



Government Gazette Staatskoerant

REPUBLIC OF SOUTH AFRICA
REPUBLIEK VAN SUID-AFRIKA

Vol. 580

Pretoria, 11 October 2013
Oktober 2013

No. 36920

N.B. The Government Printing Works will not be held responsible for the quality of "Hard Copies" or "Electronic Files" submitted for publication purposes



AIDS HELPLINE: 0800-0123-22 Prevention is the cure

IMPORTANT NOTICE

The Government Printing Works will not be held responsible for faxed documents not received due to errors on the fax machine or faxes received which are unclear or incomplete. Please be advised that an "OK" slip, received from a fax machine, will not be accepted as proof that documents were received by the GPW for printing. If documents are faxed to the GPW it will be the sender's responsibility to phone and confirm that the documents were received in good order.

Furthermore the Government Printing Works will also not be held responsible for cancellations and amendments which have not been done on original documents received from clients.

CONTENTS • INHOUD

<i>No.</i>	<i>Page No.</i>	<i>Gazette No.</i>
GOVERNMENT NOTICE		
Agriculture, Forestry and Fisheries, Department of		
<i>Government Notice</i>		
763 Publication of the National Aquaculture Policy Framework for South Africa, 2013	3	36920

GOVERNMENT NOTICE

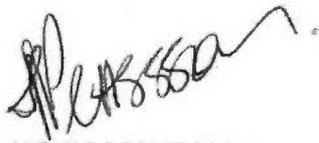
DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES

No. 763

11 October 2013

PUBLICATION OF THE NATIONAL AQUACULTURE POLICY FRAMEWORK

I, Tina Joemat-Pettersson, the Minister of Agriculture, Forestry and Fisheries, hereby publish the National Aquaculture Policy Framework, schedule hereto, for general information.



TINA JOEMAT-PETTERSSON

MINISTER OF AGRICULTURE, FORESTRY AND FISHERIES

NATIONAL AQUACULTURE POLICY FRAMEWORK FOR SOUTH AFRICA 2013



agriculture,
forestry & fisheries

Department:
Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

Table of Contents

Acronyms used in the text.....	i
Definitions	iii
SECTION A: ANALYSIS OF THE SITUATION.....	1
A.1 Overview.....	1
A.2 Political mandate	1
A.3 Constitutional mandate.....	1
A.4 Policy context	2
A.5 Global synopsis.....	4
A.6 Brief status of aquaculture in South Africa.....	5
SECTION B: NATIONAL AQUACULTURE POLICY FRAMEWORK.....	7
B.1 Aquaculture: Opportunity for South Africans.....	7
B.2 Policy principles	9
B.3 Policy objectives	10
B.4 Scope of the policy.....	12
B.5 Policy focus areas	13
B.5.1 Legal and regulatory framework	13
B.5.2 Environmental integrity	14
B.5.3 Aquaculture research, technology development and transfer	17
B.5.4 Aquaculture authorisations	19
B.5.5 Aquaculture development support	22
B.5.6 Transformation and broadening of participation	26
B.5.7 Monitoring and Enforcement of authorization conditions.....	28
B.6 Institutional arrangements	28
B.6.1 Intergovernmental relations	28
B.6.2 Sector coordination.....	29

SECTION C: POLICY IMPLEMENTATION 30

 C.1 Policy implementation strategy..... 30

 C.2 Funding 31

 C.3 Monitoring and Evaluation of policy implementation 31

 C.4 Policy review 31

D. CONCLUDING REMARKS 32

E. REFERENCES 32

ACRONYMS USED IN THE TEXT

AAHP	Aquatic Animal Health Programme
ADA	Animal Diseases Act, 1984 (Act No. 35 of 1984)
ADEP	Aquaculture Development and Enhancement Programme
ADZ	Aquaculture Development Zone
AgriBEE	Agricultural Black Economic Empowerment
AgriSETA	Agriculture Sector Education and Training Authority
AIF	Aquaculture Intergovernmental Forum
AMWG	Aquaculture Management Working Group
ARTDP	Aquaculture Research and Technology Development Programme
ASA	Aquaculture South Africa
ATC	Aquaculture Trade Council
AVCRT	Aquaculture Value-Chain Roundtable
BBEE	Broad Based Black Economic Empowerment
B&C	Biodiversity and Conservation
CCRF	Code of Conduct for Responsible Fisheries
DAFF	Department of Agriculture, Forestry and Fisheries
DWA	Department of Water Affairs
DEA	Department of Environmental Affairs
DHET	Department of Higher Education and Training
DLA	Department of Land Affairs
DOH	Department of Health
DRDLR	Department of Rural Development and Land Reform
DST	Department of Science and Technology
EDD	Economic Development Department
EIA	Environmental Impact Assessment
EQP	Environmental Quality and Protection
FAO	Food and Agriculture Organisation of the United Nations
FM&CP	Finfish Monitoring and Control Programme
GDP	Gross Domestic Income

GMO	Genetically Modified Organism
HDIs	Historically Disadvantaged Individuals
IDP	Integrated Development Plan
IPAP	Industrial Policy Action Plan
MDGs	Millennium Development Goals
MLRA	Marine Living Resources Act, 1998 (Act No. 18 of 1998)
MPA	Marine Protected Area
MT	Metric Tonnes
NADI	National Aquaculture Development Initiative
NAFA	National Aquaculture Framework Act
NASF	National Aquaculture Strategic Framework
NAPF	National Aquaculture Policy Framework
NDP	National Development Plan (Vision 2030)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organisation
NGP	New Growth Path
NRCS	National Regulator for Compulsory Standards
NWA	National Water Act, 1998 (Act No. 36 of 1998)
OiE	International Organisation for Animal Health
PAIF	Provincial Aquaculture Intergovernmental Forum
PDA	Provincial Department of Agriculture
PDI	Previously Disadvantaged Individual
PPP	Public Private Partnership
PUA	Public Understanding of Aquaculture
SACNSP	South African Council for Natural Scientific Professions
SADC	Southern African Development Community
SETA	Sector Education and Training Authority
SM&CP	Shellfish Monitoring and Control Programme

SMMEs	Small Medium and Micro Enterprises
The dti	Department of Trade and Industry
UK	United Kingdom
USA	United States of America

DEFINITIONS

Aquaculture: means the farming of aquatic (marine or freshwater) organisms including fish, mollusks, crustaceans and plants in controlled or selected aquatic environments, with some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators etc. Farming also implies individual or corporate ownership of the stock being cultivated. This definition includes ranching and stock enhancement as aquaculture activities (Nash, 1995).

Ranching: release of identifiable aquaculture products into the aquatic environment where exclusive access is confined to a limited number of harvesters.¹

Stock enhancement: release of stock for the public good without the intention of directly benefiting an exclusive user group.²

^{1 2} Bannister, 1991

SECTION A: ANALYSIS OF THE SITUATION

A.1 Overview

Give a man a fish, and you feed him for a day. Teach a man to fish, and you feed him for life. But until the fundamentals of the fishing industry are transformed, he will forever remain trapped in subsistence, catching fish to feed his family. As a developmental state, our aim must surely be for him to one day have his own fish farm and to employ others to produce fish and distribute his fish.

A.2 Political mandate

The National Development Plan (NDP), Vision 2030, provides a plan for the reduction of poverty, unemployment and inequality in 20 years. Aquaculture's role and contribution to food security is central to addressing poverty, unemployment and inequality. As a result the NDP makes reference to a number of steps that will improve job creation and provision of livelihoods opportunities, broadening of participation, especially for youth and women, including expansion of infrastructure to support the aquaculture value-chain, in the long-term, and in the medium-term, the New Growth Path (NGP) provide for the blue-print to develop industries under the agriculture job driver.

This Policy, if approved, will therefore be one of the key pillars in achieving the objectives of the New Growth Path (2020) and the National Development Plan (2030).

A.3 Constitutional mandate

The Bill of Rights states that "every citizen has a right to access to sufficient food and water" and that "the State must take reasonable legislative and other measures, within its available resources, to achieve the realisation of this right". This policy provides a broad framework for the fulfillment of this Constitutional imperative, and should serve as a guide to national, provincial and local government in pursuing aquaculture

development for job creation, livelihoods opportunities and broadening participation by disadvantaged groups whilst achieving food security at every level.

A.4 Policy context

Aquaculture in South Africa is in its infancy with output being insignificant in regional and global terms and despite some early progress in the early 1990s, output has declined in recent years. Recognising the potential opportunities presented for food security, job and wealth creation, reduction of imports and transformation, the government is committed to reversing this trend.

To date, several factors have culminated in suboptimal development of aquaculture in South Africa. Principally, the sector is fundamentally constrained by, inter alia, a lack of an enabling regulatory environment which is currently characterized by overregulation when compared with other food production sectors, and by an un-coordinated institutional environment e.g. fragmented policies and strategies from various tiers of government departments³. Moreover, the technical challenges posed by the South African high-energy coastline with a limited number of naturally protected sites; limited suitable aquaculture candidates and high water temperature variations has hitherto not been prioritised and adequately addressed. Other challenges that have affected the growth of the aquaculture sector include limited access to land and water, climate change, limited human capacity, reluctance on financial institutions to lend money to potential aquaculturists and inadequate market-related services. Consequently, aquaculture production has stagnated and declined thus requiring appropriate government intervention to kick-start the sector to reverse this process. Therefore a national policy that prioritises achievable objectives in line with broader national goals is required.

³ Rana, 2010.

In 2012, recognizing both the potential for aquaculture to benefit South Africans and the need to ensure the sustainable use of aquatic resources, Minister of Agriculture, Forestry and Fisheries endorsed the National Aquaculture Strategic Framework (NASF). NASF was a product of extensive consultations with aquaculture stakeholders and is providing a “road map” to help government facilitate the development of the aquaculture industry. NASF also affirmed the Department of Agriculture, Forestry and Fisheries (DAFF) as the lead national agency for aquaculture development. The National Aquaculture Policy Framework has been developed in response to NASF and more recent opportunities and challenges associated with aquaculture development.

The government will be guided, where appropriate, by the voluntary FAO Code of Conduct on Responsible Fisheries, the FAO Technical Guidelines for Aquaculture Certification and the NEPAD ‘Fish for All’ Action Plan for the Development of African Fisheries and Aquaculture⁴ to ensure that aquaculture development contributes to the Millennium Development Goals (MDGs) and the proposed Sustainable Development Goals beyond 2014/15. The government will craft clear and succinct objectives to promote aquaculture taking due cognisance of similarities and differences between itself and a range of countries engaged in successful aquaculture, in particular, with reference to (i) stage of development of the aquaculture sector, (ii) socio-economic environment (iii) climate, (iv) water and land availability and access, (v) nature and topography of the coastline and, (vi) market dynamics.

In developing this policy due recognition has been taken of the current position of South Africa in relation to global aquaculture production, in order to contextualize the challenges the government faces in creating and ensuring the appropriate enabling regulatory environment required to optimize its opportunities and actively contribute to national food security, national wealth and job creation; to regional and world fish supply. A brief synthesis of global aquaculture trends is therefore presented below together with a brief status of aquaculture in South Africa.

⁴ NEPAD, 2005.

A.5 Global synopsis⁵

While the global demand for aquatic products is increasing, wild harvest fisheries are under considerable pressure and their growth is either stagnant or declining. It is now internationally accepted that the increased supply of fish products to meet this demand will be sourced through aquaculture. Nations around the world have taken up this challenge and have developed a suite of technologies to farm a range of globally available aquatic organisms to meet their local and international demand.

Consequently, aquaculture is the fastest growing food production sector in the world, growing at an annual rate of 8-10% per annum for the last two decades and outstripping livestock 3-4 fold. In 2010, global aquaculture production reached 68 million metric tonnes (MT), valued at US\$ 106 billion and increased its proportional contribution to total fisheries from 15% in 1988 to 46% in 2010. This contribution, however, is largely an Asian phenomenon. Asia accounted for 62.4 million MT or 91% of total world aquaculture production in 2010, while Americas, Africa and Europe, contributed 3.5, 1.4, and 3.4%, respectively. Although over 200 species or species clusters are farmed the majority of production stems from a relatively few species and species clusters. In Europe, salmon and trout account for 52% of production, in Asia, the carps and now tilapia accounts for 34% of production. The tilapia (largely *Oreochromis niloticus*), mullet and catfish account for 75% of African production.

A significant proportion of farmed aquatic products are farmed with minimum impact on the environment when compared with other food production sectors, whilst maximizing benefits to society. In 2010, freshwater fishes accounted for 46% of global production whilst 54% was of marine and brackish origin. Of this 54%, around 70% are aquatic plants and mollusks which are not feed dependent and as such, actually remove nutrients from the natural waters, thus aiding coastal de-eutrophication and ameliorating negative impacts of other sectors.

⁵ FAO, 2012.

To date exotic species account for around 25% of world finfish and shellfish production. Rainbow trout was introduced for food or sport to at least 45 countries outside its natural range producing over half a million MT. Although indigenous to Africa, tilapias are now widespread in all countries of the subtropical and tropical region and in 2010 these countries produced around 2.4 million MT of relatively low cost protein for domestic consumption. Similarly, the salmonids introduced in Chile support a thriving multi-billion dollar aquaculture industry that is responsible for approximately 20% of the world's farmed salmon and directly employs approximately 30 000 people. The cupped oyster, native to Japan, was introduced to around 30 countries (including the UK, France, USA, Canada, Korea, China and New Zealand) where around 3.4 million MT were produced in 2010.

In addition to aquaculture, introduced species such as tilapias support significant culture based fisheries in countries such as Brazil, Mexico, Sri Lanka, Philippines and Indonesia providing low cost protein and vital income for rural, in particular asset less, communities.

A.6 Brief Status of Aquaculture in South Africa⁶

The marine species cultured in South Africa in 2011 included abalone (*Haliotis midae*), oysters (*Crassostrea gigas*), mussels (*Mytilus galloprovincialis* and *Choromytilus meridionalis*) and finfish (*Argyrosomus japonicus*, and *Seriola lalandi*). Other species included seaweed, both *Ulva* spp and *Gracilaria* spp. In 2011, 52 Permits to Engage in Marine Aquaculture were issued in South Africa to marine aquaculture operators, of which 30 farms were in operation. The Western Cape had the highest number of operating farms in 2011, with a total of 20 followed by Eastern Cape with six farms, Northern Cape with three farms and Kwazulu-Natal with only one farm. South Africa's total production (excluding seaweed) in 2011 was 1 883 MT. The Western Cape was the dominant province in terms of production and recorded a total of 1 624 MT. The

⁶ DAFF, 2012.

abalone sub-sector was the highest contributor to total production making up 55% of the total production, followed by mussels with 35.1% and oysters with 14.3% And finfish with 0.4%. The finfish subsector recorded a production of 7.99 MT.

Total marine aquaculture production in 2011 decreased by 108.6 MT (5.5%) from 2010. This production decline is mainly due to the decrease in production from two main contributing sub-sectors namely the mussels and oysters. The mussel and oyster sub-sectors recorded a decrease of 129.98 MT (18.6%) and 7.23 MT (2.6%) respectively. Most farms were experiencing environmental challenges with increasing heavy metal contents in Saldahna Bay mostly, and halted their production to deal with these challenges, which if left unchecked could result in residues accumulating in muscle tissue of these animals, making their consumption not safe. The abalone sub-sector experienced an increase in production from 2010, recording a production increase of 20.57 MT representing a 2% increase.

The freshwater species cultured in 2011 included trout (*Oncorhynchus mykiss* and *Salmo trutta*), tilapia (*Oreochromis mossambicus*), catfish (*Clarias gariepinus*), carp (*Cyprinus carpio* and *Ctenopharyngodon idella*), mullet (*Liza richardsonii*), largemouth bass (*Micropterus salmoides*), marron crayfish (*Cherax tenuimanus*), Atlantic salmon (*Salmo salar*) and a number of ornamental species. The Western Cape Province had the highest number of farms operating during 2011. Trout is the most cultured freshwater species in South Africa, followed by the culturing of Ornamental species. Total freshwater aquaculture production for 2011 was 2 921 MT. The freshwater species with the largest aquaculture production in 2011 was trout and recorded an amount of 1 428 MT. The second largest sub-sectors include ornamentals and koi carp which had production levels of ±660 and ±572 MT respectively. The total freshwater aquaculture production has shown an improvement from 2006 – 2011, recording an increase of ±660 MT (12.7%) over the last six years.

SECTION B: THE NATIONAL AQUACULTURE POLICY FRAMEWORK

B.1 Aquaculture: Opportunity for South Africans

Aquaculture is one of the fastest growing food production industries in the world and is an important part of the seafood continuum. Together, the aquaculture and fishing industries and related service sectors generate significant wealth and socio-economic benefits for South Africans in all provinces of the country.

The contribution of aquaculture to world fisheries production has been growing steadily over the last decade and now accounts for almost half of total fish supplies for human consumption. The FAO projects that by 2030, aquaculture will dominate fish supplies, with more than half of the fish being consumed originating from aquaculture operations. Indeed, by 2025, annual demand for seafood will outstrip the capacity of wild fisheries by some 55 million MT, presenting tremendous opportunities for the aquaculture sector.

With global demand increasing and natural stocks already largely at or exceeding their maximum capture potential, it is clear that aquaculture will play an important role in satisfying future global demand and in contributing to the security of the global food production system. In addition to the opportunities relating to the production of fish supplies and to all the related services supporting the aquaculture industry, important contributions can be made in the areas of biomedicine, pharmacology and bioengineering.

Aquaculture operations can be found across South Africa in every province, producing a few important species under a variety of culture methods. More and more species are being tested for commercial production, which will result in increased diversity of culture species. In 2012, the total abalone total allowable catch was set at 150 MT, whilst the output from abalone farms was about 1200 MT, with possibility of annual increases of about 10% for the next several years.

Already in South Africa, the aquaculture sector employs about 3000 people and approaches half a billion Rand annually in direct and indirect economic activities. Specific benefits for South Africans currently include the following:

- Job creation and contribution to economic growth;
- Increased social cohesion through diversification and wealth generation in rural and coastal areas;
- Reduced pressure on wild fish stocks, helping to sustain and enhance the wild fishery;
- The assurance of high-quality, safe, competitively priced and nutritious seafood; and
- Expansion of domestic and export markets for South African fish and seafood products.

Based on recent aquaculture sector growth trends and South Africa's significant aquaculture development potential, the sector's contribution to the South African economy could reach almost R1 billion by 2020. Recognizing the tremendous potential of aquaculture and consistent with national priorities, the government of South Africa identified the development of the sector as an important element of its strategies, NGP and the Industrial Policy Action Plan (IPAP) to create opportunities for South Africans.

In 2009, the President of the Republic of South Africa named DAFF as the lead agency for aquaculture development. This was further endorsed by the Minister of Agriculture, Forestry and Fisheries in her policy pronouncements on aquaculture during the 2011 and 2012 Budget Vote speeches.

Since then, DAFF took a number of important steps in recognition of the ever-growing significance of the aquaculture sector and its role as a lead national agency:

- DAFF identified aquaculture as one of the key priorities in the five-year departmental strategic plan;

- DAFF established a Chief Directorate responsible for aquaculture management;
- DAFF finalized the National Aquaculture Strategic Framework (NASF) as a blue print for aquaculture development in the country; finalization and implementation of the Abalone Ranching Policy, administering, monitoring and enforcing compliance and sustainable management through the Shellfish Monitoring and Control Programme (SM&CP) and Finfish Monitoring and Control Programmes (FM&CP), Aquatic Animal Health Programme (AAHP); positioning South Africa as a leader in aquaculture development through investments in science, research and development through the Aquaculture Research and Technology Development Programme (ARTDP); promote awareness and promote aquaculture sector through the Public Understanding of Aquaculture (PUA) programme; increased intergovernmental harmonization through the Aquaculture Intergovernmental Forum (AIF) and Provincial Aquaculture Intergovernmental Forum (PAIF); and improved sector coordination through the Aquaculture Value-Chain Roundtable (AVCRT), and most importantly providing financial resources and promoting investments in aquaculture through the establishment of the Aquaculture Development and Enhancement Programme (ADEP) in collaboration with the Department of Trade and Industry (the dti).

These recent steps confirm DAFF's commitment to enabling the responsible development of the aquaculture sector and strengthening its role as the lead national agency for aquaculture development.

B.2 Policy principles

The principles outlined below will be applicable to decision-making, management and regulation of the aquaculture sector in South Africa:

- (a) Maintaining ecosystems health is important to ensure sustainable aquaculture development;

- (b) Aquaculture should contribute to national food security, poverty alleviation and job creation;
- (c) The need to foster sustainable aquaculture development that is profitable;
- (d) Broadening participation and promote transformation of the aquaculture sector is a priority;
- (e) Good governance and intergovernmental cooperation should be encouraged;
- (f) The need to ensure transparency;
- (g) The need for an adaptive management approach to aquaculture development;
- (h) The farming of indigenous species will be promoted;
- (i) Promotion of diverse aquaculture activities;
- (j) South Africa will abide by the FAO Code of Conduct on Responsible Fisheries (CCRF) and the guidelines laid down in the Code of Conduct, as well as any other codes and guidelines that may be applicable to the field of Aquaculture, such as the FAO Technical Guidelines for Aquaculture Certification, or relevant provisions of the SADC Protocol on Fisheries;
- (k) Government led by DAFF will provide coordinated support for aquaculture sector development in terms of various policies and mandates of the Department of Environmental Affairs (DEA), , Department of Rural Development and Land Reform (DRDLR), Department of Science and Technology (DST), Department of Water Affairs (DWA), Department of Health (DOH), Department of Higher Education and Training (DHET), Economic Development Department (EDD), the dti and the Provincial Departments of Agriculture, Rural Development, Economic and Environmental Affairs. At municipal level support for aquaculture may be provided in terms of the Integrated Development Plans (IDPs).

B.3 Policy objectives

The policy has the following objectives:

- a) To encourage an integrated and holistic approach to aquaculture development in South Africa, which promote participation, inter-governmental co-ordination and partnerships;
- b) To promote the responsible and sustainable development of globally competitive aquaculture in South Africa by identifying current constraints, and by proposing action aimed at creating an enabling environment for effectively addressing those constraints;
- c) To facilitate and support the optimal growth of the aquaculture sector to ensure that aquaculture contributes to economic growth, food security and job creation in the country;
- d) To promote on-site research, demonstrations and practitioner-to-practitioner advise to increase economic and social benefits from aquaculture;
- e) To promote private sector participation through access arrangements to areas specifically designated for aquaculture and through the provision or facilitation of the necessary support services;
- f) To co-operate, where necessary, in the promotion of inland and marine ranching and stock enhancement;
- g) To promote investment in research and technological development that ensures industry growth, diversification, competitiveness and sustainable production;
- h) To monitor and regulate the introduction of exotic species or biologically transformed (e.g. genetically modified) species to aquatic eco-systems;
- i) To establish norms and standards (including regulations) and guidelines for environmental impact assessments;
- j) To monitor diseases and control the spread of diseases relevant to aquatic species (feral and cultured);
- k) To promote sustainable aquaculture development from a social, economic and environmental perspective. This includes the provision of advisory services to cater for needs such as statutory assistance to participants;

- l) To facilitate the integration of previously disadvantaged individuals, communities and demographic entities into the aquaculture development process;
- m) To establish an effective and efficient extension service that supports aquaculture development;
- n) To ensure compliance and establish an aquaculture inspectorate to support enforcement of legal framework;
- o) To promote adaptive aquaculture management that promotes opportunities for innovation, data collection and learning;
- p) To ensure transformation of the aquaculture sector in order to broaden participation by South Africans in aquaculture, and access to resources available for aquaculture must be equitable;
- q) To promote good governance for the aquaculture sector which will enable the industry to develop to its full potential within a supportive regulatory framework.

B.4 Scope of the policy

This policy is intended for use:

- Within South Africa and in the surrounding marine and aquatic environments under South African jurisdiction;
- In all facets of the aquaculture sector, marine aquaculture or freshwater aquaculture, from subsistence ventures to the production of high value export products and the ornamental aquaculture trade;
- By all parties involved and participating in aquaculture in South Africa. Participants include producers, suppliers, processors, marketers, consultants, tertiary and research institutions, environmental custodians, consumers, the general public and all regulatory and, government departments and agencies.

The policy should also facilitate the development of the emergent and smallholder sectors as well as the development of aquaculture for food security, either by way of fish for food, or fish for sale to generate an income to buy food.

Further, the policy will provide guidance on the quality and promotion of aquaculture products to export markets, the promotion and regulation of foreign investment in South African aquaculture and its role in achieving compliance with international treaties, protocols and policies to which South Africa is a signatory on behalf of the aquaculture industry.

B.5 Policy focus areas

B.5.1 Legal and regulatory framework

At the moment the marine aquaculture is regulated by the Marine Living Resources Act, 1998 (Act No. 18 of 1998) (MLRA) whilst there is no main legislation governing the freshwater aquaculture sector. Different government departments are responsible for implementing different pieces of legislation and this has created a fragmented regulatory framework for the aquaculture sector.

The implementation of this policy will therefore require the development of a new Aquaculture Act which regulates both marine and freshwater aquaculture. Such legislation should be developmental in nature and be aligned with the current legislation which has an impact on aquaculture activities. Alignment of the Aquaculture Act with current legislation is important for harmonization of legislation and also integrated authorizations. There is also a need to amend existing legislation such as the Animal Diseases Act, 1984 (Act No. 35 of 1984) (ADA) to address the current gaps in dealing with aquatic animals and implementation of the International Organisation for Animal Health (OIE) Aquatic Code.

Since it might take a while to develop the new Aquaculture Act, to prevent the current regulatory fragmentation in dealing with the aquaculture sector, it is recommended that all statutory bodies or departments should implement the existing legislation in a manner that ensures that:

- a) Aquaculture is made accessible to all sectors of the South African community;
- b) Natural resources (such as water and coastal zones) and land are responsibly allocated and used in aquaculture;
- c) Aquatic and greater ecosystems, including their biodiversity and unique habitats, are conserved;
- d) Environmental degradation through aquaculture is minimal or eliminated. South Africa meets its international obligations for sustainable use of fish resources.

B.5.2 Environmental integrity

Aquaculture has often been associated with environmental degradation, with the key issues mentioned as being biological, organic and chemical pollution, eutrophication and habitat modification. Without proper evaluation and mitigation of impacts in terms of environmental assessment, and implementation of relevant environmental management plans, aquaculture activities may degrade the ecosystems upon which they rely. Therefore, an increased understanding and monitoring of the interactions between aquaculture and the environment are required for effective management. There is a need to administer a compliance, fish health and environmental framework that provides confidence to industry, investors and the broader community.

Whereas South Africa has excellent environmental policies and legislation, specific guidelines and protocols are needed in order to:

- a) Protect the environment and assure markets that the industry adheres to good environmental practices and has good products; and
- b) Facilitate aquaculture development.

i. Carrying capacity

Environmental sustainability is a key issue with significant impact on the size, location and viability of Aquaculture operations. Site selection and avoidance of overstocking are critical in ensuring sustainability.

ii. Environmental impacts monitoring programme

It is important that some investment is made to understand the tolerance of coastal environments to various aquaculture activities. Environmental compatibility should be ensured through development of regulatory monitoring programs e.g. chemical pollutants, waste. All rights holders will be required to develop an environmental quality monitoring programme and the Department will perform random monitoring of all operations. Environmental quality standards and guidelines will be developed in line with international standards.

iii. Integrated Aquaculture

Increased emphasis needs to be placed on integrated water use to improve environmental performance. Polyculture incorporating the increased use of plants and animals for reducing waste loads should be encouraged.

iv. Biodiversity

A well-functioning management framework in support of relevant legislation such as the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) needs to be structured and established at national and regional levels to reduce negative impacts on biodiversity, thereby guiding industry as to what species are acceptable for culture and where. Guidelines are needed on genetic management of domesticated stock and Genetically Modified Organisms (GMO's) in terms of protecting natural biodiversity.

v. Animal Health

Disease is one of the greatest risks faced by operators. It is therefore critical to ensure that fish health and disease protection is given a high priority by all stakeholders in the industry. Disease control, monitoring and diagnostic services in line with industry needs should include reporting systems and the establishment of databases. Studies into emerging diseases and pathogens need to be undertaken for effective disease control. A holistic systems approach to aquatic animal health management, emphasizing preventative measures and maintenance of a healthy culture environment needs to be promoted. Developing alternate health management strategies such as the use of disease resistant, domesticated strains of animals may also reduce the impact of diseases.

vi. Harmful Algal Blooms

Harmful algal blooms are common to the South African coastline and pose a major threat to the development of aquaculture. A harmful algae monitoring and research programme is required in order to assess the risks and to mitigate the impacts on aquaculture.

vii. Marine Protected Areas (MPAs)

In order to ensure conservation of marine and coastal habitats and their biodiversity the Minister of Water and Environmental Affairs may declare the Marine Protected Areas (MPAs) in terms of the MLRA, and a number of such MPAs have been declared. This policy is based on the assumption that aquaculture is an activity that may, at least potentially, compromise the purpose of an MPA and that it generally will not be allowed to be initiated within the boundaries thereof. Ongoing aquaculture activities, however, that is already established in an area which subsequently becomes declared as an MPA, will generally be allowed to continue. Planned or ongoing aquaculture activities that constitute a problem in relation to an MPA must be rigorously

assessed on a case-by-case based on the principle of precautionary approach.

B.5.3 Aquaculture research, technology development and transfer

Aquaculture is a technology- driven sector and requires inputs from a range of scientific disciplines (physiology, genetics, biotechnology, ecology, nutrition, economics, engineering, etc.) in order to develop efficient and cost-competitive production systems. It is beyond the means of most small and medium size enterprises to carry out the required research, and therefore sector development organisations, including research institutions, must be responsive to development requirements through their ability to undertake collaborative research to include the following:

a) Species selection

Support is required for the development or adaptation of Aquaculture technologies to establish reliable breeding and rearing techniques, and to maximize production. There is a need to focus on a limited number of priority species, while maintaining the flexibility to act on viable emerging projects. Priority species may change from time to time owing to both local and external factors.

Research needs to be broadly responsive to industry and to implement projects across a number of species in parallel with an integrated focus on a few priority species. A co-operative research framework should be established with strong industry representation.

b) Nutrition

Nutrition and feeding strategies play a central and essential role in the Aquaculture sector and feed development must be undertaken by understanding the dietary requirements of cultured species, including their application to practical culture conditions. Developing species-specific broodstock and larval diets will be a priority.

c) Application of genetics

Genetics has an important role to play in increasing productivity and sustainability in aquaculture through higher survival, increased turnover rate, better use of resources, reduced production costs and environmental protection. High priority should be given to selective breeding and stock improvement programmes.

d) Farm design

The technologies for land based and offshore aquaculture should be varied to enable operators to select and design systems which most effectively meet their needs and best fit the opportunities and constraints of the local environment. Assessment of emerging technologies (e.g. re-circulating systems, cage culture systems) is a continual requirement.

e) Education and training

A successful aquaculture industry is built on a strong educational and training foundation that improves the knowledge and skills of all people involved in the sector, across all disciplines. There is a particular need to provide a balance of practical and theoretical approaches to train farmers and to provide more skillful and innovative staff to industry.

f) Best Management Practice for Aquaculture

In order to meet international and national obligations relating to environmental sustainability, coastal zone management, product health, and disease management, protocols and guidelines for “best management practice” should be promoted. The implementation of auditable “best management practices” will enhance the competitiveness of the aquaculture industry, open new markets, and reduce threats to the aquaculture industry, such as disease and sanctions by regulatory authorities and consumers. Best management practice may be applied in terms of:

- Site requirements, water supply and effluent discharge;

- Species selections, genetic enhancement and GMO's;
 - Feeding practices and chemical usage; and
 - Disease management and predation control.
- g) Centres of Excellence / Service Centres
- Centres with the capacity to provide information, training, fingerlings, equipment and marketing and other services will be established in suitable production areas. Existing structures will be reviewed and improved where necessary and new structures should be established wherever necessary. It's important to ensure that such centres promote public-private partnerships as well as interdepartmental cooperation to ensure that clients at all levels have access to high quality service.

B.5.4 Aquaculture authorisations

a) Application assessment, authorization and licensing/permitting

In order for the DAFF to fulfill the management and regulation of the sector efficiently, all aquaculture operators must apply for a license under the new Aquaculture Act. The licenses will be granted for a period not exceeding 25 years. Once a license has been granted, a permit will be issued subject to conditions, for a specified period not exceeding two years.

Applications for the marine aquaculture sector may be lodged with DAFF at any time and will be assessed and adjudicated monthly by the Aquaculture Management Working Group (AMWG) which makes recommendations to the Department.

Applications for the freshwater aquaculture sector may be lodged within the province that the farm will be located at any time and will be assessed and adjudicated by the Provincial authorities. A provision for a joint Provincial Aquaculture Management Working Group is also proposed. The provincial authorities may seek advice from the AMWG.

The criteria that will be used to assess applications will include job creation (number of jobs per tonne), investment (Rands per year), transformation, including BBBEE objectives. Applications will be given up to three years to exercise the license, failing which the license will be revoked. This process is also aligned to the environmental authorisations under National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).

Until the new Aquaculture Act is promulgated, marine aquaculture operations shall apply for a right to engage in marine aquaculture operations in accordance with section 18 of the MLRA. The freshwater aquaculture operators will continue to under the existing regime mainly, NEMA, NEMBA and water licensing requirements in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA).

b) Integrated and Streamlined Authorisations

The current process of obtaining authorisations for starting an aquaculture farm can be time consuming, complicated and expensive mainly due to the number of regulatory departments involved and the complexity of issues. The aim of this Policy should be to establish a user-friendly, streamlined authorisation procedure and to provide for integrated permitting in order to improve the efficiency and effectiveness of the authorisation process.

The new Aquaculture Act should reduce the existing fragmented regulatory framework by providing for integrated permitting that may be issued by the Department in consultation with relevant Departments (e.g. DEA, DWA).

c) Environmental impact assessment (EIA)

Inappropriately sited and poorly planned aquaculture ventures have the potential to be environmentally degrading leading to loss of biodiversity and impairment of ecosystem function. Potential aquaculture endeavours should be subject to an environmental impact assessment (EIA) process as provided by the NEMA.

d) Site selection and coastal zoning

Within the wider goals and objectives of coastal management and the implementation of coastal policy there is a need to zone aquaculture activities and thereby prevent or minimize conflict with other users. There is a need to identify, secure, and where appropriate promote suitable species and specific sites for future investment opportunities. The lack of “ready to invest” sites zoned for aquaculture (Aquaculture Development Zones (ADZs)) is seen as one of the most significant impediments to rapid growth and investment., while the process of obtaining approval for access to sites is time consuming and costly and involves the evaluation of a variety of issues across physical, biological, ecological, economic, social and legal dimensions. Identification of sites that have full or partial approval for aquaculture, specifically for marine aquaculture, will have significant impact on the marketability of aquaculture, and subsequent investment and development.

e) Norms and Standards for Sustainable Aquaculture

Norms and standards for sustainable aquaculture at different levels and for different production systems will be developed. These will include large to small-scale operations with guiding principles and in harmony with relevant legislation. Area-wide planning and zoning should also be taken into consideration. This is of critical importance as the provisions of NEMBA and NEMA regulations which require impact studies and risk assessments. The sale of ‘farmed fish and fish products’ will also require permits. Clearly several government departments must have a role in the regulation of inland fisheries.

Compliance to all norms and standards shall be achieved through cooperative governance and consultation with all interested and affected parties.

f) Operational guidelines and permit conditions

There is a need to develop and implement clear permit conditions and performance criteria. Accurate and easily available statistics form a key component

of effective strategic planning and management and there is a need to establish and maintain a national aquaculture database for that purpose. Farm administration and compliance require strengthening, including the development of mechanisms and protocols for the timely collection and reporting of statistics.

B.5.5 Aquaculture development support

a) Aquaculture starter packs

Taking fish for food and fish to generate an income to buy food as a guideline, attention will be given to the development of working models for starter packs. These will include training, equipment and feeding. Community based fisheries will also be considered, where local impoundments can be fished and stocked/restocked with suitable species.

b) Small Medium, and Micro Enterprises and Community Aquaculture

Programmes to involve SMMEs and rural communities from areas with suitable water resources in sustainable forms of aquaculture shall be part of any implementation strategy. These programmes will include integrated systems, advisory and support services, starter packs and other means of support and would require inputs from all relevant stakeholders and role players. The village head of traditional/local government have responsibility to ensure that local resources such as water and fish are managed to provide an optimal level of income to the community. It is also important that such programmes take all the relevant regulations (NEMA, Biodiversity) into consideration.

c) Community based aquaculture- and inland fisheries programme

A system whereby suitable impoundments can be stocked with suitable fingerlings for natural growth and capture by way of netting will be developed and implemented as a food security initiative wherever possible. This will require surveys of suitable impoundments, training and equipment of artisanal fisher people and the provision of fingerlings. In addition, links will be established to

centres providing aquaculture services and inputs. In addition, a system of pilot projects will be considered as a priority action.

d) Development of pilot farms and hatcheries

As there have been changes in small-scale aquaculture throughout Africa it's important that Government re-assess the role of hatcheries on an ongoing basis. Notably, the role of hatcheries has remained static while small-scale aquaculture has progressed. Hatcheries will play a supporting role and will also be considered for use as aquaculture centers that provide training and advice on an ongoing basis.

Government can play a pivotal role in the initial stage of the establishment of aquaculture enterprises through the facilitation of access to capital. The requirement for industry entrants to integrate across all phases of the production cycle can significantly impact on development, because it raises the capital and expertise needed to enter the industry, and consequently the risk profile for investors. In many instances a single hatchery can service many farms and enable the achievement of both significant economies of scale and reduce the initial capital needs of new participants. The timely investment in hatchery technology by government can provide a major stimulus to the establishment and growth of key sectors of the aquaculture industry.

e) Aquaculture Advisory Services

Agricultural advisory services linked to provincial departments of agriculture and other service providers will pay attention to issues such as aquaculture technology transfer to farmers particularly those in development programmes. Training trainers and providing for aquaculture specialists within various Provincial Departments of Agriculture (PDAs) will be taken into consideration in any aquaculture development programme.

f) Food quality, safety and public health

As consumer awareness increases, producers, suppliers and processors need to improve the quality of products and enhance product safety. A shellfish sanitation and seafood quality management programmes are required and should adopt international food safety standards, protocols and quality systems. It is proposed that a collective responsibility by the DAFF, DOH, the National Regulator for Compulsory Standards (NRCS) and local Health authorities be formalised by appropriate arrangements.

g) Industry liaison and consultation

The growth potential and profitability of aquaculture is also limited by a lack of co-operation and information sharing between individual producers. A high degree of industry participation in all strategic and developmental activities will be encouraged through formal liaison with representative industry associations as well as with relevant working groups.

h) Marketing and trade

The department in partnership with the dti and other stakeholders will assist the development of markets for aquaculture production, services and technologies. Studies will be undertaken to identify new markets, and promotion programmes targeting South African farmed fish products will be supported. DAFF will encourage industry and the dti to establish a strategic Aquaculture Trade Council (ATC) that will promote export of South African aquaculture products.

i) Socio-economic considerations

The practice of aquaculture should be pursued as an integral component of development, contributing towards sustainable livelihoods for poor sectors of the community, promoting human development and enhancing social well-being. Where appropriate the development focus will be pro-poor, recognizing that development of small-scale aquaculture may require initial public sector support with greater support of poor target groups. To increase the impact of aquaculture

on rural development and poverty alleviation, aquaculture will be integrated into overall rural development programmes.

j) Communication and information dissemination

The policy identifies the need to improve communication and dissemination of information between the Department and stakeholders. The department will promote knowledge transfer and strengthen networks with stakeholders, including universities, industry, communities and NGOs. Information for the industry and other stakeholders will be made available through publications, electronic media, industry liaison forums etc. The information will include both technical (new techniques and equipment) and non-technical (markets, government legislation, regulations, policies etc.). The aquaculture industry will be encouraged to form representative industrial bodies with which the Department can liaise and disseminate information on a regular basis.

k) Human resources development

There is a need to increase the technical capacity in aquaculture at all levels. Small-scale farmers need access to trained aquaculture extension officers, technicians and scientists. At the provincial level, there is a need for qualified managers to coordinate and promote the sector. More bursaries and scholarships should be made available to attract more students to study aquaculture, especially black students. Funding programmes should also be considered to retrain officials already in the employ of government, extension officers, economists, technicians and veterinarians.

As more professionals qualify with aquaculture qualifications, there will be a need for a professional or scientific body to assist in setting training standards and professionalization of aquaculture as a career under the South African Council for Natural Scientific Professions.

Appropriate training manuals for small-scale farmers and new entrants in aquaculture will have to be developed and should conform to Agricultural Sector Education and Training Authority (AgriSETA) requirements.

l) International obligations and cooperation

The policy seeks to ratify, accede to, implement and comply with the requirements set by international treaties, conventions, policies and protocols applicable to aquaculture, and to actively engage in international cooperation that can contribute towards the building of skills capacity and sector development. Where South African aquaculture activities have a potential social, political, economic or environmental effect on other countries, it is a policy objective that instruments be established for the coordination, cooperation, or integration of management of that activity. Further, it is a policy objective that information be shared on the cultured resource and that measures be taken to research, monitor and control the use of the resource.

B.5.6 Transformation and broadening of participation

Few previously disadvantaged individuals (PDIs) own or are involved in aquaculture operations at a senior management level. Furthermore, aquaculture is a capital-intensive activity that SMMEs may find difficult to undertake due to difficulty in acquiring finance. In addition, potential new entrants may lack the required technical and management skills to operate sustainable businesses.

The elements to drive transformation of large scale commercial operations and support for community entities, and SMMEs shall include the following:

a) Promotion of transformation

The department will promote transformation and broader participation by encouraging the internal transformation of existing entities. In the allocation of any limited public resources (including the allocation of land, estuaries-space or sea-

space zoned for aquaculture) preference will be given to those entities that are able to demonstrate meaningful transformation in accordance with the dti's codes on BBBEE and DAFF's AgriBEE codes.

b) Access to finance

There are programmes that already exist within DAFF and the dti that are aimed providing support in the form of incentive schemes and other financial facilities for aquaculture producers. The department will facilitate access to finance for emerging aquaculture farmers, community initiatives in collaboration with the dti and other relevant agencies.

c) Partnerships

The department will support various initiatives in support of community entities, their involvement (participation) and SMME development in aquaculture. Such initiatives might include developing incentives to encourage established aquaculture operators to support communities and emerging SMMEs. The promotion of community entities and SMMEs could also be achieved through the establishment of Public Private Partnerships (PPPs).

In addition, programmes to empower communities using vehicles such as co-operatives, joint ventures, technical assistance will be supported to promote aquaculture in rural, peri-urban areas and fishing communities. Emphasis will be put on job creation and community ownership of such ventures.

d) Women and youth empowerment

The participation of women and youth in economic development is a national priority. Recognition of this priority will have to be taken into consideration when developing this sector. Special programmes targeting women and youth in aquaculture will be developed and implemented in partnership with respective agencies and departments or organisations promoting role of women and youth in the economy.

B.5.7 Monitoring and Enforcement of Authorization Conditions

Licenses (or rights during MLRA dispensation) and permits shall be issued with conditions, which may either be designed to avoid conflict with other resource users or to protect the environment. The existing monitoring programmes will be strengthened and the capacity of the department to implement them will be increased. Appropriate environmental quality standards, guidelines, penalties, monitoring, compliance, enforcement, traceability and labeling as well as information systems will be developed. To ensure compliance, all lease areas/sites will be subject to physical inspections annually, and the lease agreements will remain in place for as long as all performance requirements and obligations are met by the aquaculture farmers.

B.6 Institutional arrangements

In South Africa, like most other countries, different national and provincial departments as well as municipalities have different mandates that impact, or have the potential to impact on the aquaculture sector. This Policy aims to promote co-ordination and collaboration between all the role players in the aquaculture sector including farmers, civil society, research institutions, farmer associations, government departments, etc. This will assist with developing partnerships and reducing fragmented, overlapping and ineffective implementation.

The Policy therefore proposes the establishment of the following institutions/forums/associations aimed at encouraging participation and ensuring coordinated aquaculture development in South Africa:

B6.1 Intergovernmental relations

a) National Aquaculture Intergovernmental Forum (AIF)

This Forum will be composed of representatives of the national government departments that have a role to play in aquaculture development, e.g. DAFF,

DEA, the dti, DST, EDD, DRDLR, DWA, DOH, DHET etc. It will assist with ensuring intergovernmental cooperation amongst the relevant government departments with the framework of the Constitution. It will assist with implementing the NASF and most importantly this policy.

b) Provincial Aquaculture Intergovernmental Forum

This Forum will be composed of representatives from provincial departments that have a role to play in aquaculture development and DAFF. It will assist with aligning provincial aquaculture activities with the national plans/strategies as aquaculture development is a concurrent function for both the national and provincial spheres of governments.

B6.2 Sector coordination

a) Aquaculture Value-Chain Round Table

This Forum will be composed of representatives from all nodes of the aquaculture value-chain, e.g. representatives from research institutions, AIF, hatchery operators, producer associations, feed manufacturers, services suppliers, traders/marketers etc. It will discuss and find solutions to value chain issues that hamper competitiveness of the sector.

b) The Marine Aquaculture Liaison Forum

This Forum will be composed of marine aquaculture right-holders and relevant officials from DAFF and DEA: Oceans and Coast. It aims to provide a platform for industry to engage, discuss and find solutions to issues affecting the marine aquaculture right holders. It also creates a platform for exchanging relevant information relating to the aquaculture sector.

c) Freshwater Aquaculture Liaison Forum

This Forum will be composed of freshwater aquaculture permit-holders and relevant officials from DAFF. It will provide a platform for industry to engage,

discuss and find solutions to issues that affect the freshwater aquaculture industry.

SECTION C: POLICY IMPLEMENTATION

C.1 Policy implementation strategy

In achieving the goals of this policy framework the strategies for implementation will include the following steps:

- a) The National Aquaculture Policy Framework (NAPF) once approved by the Cabinet, will be implemented through departmental and other appropriate structures with the requisite resources. Whereas the work of other departments or agencies in aquaculture development or management will also be coordinated through the proposed structures and institutional arrangements defined in this policy.
- b) Additional capacity should be created within the national and provincial departments managing aquaculture development, especially DAFF and PDAs.
- c) Once approved, all officially commissioned industry sector or national/provincial plans will be aligned with the policy on a national, provincial and municipal level. This will set the stage to develop a single national sector development plan for aquaculture.
- d) The resultant sector plans and the policy will be used in the formulation of a legislative and administrative framework for the aquaculture industry. This will lead to the establishment of improved institutional arrangements.
- e) A collaborative platform between government and industry in the form of the National Aquaculture Development Initiative (NADI) will be created to drive joint development initiatives and coordination of industry and government efforts towards aquaculture development. This will take a form of a special-purpose vehicle that will be housed within DAFF and funded through DAFF and Industry budgeting processes. The NADI will also provide secretariat support to all institutional arrangements and structures created in the sector for better coordination and

optimal use of resources. The NADI will function as a development platform for the sector will create a strong project management capacity to ensure success of projects created for development in the sector. The NADI will also ensure that as development progresses, transformation objectives are observed and that broadening of sector participation to include HDIs is achieved through implementation of programmes specific for such purposes (e.g. incubation of black entrepreneurs, support for SMMEs, community aquaculture development projects etc.).

C.2 Funding

The successful implementation of this policy framework, including the NASF requires adequate funding. The Government commits to provide adequate funding to the sector. A new funding model (such as the establishment of an Aquaculture Fund) should also be explored in the new National Aquaculture Framework Act (NAFA) to supplement government funding for aquaculture research and to support commodity associations.

C.3 Monitoring and Evaluation of policy implementation

The implementation of the NAPF requires an effective monitoring and evaluation mechanism that has an appropriate and efficient feedback mechanism. This will require gathering the relevant information from the aquaculture sector and at the national, provincial and local spheres of government. The production of progress reports and setting of specific targets is important for the monitoring and evaluation of this Policy.

C.4 Policy review

The policy framework will be reviewed after every 10 years to continue to align with the ensuing Political mandates and national priorities and responses to global issues, especially governance regimes.

D. CONCLUDING REMARKS

This document has highlighted the need for an integrated multi-departmental and multi-stakeholder approach for the development of a sustainable aquaculture sector. This policy recognizes the need to support commercial and small-scale emerging farmers, and promote the value-chain approach. Furthermore, the DAFF has identified the role that women and youth can play in aquaculture to meet national goals with regard to food production, job creation and economic development.

Inter-departmental cooperation is central to the success of aquaculture. It is envisaged that this policy will strengthen implementation of the current NASF and identified development initiatives, and improve output and growth of this sector.

E. REFERENCES

Bannister, R.C.A. 1991. Stock enhancement (workshop report), *ICES Marine Science Symposium*, 192: 191-192.

DAFF. 2012. South African Aquaculture Yearbook. Department of Agriculture, Forestry and Fisheries, Cape Town.

FAO. 2012. State of World Fisheries and Aquaculture. Food and Agriculture Organisation of the United Nations, Rome.

Nash, C.E. 1995. Aquaculture sector planning and management. Oxford, Blackwell, Fishing News Books. 310p.

NEPAD. 2005. Action Plan for the Development of African Fisheries and Aquaculture. The New Partnership for African Development.

Rana, K.J. 2010. Critical review and analysis of the current aquaculture regulatory framework in the Republic of South Africa in relation to international benchmarks. Department of Economic Development and Tourism, Western Cape Government. 105p.

Printed by and obtainable from the Government Printer, Bosman Street, Private Bag X85, Pretoria, 0001
Publications: Tel: (012) 334-4508, 334-4509, 334-4510
Advertisements: Tel: (012) 334-4673, 334-4674, 334-4504
Subscriptions: Tel: (012) 334-4735, 334-4736, 334-4737
Cape Town Branch: Tel: (021) 465-7531

Gedruk deur en verkrygbaar by die Staatsdrukker, Bosmanstraat, Privaatsak X85, Pretoria, 0001
Publikasies: Tel: (012) 334-4508, 334-4509, 334-4510
Advertensies: Tel: (012) 334-4673, 334-4674, 334-4504
Subskripsies: Tel: (012) 334-4735, 334-4736, 334-4737
Kaapstad-tak: Tel: (021) 465-7531