,000	<p>Fisheries Commission</p> <p>Research and Development Center (ARDEC) of the Water Research Institute</p>
5.	Facilitate increased supply of high quality aquaculture-logistics by the private sector to fish farmers in high priority aquaculture-zones	i) Set up at least 2 private, one stop, large scale, commercial aquaculture-logistics supply enterprises in high priority aquaculture zones, according to set guidelines and regulations	<p>51) At least 2 private, one stop, large scale, commercial aquaculture-logistics supply enterprises established in high priority aquaculture-zones, according to set guidelines and regulations</p> <p>52) High quality aquaculture-logistics supplies to high priority aquaculture-zones increased by up to 1000%</p> <p>53) Costs of high quality aquaculture-logistics purchased and used by aquaculture-entrepreneurs in high priority aquaculture-zones, become more competitive due to increased supply and competition</p>	a) High priority aquaculture-zones	2013	4,000,000	<p>Private Investors including local and international banks and existing aquaculture-entrepreneurs</p> <p>Fisheries Commission</p> <p>Ghana Investment Promotion Center</p>

Ghana National Aquaculture Development Plan

		ii) Provide technical and administrative assistance for at least 5 aquaculture-logistics firms to expand existing enterprises, establish new enterprises and/or locate in high priority aquaculture-zones	<p>54) Technical and administrative assistance provided for at least 5 aquaculture-logistics supply firms and investors to expand existing enterprises, establish new enterprises and/or locate in high priority aquaculture-zones</p> <p>55) Supplies of high quality aquaculture-logistics to fish farmers in high priority aquaculture-zones increased by up to 1000%</p>	<p>a) Accra</p> <p>b) High priority aquaculture-zones</p>	2012	100,000	<p>Fisheries Commission</p> <p>Private consultancy service providers</p>
		iii) Design and establish permit system for certifying existing aquaculture-logistics firms and for permitting establishment of new ones in high priority aquaculture-zones	<p>56) Permit system designed and established for certifying existing aquaculture-logistics firms and for permitting establishment of new ones in high priority aquaculture-zones</p> <p>57) Aquaculture-logistics supplies regulated</p>	a) Accra	2012	30,000	<p>Fisheries Commission</p> <p>Ministry of Justice and Attorney General's Department</p>
6.	Assist more fish farmers to access funds more easily on competitive terms for investment in aquaculture business	i) Procure technical assistance for the design of a dedicated fund and a national subsidy for aquaculture business	<p>58) Technical assistance procured and dedicated fund and a national subsidy for aquaculture business designed</p> <p>59) Dedicated fund for aquaculture business and a national special subsidy for aquaculture business well designed</p>	a) Accra	2012	25,000	<p>Fisheries Commission</p> <p>Private consultancy service providers</p>

Ghana National Aquaculture Development Plan

		<p>ii) Establish and operate dedicated fund for aquaculture business for the benefit of up to 500 small and medium, cage and pond culture commercial aquaculture-enterprises, located in high priority aquaculture-zones</p>	<p>60) Dedicated fund for aquaculture business established and operated</p> <p>61) Up to 500 small and medium, cage and pond culture, commercial aquaculture-enterprises, located in high priority aquaculture-zones, more easily access investment funds on more competitive terms</p>	<p>a) Accra</p> <p>b) High priority aquaculture-zones</p>	2015	25,000,000	<p>Fisheries Commission</p> <p>National or international commercial bank with sufficient outreach in identified high priority aquaculture-zones</p>
		<p>iii) Establish and operate special subsidy for the benefit of up to 500, small and medium, cage and pond culture, commercial fish farmers, located in high priority aquaculture-zones</p>	<p>62) Special subsidy established and operated;</p> <p>63) Up to 500, small and medium, cage and pond culture, commercial aquaculture-enterprises, located in high priority aquaculture-zones benefit from subsidized aquaculture-inputs</p> <p>64) Farmed fish products sell at more competitive prices</p> <p>65) Small and medium, cage and pond culture, commercial aquaculture-enterprises, located in high priority aquaculture-zones gain competitive advantage relative to capture fisheries and imported fish products</p>	<p>a) Accra</p> <p>b) High priority aquaculture-zones</p>	2015	5,000,000	<p>Fisheries Commission</p> <p>Ministry of Food and Agriculture</p>

Ghana National Aquaculture Development Plan

7.	Explore the feasibility of aquaculture business in new/other species and environments with perceived aquaculture potential	i) Conduct research into the technical and economic feasibility of mariculture of anchovies as baits for Tuna fishing; shrimp and grey mullet culture and identify suitable areas in Ghana's continental shelf for the development of this industry	<p>66) Research conducted into the technical and economic feasibility of mariculture of anchovies in Ghana's continental shelf</p> <p>67) Basis for expanding Ghana's aqua - business into mariculture of anchovies in Ghana's continental shelf established</p>	b) The continental shelf of Ghana's marine waters	2014 to 2015	3000,000	<p>Fisheries Commission</p> <p>University of Ghana/Department of Oceanography</p>
		ii) Conduct research into the technical and economic feasibility of clam culture in the Lower Volta Basin	<p>68) Research conducted into the technical and economic feasibility of clam culture in the Lower Volta Basin</p> <p>69) Basis for expanding Ghana's aqua - business into clam culture established for potential development and investment</p>	a) The Lower Volta Basin	2014 to 2015	200,000	<p>Fisheries Commission</p> <p>Research and Development Center (ARDEC) of the Water Research Institute</p>
		iii) Conduct research into the aquaculture business potential of Ghana's small water bodies (Lake Bosumtwi, Weija Lake etc)	<p>70) Research conducted into the aquaculture business potential of Ghana's small water bodies (Lake Bosumtwi, Weija Lake etc)</p> <p>71) Aquaculture business potential of Ghana's small water bodies (Lake Bosumtwi, Weija Lake etc) scientifically and economically assessed</p>	a) All fresh water bodies comprising major rivers and lakes in Ghana (Pra, Densu, Oti etc) apart from the Volta.	2014	200,000	<p>Fisheries Commission</p> <p>Research and Development Center (ARDEC) of the Water Research Institute</p>
		iv) Conduct research into the technical and economic feasibility of shrimp culture in the estuary of the Lower Volta Basin	<p>72) Research conducted into the technical and economic feasibility of shrimp culture in the estuary of the Lower Volta Basin</p> <p>73) Basis for expanding Ghana's aqua - business into shrimp culture in the Lower Volta Basin established for potential development and investment</p>	a) The estuary of the Lower Volta Basin	2015 - 2016	200,000	<p>Fisheries Commission</p> <p>University of Cape Coast</p>

Ghana National Aquaculture Development Plan

		v) Conduct research into the aquaculture business potential of Ghana's lagoons	<p>74) Aquaculture business potential of Ghana's lagoons scientifically and economically assessed</p> <p>75) Basis for exploiting Ghana's lagoon resources for aquaculture business established for development and investment</p>	a) All lagoons in Ghana	2013	200,000	<p>Fisheries Commission</p> <p>University of Cape Coast</p>
		v) Conduct research into the aquaculture business potential of the Bui-Dam	<p>76) Research conducted into the aquaculture business potential of the Bui-Dam</p> <p>77) Aquaculture business potential of the Bui-Dam assessed</p>	<p>a) Accra;</p> <p>b) Bui-Dam catchment area</p>	2012	200,000	<p>Food and Agriculture Organization of the United Nations</p> <p>Kwame Nkrumah University of Science and Technology;</p> <p>University of Development Studies</p>
		vi) Organize at least one dissemination workshop for not less than 40 potential investors and representatives of aquaculture-associations on the technical and economic feasibility of shrimp culture in the estuaries of the Lower Volta Basin	<p>78) At least one dissemination workshop organized for not less than 40 potential investors and representatives of aquaculture-associations on the technical and economic feasibility of shrimp culture in the estuary of the Lower Volta Basin</p> <p>79) Potential investors and members of aquaculture-associations sensitized and enabled to make informed investment decisions on undertaking shrimp culture in the estuaries of the Lower Volta Basin</p>	a) Accra	2015	50,000	<p>Fisheries Commission</p> <p>University of Cape Coast</p>

Ghana National Aquaculture Development Plan

		<p>vii) Organize at least one dissemination workshop for not less than 40 potential investors and representatives of aquaculture-associations on the technical and economic feasibility of clam culture in the Lower Volta Basin</p>	<p>80) At least one dissemination workshop organized for not less than 40 potential investors and representatives of aquaculture-associations on the technical and economic feasibility of clam culture in the Lower Volta Basin</p> <p>81) Potential investors and members of aquaculture-associations sensitized and enabled to make informed investment decisions on undertaking clam culture in the Lower Volta Basin</p>	<p>a) Accra</p>	<p>2015</p>	<p>50,000</p>	<p>Fisheries Commission</p> <p>Research and Development Center (ARDEC) of the Water Research Institute</p>
		<p>viii) Organize at least one dissemination workshop for not less than 40 potential investors, representatives of aquaculture-associations and representatives of the Ghana Tuna Association (GTA) on the technical and economic feasibility of mariculture of anchovies as baits for Tuna fishing and suitable areas in Ghana's continental shelf for the development of this industry</p>	<p>82) At least one dissemination workshop organized for not less than 40 potential investors, representatives of aquaculture-associations and representatives of the Ghana Tuna Association (GTA) on the technical and economic feasibility of producing anchovies as baits for Tuna fishing</p> <p>83) Potential investors, members of aquaculture-associations and Ghana Tuna Association (GTA) sensitized and enabled to make informed investment decisions on undertaking mariculture of anchovies as baits for Tuna fishing</p>	<p>Accra</p>	<p>2015</p>	<p>50,000</p>	<p>Fisheries Commission</p> <p>University of Ghana's Department of Oceanography,</p>

Ghana National Aquaculture Development Plan

		ix) Organize at least one dissemination workshop for not less than 40 potential investors and representatives of aquaculture-associations on the aquaculture business potential of Ghana's lagoons	<p>84) One dissemination workshop organized for 40 potential investors and representatives of aquaculture-associations on the aquaculture business potential of Ghana's lagoons</p> <p>85) Potential investors and members of aquaculture-associations sensitized and enabled to make informed investment decisions on undertaking aquaculture business in Ghana's lagoons</p>	a) Accra	2014	50,000	<p>Fisheries Commission</p> <p>University of Cape - Coast</p>
		x) Organize at least one dissemination workshop for not less than 40 potential investors and representatives of aquaculture-associations on the aquaculture business potential of Ghana's small water bodies (Lake Bosumtwi, Weija Lake etc)	<p>86) At least one dissemination workshop organized for not less than 40 potential investors and representatives of aquaculture-associations on the aquaculture business potential of Ghana's small water bodies (Lake Bosumtwi, Weija Lake etc)</p> <p>87) Potential investors and members of aquaculture-associations sensitized and enabled to make informed investment decisions on undertaking aquaculture business</p>	a) Accra	2014	50,000	<p>Fisheries Commission</p> <p>Research and Development Center (ARDEC) of the Water Research Institute</p>

Ghana National Aquaculture Development Plan

Result 2 - Increased quantities of high quality commercial farmed fish products produced in high priority aquaculture-zones, sold at more competitive prices				Implementation			
	Activity	Description	Output	Where	When	Cost	Whom
1.	Establish appropriate farmed fish value addition and marketing infrastructure in high priority aquaculture-zones	i) Procure technical assistance for and conduct needs and feasibility assessment for the provision of value addition and market infrastructure in all identified high priority aqua zones	<p>88) Needs and feasibility assessment conducted for the provision of value addition and market infrastructure in all identified high priority aqua zones</p> <p>89) Specific value addition and market infrastructure needs of high priority aquaculture-zones determined</p> <p>90) Feasibility of the provision of value addition and market infrastructure in all identified high priority aqua zones determined</p>	a) High priority aqua zones	2012	120,000	<p>Fisheries Commission</p> <p>Local or international consultancy firms</p>
		ii) Organize at least one sensitization workshop for not less than 20 relevant staff of infrastructure provision and related investor institutions on public and private investment opportunities and options for the supply of value addition and market infrastructure and services to aquaculture-enterprises in high priority aquaculture-zones	<p>91) At least 20 relevant staff of public and private infrastructure provision institutions sensitized on investment opportunities and options for the supply of value addition and market infrastructure and services to aquaculture-enterprises in high priority aquaculture-zones</p> <p>92) Identified, relevant public and private infrastructure development institutions make informed investment decisions on undertaking value addition and marketing infrastructure provision in high priority aqua – zones</p>	Accra	2012	50,000	<p>Fisheries Commission</p> <p>Ghana Investment Promotion Center</p> <p>Volta River Authority,</p> <p>Ministry of Roads and Highways,</p> <p>Ministry of Trade and Industry,</p>

Ghana National Aquaculture Development Plan

							<p>Volta River Authority,</p> <p>Electricity Company of Ghana,</p> <p>GRIDCO,</p> <p>Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones,</p> <p>Ministry of Water Resources, Works and Housing,</p> <p>Ghana Water Company;</p> <p>Private Telecommunication companies,</p> <p>Commercial Banks</p>
		<p>iii) Provide up to 200 km of year-round motorable road infrastructure in high priority aquaculture-zones lacking such infrastructure</p>	<p>93) Up to 200 km of year-round motorable road infrastructure provided in high priority aquaculture-zones lacking such infrastructure</p> <p>94) Fish farmers in high priority aquaculture-zones access adequate road infrastructure for effective marketing of farmed fish products</p>	<p>a) High priority aquaculture-zones lacking motorable roads</p>	<p>2013 to 2015</p>	<p>3000,000</p>	<p>Fisheries Commission</p> <p>Ministry of Roads and Highways</p> <p>Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones,</p>

Ghana National Aquaculture Development Plan

		iv) Provide up to 10 water treatment and pumping stations and up to 100 km of water supply pipelines in high priority aquaculture-zones lacking clean water supply services	<p>95) Up to 10 water treatment and pumping stations and up to 100 km of water supply pipelines provided in high priority aquaculture-zones lacking clean water supply</p> <p>96) Fish farmers in high priority aquaculture-zones access sufficient supply of clean water for value addition to farmed fish products</p>	a) High priority aquaculture-zones lacking potable water infrastructure and services	2013 to 2014	2,500,000	<p>Fisheries Commission</p> <p>Ministry of Water Resources, Works and Housing</p> <p>Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones,</p>
		v) Extend up to 100 km of high-tension electricity lines through high priority aquaculture-zones lacking electricity supply services	<p>97) Up to 100 km of high-tension electricity lines extended through high priority aquaculture-zones lacking electricity supply services</p> <p>98) Fish farmers in high priority aquaculture-zones access adequate supply of electricity to facilitate value addition to farmed fish products</p>	a) High priority aquaculture-zones lacking electricity infrastructure and services	2013 to 2014	3,000,000	<p>Fisheries Commission</p> <p>Ministry of Energy</p> <p>Volta River Authority,</p> <p>Electricity Company of Ghana,</p> <p>GRIDCO,</p> <p>Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones</p>

Ghana National Aquaculture Development Plan

		vi) Provide up to 10 information communication technology (ICT) masts in high priority aquaculture-zones lacking ICT infrastructure	<p>99) Up to 10 information, communication technology (ICT) masts provided in high priority aquaculture-zones lacking ICT infrastructure</p> <p>100) Fish farmers in high priority aquaculture-zones have improved access to aquaculture-development and fish market/price information</p> <p>101) Fish farmers in high priority aquaculture-zones link up more effectively with buyers</p>	a) High priority aquaculture-zones lacking ICT infrastructure and services	2013-2014	162,500	<p>Fisheries Commission</p> <p>Ministry of Communications</p> <p>Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones,</p>
		vii) Provide up to 10 fish market centers in high priority aquaculture-zones lacking such centers, and equip these with water and sanitation facilities,	<p>102) Up to 10 Fish market centers provided in high priority aquaculture-zones and equipped with water and sanitation facilities;</p> <p>103) Fish farmers in high priority aquaculture-zones, market farmed fish products more easily and in a more appropriate environment in which buyers may be more willing to pay more competitive prices</p>	a) High priority aquaculture-zones lacking fish market centers equipped with water and sanitation facilities	2014 to 2016	1,000,000	<p>Ministry of Local Government</p> <p>Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones,</p>
		viii) Provide cold storage services (including cold storage facilities and vans) according to set guidelines and regulations, for at least 10 farmed fish marketing centers in high priority aquaculture-zones	<p>104) Cold storage services (including cold storage facilities and vans), provided at 10 farmed fish marketing centers, in high priority aquaculture-zones according to set guidelines and regulations</p> <p>105) Post-harvest losses of farmed fish products, in high priority aquaculture-zones, minimized</p>	a) High priority aquaculture-zones lacking access to cold storage facilities and services	2014 to 2016	1,000,000	<p>Fisheries Commission</p> <p>Private entrepreneurs already providing cold storage services in Ghana or elsewhere and private investors including local and international bank</p> <p>Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones,</p>

Ghana National Aquaculture Development Plan

		ix) Organize at least 2 training workshops to the benefit of not less than 50 Staff of Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones, in fish marketing center management	<p>106) At least 2 training workshops organized for 50 Staff of Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones</p> <p>107) At least 50 Staff of Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones acquire the needed knowledge and skills for the effective management of fish marketing centers in those areas</p> <p>108) Fish marketing centers in high priority aquaculture-zones are more professionally manage</p>	a) National political and administrative areas/districts, located in high priority aquaculture-zones	2015	100,000	<p>Fisheries Commission</p> <p>Institute of Local Government Studies</p>
2.	Strengthen the capacity of fish farmers to add value to and market farmed fish more competitively	i) Conduct research into and assess the feasibility of developing new farmed fish market – products for Tilapia and Catfish, targeted at high value market niches	<p>109) Research and feasibility assessment conducted into developing new farmed fish market – products for Tilapia and Catfish, targeted at high value market niches</p> <p>110) New farmed fish market – products developed for Tilapia and Catfish, targeted at high value market niches</p>	a) Accra b) High priority aquaculture-zones	2013 to 2014	100,000	<p>Fisheries Commission</p> <p>Food Research Institute</p>

Ghana National Aquaculture Development Plan

		<p>ii) Organize at least 10 sensitization workshops for not less than 500 participants comprising fish processors and cage and pond culture, commercial, small, medium, large scale fish farm enterprises, located in high priority aquaculture-zones, on feasible value addition and marketing options for farmed fish products</p>	<p>111) At least 10 sensitization workshops organized for 500 participants, comprising fish processors and cage and pond culture, commercial, small, medium, large scale fish farm enterprises, located in high priority aquaculture-zones on viable value addition and marketing options for farmed fish products</p> <p>112) Fish processors and cage and pond culture, commercial, small, medium, large scale fish farmers, located in high priority aquaculture-zones, sensitized and enabled to make informed investment decisions on undertaking value addition to marketing of farmed fish products</p>	<p>a) Accra</p> <p>b) High priority aquaculture-zones</p>	2015	300,000	<p>Fisheries Commission</p> <p>Food Research Institute</p>
		<p>iii) Organize at least 3 training workshops for not less than 90 staff of enterprises opting to invest in value addition to, and enhanced marketing of, farmed fish in high priority aquaculture-zones, to acquire skills and appropriate technologies in value addition and enhanced marketing of farmed fish products</p>	<p>113) 90 staff of enterprises opting to invest in value addition to and enhanced marketing of farmed fish in high priority aquaculture-zones trained</p> <p>114) 90 staff of enterprises opting to invest in value addition to and enhanced marketing of farmed fish in high priority aquaculture-zones acquire skills and appropriate technologies in value addition and enhanced marketing of farmed fish products</p> <p>115) Fish farm and fish processing entrepreneurs develop the potential to penetrate high value market niches</p>	<p>a) Accra</p> <p>b) High priority aquaculture-zones</p>	2015	300,000	<p>Fisheries Commission</p> <p>Food Research Institute</p>

Ghana National Aquaculture Development Plan

<i>Result 3 - Increased productivity and profitability of large, medium and small scale, existing and start-up, commercial fish farms in high priority aquaculture-zones and related aquaculture value chain enterprises</i>				Implementation			
No.	Activity	Description	Output	Where	When	Cost	Whom
1.	Supply increased numbers of appropriately skilled persons to be employed at the different levels of the aqua -business value chain on a sustained basis	i) Establish industry-oriented aqua degree programs at the University of Cape Coast, University of Science and Technology, University of Development Studies and University College of Education at Winneba	116) Industry-oriented aqua degree programs established in University of Cape Coast, Kwame Nkrumah University of Science and Technology, University of Development Studies and University College of Education at Winneba 117) Production of more aquaculture business professionals on a sustained basis assured	Cape Coast, Kumasi Tamale Winneba	2016	360,000	Fisheries Commission University of Cape Coast University of Science and Technology University of Development Studies University College of Education, Winneba
		ii) Conduct training needs assessment for, and review and update curriculums of Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges in aqua extension to holistically reflect scientific, business, environmental and social dimensions of aquaculture;	118) Training needs assessment of Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges conducted and their curriculums reviewed and updated; 119) Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges become more current in aquaculture-production and marketing knowledge, skills and technology; and more sensitive to productivity, profitability sustainability, and fish health and fish food safety issues	Ohawu, Kwadaso, Ejura, and Damongo	2013	120,000	Fisheries Commission University of Cape Coast

Ghana National Aquaculture Development Plan

		<p>iii) Organize at least 2 workshops for up to 20 staff of Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges to update their knowledge and skills for currency, effectiveness, technical and economic efficiency, as well as develop more sensitivity to productivity, profitability sustainability, and fish health and fish food safety issues</p>	<p>120) At least 2 retraining courses organized for 20 staff of Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges to update their knowledge and skills for currency, effectiveness, technical and economic efficiency, as well as develop more sensitivity to productivity, profitability sustainability, and fish health and fish food safety issues</p> <p>121) Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges become more current in aquaculture-production and marketing knowledge, skills and technology; and more sensitive to productivity, profitability sustainability, and fish health and fish food safety issues</p>	Accra	2013 to 2014	100,000	<p>Fisheries Commission</p> <p>University of Cape Coast</p>
		<p>iv) Procure ICT equipment including computers and establish aquaculture-related demonstration farms, and laboratories, for the Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges and Pong Tamale Animal Health and Production College</p>	<p>122) Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges equipped with demonstration farms, laboratories and ICT equipment including computers</p> <p>123) Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges better equipped for training aquaculture workers and extension officers</p>	Ohawu, Kwadaso, Ejura, and Damongo	2014 to 2015	500,000	<p>Fisheries Commission</p> <p>Ministry of Food and Agriculture</p> <p>Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges</p>

Ghana National Aquaculture Development Plan

		<p>v) Sponsor post graduate training for not less than 8 aquaculture graduates to man the Ohawu, Kwadaso, Ejura, and Damongo and agricultural colleges and Pong Tamale Animal Health and Production College, to facilitate the training of more workers in the aquaculture-value chain including aquaculture-extension agents</p>	<p>124) At least 8 more trainers of skilled aquaculture workers and extensionists produced for Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges</p> <p>125) Capacity of Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges for training more aquaculture-extensionists increases</p>	Cape Coast	2013	50,000	<p>Fisheries Commission</p> <p>Ministry of Food and Agriculture</p> <p>Ohawu, Kwadaso, Ejura, and Damongo agricultural colleges</p>
		<p>vi) Establish one new fisheries training institution at Anomabu to produce fisheries and aquaculture extensionists</p>	<p>126) One new fisheries training college established in the Lower Volta Basin, to produce fisheries and aquaculture extension agents</p> <p>127) Production of more aquaculture business extension agents on a sustained basis, assured</p>	Lower Volta Basin	2015 to 2016	3000,000	<p>Fisheries Commission</p> <p>Ministry of Food and Agriculture</p> <p>University of Cape - Coast</p> <p>Metropolitan, Municipal and District Assemblies in the Lower Volta Basin</p>

Ghana National Aquaculture Development Plan

		vii) Organize refresher courses for not less than 40 aquaculture extension agents of the Fisheries Commission and Non-Governmental Organizations to improve their currency, effectiveness and efficiency	<p>128) Extension needs assessment conducted</p> <p>129) Production of extension manuals;</p> <p>130) At least one refresher course organized for 40 aquaculture extension agents of the Fisheries Commission and Non-Governmental Organizations</p> <p>131) Existing aquaculture extension agents become more current in aquaculture-production and marketing knowledge, skills and technology; and more sensitive to productivity, profitability sustainability, and fish health and fish food safety issues</p>	a) Accra	2013	80,000	<p>Fisheries Commission</p> <p>Ministry of Food and Agriculture</p> <p>University of Cape - Coast</p> <p>Private fish farms</p>
		viii) Organize at least one training course for not less than 10 staff of 5 private fish feed supply/production firms to provide follow-up after sales extension services to fish farmers	<p>132) At least one training course organized for 10 staff of 5 private fish feed supply/production firms to provide follow-up after sales extension services to fish farmers</p> <p>133) More fish farmers reached with aquaculture-extension information regarding effective and efficient administration of fish feed</p>	Accra	2014	15,000	<p>Fisheries Commission</p> <p>University of Cape - Coast</p> <p>Private fish farms</p>
		ix) Organize at least one training course for not less than 15 staff private hatchery/ /grow-out enterprises to enable them to provide follow-up after sales extension services to fish farmers	<p>134) At least one training course organized for 15 staff of 5 private hatchery, 5 private nursery, and 5 private grow-out enterprises and fingerling producers to enable them provide follow-up after sales extension services to fish farmers</p> <p>135) More fish farmers reached with aquaculture-extension information regarding effective and efficient management of fish seed</p>	a) Accra	2014	30,000	<p>Fisheries Commission</p> <p>University of Cape - Coast</p> <p>Private fish farms</p>

Ghana National Aquaculture Development Plan

		x) Organize at least one training course for not less than 10 staff of private aquaculture-logistics supply firms to provide follow-up after sales extension services to fish farmers	<p>136) At least one training course for 10 staff of 5 private aquaculture-logistics supply firms to provide follow-up after sales extension services to fish farmers</p> <p>137) More fish farmers reached with aquaculture-extension information regarding effective and efficient use and management of different aquaculture-logistics</p>	Accra	2014	30,000	Fisheries Commission
		xi) Prepare and disseminate guidelines and regulations to guide and regulate private participation in aquaculture-extension	<p>138) Guidelines and regulations prepared to guide and regulate private participation in aquaculture-extension</p> <p>139) Quality of private aquaculture-extension services assured and regulated</p>	Accra	2012	37,000	Fisheries Commission Ministry of Justice and Attorney General's Department
2.	Strengthen the capacity of existing fish feed, fish seed and fish farm enterprises to manage their enterprises more professionally and produce and market their products more competitively	i) Organize at least one workshop for not less than 10 staff of private fish feed supply/production firms on productivity, profitability, quality assurance and sustainability enhancing management and technology – related issues.	<p>140) At least one workshop organized for not less than 10 staff of commercial fish feed producers on how to improve the performance of their feed production and supply enterprises</p> <p>141) Private commercial fish feed producers learn from each other about ways of improving their fish feed production and supply enterprises</p>	Accra	2012	30,000	Fisheries Commission Research and Development Center (ARDEC) of the Water Research Institute Institute of Management and Public Administration

Ghana National Aquaculture Development Plan

		<p>ii) Organize at least one workshop for not less than 15 staff of private fish hatchery and grow-out enterprises organized for not less than 15 staff of private fish hatchery, and grow-out enterprises to exchange experiences and ideas on productivity, profitability, quality assurance and sustainability enhancing management and technology – related issues.</p>	<p>142) At least one training course organized for not less than 15 staff of private fish hatchery and grow-out enterprises to exchange experiences and ideas on productivity, profitability, quality assurance and sustainability enhancing management and technology – related issues</p> <p>143) Private fish hatchery and grow-out enterprises learn from each other about ways of improving the performance of their fish seed production and supply enterprises</p>	Accra	2012	30,000	<p>Fisheries Commission</p> <p>Research and Development Center (ARDEC) of the Water Research Institute</p> <p>Institute of Management and Public Administration</p>
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Ghana National Aquaculture Development Plan

		<p>iii) Organize at least 10 training courses for not less than 500 staff of private, small scale commercial fish farm enterprises, on aquaculture business management including preparation of good business plans, credit negotiation, good financial practices; procurement and utilization of quality fish feed, fish seed and aquaculture-logistics, as well as current productivity and profitability enhancing technologies</p>	<p>144) At least 10 training courses organized for not less than 500 staff of private, small scale, commercial fish farm enterprises, on aquaculture business management</p> <p>145) Staff of private commercial fish farm enterprises, acquire more knowledge and improved skills on aquaculture business management including preparation of good business plans, credit negotiation, good financial practices; procurement and utilization of quality fish feed, fish seed and aquaculture-logistics, as well as current productivity and profitability enhancing technologies</p>	<p>a) Accra</p> <p>b) High priority aquaculture-zones</p>	2012	300,000	<p>Fisheries Commission</p> <p>Research and Development Center (ARDEC) of the Water Research Institute</p> <p>Institute of Management and Public Administration</p>
3.	<p>Strengthen the capacity of aqua associations to deliver improved services to and advocacy on behalf of member aqua-enterprises</p>	<p>i) Formulate and publish criteria and procedure for registration of aquaculture-associations on national aquaculture-website and in local newspapers</p>	<p>146) Criteria and procedure for registration of aquaculture-associations formulated and published on national aquaculture-website and local newspapers</p> <p>147) Aquaculture-associations sensitized to the need to formalize their existence with the Fisheries Commission by registration according to criteria and procedures disseminated through national aquaculture-website and local newspapers</p>	Accra	2012	10,000	Fisheries Commission
		<p>ii) Register and publicize list of recognized aqua – associations on national aquaculture-website and local newspapers</p>	<p>148) Aqua –associations registered and publicized on national aquaculture-website and in local newspapers</p> <p>149) Existing aquaculture-associations gain recognition from Fisheries Commission</p>	Accra	2012	20,000	Fisheries Commission

Ghana National Aquaculture Development Plan

		<p>iii) Organize at least 3 consultative workshops for not less than 90 participants from registered aquaculture-associations, on the formation of national umbrella aquaculture-association</p>	<p>150) At least 3 consultative workshops organized for a total of 90 participants from registered aquaculture-associations, on the formation of national umbrella aquaculture-association</p> <p>151) Registered aquaculture-associations participate in and take ownership of the formation of a national umbrella aquaculture-association</p>	High priority aquaculture-zones	2012	120,000	<p>Fisheries Commission</p> <p>National NGO /Ghana Aquaculture Association</p>
		<p>iv) Provide initial set-up - office space, furniture, ICT equipment and means of transport for national umbrella aquaculture-association (to be formed)</p>	<p>152) Initial set-up - office space, furniture, one computer and means of transport provided for national umbrella aquaculture-association</p> <p>153) Aquaculture-associations in Ghana gain voice with the Fisheries Commission and other public agencies</p>	Suitable location in high priority aquaculture-zones	2012	175,000	Fisheries Commission
		<p>vi) Organize at least 3 training workshops for 90 leaders of the national umbrella aquaculture-association and its member associations in group dynamics, leadership, communication and negotiation skills</p>	<p>154) At least 3 training workshops organized for 90 leaders of the national umbrella aquaculture-association and its member associations in group dynamics, leadership, communication and negotiation skills</p> <p>155) Capacity of national umbrella aquaculture-association and its member associations strengthened for more effective management of and services to their members</p>	High priority aquaculture-zones	2012	150,000	<p>Fisheries Commission</p> <p>National NGO /Ghana Aquaculture Association</p>

Ghana National Aquaculture Development Plan

		<p>vii) Provide national umbrella aquaculture-association with needed technical assistance to publish national quarterly aquaculture-newsletter</p>	<p>156) National umbrella aquaculture-association provided with needed technical assistance to publish national quarterly aquaculture-newsletter</p> <p>157) National umbrella aquaculture-association is more capable of producing a quality aquaculture-newsletter</p> <p>158) High quality national, quarterly, aqua newsletter published</p> <p>159) Information about events, developments activities and topical national issues related to aquaculture business development disseminated through aquaculture-newsletter on a quarterly basis</p> <p>160) Perception of aquaculture as a business among industry players improves</p>	<p>Accra</p> <p>High priority aquaculture-zones</p>	<p>2012</p>	<p>50,000</p>	<p>Fisheries Commission</p> <p>National umbrella aquaculture-association</p> <p>Ghana Institute of Journalism</p>
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Ghana National Aquaculture Development Plan

<i>Result 4 - Increased compliance of (large, medium and small scale, existing and start-up) commercial fish farms in high priority aquaculture-zones to national environmental, fish health and food safety guidelines and regulations</i>				Implementation			
	Activity	Description	Output	Where	When	Cost	Whom
1.	Strengthen the national capacity for ensuring the sustainable use of land and water resources in aquaculture-production	i) Conduct strategic environmental assessment for all identified high priority aquaculture-zones and formulate environmental safeguards for each zone	<p>161) Strategic environmental assessment conducted for all identified high priority aquaculture-zones</p> <p>162) Environmental issues related to each high priority aquaculture-zones identified</p> <p>163) Environmental safeguards formulated for each high priority aquaculture-zone</p>	High priority aquaculture-zones	2012	80,000	Fisheries Commission Environmental Protection Agency Research and Development Center (ARDEC) of the Water Research Institute
		ii) Provide technical assistance for at least 20 start-up small, medium and large fish farm enterprises in high priority aquaculture-zones, to conduct sustainability-related micro-environment studies during site selection	<p>164) Start-up small, medium and large, cage and pond, fish farm enterprises in high priority aquaculture-zones conduct micro-environment studies during site selection</p> <p>165) Micro-environmental issues associated with selected sites of each start-up small, medium and large, pond or cage fish farm enterprise and associated safeguards identified</p> <p>166) At least 20 start-up small, medium and large, cage and pond, fish farm enterprises manage their aquaculture-enterprises sustainably</p>	Accra High priority aquaculture-zones	2013 - 2016	60,000	Fisheries Commission Environmental Protection Agency Research and Development Center (ARDEC) of the Water Research Institute

Ghana National Aquaculture Development Plan

		<p>iii) Provide technical assistance for at least 6 start-up large scale hatcheries, grow-out enterprises, to conduct sustainability-related micro-environment feasibility studies during site selection</p>	<p>167) Technical assistance provided for at least 6 start-up large scale hatcheries and 2 start-up large scale grow-out enterprises, to conduct sustainability-related micro-environment feasibility studies during site selection</p> <p>168) Environmental safeguards identified for chosen sites of at least 2 start-up large scale nurseries/fingerling producers, and 2 start-up large scale grow-out enterprises,</p> <p>169) Start-up large scale nursery, and 2 grow-out enterprises, operate and manage their enterprises sustainably</p>	<p>Accra</p> <p>High priority aquaculture-zones</p>	<p>2013</p>	<p>60,000</p>	<p>Fisheries Commission</p> <p>Environmental Protection Agency</p> <p>Research and Development Center (ARDEC) of the Water Research Institute</p>
		<p>iv) Design, establish and operate environmental assessment permit system for existing and start-up fish farm/hatchery and grow-out enterprises in high priority aquaculture-zones</p>	<p>170) Environmental assessment permit system designed and established</p> <p>171) Compliance with national aquaculture business environmental guidelines and regulations, by existing and start-up fish farm/hatchery /nursery/ grow-out enterprises in high priority aquaculture-zones improves</p>	<p>Accra</p>	<p>2014</p>	<p>35,000</p>	<p>Fisheries Commission</p> <p>Environmental Protection Agency</p> <p>Ministry of Justice and Attorney General's Department</p>

Ghana National Aquaculture Development Plan

		<p>v) Organize at least 10 training workshops for not less than 400 staff of fish farm enterprises to enable them acquire the skills necessary for more effective compliance with national regulations regarding sustainable land and water resource use in fish farming</p>	<p>172) At least 10 training workshops organized for not less than 400 staff of fish farm enterprises to enable them acquire the skills necessary for effective compliance with national guidelines and regulations regarding sustainable land and water resource use in fish farming</p> <p>173) Fish farm enterprises more compliant with national guidelines and regulations regarding sustainable land and water resource use in fish farming</p>	High Priority aquaculture-zones	2014	140,000	<p>Fisheries Commission</p> <p>Environmental Protection Agency</p> <p>Research and Development Center (ARDEC) of the Water Research Institute</p>
		<p>vi) Establish at least 10 aquaculture-resource management committees in high priority aquaculture-zones as co-management structures to report non-compliance with guidelines and regulations on land and water resource use in high priority aquaculture-zones</p>	<p>174) At least 10 aquaculture-resource management committees established in high priority aquaculture-zones</p> <p>175) Aquaculture-resource management committees report non compliance with guidelines and regulations on land and water resource use in high priority aquaculture-zones</p>	High Priority aquaculture-zones	2014	100,000	<p>Fisheries Commission</p> <p>National NGO</p>

Ghana National Aquaculture Development Plan

		vii) Organize at least 4 training workshops for not less than 10 aquaculture-resource management committees in high priority aquaculture-zones to enable them to report non-compliance with guidelines and regulations on land and water resource use in high priority aquaculture-zones	<p>176) At least 4 training workshops organized for 10 aquaculture-resource management committees in high priority aquaculture-zones</p> <p>177) Mechanism for reporting non-compliance with guidelines and regulations on land and water resource use in high priority aquaculture-zones established</p>	High Priority aquaculture-zones	2014	120,000	<p>Fisheries Commission</p> <p>National NGO</p> <p>Environmental Protection Agency</p>
		viii) Design, establish and operate permit system to regulate water resource use for aquaculture business, in high priority aquaculture-zones	<p>178) Permit system designed for water resource use for aquaculture business, in high priority aquaculture-zones</p> <p>179) Water resource use in high priority aqua zones regulated</p>	Accra	2014	15,000	<p>Fisheries Commission</p> <p>Water Resources Commission</p>
2.	Strengthen the national capacity for ensuring farmed fish health and farmed fish food safety	i) Adopt, adapt and further equip at least 3 diagnostic laboratories of the Veterinary Services Directorate, located in high priority aquaculture-zones for testing aquaculture water resource quality, farmed fish health; fish food safety and effects of climate change and pollution	<p>180) At least 3 laboratories of the Veterinary Services Directorate, located in high priority aquaculture-zones adopted and adapted for use in testing aquaculture water resource quality, farmed fish health; fish food safety and effects of climate change and pollution</p> <p>181) National capacity to monitor water resource quality, farmed fish health; fish food safety and effects of climate change and pollution enhanced</p>	Veterinary Services Directorate laboratories located in or close to high priority aquaculture-zones	2013	6,000,000	<p>Fisheries Commission</p> <p>Ministry of Food and Agriculture</p> <p>Veterinary Services Directorate</p> <p>Food and Drugs Board</p>

Ghana National Aquaculture Development Plan

		<p>ii) Organize at least one training course for up to 20 veterinary technicians/doctors in testing farmed fish for fish health, fish food safety and effects of climate change and pollution</p>	<p>182) At least one training course organized for up to 20 veterinary technicians/doctors in testing farmed fish for fish health, fish food safety and effects of climate change and pollution</p> <p>183) Up to 20 veterinary technicians/doctors acquire skills in testing farmed fish for fish health, fish food safety and effects of climate change and pollution</p>	Accra	2013	60,000	<p>Fisheries Commission</p> <p>Ministry of Food and Agriculture</p> <p>Veterinary Services Directorate</p> <p>Food and Drugs Board</p>
		<p>iii) Design, establish and operate a permit system for enforcing guidelines and regulations on farmed fish health and farmed fish food safety in high priority aquaculture-zones (Fisheries Regulations LI 1968; Water Resources Commission Act, 1996 Act 522)</p>	<p>184) Permit system designed, established and operated for enforcing guidelines and regulations on farmed fish health and farmed fish food safety, in high priority aquaculture-zones (Fisheries Regulations LI 1968; Water Resources Commission Act, 1996 Act 522)</p> <p>185) Farmed fish health and farmed fish food safety, in high priority aquaculture-zones effectively regulated</p>	Accra	2014	35,000	<p>Fisheries Commission</p> <p>Food and Drugs Board</p> <p>Ministry of Justice and Attorney General's Department</p>
		<p>iv) Organize at least 5 training workshops for not less than 100 leaders of aquaculture-associations located in high priority aquaculture-zones, on compliance with fish health and fish food safety guidelines and regulations</p>	<p>186) At least 5 training workshops organized for not less than 100 leaders of aquaculture-associations, located in high priority aquaculture-zones, on fish health and fish food safety</p> <p>187) At least 100 leaders of aquaculture-associations, located in high priority aquaculture-zones, sensitized on farmed fish health and fish food safety</p>	High priority aquaculture-zones	2014, 2015	100,000	<p>Fisheries Commission</p> <p>Food and Drugs Board</p>

Ghana National Aquaculture Development Plan

			188) At least 100 leaders of aquaculture-associations, located in high priority aquaculture-zones acquire relevant knowledge and skills in complying with national fish health and fish food safety guidelines and regulations				
<p><i>Result 5 – Increased, effectiveness and efficiency of public institutions in policy making, regulation and facilitating aquaculture development</i></p>			<p align="center">Implementation</p>				
	Activity	Description	Output	Where	When	Cost	Whom
1.	Strengthen the capacity of the Fisheries Commission to facilitate aquaculture development, policy making, and regulation more effectively	i) Procure technical assistance and conduct institutional capacity needs assessment of the Fisheries Commission in effective aquaculture development; policy making, and industry regulation with holistic attention to scientific, business, environmental and social dimensions of aquaculture	<p>189) Institutional assessment conducted on the Fisheries Commission</p> <p>190) Institutional capacity and needs gaps of the Fisheries Commission for effective aquaculture development, policy making, and regulation identified</p> <p>191) Mechanisms formulated and resources mobilized to respond to the needs and capacity gaps of the Fisheries Commission</p>	<p>Accra</p> <p>Metropolitan, Municipal and District Assemblies in high priority aquaculture-zones</p>	2012	120,000	<p>Fisheries Commission</p> <p>Private international or local consultancy service providers</p>

Ghana National Aquaculture Development Plan

		ii) Conduct research and development into aquaculture holding systems	<p>192) Research conducted into holding systems in aquaculture</p>	Each high priority aquaculture zone	2012 to 2013	400,000	Fisheries Commission Water Research Institute,
		iii) Organize at least one training course for 10 Fisheries Commission staff to acquire skills in the development of efficient aquaculture units/systems.	<p>193) At least one training course organized for not less than 10 Fisheries Commission staff to acquire skills in development and standardization of cages/ponds/pens</p> <p>194) Capacity of Fisheries Commission improves in development and standardization of cages/ponds/pens</p>	Accra	2013	60,000	Fisheries Commission Water Research Institute, University of Cape Coast Kwame Nkrumah University of Science and Technology
		iv) Organize at least one training course for not less than 10 staff of Fisheries Commission on the operation of aquaculture-related regulatory systems	<p>195) At least one training course organized for at least 10 staff of Fisheries Commission on the operation of aquaculture-related regulatory systems</p> <p>196) Capacity of Fisheries Commission in operation of aquaculture-related certification and permit systems enhanced</p>	Accra	2013	60,000	Fisheries Commission Water Resources Commission, Food and Drugs Board, Environmental Protection Agency and the Volta River Authority (VRA)

Ghana National Aquaculture Development Plan

		<p>v) Formalize institutionalization of the Aquaculture Advisory Group as a sub-committee of the Fisheries Commission and provide facilities, equipment and funding for their activities</p>	<p>197) Aquaculture Advisory Group formally institutionalized as a sub-committee of the Fisheries Commission</p> <p>198) Capacity of Fisheries Commission strengthened with aquaculture-industry-oriented support and inputs, for a more effective development, management, and regulation of the aquaculture subsector</p>	Accra	2012 to 2016	60,000	Fisheries Commission
2.	Establish national aquaculture business database	<p>i) Procure technical assistance from national and international consultancy sources to determine national aqua – data needs, develop standard data collection formats for the different segments of the aqua – value chain, set up, process, manage and regularly update a national aquaculture-database</p>	<p>199) Fisheries Commission provided with needed technical assistance to determine national aqua – data needs, develop standard data collection formats for the different segments of the aqua – value chain, and set up, process, manage and regularly update a national aquaculture-database</p> <p>200) Quality and effectiveness of national aquaculture-data collection and management systems assured</p> <p>201) Confidence in national aquaculture-data improved</p>	Accra	2012	100,000	<p>Fisheries Commission</p> <p>Private national and international consultancy service providers</p>

Ghana National Aquaculture Development Plan

		<p>ii) Organize at least one training course for 10 Fisheries Commission staff to acquire the skills for managing and regularly updating national aquaculture-database</p>	<p>202) At least one training course organized for 10 Fisheries Commission staff, to acquire the skills for managing and regularly updating a national aquaculture-database</p> <p>203) Capacity of the Fisheries Commission for establishing and managing a national aquaculture-database improved</p>	Accra	2012	30,000	<p>Fisheries Commission</p> <p>Private national and international consultancy service providers</p>
		<p>iii) Organize at least 4 training workshops for not less than 100 leaders of not less than 10 aquaculture-associations, located in high priority aquaculture-zones, on aqua record keeping, data capture and transmission, as well as the importance of data-use for enterprise management, policy making, monitoring and evaluation</p>	<p>204) At least 4 training workshops organized for not less than 100 leaders/members of aquaculture-associations located in high priority aquaculture-zones, on aqua record keeping, data capture and transmission, as well as data-use for enterprise management, policy making, monitoring and evaluation</p> <p>205) At least 10 aquaculture-associations, located in high priority aquaculture-zones, acquire skills in aqua record keeping, data capture and transmission, as well as data-use for enterprise management,</p> <p>206) Members of aquaculture-associations, located in high priority aquaculture-zones, sensitized to the importance of data-use for policy making, monitoring and evaluation and are more willing to disclose aquaculture-enterprise operational and performance data</p> <p>207) Quality of aquaculture data from high priority aquaculture-zones improves</p>	High priority aqua - zones	2013	200,000	<p>Fisheries Commission</p> <p>Private national and international consultancy service providers</p>

Ghana National Aquaculture Development Plan

		iv) Equip at least 10 aquaculture-associations in high priority aquaculture-zones with basic ICT equipment for aquaculture-data capture, collation and transmission	<p>208) At least 10 aquaculture associations in high priority aquaculture zones, equipped with basic ICT equipment for aquaculture-data capture, collation and transmission</p> <p>209) Documentation and transmission of aquaculture data, from high priority aquaculture-zones to Fisheries Commission, improves</p>	Accra High priority aqua - zones	2013	230,000	Fisheries Commission
		v) Collect, process, analyze, interpret, store, and disseminate aquaculture-data	<p>210) Aquaculture data effectively collected and promptly transmitted to Fisheries Commission</p> <p>211) Fisheries Commission accesses sufficient, high quality aquaculture data for planning, policy making, and regulation of aquaculture business</p>	Accra High priority aqua - zones	2013	200,000	Fisheries Commission
		vi) Procure additional ICT systems to facilitate the setting up, operation, management and updating of national aquaculture-database	<p>212) Fisheries Commission provided with additional ICT equipment</p> <p>213) Fisheries Commission is better equipped to host and manage a national aquaculture data base</p>	Accra	2012	20,000	Fisheries Commission
		vii) Procure additional means of transport for field visits for continuous quality assurance of aquaculture-data processes	<p>214) Fisheries Commission provided with additional means of transport for field visits for continuous quality assurance of aquaculture-data processes</p> <p>215) Quality of national aquaculture-data used for planning, and policy making improved</p> <p>216) Quality of national aquaculture-policies improved</p>	Accra	2012	300,000	Fisheries Commission

Ghana National Aquaculture Development Plan

3.	Establish arrangements and mechanisms for improved inter-institutional role sharing, coordination, communication, networking and partnerships among public institutions associated with the development, policy and regulation of aquaculture business	i) Organize at least one stakeholder consultative workshop on institutional roles, arrangements and mechanisms for coordination and networking among aquaculture-related public institutions in areas including: data sharing; education, training, research, extension and resource sharing; regulation and enforcement;	<p>217) At least one stakeholder consultative workshop organized on institutional roles, arrangements and mechanisms for coordination and networking among aquaculture-related public institutions</p> <p>218) Consensus reached on institutional roles, arrangements and mechanisms for coordination and networking among aquaculture-related public institutions in areas including: data sharing; education and training; research; extension and resource sharing; enforcement of guidelines and regulations;</p>	Accra High priority aqua - zones	2012	60,000	Fisheries Commission
		ii) Procure technical assistance to set up and manage national aquaculture-website	<p>219) Fisheries Commission provided with needed technical assistance to set up and manage national aquaculture-website</p> <p>220) Quality of national aquaculture-website assured</p>	Accra	2012	30,000	Fisheries Commission
		iii) Procure additional ICT equipment dedicated to setting up and managing a national culture website	<p>221) Fisheries Commission provided with additional ICT equipment to set up and manage a national aqua website</p> <p>222) Capacity of fisheries Commission to establish and run a national aquaculture-website improved</p>	Accra	2012	10,000	Fisheries Commission

Ghana National Aquaculture Development Plan

		iv) Train Fisheries Commission staff to operate and manage national aquaculture website	<p>223) National aquaculture-website, established, managed and operated;</p> <p>224) Needed information on aquaculture business developments; guidelines; regulations, prices, associations, disseminated to stakeholders</p> <p>225) Institutional role sharing, coordination, communication, networking and partnerships among public institutions associated with the development, policy making and regulation of aquaculture business improves</p>	Accra	2012	10,000	Fisheries Commission
4.	Establish monitoring and evaluation system for GNADP implementation and aquaculture business performance	i) Procure technical assistance for setting up and managing national aquaculture business monitoring and evaluation system	<p>226) Fisheries Commission provided with technical assistance to set up and manage national aquaculture business monitoring and evaluation system</p> <p>227) Quality of aquaculture business monitoring and evaluation system assured</p>	Accra	2012	50,000	Fisheries Commission
		ii) Organize at least one training course for not less than 10 staff of the Fisheries Commission to acquire skills in setting up and managing a national aquaculture business monitoring and evaluation system	<p>228) At least one training course organized for 10 staff of the Fisheries Commission, to acquire skills in setting up and managing a national aquaculture business monitoring and evaluation system</p> <p>229) Capacity of Fisheries Commission, improves in monitoring and evaluation of the aquaculture subsector</p>	Accra	2012	20,000	Fisheries Commission

Ghana National Aquaculture Development Plan

		iii) Procure additional means of transport to facilitate monitoring and on-going evaluation of national aquaculture development and associated management, safety and sustainability systems	<p>230) Additional ICT equipment and means of transport procured by the Fisheries Commission to facilitate monitoring and on-going evaluation of national aquaculture development and associated management, safety and sustainability systems</p> <p>231) Fisheries Commission becomes better equipped to monitor and evaluate aquaculture development and associated business management and sustainability systems</p>	Accra	2012	600,000	Fisheries Commission
5.	Monitor GNADP implementation effectively	i) Organize and conduct regular field visits and inspection of facilities, equipment and records on the implementation of the different activities of the GNADP and arrange regular reporting according to approved formats, from different segments of the aquaculture business value chain	<p>232) Field visits and inspection of facilities, equipment and records on the implementation of the different activities of the GNADP designed, organized and conducted</p> <p>233) GNADP implementation is effectively monitored and quality assured</p> <p>234) Regular reports from different institutional collaborators arranged</p>	Accra High priority aqua - zones	2012-2016	790,000	Fisheries Commission
6.	Monitor the performance of aquaculture businesses	i) Organize biannual fora for representatives of aquaculture business associations; NGOs in aquaculture; and public institutional collaborators in the development and regulation of aquaculture business	<p>235) Biannual fora organized for representatives of aquaculture business associations, NGOs and public institutional collaborators in aquaculture business development and regulation;</p> <p>236) Feed back to Fisheries Commission on performance of aquaculture-industry</p>	Accra High priority aqua - zones	2013 to 2016	400,000	Fisheries Commission

Ghana National Aquaculture Development Plan

		ii) Organize and conduct regular field visits and inspection of facilities, equipment and records of hatcheries, nurseries, fingerling production enterprises and aquaculture-logistic supply enterprises, to monitor compliance with aquaculture business quality, environmental, fish health and fish food safety standards, specified in appropriate guidelines and regulations.	<p>237) Regular field visits and inspection of facilities, equipment and records of hatcheries, nurseries, fingerling production enterprises and aquaculture-logistic supply enterprises, designed and conducted;</p> <p>238) Compliance with aquaculture business quality, environmental, fish health and fish food safety standards specified in appropriate national aquaculture-related guidelines and regulations monitored.</p>	Accra High priority aqua - zones	2014-2016	284,400	Fisheries Commission
7.	Evaluate GNADP implementation, and Performance of aquaculture businesses	i) Procure technical assistance from private national or international consultancy sources to conduct baseline study and establish baseline indicators for the GNADP	<p>239) National aqua -business baseline study conducted with technical support</p> <p>240) National baseline indicators established for the GNADP</p>	Accra High priority aqua - zones	2012	100,000	Fisheries Commission
		ii) Conduct annual reviews of the implementation of GNADP	241) Annual reviews conducted on the implementation of the GNADP and management decisions made to improve GNADP implementation	Accra	2012-2016	60,000	Fisheries Commission

Ghana National Aquaculture Development Plan

		iii) Procure technical private national or international consultancy firm assistance to conduct mid-term evaluation of the GNADP	242) Mid-term evaluation of the GNADP conducted and management decisions made to improve GNADP implementation	Accra	2014	30,000	Fisheries Commission
		iv) Procure technical assistance from private national or international consultancy firm to conduct terminal evaluation of the GNADP	243) Terminal evaluation of the GNADP conducted with technical assistance 244) Performance of the GNADP assessed 245) Lessons from GNADP captured	Accra High priority aqua - zones	2016	50,000	Fisheries Commission
		v) Organize annual national dissemination workshops to disseminate the results of the GNADP	246) Processes, performance and lessons from GNADP disseminated 247) Management decisions taken on next steps	Accra	2016	120,000	Fisheries Commission

Ghana National Aquaculture Development Plan

GNADP Budget -Summary

No.	Activity	Private/Public Contributions (US\$)		Total Costs (US\$)
		Public	Private	
1.	Establish high priority aquaculture zones	1,390,000	3,750,000	5,140,000
2.	Promote increased private investments into establishment of new fish farm, fish seed, and aquaculture-logistics enterprises in high priority aquaculture-zones	220,000	0	220,000
3	Facilitate increased supply of high quality fish feed by the private sector to fish farmers in high priority aquaculture-zone	680,000	5,000,000	5,680,000
4	Facilitate increased supply of high quality fish seed by the private sector to fish farmers in high priority aquaculture-zones	1,480,000	5,400,000	6,880,000
5	Facilitate increased supply of high quality aquaculture-logistics by the private sector to fish farmers in high priority aquaculture-zones	130,000	4,000,000	4,130,000
6	Assist more fish farmers to access funds more easily on competitive terms for investment in aquaculture business	30,025,000	0	30,025,000
7	Explore the feasibility of aquaculture business in new/other species and environments with perceived aquaculture potential	4,200,00	0	4,200,000
8	Establish appropriate farmed fish value addition and marketing infrastructure in high priority aquaculture-zones	10,351,250	581,250	10,932,500
9	Strengthen the capacity of fish farmers to add value to and market farmed fish more competitively	700,000	0	700,000
10	Supply increased numbers of appropriately skilled persons to be employed at the different levels of the aqua -business value chain on a sustained basis	4,322,000	0	4,322,000
11	Strengthen the capacity of existing fish feed, fish seed and fish farm enterprises to manage their enterprises more professionally and produce and market their products more competitively	360,000	0	360,000
12	Strengthen the capacity of aqua culture associations to deliver improved services to and advocacy on behalf of member aquaculture enterprises	525,000	0	525,000
13	Strengthen the national capacity for ensuring the sustainable use of land and water resources in aquaculture-production	590,000	0	590,000
14	Strengthen the national capacity for ensuring farmed fish health and farmed fish food safety	6,195,000	0	6,195,000
15	Strengthen the capacity of the Fisheries Commission to facilitate aquaculture development, policy making, and regulation more effectively	700,000	0	700,000
16	Establish national aquaculture business database	1080,000	0	1080,000
17	Establish arrangements and mechanisms for improved inter-institutional role sharing, coordination, communication, networking and partnerships among public institutions associated with the development, policy and regulation of aquaculture business	110,000	0	110,000
18	Establish monitoring and evaluation system for GNADP implementation and aquaculture business performance	690,000	0	690,000
19	Monitor GNADP implementation effectively	790,000	0	790,000
20	Monitor the performance of aquaculture businesses	684,400	0	684,400
21	Evaluate GNADP implementation, and Performance of aquaculture businesses	390,000	0	360,000
GRAND TOTAL		65,532,650	18,731,250	84,313,900

Ghana National Aquaculture Development Plan