

## POLICY NOTE

# REGIONAL ENVIRONMENTAL AND BIOSECURITY FRAMEWORKS FOR SUSTAINABLE AQUACULTURE DEVELOPMENT FOR NORTHERN AFRICA

### *Executive Summary*



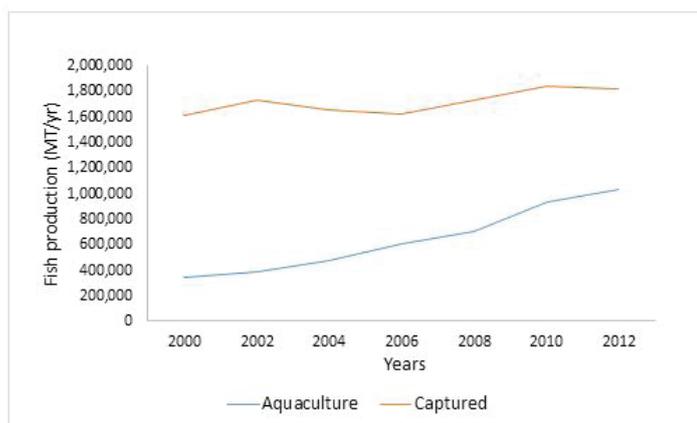
In Northern Africa, the gap between the demand for and supply of food fish has been widening rapidly due to the decline of capture fisheries production and a continually growing population. However, aquaculture production has been increasing rapidly from a recorded 929, 6120 tons/year in 2010 to 1,196,149 tons in 2015 (FAO Stat, 2016), with Egypt alone registering 1,174, 831 tons/year in 2015. This rapid growth calls for careful consideration on management of aquatic environment and biosecurity issues to promote aquaculture sustainability. The Regional Framework on Environmental Management for Sustainable Aquaculture Development in Africa - Northern Africa Region, which was developed after consultative process by the African Union: Interafrican Bureau for Animal Resources (AU-IBAR) as part of implementation of the Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa (PFRS) also advocates for issues of sustainable management of aquaculture. The Regional framework has also been drawn from African Union Aquaculture Plan for Africa (2016-

2025). The PFRS is a product of the Comprehensive African Agriculture Programme (CAADP) and Council for African Ministers in Fisheries and Aquaculture (CAMFA) which aim at bringing policy coherence among African Members States. Thus this policy note has been designed to provide a simple and clear pathway for the development and operation of aquaculture as an integrated component of the natural and human landscapes of the Northern African region. It is recommended that Member States follow precautionary approach (PA) /adaptive management (AM) of aquatic resources, conduct appropriate and long term goal-aimed research, guided by a participatory process and focusing on ecosystem functioning and services and where possible, carry out sectoral integration, broaden stakeholder participation, institute standards to enhance product safety and consumer awareness and promote understanding and inclusion of people/societal values in undertaking sustainable aquaculture.

## Introduction and Background

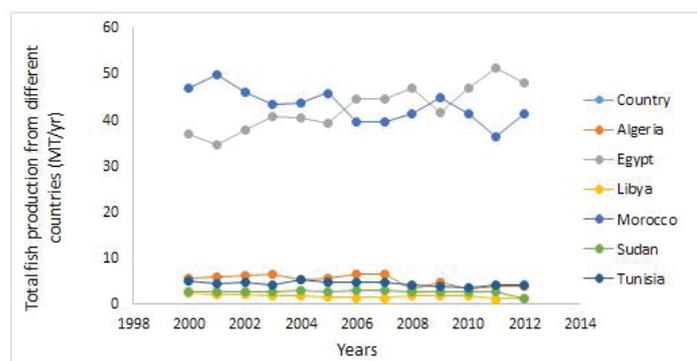
### Overview of Aquaculture in the Northern region

Mediterranean basin is the main fishing basin for the North African region. Their main fish stocks appear to be reaching their maximum production while some have been overfished and have drastically declined in numbers. On the other hand aquaculture production has increased from 344,986 MT/year to 1,032,655 tons /yr in 2012 representing about 300% increase (Figure 1).



**Figure 1:** Fish production in Northern Africa Region (MT/yr) (Source: El Naggat, 2013)

The major contributors of aquaculture production in the Northern Africa region are Egypt and Morocco. Together the two countries together produce about 90% of the regions total fish production leaving only less than 11% for the other four countries in the region (Figure 2).



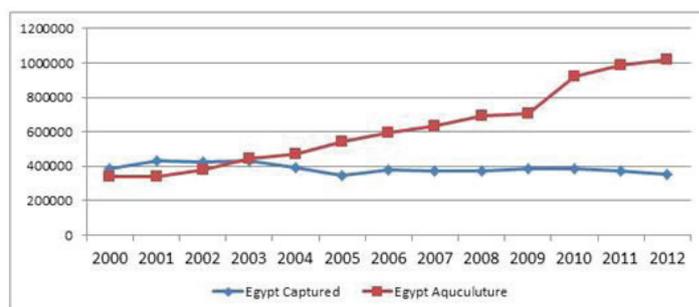
**Figure 2:** Trend of total fish production from different countries as a % of total Northern African production (MT/yr)

Over 98% of the total aquaculture production in the Northern Africa region is contributed by Egypt.

### A brief description of Aquaculture production in different countries

#### Aquaculture in Egypt

Fish farming was practiced since 4000 years ago but matured over the last three decades. In 2011 Egypt landed almost 1 million tonnes from aquaculture from only 57,000 tonnes in 1994 (Figure 3).



**Figure 3:** Fish production in Egypt from capture fisheries and aquaculture

Egypt is the 8th largest world farmed fish producer, first in Africa and second to China in tilapia production. Egypt raised per capita consumption from 8.5 kg a decade ago to 17 kg in 2011.

#### Aquaculture in Libya

In 2011, Libya produced 240 tonnes from aquaculture. Intensive land based production is in earthen and concrete ponds. Hatcheries are distributed along the county's coastline. In 1990s mariculture of sea bass, sea bream and mullet in cages grew in east coast with imported fry. Rearing Atlantic tuna started in 2003 but production is low. The current contribution of aquaculture to the economy is negligible.

#### Aquaculture in Tunisia

In 2011, Tunisia produced 8,126 tonnes from aquaculture. Geographically Tunisia opens up widely into the sea with 1,300 km. of coastline. Both marine and inland species are farmed: Tunisia has several blue-fin tuna fattening projects with fry from the wild and Aquaculture has high potential to land 20,000 tonnes/year. The government has national Master Plan for aquaculture. It encourages and provides incentives to build up aquaculture infrastructure.

#### Aquaculture in Algeria

In 2011 Algeria produced 2,244 tonnes from aquaculture. Farming is undertaken in brackish, fresh

waters as well as inland impoundments. Shellfish culture and mussels are usually kept by private sector. Government projects are demonstrations to private sector. Production is 90% from freshwater farming. Aquaculture is in take-off phase through:

- Freshwater fish farming and shrimp breeding trials;
- Experimental shellfish production in brackish lagoons;
- Development of restocking for commercial inland aquaculture; and
- Encouraging private sector to engage in aquaculture.

#### *Aquaculture in Morocco*

Morocco produced 1,397 tonnes from aquaculture in 2011. Fisheries make substantial contribution to national economy but so far aquaculture is negligible. Aquaculture began over 50 years ago with marine culturing of cupped oysters along the Atlantic coast and later inland farming. In 1980s intensive sea bass and bream farmed only for export to EU. 3 types of marine aquaculture are being practiced in:

- protected lagoons and estuary environment;
- basins replenished with pumped seawater; and
- Cages in open sea for sea bass, bream and meagre species.

#### **Challenges and Opportunities**

With the exception of Egypt, aquaculture in North Africa (NA) countries is in the take-off stage. NA Governments encourages and supports growth to meet increasing demand for local consumption and for export (High demand by EU to import highest valued seafood products). National and foreign entrepreneurs alike are invited to invest. With population growth, sustainability is required for generations.

The following opportunities are bound to result in growth and progression of aquaculture in the North Africa Region:

- Population growth in the region.
- Demand for more fish at affordable prices expected to continue.
- Measures for responsible fisheries are taken to combat declining trend in capture fisheries.
- Sustainable and environment friendly aquaculture is expanding in almost all countries of the region.

- On-going aquaculture research in introducing potential species.
- New international markets for farmed species are opening up and expanding.

In order to utilize the opportunities on the future of aquaculture production, processing and consumption in North Africa, it will be necessary for the countries in the region to implement measures to combat, reverse or strengthen the following challenges:

- Weak laws and regulations governing aquaculture
- Low availability of fry due to lack of hatcheries for year-round supply to farms
- Low production of locally specialized fish feeds
- Lack of effective partnerships and stakeholders representative bodies and assemblies
- Lack or absence of supportive policies
- Resource limitations (Human, financial and Natural)
- Poor enforcement of rules and regulations
- Insufficient information sharing within and between countries (databases and resources)
- Lack of a coherent continental and sub-regional policies
- Quality of inland and coastal waters;
- Shortage of research and development of indigenous and imported new species as well as adaptation of new culturing technologies;
- Constraints in inputs, quality of production, post-harvest losses and marketing
- Competition with agriculture, other coastal activities, land use, fry mortality, enforcement of regulations, feed supply, trained manpower, etc.
- Efficient institutional adjustments for good governance;
- Price fluctuations on the international market for farmed products;
- Relatively high input costs; and
- Improvement and expansion of statistics and reporting in order to have a full understanding of the sector.

## Challenges in Relation to Environmental and Biosecurity Management (Issues) and Sustainable Aquaculture Development

Northern African aquatic environment faces different challenges following the growth in aquaculture production in the region. There is high presence of heavy metals and pesticides in Northern African waters and general degradation of lakes and other naturally occurring water bodies. In North Africa, hydraulic traditions have also remained limited and generally rather elementary. Despite interest in the subject, no in-depth studies in environmental economics have also been identified in North Africa yet the challenge is nonetheless great.

Although aquatic resources are generally considered renewable, irresponsible aquatic production practices can have significant adverse environmental impacts. For example, there is concern of pollution in the region due to poor production practices. At farm scale, effluents from production facilities pose a threat to the surrounding ecosystems due to improper disposal. This worsens with increase in production intensity. Clusters of farms that share a common water body or watershed are not well coordinated to ensure sustainable utilization and biosecurity. Bearing in mind that cultured species are sensitive to water quality and are therefore extremely vulnerable to the damage inflicted by other users of the water body or watershed, it is important to always consider environment and issues of biosecurity in aquaculture operations. Issues of fish health are also of concern in the region. The aquaculture industry has

been overwhelmed with aquatic animal diseases caused by viruses, bacteria, fungi, parasites and other non-identified and emerging pathogens. In addition to the economic consequences, disease outbreaks negatively affect fish welfare, losses in production through fish mortalities, reduced income, low or no employment, limited market share, investment, loss of consumer confidence; food shortages, industry failure and closure of business. Furthermore, while disease incidences can be controlled at farm level, their effects occur at the watershed level and often do require control, management and mitigation at the watershed level. Likewise, exotic fish that escape from fish farms often impacts on biodiversity across the entire watershed.

In order to fully combat the effects aquaculture may have on the environment in North Africa, it is necessary to look into the different levels at which production occurs and also beyond the farm. This policy note is intended to provide recommendations for management of all productive scales (from small-scale to intensive, large scale farming) for North Africa and shall therefore respond to sustainable development of aquaculture with regards to environmental management.

### Policy Recommendations

The following recommended management measures aim to promote the compliance of the three EAA principles in order to ensure aquaculture contribution to sustainable development in the region. There is also some degree of overlap between them.

### The precautionary approach (PA) / adaptive management (AM)

Global	Watershed/ Coastal Zone	Farm
<ul style="list-style-type: none"> <li>Promote capture of existing knowledge to design best sustainable farming approaches (e.g. production technologies and species requirements considering site carrying capacity)</li> <li>Disseminate knowledge of adverse impact of improper practice and better alternative technologies</li> <li>Promote the use of risk analysis as a tool for farm decisions and promote monitoring programs proportional to the level of risk</li> </ul>	<ul style="list-style-type: none"> <li>Promote regulations which consider this scale as the proper focus when relevant</li> <li>Ensure permanent review and implementation of better management practices at this scale considering the influence of all sectors (aquaculture and agriculture industry and other interacting sectors)</li> <li>Facilitate decentralization of management at the watershed/coastal zone level</li> </ul>	<ul style="list-style-type: none"> <li>Knowledge enhancement and dissemination of risk assessment tools and other similar practices to deal with the management of uncertainties</li> <li>Develop global agreements on better management practices</li> <li>Promote dissemination of appropriate information to consumers allowing them to differentiate products regarding sustainable and unsustainable practices</li> </ul>

Global	Watershed/ Coastal Zone	Farm
<ul style="list-style-type: none"> <li>Promote the design and use of simple/ inexpensive physical, chemical and biological indicators of ecosystem health (Secchi disk, dissolved oxygen, key species) and sustainability at the different levels</li> <li>Promote integrated or multi trophic aquaculture where appropriate</li> <li>Promote environmental insurance systems when appropriate</li> <li>Promote better management practices in general.</li> </ul>	<ul style="list-style-type: none"> <li>Promoting monitoring programs and use of easy indicators at this level is most relevant</li> <li>Consider existing management models; circulation/deposition models; or develop proper management models considering local particularities</li> <li>Facilitate the acquisition of reliable data/ knowledge</li> <li>Understand competing demands; and use best information for settling multiuser conflicts</li> <li>Promote certification systems based on best information to differentiate sustainable practices</li> </ul>	<ul style="list-style-type: none"> <li>Promotion of global sharing of sustainable practices, sustainable technologies</li> <li>Promote certification systems based on best information to differentiate sustainable practices</li> </ul>

***Appropriate and long term goal-aimed research, guided by a participatory process and focusing on ecosystem functioning and services***

Global	Watershed/ Coastal Zone	Farm
<p>conduct research to:</p> <ul style="list-style-type: none"> <li>Define the proper species to culture</li> <li>Estimate externality costs and alternative development pathways</li> <li>Improve management and especially feed conversion ratios and minimize effluents and wastes</li> <li>Improve feasibility and promote integrated aquaculture (multi trophic aquaculture / polyculture) at the farm level</li> <li>Facilitate budget calculations (e.g. Biomass, nutrients, monetary etc.)</li> <li>Facilitate evaluation of farm carrying capacity</li> <li>Facilitate the understanding and value of ecosystem goods and services</li> <li>Carry on studies on comparative regulatory and governance studies</li> </ul>	<p>conduct research to:</p> <ul style="list-style-type: none"> <li>Close the life cycle in captivity of many species</li> <li>Estimate externality costs and socioeconomic implications of alternative development pathways</li> <li>Evaluate and model cumulative, effects of aquaculture and other sectors on biodiversity and ecosystem functions</li> <li>Develop tools for evaluating carrying capacity at this scale also considering other users, inputs</li> <li>Understand and value of ecosystem goods and services</li> <li>Promote the right species based on market demands, ecosystem functions, species requirements and to facilitate integration with other sectors Develop, improve markets and consumer awareness/certification and eco-labelling</li> <li>Develop regulatory and governance tools</li> <li>To enhance integrated aquaculture practices</li> <li>To improve biosecurity, health management</li> <li>Use genetics for better management and increased production</li> </ul>	<p>conduct research to:</p> <ul style="list-style-type: none"> <li>Produce more friendly feeds with ecosystem considerations and global accounting (e.g. Lifecycle analysis)</li> <li>Develop energy efficient farming technologies and the treatment of effluents</li> <li>Improve health management</li> <li>Develop safer containment technologies</li> <li>Develop further integrated aquaculture/integrated multi trophic aquaculture (IMATA)</li> <li>Improve management in general on genetics for better management and increased production</li> </ul>

### Sectoral integration when appropriate

Global	Watershed/ Coastal Zone	Farm
<ul style="list-style-type: none"> <li>Facilitate access to proper technologies</li> <li>Widespread dissemination of effective and sustainable traditional technologies; integrating traditional and modern practices; IMTA, Integrated crops/ livestock/Fish, IMTA</li> </ul>	<ul style="list-style-type: none"> <li>Facilitate integration IMTA (within farm and amongst farmers, prompter farmers associations interactions (e.g. mussel farmers and fish farmers)</li> <li>Facilitate integration with fisheries and fisher folk, with agriculture, recreation, urban and industrial activities and stakeholders involving R&amp;D, common resource management and education.</li> <li>Facilitate decentralization of management at the watershed level.</li> </ul>	<ul style="list-style-type: none"> <li>Must promote connections, cooperation of farmer associations, international institutions, NGOs, etc.</li> </ul>

### Broadening stakeholder participation

Global	Watershed/ Coastal Zone	Farm
<ul style="list-style-type: none"> <li>Policies must create mechanisms to guarantee farmer (and his family when appropriate), employees, and extension agencies the adequate participation.</li> </ul>	<ul style="list-style-type: none"> <li>Facilitate capacity building and empower all stakeholders to ensure equitable participation</li> <li>Create mechanisms to guarantee equitable participatory extension, cooperation, R&amp;D</li> <li>Facilitate (create mechanisms) integrated coastal zone management (ICZM) other productive sectors (e.g. Agriculture and management of connected water ways considering EAA principles and involving stakeholders and institutions in and Fisheries/Aquaculture, Forestry ministries etc.)</li> <li>Facilitate equitable participation by decentralized management measures</li> <li>Facilitate capacity building and empower all stakeholders to ensure equitable participation</li> <li>Create mechanisms to guarantee equitable participatory extension, cooperation, R&amp;D</li> <li>Facilitate (create mechanisms) integrated coastal zone management (ICZM) other productive sectors (e.g. Agriculture and management of connected water ways considering EAA principles and involving stakeholders and institutions in and Fisheries/Aquaculture, Forestry ministries etc.)</li> <li>Facilitate equitable participation by decentralized management measures</li> </ul>	<ul style="list-style-type: none"> <li>Must Promote connections, cooperation of farmer associations, international institutions, NGOs, etc.</li> </ul>

### Standards to enhance product safety and consumer awareness

Global	Watershed/ Coastal Zone	Farm
<ul style="list-style-type: none"> <li>• Improve the institutional framework</li> <li>• Develop collective values (education, information, and training)</li> <li>• Create mechanisms to internalize externalities</li> <li>• Implement gradual mechanisms for the compliance of norms, regulations and agreements including aspects of economic assistance to bear especially with initial costs Create tax mechanisms, special advantageous licences Simplify mechanisms for EFA certification or compliance</li> </ul>	<ul style="list-style-type: none"> <li>• Facilitate area-geographic zoning, regulations (Licensing, Certification)</li> <li>• Facilitate and promote waterbody/ watershed certification of EFA compliance, Eco labeling etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Promote EAA markets with demand for appropriate certification.</li> <li>• Proper use of Taxation (int. market).</li> </ul>

### Standards to enhance product safety and consumer awareness

Global	Watershed/ Coastal Zone	Farm
<ul style="list-style-type: none"> <li>• Considerations should be made to whom is working at the farm weather a family, children, women, mostly men etc. Such information must translate in adequate working conditions in the farm</li> </ul>	<ul style="list-style-type: none"> <li>• Promote the consideration and respects of cultural, ethnic and religious aspects</li> <li>• Ensure proper markets and market conditions</li> <li>• Promote consideration and respect of community decisions for development options</li> <li>• Facilitate participatory decision processes for the different communities, localities even countries which share common watersheds/ water bodies Relevance should be given to sociocultural markets, governance systems; regulatory systems considering historical reasons and present appropriateness</li> </ul>	<ul style="list-style-type: none"> <li>• Promote the considerations to socio-cultural markets, governance systems; regulatory systems: historical reasons and present appropriateness taking in account inter regional differences and developing countries/regions needs</li> </ul>

### Standards to enhance product safety and consumer awareness

Global	Watershed/ Coastal Zone	Farm
<ul style="list-style-type: none"> <li>• Target education and training to the farm stakeholders (farm owners, workers, site managers) focusing on EAA principles and knowledge-management oriented</li> </ul>	<ul style="list-style-type: none"> <li>• Target education to the right portion of the population (aquaculture associations, companies, other relevant sectors e.g. agriculture, industry, general public and policy makers)</li> <li>• Orient education to the watershed issues focusing on EAA principles and knowledge-management oriented.</li> <li>• Promote education fostering integration of sectors</li> </ul>	<ul style="list-style-type: none"> <li>• Target education to trans-national institutions, policy makers</li> <li>• Promote education of public opinion based on scientific-based information particularly regarding some aquaculture myths, e.g. nutrients are “pollutants”, use of some therapeutants, bioavailability of hazardous substances, etc.</li> </ul>

## Conclusion

This policy note for Northern Africa has synthesized existing challenges and opportunities faced in aquaculture. It has also given recommended management approaches and principles to effectively implement Ecosystem approaches for Aquaculture in the region at different levels of aquaculture operation. This seeks to support the advancement of aquaculture in the Northern Africa region, by providing guidance around the management of an aquaculture sector that can perform well within the capacity of natural resources. Recommendations have been made on precautionary approach (PA) /adaptive management (AM) of aquatic resources, long term goal-aimed research, guided by a participatory process, sectoral integration, stakeholder participation, instituting standards to enhance product safety and consumer awareness and promoting understanding and inclusion of people/societal values in undertaking sustainable aquaculture. Their application has been recommended at farm, watershed/coastal zone and global level. Their implementation will contribute to the achievement of sustainable aquaculture in Africa.

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**Note:** This Policy Note is a synthesis of series of reports based on activities implemented by AU-IBAR under the project 'Strengthening Institutional Capacity to enhance governance of the fisheries sector in Africa', Project number: DCI-FOOD 2013/331 -056' funded by the EU.

**Citation:** AU-IBAR, 2018. Policy Note: Regional Environmental and Biosecurity Frameworks for sustainable aquaculture development for Northern Africa



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