Project no. **032103**

Project acronym

BOMOSA

Project title

Integrating BOMOSA cage fish farming system in reservoirs, ponds and temporary water bodies in Eastern Africa

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Deliverable 4.10: Recommendations for aquaculture institutional environment in Eastern Africa IMPROVED VERSION

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1 INTRODUCTION

Global population demand for aquatic food products is increasing, the production from capture fisheries has leveled off, and most of the main fishing areas have reached their maximum potential. Sustaining fish supplies from capture fisheries will, therefore, not be able to meet the growing global demand for aquatic food.

Aquaculture appears to have the potential to make a significant contribution to this increasing demand for aquatic food in most regions of the world. As a consequence, increasing emphasis is placed on enhanced enforcement of regulation and better governance of the sector. It is increasingly realized that this cannot be achieved without the participation of the producers in decision-making and regulation process, which has led to efforts to empower farmers and their associations and move towards increasing self-regulation (FAO, 2006).

Aquaculture is developing, expanding and intensifying in almost all regions of the world, except in sub-Saharan Africa (FAO, 2006). In most of its countries, the legislative and regulatory environment is weak and does not encourage the development of the sector. The problem is recognized and is being addressed by several countries in the region. As part of this process, a core of countries has now adopted strategic sector development plans, while others are following. Furthermore some recent overarching Plans and Programmes (i.e. NEPAD Action Plan, 2005 and FAO's SPADA Programme, 2008) are trying to develop pan-African programs aimed at enabling the expansion of responsible/sustainable aquaculture across the continent.

Sustainable development of aquaculture requires a government's commitment to provide appropriate support to the sector. Commitment is seen in the form of clear policies, plans and strategies combined with adequate funding for their implementation.

Therefore there is a need to have clearly defined aquaculture policies and regulations that suit the development of the sector at all levels. Based on such plans, specific development projects can be formulated by the public or the private sector. For any development of aquaculture activity there should be a suitable legal and regulatory framework that facilitate the implementations of the project.

The Deliverable 4.10 take inputs from the existing aquaculture regulatory framework listed in the Deliverable 4.6 to produce a review of legal documents, policy documents and institutional arrangements for each country, making analysis and comments with main reference to implementation and up scaling of integrating BOMOSA cage fish farming system.

2 ANALYSIS AND INTERPRETATION OF AQUACULTURE LEGAL FRAMEWORK

2.1 Kenya

2.1.1 Legal documents

Fisheries and Aquaculture

Major legal documents that are relevant to fisheries and aquaculture were listed in Deliverable 4.6.

The Fisheries Act Cap 378 (1991) and the following updates appear to be the most comprehensive in their coverage and contents. This act mainly regulates and deals with the fisheries activities in Kenya, introducing only some concepts concerning Aquaculture:

- “Kenya fishery waters” are distinguished from “fish ponds and fish farms and any private fish ponds or fish farms and any private fish ponds or fish farms not established for commercial purposes”;
- the Minister of Fisheries Development and the Director of Fisheries Office should promote, regulate and control the cultivation of live fish of any kind or species and the development of traditional and industrial fisheries, fish culture and related industries;
- aquarium fish culture activities need a specific licence.

The definition of “fish culture” as “a person fishing in Kenya fishery waters” seems unclear and ambiguous also on the evidence of the following definition of "fish farmer" that means a person engaged in fish culture. In this case the difference between fisherman and fish farmer is not evident.

The following Fisheries (General) Regulations (1991) re-defines the concept of fish culture that means “propagating, breeding or raising of fish under confinement by man”. Despite what is presented by FAO on the fisheries management in Kenya (www.fao.org/fi/fcp/en/KEN/body.htm), no more sections of the Fisheries Act concern Aquaculture.

Regulations and management measures on the fisheries activities, the detailed licensing provisions, regulations on live fish importation restriction on purchasing fish, prevention of pollution and protection and conservation of fishery waters (Part X), seem adequate if well applied.

Wider implications of the Fisheries Act involve also control of the spreading of alien fish species and fish disease, overfishing, assessing of environmental impact, etc. and it could be considered a good starting point to reach a well developed aquaculture/fisheries policy. The disappearance of regulations on the commercial fish hatcheries in the most recent Forest Act (2005), repealing the Forest Act 1982 where this concept was clearly stated, seems not adequately replaced by pertinent rules in different regulatory sets.

Environment and Water Resources

The Environmental Management and Co-ordination Act - EMCA (1999) is the most comprehensive institutional law concerning environment. It furnishes a wide range of environmental rules and competencies, trying to de-centralize the environment management and to give responsibility on it to the local communities. In this Act, fish are considered essential component of the environment and should be protected together with others

components from pollution and water exploitation, guaranteeing minimum water quality standards.

These standards should be guaranteed to the National Environment Management Authority (NEMA) by the Standard and Enforcement Review Committee.

No specific mention is done on aquaculture involvement in environmental protection and conservation (Part V of the Act) but fish farming should not fall in conflict with indications such as:

- erect, reconstruct, place, alter, extend, remove or demolish any structure or part of any structure in, or under the river, lake or wetland without Director-General written approval;
- introduce any animal whether alien or indigenous in a lake, river or wetland without Director-General written approval;
- deposit any substance in a lake, river or wetland or in, on, or under its bed, if that substance would or is likely to have adverse environmental effects on the river, lake or wetland without Director-General written approval.

These restrictions may represent a problem for intensive fish farming in the next future and an environmental impact assessment should be done, but actually BOMOSA systems are based on a small-scale farming with very low bio-mass density of native fish (tilapia) so the problems related to pollution and introduction of alien species are not significant for the surrounding environment.

Although in the EMCA is not expressly indicated, a big attention should be addressed to the wild/farmed fish handling/transport form different environments, through a careful management of the stocks and a preventive check of the sanitary status of the fish to prevent diffusion of pathogens.

The major law dealing with water management is the Water Act (2002), where it is stated that the right over all surface and ground water is of the State and the control of all the water bodies is excercised by the Ministry of Water. The Water Act has introduced substantial changes to the management of water sector in Kenya, separating the management of water resources from the provision of water services, separating policy making from daily administration, proposing a decentralization of function to lower governative level and involving non-governative entities in water management (Mumma, 2005).

The allocation of the water resources is possible through a “permit system” for which the WRMA (Water Resources Management Authority) is responsible. In the Water Act, the role of community group (organized as water resources users association) seems well recognized in the management of water reosurces, giving the opportunity to the WRMA to appoint a catchement area advisory committee of no more of 15 members chosen from among governative (Ministry, region and local authorities) and not governative (representative from farmers, pastoralists, business community, etc.) persons with competence in water management resources.

Quality standards and Environmental Impact Assessment (EIA) are under the responsibility of the NEMA.

Two major aspects of this Act should be underlined:

1 considering the utilization of water resources for fish farming purposes it has to be remembered that the use of water for domestic purposes shall take precedence over the use of water for any other purpose and that the nature and degree of water use authorized by a permit shall be reasonable and beneficial in relation to others who use the same sources of supply;

2 the permit system as proposed in the Water Act 2002 gives the whole water management to the State and moreover it apparently restricts water rights to a small section of the community, essentially property owners. Poor rural communities are unable to meet requirements for obtaining a permit, mainly land ownership, resulting in this way marginalized.

The first aspect doesn't seem in conflict with BOMOSA Integrated Farming System because one of the strength of the project is the utilization of marginal temporary water bodies not used for drinking purposes. The second aspect is a delicate question that could origin hard-to-solve conflicts between land owners, pastoralist, fish farmers and local communities. An enforcement of the local component in the Water Resources Users Associations could be a key factor for a collective involvement of the community in making decision.

However until now the ownership of water systems is still ambiguous so that the community investment in the water management is very low, especially if associated to lacking of a clear community leadership and of inclusive projects on water management.

Animal (Fish) Diseases, Food Safety and Public Health

In the Animal Diseases Act (1965) no mention is provided to fish as animals. In fact "animals" means "all stock, ruminating animals, dogs, cats, rabbits, captive wild animals and any other animal which the Minister may, by notice in the Gazette, declare to be an animal", where "stock" include "camels, cattle, sheep, goats, horses, mules, donkeys, swine, birds and bees".

Although no specific legislation concerning fish diseases is actually present in Kenya, Kenya is a member of the Office International des Epizooties (OIE) / World Organization for Animal Health and it should follow its recommendations presented in the Aquatic Animal Health Code. The poor knowledge on the current situation of sanitary status of fishes in Kenya strongly suggests improving the scientific researches on this field following step-by-step the increasing of Kenyan Fisheries and Aquaculture. In this sense also the ornamental fish trade should be taken in careful consideration by the lawmakers for the potential risk of diffusion of new or not-well-known pathogens. Furthermore the adoption of the OIE Manual of Diagnostic Tests for Aquatic Animals and the capacity building of specialized reference laboratories able to apply these tests are strongly necessary for the next future.

On the basis of FAO (Food and Agriculture Organization) and WHO (World Health Organization) advices and recommendations, during last decades all the African governments have been encouraged to develop national legislation aimed to establish food standards and implement the control strategies of food safety and food quality. Kenya is a member of the World Trade Organization (WTO) and of the Codex Alimentarius Commission and has established a National Codex Committees (NCC) and National Codex Contact Points (NCCP), answering to the FAO/WHO requests.

In Kenya the NCCP and NCC chair is the Kenyan Bureau of Standards and the NCC comprises government ministries, universities, private sector, and consumer organizations.

About Food Safety, the Fisheries Regulations don't seem adequately addressed to the safety and sanitary controls that need to be put in place to assure fish quality and safety, even if they deal with topics concerning quality assurance and safety of fish, fish products and fish feed. No specific legislation relating to hygiene in the processing and marketing of fish and fishery products is active at this moment, but various acts and regulations contain some general advices, such as Public Health Act and Food, Drugs and Chemical Substances Act. Furthermore the Kenya Bureau of Standards (KEBS) published in 1986 a Code of Hygiene Practice for the fish and fishery sector.

However, in most cases legislation was out-dated and not compatible with international standards, so the more fundamental weakness was in the implementation and enforcement

of existing regulatory requirements (Henson & Mitullah, 2004). Previous to the bans on exports to the EU (1997-1999), the whole Kenyan fish sector had made little progress in hygiene and food safety controls and the co-ordination or cooperation between government and the private sector was sporadic. However, the need to address the concerns of the EU to regain market access brought about wholesale and fundamental change to the sector in a relatively short period of time. One of the major weaknesses in food (fish) safety capacity is on fishing vessels and landing beaches. Fishing is mainly undertaken in small wooden craft with no facilities for cold storage to permit early chilling. The supply of potable water is frequently inadequate and toilets and hand washing facilities with soap are very scarce. Transport of fish from beaches is usually in trucks with ice not always clean. More still needs to be done.

The Public Health Act (1961) covers a very wide range of Public Health matters; fish as fisheries and aquaculture could fall into water supply protection (prohibiting pollution of water for drinking and domestic purpose, Art. 129-130, although fish farming systems are not explicitly included in the cited categories, see Deliverable 4.6) and into food protection (sale, seizure penalty for unwholesome food, Art. 131-132-133-134). Although fish is never expressly cited, it could fall into the definition of food as “any article used for food or drink- other than drugs or water, and any article intended to enter into or be used in the preparation of such food, and flavoring matters and condiments”. According to the FAO, food-borne disease remain a problem in Kenya and a well coordinated food safety management involving all stakeholders within the supply chain is necessary for prevention of potential risk as seen in the horticulture and fish sector (FAO, 2005, Document 17).

2.1.2 Policy Documents

Starting from the above mentioned lacks, several intent declarations were proposed in various national and extra-national documents/policies (see list in Deliverable 4.6) concerning the necessity of a strong improvement of fisheries and aquaculture sector.

Among these the most relevant is the National Oceans and Fisheries Policy (2008), recently edited by the Ministry of Fisheries Development in order to give a specific policy framework to the fisheries sector, actually threatened by uncoordinated development approach, low investment, over-exploitation of some water body, weak linkages between research, management and other private/public players and a low aquaculture development.

The Fisheries Management Bill (2009), actually under evaluation at the Kenyan Parliament, tries to give a strong input to the Aquaculture development, through regulations and permits on the main aquaculture sectors (standardization of farming systems, fish diseases surveillance, control and management, etc. - see Dev. 4.6). Although the assumptions appear positive, in this case, as in the water management previously analyzed (see above), the main criticisms are the environmental impact assessment of aquaculture and the permit system. The former has already been discussed. Regarding the latter aspect BOMOSA integrated systems were thought for a deeper involvement of the whole rural community around a water body and it will be very important to keep them in prior consideration for the aquaculture permits. Furthermore the personal assignment of such permits, not transferrable without Director-General consent, seems inadequate for an inclusive community involvement. A “community permit” shall be considered to not give too much power in few hands. In conclusion more specific rules need to be moved towards land ownership around water bodies and accession rights to water bodies. Regulations on these aspects are still lacking.

All the other National Development Plans (see D4.6) didn’t adequately deal with efficient strategies to support the fisheries/aquaculture sector development. Moreover fisheries in the inland waters are overexploited and Nile Perch and Nile Tilapia stocks in Victoria Lakes are

showing signs of decline. On this evidence Aquaculture seems to have a substantial potential to contribute to food security, poverty reduction, employment creation and reduction of pressure on fisheries. In the following scheme (Figure 1) the legal and policy documents regulating aquaculture institutional environment in Kenya are listed.

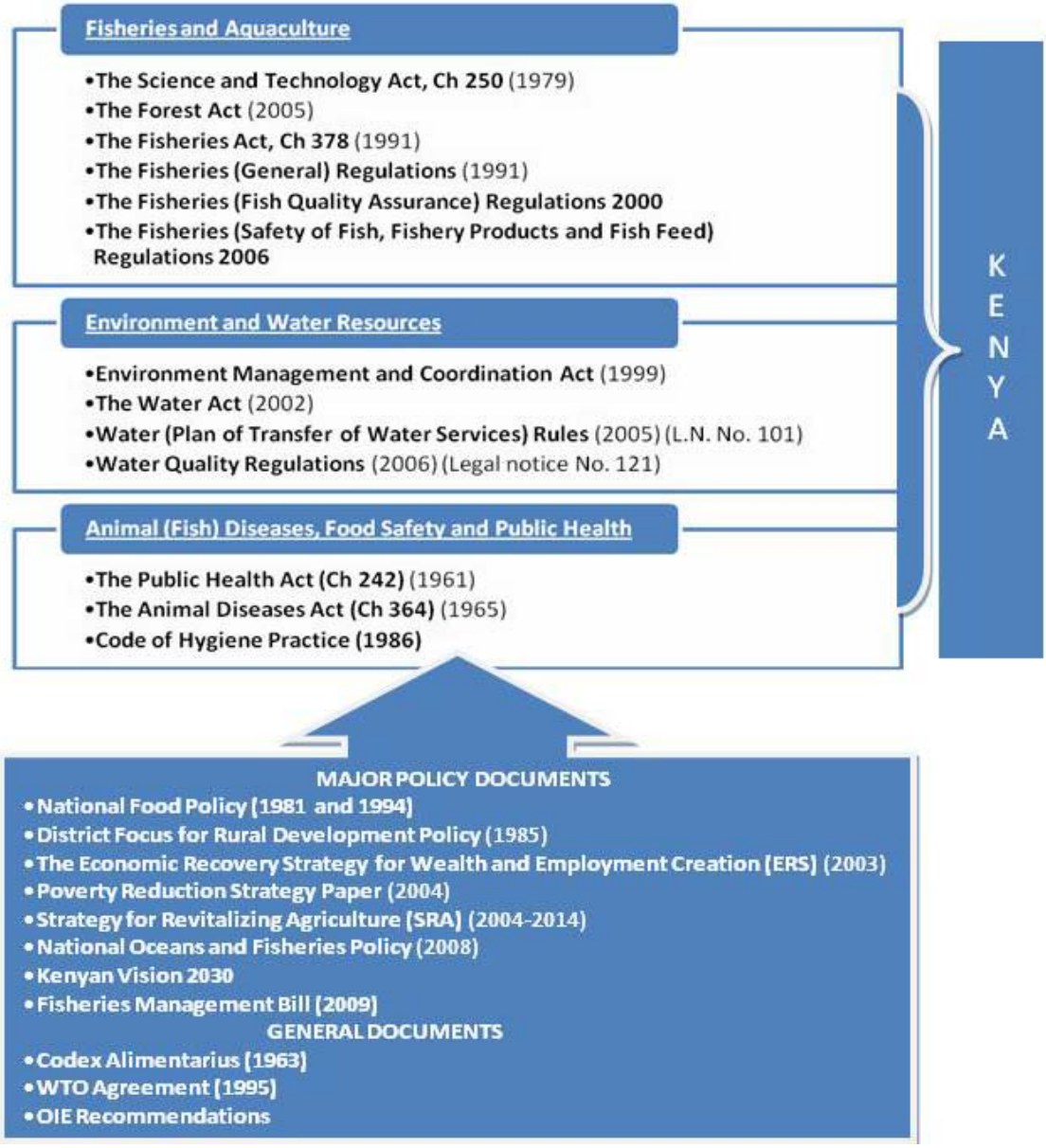

Figure 1: Legal and policy documents regulating aquaculture institutional environment in Kenya.

2.1.3 Institutional arrangements

Since in April 2008 the Ministry of Fisheries Development has been created, the major aim is to give a strong impulse to the activities concerning a responsible aquaculture in Kenya, and to regulate Kenyan fisheries in a more sustainable approach. The principal actor of these purposes should be Kenya Marine and Fisheries Research Institute (KMFRI). Nevertheless regulation on the correct approaches to improve the sanitary aspects in aquaculture is still poor, also for a marginal interest on this kind of production, limited to local markets around the farms.

The utilization of water bodies for fish farming purposes has to take in account the complexity of many practical aspects starting from the social structure of the rural communities, the unsolved problem of land ownership vs. water bodies public access and the environmental protection. Similarly the institutional competencies and the regulatory frameworks in this particular case are frequently overlapped, involving several Ministries and Authorities, each one producing their own documents and laws.

It must be considered that in Kenya the legal framework is widely pluralistic and deny this fact will make any new law ineffective in meeting the needs of rural people, to which BOMOSA project is oriented. Kenya rural poor, typically, live within normative frameworks in which state-based law is no more applicable than customary and traditional norms (Mumma, 2005).

However, considering the particularity of fish culture in small and temporary water bodies, as planned in BOMOSA project, a specific and clear normative addressed to regulate all the managerial aspect of this specific production could be useful to solve potential interest conflicts.

Concerning the national food safety system in Kenya, it is managed by various agencies under different ministries and laws as indicated in Deliverable 4.6. They have the main aim of promoting public health and protecting the consumer against health hazards.

In 1994 it had been decided that the Competent Authority for export to the EU would be the Public Health Department of the Ministry of Health. In the case of fish and fishery products, however, multiple agencies had responsibility for inspecting and approving fish processing facilities, namely: Public Health Department; Ministry of Fishery Development, Ministry of Agriculture and Rural Development, KEBS. Each consignment for export required a Health Certificate issued by a Public Health Officer and a Fish Export Certificate issued by the Fisheries Department. Over time it became apparent that the involvement of three separate ministries/agencies and in particular communication/co-ordination difficulties and the potential for overlap of responsibilities was a significant impediment to conformity with EU requirements. Thus, it eventually was recognized that a single authority was required to regulate the fish and fishery products sector and implement the controls required for export to the EU. In 2002, the Fisheries Department established the Competent Authority and given sole responsibility for food safety controls relating to fish and fishery products and the approval of processing establishments. The centralisation of food safety controls within the Fisheries Department has swept away the prevailing bureaucracy and streamlined procedures and functions.

2.2 Ethiopia

2.2.1 Legal documents

Fisheries and Aquaculture

The few legal documents that are relevant to fisheries and aquaculture are listed in Deliverable 4.6.

The most important policy document which is relevant to fisheries and aquaculture in Ethiopia is the Fisheries Development and Utilization Proclamation (No. 315/2003). This proclamation contains 21 articles that describe procedures and rules to be enforced in order to utilize the country's fishery resources and develop aquaculture. This is the only proclamation in Ethiopia that legally describes and elaborates capture fishery and aquaculture at the federal level. Important Articles included in the proclamation are:

Article 2(1) defines fish as any fish species, crustaceans, and mollusks, including their eggs, spawns, fries or fingerlings.

Article 2(2) defines fishery resources as the fish stock contained in natural and manmade water bodies.

Article 2(3) defines aquaculture as the breeding and/or cultivation of fish, including other related activities in natural and man-made water bodies under controlled conditions.

Article 5 contains provisions on capture fisheries from natural and manmade water bodies. Important articles are

a). Article 5(9) states that any person who wishes to undertake fishing research on the water bodies of the country shall do so by obtaining a permit from the authorized Federal or Regional Government organ designated to direct research activities and, as may be necessary, the body authorized to administer water resources.

b)Article 5(10) states that any person who wishes to import or export any type of exotic live fish species shall have a written permit from the Ministry.

c). Article 5(10) states that any person who wishes to transfer live fish which has been exported with permit, or an indigenous species from one region water body to regional water body have to do so with a written permit from the Ministry.

Similarly Article 6 contains provisions that deal with how to obtain permits to establish aquaculture firms, control of fish disease, standards for the establishment and operation of aquaculture facilities.

Article 8 deals with environmental protection and states that concerned organs of the Federal and Regional Governments.

Based on the Federal proclamation of the Fisheries Development and Utilization Proclamtion (Proc. No. 315/2003), the Council of the Amhara National Regional State of the Federal Democratic Republic of Ethiopia (FDRE) issued the Amhara National Regional State Fisheries Development, Prevention and Utilization Proclamation (Proc. 92/2003) which consists of 20 articles that deals with fisheries and aquaculture. The main objectives of the proclamation are:

1 Conserve fish biodiversity and environment, cultivate fisheries resources with appropriate fishing equipment as well as prevent and control overexploitation of the fisheries resource;

2 Cause fisheries development to have proper contribution speed economic growth through the expansion of aquaculture development in natural and man made water bodies;

3 Increase the supply of safe and good quality fish and ensure a sustainable contribution of the fisheries towards food security;

4 Create conducive condition for the community found in areas of fishery resources to become beneficial and get job opportunities.

However, this proclamation is applicable to water bodies where fish are bred and cultivated and all areas where fishing, preparing and marketing takes place within the boundary of the Amhara Region. There are some directives based on this legislation under preparation by the Ministry of Agriculture and Rural Development (MoARD). Similarly, the Southern Nations and Nationalities and peoples Regional State (SNNPRS) issued a legislation which is applicable to the state.

Very recently, the Ministry of Agriculture and Rural Development (MoARD) in collaboration with Food and Agricultural Organization sub Regional Office for East Africa (FAO/SFE) drafted the National Aquaculture Development Strategy framework of Ethiopia. This draft document reviewed the current status of Aquaculture development, identified key

constraints and developed aquaculture strategies including the roles of Government and private sector in implementing the strategy.

Environment and Water Resources

The Environmental Protection Authority (EPA) is the main Federal organ (Proc. No. 295/2002) which is legally mandated to formulate policies, strategies, laws and standards, which foster social and economic development in a manner that enhance the welfare of humans and the safety of the environment sustainable, and to spearhead in insuring the effectiveness of the process of their implementation. Each regional state shall establish independent regional environmental agency responsible to implement the Ethiopian Environmental policy and strategy in respective states.

The environmental Impacts Assessment (Proc. 299/2202) was issued to assess possible impacts of projects on the environment prior to their approval and implementations. This instrument provides an effective means of harmonizing and integrating environmental, economic, cultural and social considerations into a decision making process in a manner that promotes sustainable development. The EPA is given the legal mandate to assess the impact of any project or program that may threaten the health of the water and the aquatic biodiversity.

The BOMOSA cage fish farming system targets small and marginal waters which are mostly seasonal water bodies. The fish used are mostly native fish (tilapia) so the problems related to environmental pollution and introduction of alien fish species appear to be insignificant for the surrounding environment. However, if BOMOSA project requires the environmental impact assessment scrutiny or not depends on the decision EPA yet.

The Ethiopian Water resources Management, protection (proc. No. 197/2000) was issued to put the water resources of the country to the highest social and economic benefit for its people through appropriate protection and due management. In this legislation Article 5 clearly indicated that all water resources of the country are common property of the Ethiopian people and the state. Thus the BOMOSA fish farming project in Ethiopia will be implemented on water bodies only owned by the people and the state.

Animal (Fish Diseases), Food Safety and Public Health

It is there extremely important to understand and abide to all articles included in Fisheries Development and Utilization Proclamation (No. 315/2003) for proper and wise implementation and up scaling of BOMOSA in Ethiopia. In addition to proc. 315/2003, the following legal documents contain important provisions that are pertinent to animal products and marketing, animal diseases and environmental issues.

1. Animal, Animal products and by products Marketing Development Authority Establishment Proclamation (No. 117/1998).
2. Animal, Animal products and by products Marketing Development Authority Establishment (Amendment) Proclamation (No. 198/2000).
3. Animal Diseases Prevention and Control Proclamation (No. 267/2002).

In Ethiopia the Proclamation No. 267/2002 “Animal Diseases Prevention and Control Proclamation” deals with the “Noticeable animal diseases” with reference to OIE recommendations and in the Proclamation No. 315/2003 “Fisheries Development and Utilization Proclamation”, article. 6 (*Aquaculture*) clearly states that “The Ministry or the concerned Regional Authority shall take an appropriate measure when it is convinced that there is a risk that a *fish disease* in the aquaculture facility may spread into the surrounding or into the water basin”.

In Ethiopia the NCCP is located in the Quality and Standards Authority of Ethiopia which is also the secretariat of the NCC. With specific reference to “fish safety” in Ethiopia the Proclamation No. 315/2003 “*Fisheries Development and Utilization Proclamation*” article 10 describes Handling of Fish Products and says “Fish and fish product handling, processing, storage, transportation and trade shall meet the requirements of fish quality and trade standards procedure.

Details shall be determined by regulations issued pursuant to this proclamation in article 13. Powers and Responsibilities of a fishery inspector is stated in sub article (f) “as destroy or otherwise render harmless any fish the inspector has reasonable grounds to prove that it is diseased, contaminated or spoiled” and “(h) inspects any aquaculture, fish processing, storage, transport and marketing facilities as well as equipment and suspend the permit or close the facilities when they are found to have failed to operate up to the standards”.

Various regulatory bodies enforce regulations associated with food safety, but no laboratory support services are established and the capability of fishery industries to provide safe fish is not documented.

2.2.2 Policy documents

There are no specific terminologies mentioned which are related to the fisheries and aquatic resources of the country. Some of the documents appear to be very broad dealing with general issues. Some of these documents include the Constitution of the Federal Democratic Republic of Ethiopia (Proc. 1/1995) and the Agricultural and Rural Development Policy and Strategy document (November, 2001).

However, one important point indicated in the above two documents is that land and water resources belong to nation, nationalities and peoples of the country. This indicates that land can neither be privately owned nor sold in Ethiopia. However, it can be leased on contractual basis.

The Environments policy of Ethiopia is a broad document which aims to improve and enhance the health and quality of life of all Ethiopians and to promote sustainable social and economic development through the social management and use of natural, human-made and cultural resources and the environment.

Specific objectives that are related to water resources include:

- ensures that essential ecological processes and life support systems are sustained, biological diversity is preserved and renewable natural resources are used in such a way that their regeneration and productive capabilities are maintained;
- prevent the pollution of land, air and water in the most cost effective way so that the cost of effective preventive intervention would not exceed the benefit.

The Federal Rural Land Administration Proclamation (Proc. No. 89/1997) states that land is a common property of the Nations. Nationalities and people of Ethiopia shall not be subject to sale or to other means of exchange. Thus, in Ethiopia both land and water are community and state owned.

Agricultural and Rural Development Policy and Strategy document is very broad which highlights on the economic and proper use of the country's water bodies such as lakes and river systems.

Water harvest from rain using small and micro ponds have been stated as one of the strategies for efficient use of water for irrigation and other development activities. It should be stressed that, there has been no specific term mentioned on the country's fishery resource and aquaculture in this strategy document.

In the following scheme (Figure 2) the legal and policy documents regulating aquaculture institutional environment in Ethiopia are listed.

Figure 2: Legal and policy documents regulating aquaculture institutional environment in Ethiopia.

2.2.3 Institutional arrangements

At the Federal level the Ministry of Agriculture and Rural Development, the Department of Fisheries and Livestock has been legally authorized to conserve and properly utilize the fishery resource and development of aquaculture in the 1990s. Then the sector has been down sized to a team level until the recent BPR restructuring. Currently, the Ministry has undergone the BPR restructuring and the fishery and aquaculture has been spread in the various directorates. The Bureau of Agriculture of the different States is given the mandates to implement the proclamation in their respective states. Moreover, each state can issue its own proclamation based the Federal proclamation. In line with this, the Amhara Regional State issued similar proclamation adapted to its state in 2002.

In the newly implemented restructuring, the Federal MoARD consists of four sector offices i.e. Agricultural Development Sector, Agricultural Marketing Sector, Natural Resources Sector and Disaster Prevention, Preparedness and Food Security Sector each led by State Minister. Each Sector office is further split in to various directorates. Under each directorate there are experts specializing in different disciplines. For example, the Fishery and aquaculture is included under the Agricultural Development Sector which in turn is divided into three directorates i.e. Animals and Crop Regulatory Directorate (A C R D), Agricultural Extension Department (AED), and Investors Support Directorate (ISD). The newly developed structure of the Federal MoARD is shown in deliverable 4.6. The various autonomous Institutes and Agencies accountable to MoARD including the EIAR have also been restructured following the BPR.

The Ethiopian Agricultural Research Organization (EARO) is one of the autonomous institutes accountable to the MoARD at the Federal level (Proc. No. 79/1997). The organization has been renamed as the Ethiopian Institute of Agricultural Research (EIAR) recently. The EIAR has been mandated to conduct, coordinate and popularize research technologies in the country. The research component is divided in to five directorates namely, animal directorate, crop directorate, forestry directorate, soil and water directorate and the farm machinery directorate. Each directorate is further divided into case teams that deal with specific commodities. Fisheries research case team is one of the teams included under the animal research directorate. Currently, there are 13 Federal Research Centers which are administered by EARO. The National Fisheries and Aquatic Life Research Center (NFALRC) under takes research on fisheries, aquaculture and limnology. At the regional level there are regional research institutes that deal with research topics of each region. The EIAR closely collaborates and works with Regional Agricultural Research Institutes (RARI) and Higher Learning Institutes (HLI) colleges.

The Environmental Protection Authority (EPA) is another autonomous public institution (Proc. No. 295/2002) accountable to the Federal Government. EPA has been legally mandated to formulate policies, strategies, laws and standards, which foster social and economic development in a manner that enhance the welfare of humans and the safety of the environment sustainable, and to spearhead in insuring the effectiveness of the process of their implementation. At the Federal level the Authority is directly accountable the Prime Minister. However, each regional state establish independent regional environmental agency with autonomous mandates and responsibilities to implement the Ethiopian Environmental policy and strategy. The impact of BOMOSA on the environment should be reviewed in line with Environmental Impact Assessment (Proc. No. 299/2002).

2.3 Uganda

2.3.1 Legal documents

Fisheries and Aquaculture

In the main Act regarding fishery, the Fish Act (Ch 197) (1964/2000), where fisheries aspects are widely discussed, only few notes deal with aquaculture, in particular in the definition of “fish pond” that means “any accumulation or expanse of water which is erected by artificial means for the express purpose of fish culture, fish farming or fish breeding” and “the Minister may make rules generally for regulating and controlling fish culture, fish farming and fish breeding”.

Management and utilization of the fisheries resources in Uganda is moreover guided by the National Fisheries Policy (2004). This policy document generally calls for sustainable utilization of fisheries resources so that current exploitation of fisheries resources is optimal and efficient and does not compromise the ability of future generations to exploit resource for their needs.

Aquaculture has been more considered in Fish Rules (Aquaculture) (2003), in which there are many related regulations, i.e. Chief Fisheries Officer permission for import/export of live fish for purposes of aquaculture, certification of aquaculture products conform to the National Bio-safety Guidelines by the competent agency, prohibition to carry out aquaculture production if:

- degrades the environment without mitigation,
- introduces new species apart from those approved for that area,
- Compromises safety of food fish and Aquaculture Inputs”.

The ecological sustainability of aquaculture on the basis of these rules appears a priority. Generally a state licensing system tries to ensure local quality of fish farming activities but such rules may demotivate potential fish farmers. In any case local people thinking seems not considered in these rules suggesting that they are being imposed on them.

Fishing villages in Uganda are at varying levels of permanency and development. While a few, shift from site to site completely, some of them are partly abandoned by some fishermen following seasonal fish migration to new grounds or because depletion of fish stocks. The fishing communities are mainly organized informally: an half of fishing communities have a head fisherman known as Gabunga, chosen by general consensus of the community, through a vote or by virtue of being a land owner or long stay in the area. He enforces discipline in the community, keeps records of fishermen and their fishing gear, and attends to welfare issues of the community (Ministry of Agriculture Animal Industry and Fisheries, 1999: Uganda Fisheries Master Plan study). A recent development is the Fishermen's Management Committees. These are formal administrations initiated by the Uganda Fisheries and Fish Conservation Association (UFFCA). About 13% of fishing communities have this kind of administration. Co-operative Societies mostly exist on paper. About 15% of the communities have co-operative societies, over 95% of that is not active; mainly due to lack of good and able leadership i.e. mismanagement and embezzlement of funds. Over 90% of the fisher communities live on land which is not theirs - either on private land or government/public land. This leads to insecurity of tenure, which in turn makes it difficult for them to make long term development plans.

There are many categories of participants in fish production of which fish farmers represent a minority (5%) (Ministry of Agriculture Animal Industry and Fisheries, 1999: Uganda Fisheries Master Plan study).

In Uganda's fishing communities, people of different ages are involved in fish production activities, the majority are youth. According to the survey results (FMPS 1997), youth participation in capture fisheries production activities is 90%, while that in fish farming activities is 37%. Most involvement by youth in fish farming is in areas of pond construction and harvesting. The participation of women in fish production is about 20.1%, 59% of which is in fish farming/aquaculture. The latter is mainly a family activity and the women are involved in the production of feeds and feeding the fish as part of their household activities. The women work then remains supervisory, as well as general management of the business (Ibale, 1998).

Environment and Water Resources

The National Environment Act – NEA (1995) interprets “Environment” to mean the physical surroundings of human beings including land, water, atmosphere, climate, sound, odor, taste, the biological characteristics of animals and plants, and the social factor of aesthetics including both the natural and built environment. Moreover “element” in relation to the environment means any of the principal constituent parts of the environment, including water, atmosphere, soil, vegetation, climate, sound, odor, aesthetics, fish and wildlife. By this definition, fisheries and aquaculture resources are part of the environment. Section 20 requires carrying out an environmental impact assessment on the development of a project involving environment. Among these projects, fish processing plants, commercial exploitation of natural fauna and flora and introduction of alien species of fauna and flora into the ecosystem are included.

The NEA prohibits the introduction of any animal or micro-organism whether alien or indigenous in any river or lake, except with written permission from the Authority. The same is provided for wetlands in Section 37 of the same Act. Although the NEA introduces good management principles, there may still arise a problem of law enforcement because the Authority cannot prosecute offenders and it is not clear how far the role envisaged by the District and Local Environment Committee extends in the management of fisheries resources. Since the Constitution does not clearly indicate where fisheries resources lie, their management in the decentralization process may prove to be difficult to implement.

However the Fisheries Draft Bill 2008 shall state that any destruction of fisheries resources or their environment through pollution and any person who (a) disturbs, injures, poisons, kills or detrimentally affects any fish, fish spawning ground including any aquatic plant life or food of fish in any part of the fishing waters by casting, discharging or allowing to fall, flow or percolate into those waters, oil, chlorinated hydrocarbon, biocide, pesticide, toxic or any other substance heavy metal or other material or rubbish; or (b) places any pollutants in a place where, by natural means, they can be washed into or otherwise reach the waters, commits an offence and is liable, on conviction, to a fine not exceeding one hundred currency points or to imprisonment for a term not exceeding five years, or both.

Concerning water management, the Water Statute (1995) interprets a “subsistence fish pond” to mean a fish pond appurtenant to, or used in connection with, a dwelling or a group of dwellings for subsistence of the residents thereof, the producer of which is predominantly consumed by the residents and is not sold or bartered.

It establishes a Water Policy Committee (WPC) which consists of, among others, the Director responsible for Animal Industry and Fisheries. Among the objectives of this statute is allowance for the orderly development of water resources for purposes other than domestic use, such as fishing. The Statute empowers the minister to declare a controlled area and establish a comprehensive and integrated plan for managing land, water and natural resources within that area. It should be noted that this Statute concentrates more on water supply than other natural resources so it is not easily discernible how fisheries resources can be managed under the Water Statute.

Animal (Fish) Diseases, Food Safety and Public Health

Uganda is a member to the World Organization for Animal Health /OIE and of the World Trade Organization. The Directorate of Animal Resources is the competent authority of the OIE with a number of legislations that regulate the import and export, and movement within of animals in the country including the Fish Act (2000), Animal Disease Act (1964) and several subsidiary legislations and statutory instruments related to sanitary and phytosanitary measures, quality and safety of food; and those dealing in trade of food items made. The aquatic Biosecurity of the fisheries resources is mainly guided and enabled through the adoption of the FAO precautionary approach.

Currently there is no specific policy of aquatic Biosecurity in Uganda and planning is based on the need to ensure sustainable fish supply. As such, sub-national entities including local governments and other technical agencies don't have a clear platform for participation in the policymaking and planning for aquatic Biosecurity. The lack of explicit policy makes aquatic Biosecurity planning and management inadequate and unfunded in the public sector.

The existing policy/legal documents cannot therefore adequately prevent entry and spread of exotic aquatic animal pathogens; are not adequate for control fish diseases in the country; and nor can the policy be implemented as it's implied and not direct.

The existing national policies regarding aquatic Biosecurity (implied or direct) do not make explicit provisions for national diagnostic services, risk analysis, manpower requirements, training requirements, financial requirements, international treaties, memberships and linkages nor communication. However there is explicit mention for emergency preparedness, prevention and farm level treatment and disease control.

Uganda's expertise is actually very limited. A first government fish pathology laboratory shall only be built over the next year at the National Aquaculture Research and Development Centre with the completion of the rehabilitation works of the station. All major border control points have Ministry of Agriculture Officers manning the entry of agriculture products especially live fish imported as brood stock for hatchery production. The Fish (Aquaculture) Rules (2003) requires in some cases that fish be quarantined for some period of time at the National Aquaculture Research and Development Centre for observation and clearance. All importers and dealers in ornamental and bait fish must be registered and cleared with the Department of Fisheries Resources.

Each imported live fish consignment must have import permit for the Department coupled with a mandatory inspection of all records and facilities handling imported live fish.

Fish traded internally have a local Inspection system that certifies the fish as to wholesomeness (quality and safety) of the fish, and whether it's appropriate for either further processing or direct consumption at the point of first landing. At which point local inspection certificate and a fish movement permit are issued that allow fish products to move from point of landing to the processing or consumer market points. For external trade the Fish (Quality Assurance) Rules (1998) require that each consignment processed and traded externally is accompanied by a Fish Health Certificate, which must accompany any exported fish consignment attesting to the quality, safety and original of the traded fish. This especially enforced for international markets.

There are Aquaculture Inspectors under the Department of Fisheries Resources and the local governments responsible for compliance and enforcement of the regulations pertaining to aquaculture activities and practices; whereas the Monitoring, Control and Surveillance of fisheries is carried out by the Fish Inspectors in charge Regulation and Control at both central and local government levels.

On the basis of FAO/WHO advices and recommendations, Uganda is a member of the Codex Alimentarius Commission and has established National Codex Committees (NCC) and National Codex Contact Point (NCCP), answering to the FAO/WHO request. In Uganda

the National Codex Contact Points is located in National Bureau of Standards, was established in 2002 and comprises government ministries, industry and trade associations, academia, research institutions and consumer organizations. The Fish Safety control measures are regulated also by the Fish Quality Assurance Rule (of the Uganda National Bureau of Standards). An established system for imports clearance, including food, is active and food laboratories UNBS provide basic technical assistance. During last years, after the ban on fish exports to EU in 1997-2000, the fishing industry has been strongly assisted to develop the capacity to meet the safety requirements of the national/international market.

2.3.2 Policy documents

In the general policy documents presented in Dev. 4.6, aquaculture seems to play an important role in the future strategies of Uganda Government. For example in the National Fisheries Policy (2004 - see D4.6) a precise mention is produced just in the summary, where "aquaculture fish production will be promoted to reduce the gap between fish supply and the increasing demand for food fish", and "a realistic long term vision embraces a flourishing fisheries and aquaculture sector" with "modern aquaculture technologies" and "a fully developed and productive aquaculture systems for all water bodies in agro-ecological zones and integrated into agro-farming systems". According to this document among the key issues that are currently faced by the fisheries sector are:

- resource depletion through over-fishing aggravated by use of destructive fishing gear and methods;
- inadequate information on the fisheries resources and the state of the aquatic environmental;
- an inappropriate regulatory framework.

Some of the main underlying causes for these issues are:

- inappropriate mechanisms for controlling access to fisheries resources;
- inadequate monitoring, extension and enforcement mechanisms;
- inadequate mobilization and involvement of the communities in development and management of fisheries resources;
- inadequate research work which critically hinder capture fisheries and aquaculture development;
- inadequate fisheries infrastructure.

In the National Environment Management Policy, fisheries and other aquatic resources constitute an important resource and contribute greatly to the nutritional welfare of the people while providing employment to thousands. This sector also makes significant contribution to the national economy. Considering introduction of exotic species, pollution of the water bodies and over-exploitation great threats for fisheries, the main objectives are sustainable conservation and management of fisheries and other aquatic resources. Sustainable production of fisheries resources and the maintenance of aquatic biodiversity depend in great part on: increasing the availability of artificial breeding, fish farming and restocking; the management and conservation of fisheries resources and aquatic biodiversity should be based on scientific research and information; the successful management of fisheries resource is dependent on a clear demarcation of enforcement and extension roles; the involvement of the local community is essential for effective management of the fisheries resources.

On the basis of these statements the principal strategies of the policy are to separate the roles of enforcement and extension and involve NGOs, among others, in implementation and extension; update and enforce provisions for fish culture, processing and marketing; give to local communities better control over the management of fisheries resources and strengthen local management capacity; contain over exploitation, the destruction of habitat and control of species introduction through strengthened research efforts and better planning and monitoring; etc.

Again, in 2005 the Uganda National Water Development Report distinguished four main subsectors to be reformed, Sanitation of Rural and Urban Water subsectors, Water Resources Management sub sector and Water for Production sub sector, underlining in the latter, among the key strategic intervention, the promotion of small-scale aquaculture and culture-based fisheries in existing reservoirs. This perfectly matches with BOMOSA integrated farming systems purposes. Water requirements for Aquaculture are currently minimal, as water for aquaculture at current production takes place in wetlands and with no significant water consumption compared to the natural status of wetlands.

From a water point of view, there is need for clear guidelines and instruments regarding: the utilization of wetlands/swamps for aquaculture, the use of streams (i.e. diversion canals) for aquaculture production, cage culture farming in water bodies (location, size, pollution control, etc.), the use of genetically modified fish including the use of chemicals (hormones) by private farmers. Just on the basis of these documents, until now it doesn't seem that many progresses have been achieved, although Fisheries and Aquaculture sector in Uganda is considered of basilar importance.

In the following scheme (Figure 3) the legal and policy documents regulating aquaculture institutional environment in Uganda are listed.

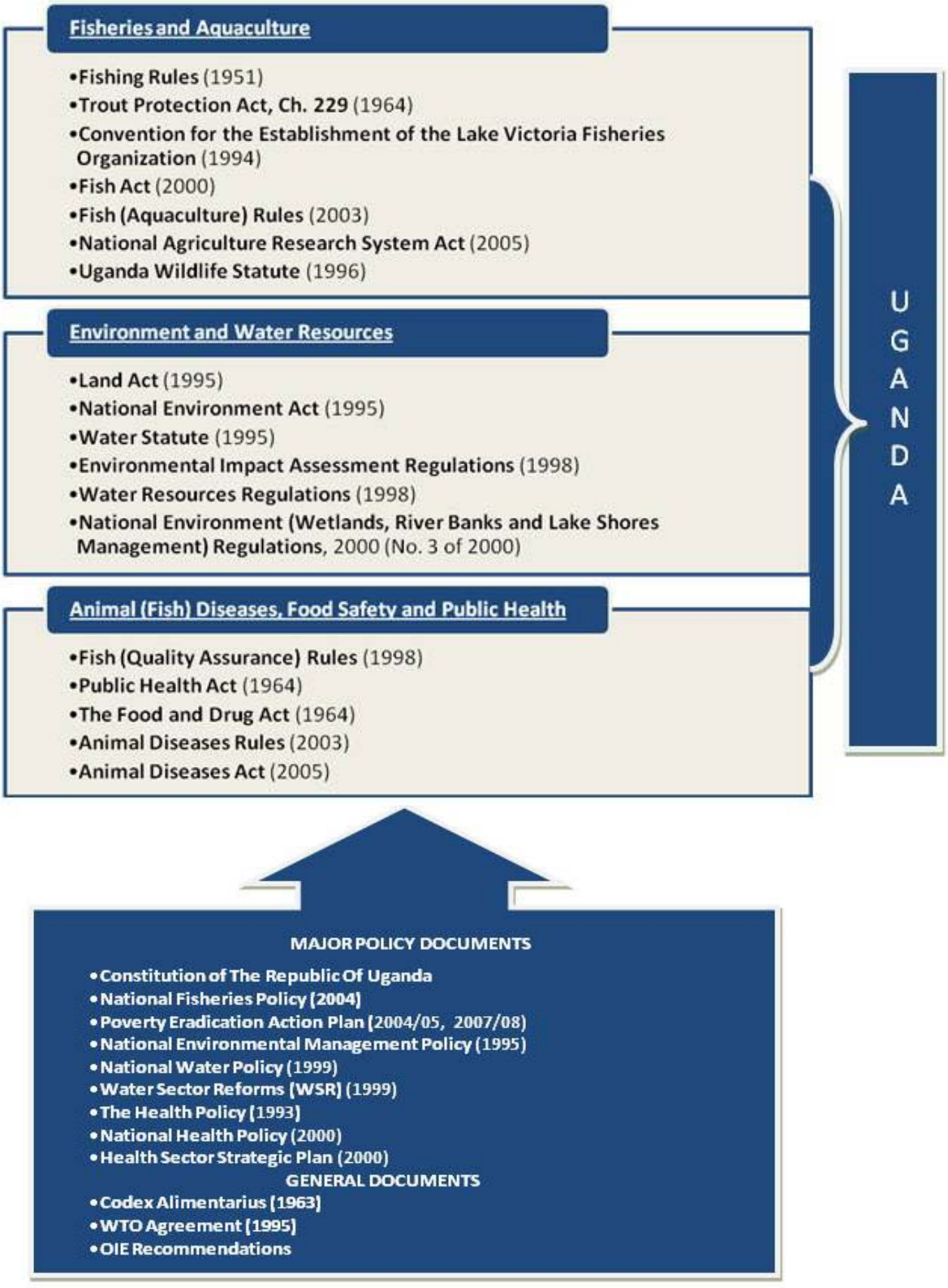

Figure 3: Legal and policy documents regulating aquaculture institutional environment in Uganda.

2.3.3 Institutional arrangements

According to the 1995 Constitution of the Republic of Uganda and the 1998 post constitution, reform development and management of the fisheries sector is the public mandate of Ministry of Agriculture, Animal Industry and Fisheries. This includes policymaking and implementation, planning, supporting, coordinating and regulating of all activities related to aquatic life other than that protected under the Wildlife Act. Largely this is fish and fisheries products. According to the Fish Act (2000) the law is vested in the Minister responsible for the sector, who in turn is advised by the Chief Fisheries Officer (Commissioner for Fisheries) who is charged also with the implementation of the law. The Commissioner is normally the technical head of the Department of Fisheries Resources which currently is in charge of both capture and culture based fisheries including aquaculture.

The Department of Fisheries Resources (DFR) is the government agency responsible for fisheries management services and is mandated to promote, guide and support the fisheries public and private sector partners in sustainable development. It is responsible for setting and enforcing standards and regulations for practices pertaining to fisheries.

The state of aquaculture management seems in a transitory state, due to an inadequate budgetary provision and administration within the DFR. Limited production of seed fry for distribution to small-scale farmers and poor pond management practice are probably the major constraints. Furthermore although government has established some rules on fish seed production and distribution, there is still a need for technical assistance to review and develop clear and implementable standards and guidelines for the private fish hatchery owners and operators in Uganda (Mwanja, 2007).

Moreover currently the country lacks a Fish Health Management Plan and specific regulatory framework and policy for fish health. However, the Fish Act provides for the responsible Minister to intervene directly with the technical support of the Department of Fisheries Resources in case of fish health/disease emergency situations.

In Uganda many environmental institutions are young or in a formulate stages. Since a number of institutions take a part in the management of water bodies depending on use, there are usually conflicts resulting from their mandates, for example the Ministry of Water, Lands and Environment is the lead agency for water issues, but it's the responsibility of Ministry for Agriculture to provide water for production The main issue of institutionalization is that there are no adequate mechanisms to co ordinate participation by the different players who are often mandated to deal with water and fisheries issues. There also exist conflicting national and local policies, for instance industrialization and rural transformation versus environmental protection and sound natural resource management.

The ownership of a section of water body or fisheries and other natural resources is still a problem that leads to either over or under exploitation. In Uganda swamp fisheries and many wetland products are a still a free resource usually harvested in the dry season by communities. The evaluation of these resources, especially water and fish as a benefit needs to be put on economic scales. Ownership, before and after exploitation in many areas of the country is still undefined (Ssemwogerere, 2005).

3 COMMENTS AND RECOMMENDATIONS ON THE AQUACULTURE INSTITUTIONAL ENVIRONMENT IN KENYA, ETHIOPIA AND UGANDA

On the basis of the reviewed regulations, policy documents and proclamations, some specific comments and recommendations (in italic) on aquaculture institutional environment existing in Kenya, Ethiopia and Uganda have been elaborated.

3.1 Fisheries and Aquaculture

- The aquaculture sector appears underpowered if compared to its potential and most of the policy documents and intent declarations for a strong input on fish farming remain on the paper; this could be an index of low priority of Aquaculture for institutions. *Nevertheless the importance given to aquaculture in several national and overarching African Poverty Eradication Plans, in the three countries the amount of policy documents and institutional arrangements specifically targeted to aquaculture seem to be widely not homogenous, with an increasing attention to this sector in Kenya and Uganda and a decreasing interest in Ethiopia despite the great potential of this country;*
- a large-scale aquaculture is still far to start with the exception of hatcheries and fingerlings production, but standardization of feeding and fish production procedures is lacking; furthermore the lack of adequate infrastructures for fish movement/trade and fish products conservation, and the difficult access to the market for local people are main threats for aquaculture development in a large scale; *an efficient policy of infrastructure improvement may represent the starting point to facilitate the market expansion, farmed fish production included; BOMOSA integrated farming systems are based on a small-scale production at local community level and could represent a good first answer to the fish demand on the local markets;*
- the presence of too many competent authorities without a coordination create a confused situation for fish farmers and stakeholders; the poor information exchange between competent institutions and stakeholders has hampered aquaculture development strategies affecting both policy makers and investors; c*ollaboration between different authorities working directly or indirectly on the same topic, i.e. aquaculture, is basilar to better define all the frameworks in which aquaculture will move in the future;*
- constraints on aquaculture can take many forms but entrepreneurs encountered the main constraints when they want to start an aquaculture activity or expand an already functioning aquaculture enterprise. One of the most important is microeconomic constraint (or access to capital assets); *these problems could be partially solved through the introduction of economic incentives and disincentives, such as for examples fiscal reforms and micro-credit facilities for small enterprises. Actually the promising growth of African aquaculture is due to the inflow of foreign capital and expertise in aquaculture ventures that supply overseas markets and to the growing public support for aquaculture.*

3.2 Environment and Water Resources

- Aquaculture activities are suspected to have some environmental impact to water bodies; it is important to evaluate the impact of BOMOSA cages on the environment, depending on the level of production (biomass) and magnitude of the farming system. The up scaling of the BOMOSA system should fulfill the minimum requirements and abide by provisions included in the Environmental Impact Assessment prescriptions provided by Kenya, Ethiopia and Uganda. The local communities will actively oppose any activities that are seen to interfere with their drinking water. *As shown by the environmental data collected in WP4, BOMOSA technology is environment friendly and causes low impact or no damage at all to the water bodies. The BOMOSA system uses a volume-low density type of cage that has little or no effect on the quality of water. On top of this, an environment monitoring plan will be developed for each plot to monitor the quality of the water body and the catchments activities before and during the fish culture and harvesting. It is important to put in evidence that the water bodies where BOMOSA systems are located are not sources of drinking water;*

- water bodies such as lakes, rivers and reservoirs are owned by the state in Ethiopia, whereas there are both state owned and privately owned water bodies in Kenya and Uganda; the BOMOSA systems should take into consideration the different scenarios of land and water ownership and uses. *BOMOSA is mainly based on establishing schemes on water bodies, seen to be favorable in terms of location, physical conditions, as well as use and ownership conditions. It is therefore important to encourage the technology on water bodies owned by the community for the mutual benefit of the society.*

- private plots in community or state owned water bodies lead frequently to conflicts of usage which are in many cases very difficult to resolve; *private ownership is also encouraged for BOMOSA plots and needs to be encouraged and supported to promote individual entrepreneurship. The water bodies recommended for BOMOSA plots especially at community and state ownership levels are under other uses such as watering animals or providing water for irrigation. It is therefore paramount that proper education is carried to the communities where the benefits and disadvantages of fish farming are explained and concurrence sought before BOMOSA plots are established;*

- the role of community groups (organized as water resources users association) seems to take moreover increasing importance in the management of water reosurces, giving the opportunity to appoint committees of governative (Ministry, region and local authorities) and not governative (representative from farmers, pastoralists, business community, etc.) people. Such system as proposed in the Kenyan Water Act gives apparently restricts water rights to a small section of the community, essentially property owners. Poor rural communities are unable to meet requirements for obtaining a permit, mainly land ownership, are in this way marginalized. *An enforcement of the local component in the Water Management committees could be a key factor for a collective involvement of the community in making decision. The land ownership around water bodies and its relation to the public water access by all the community need to be better and clearly regulated so that the community investment in the water management will be more active.*

3.3 Animal (Fish) Diseases, Food Safety and Public Health

- Lack of national legal frameworks on fish diseases in order to improve health and productivity of farmed fish, avoid the spread of disease, guarantee the safety of aquaculture fish products, prevent public health aspects and avoid possible

environmental impacts; the existing policy/legal documents cannot therefore adequately prevent entry and spread of exotic aquatic animal pathogens; are not adequate for control fish diseases in the country; and nor can the policy be implemented as it's implied and not direct; Kenya, Ethiopia and Uganda are members of the Office International des Epizooties (OIE)/World Organization for Animal Health and they should follow the recommendations presented in the Aquatic Animal Health Code. Specific normative will be produced in each country taking into account the specific situation on fish health, and food (fish) safety for human consumption.

- The knowledge on the current situation of sanitary status of fish in the three countries is poor and few Research Institutions are actually competent for fish diseases; improvement of the knowledge on fish pathogens/diseases of aquatic animals, and their impact in the wild and under farming conditions. Furthermore the adoption of the OIE Manual of Diagnostic Tests for Aquatic Animals and the capacity building of specialized reference laboratories able to apply these tests are strongly necessary for the next future. BOMOSA Vet activities during WP 4 allowed to delineate a first sight on the sanitary status of farmed fish and its relation with aquatic wild environment in the three countries;
- many diseases outbreaks and low efficiency in fish productivity are related to not optimal or sub-optimal management practice by farmers; improvement of farmers' knowledge on the best management practice for transportation, handling, stocking of fish in order to avoid stressful condition that could affect fish health/productivity; assessment of standards methods for monitoring of fish involved in movements to avoid the spreading of diseases and to optimise the fish production in the final destination plots; BOMOSA manual will try to furnish to the fish farmers some practical suggestion to better follow their farming systems. A first approach of health education will be given in the BOMOSA manual to the fish-eating community leaving in areas to make all precautions to prevent the accidental transmission of pathogens by eating spoiled/parasitized fish. Inspection/control standardized methods of fish products for the prevention of possible infections in humans are necessary;
- sanitary and phytosanitary standards in aquaculture are not adequately developed; the Agreement on the Application of Sanitary and Phytosanitary Measures by World Trade Organization sets out the basic rules for food safety and animal and plant health standards. It allows countries to set their own standards. But it also says regulations must be based on science. Research Institutions are often marginally involved in making decision even if scientific knowledge should play a key role in standardization of methods for fish safety and quality;
- on the basis of FAO/WHO advices and recommendations, Kenya, Ethiopia and Uganda are members of the Codex Alimentarius Commission and have established National Codex Committees (NCC) and National Codex Contact Point (NCCP), answering to the FAO/WHO request. During the last decade, the fish industry has been strongly assisted to develop the capacity to meet the safety requirements of the national/international market, but few regulations have been implemented in order to apply a throughout sanitary control of regional/local aquaculture production. An enforcement of regulatory requirements concerning hygiene, safety and quality of aquaculture and fishery products standards should be managed; furthermore, specific educational programme on safe consumption and preservation methods of fish products, especially in areas such (i.e. Awassa Lake district, Ethiopia) where tilapia are consumed raw, should be planned in order to avoid possible public health implications.

The sustainable development of aquaculture productions in these countries require more effort to implement and strengthen the legal framework on fish diseases, as well as the correct utilization of disinfectants and therapeutical agents, in order to:

- improve health and productivity of farmed fish;
- avoid the spread of disease;
- guarantee the safety of aquaculture fish products;
- prevent public health problems;
- avoid possible environmental impacts.

Lack of adequate knowledge of fish pathogens, diseases of aquatic animals; lack of information and data on the occurrence and impact of disease/parasites/pests aquatic organisms both in the wild and culture conditions are critical problems. One of the most important risk factors for the spread of diseases is the transfer of alien fish species, which is strictly forbidden in all the three countries. The BOMOSA fish farming system is based on transfer of fingerlings only from the hubs to the plots within a national/regional production net. The fish used for this technology are mostly indigenous ones such as Nile tilapia (*Oreochromis niloticus*) and African catfish (*Clarias gariepinus*). However, there are rules which prohibit the transfer of even live indigenous fish from one regional water body to another regional water body with out a written permit obtained from the competent Authority.

A periodic monitoring on the sanitary and health of fish transported is strongly recommended to avoid the spread of fish diseases and optimise the fish production.The results of the survey on veterinary and public health aspects conducted in Kenya, Ethiopia and Uganda (see Deliverable 4.7) showed that there are several parasites infecting fish and that some bacterial disease outbreaks may occur in some BOMOSA sites mainly under stressful conditions.

The main risk factors causing parasitic and bacterial outbreaks in BOMOSA sites have been observed so that preventive strategies and best management practices should be developed to reduce or prevent the risk (see BOMOSA Manual and D4.7). Some parasites could be transmitted to humans if infected fish products are under cooked or eaten raw. Except in some districts in Ethiopia (e.g., Lake Awassa area), tilapia are consumed well cooked, ensuring the inactivation of the parasites. Also the hot-smoked fish processing (≥60°C) can easily inactivate the parasites. Generally, health education should be given to the community at all level to prevent the transmission of pathogens and parasites fish. The transmission and life cycle of Clinostomatid parasites which are potentially zoonotic to humans are sketched in figure 4. Health education and inspection/control of fish products are key-factors for the prevention of possible infections in humans.

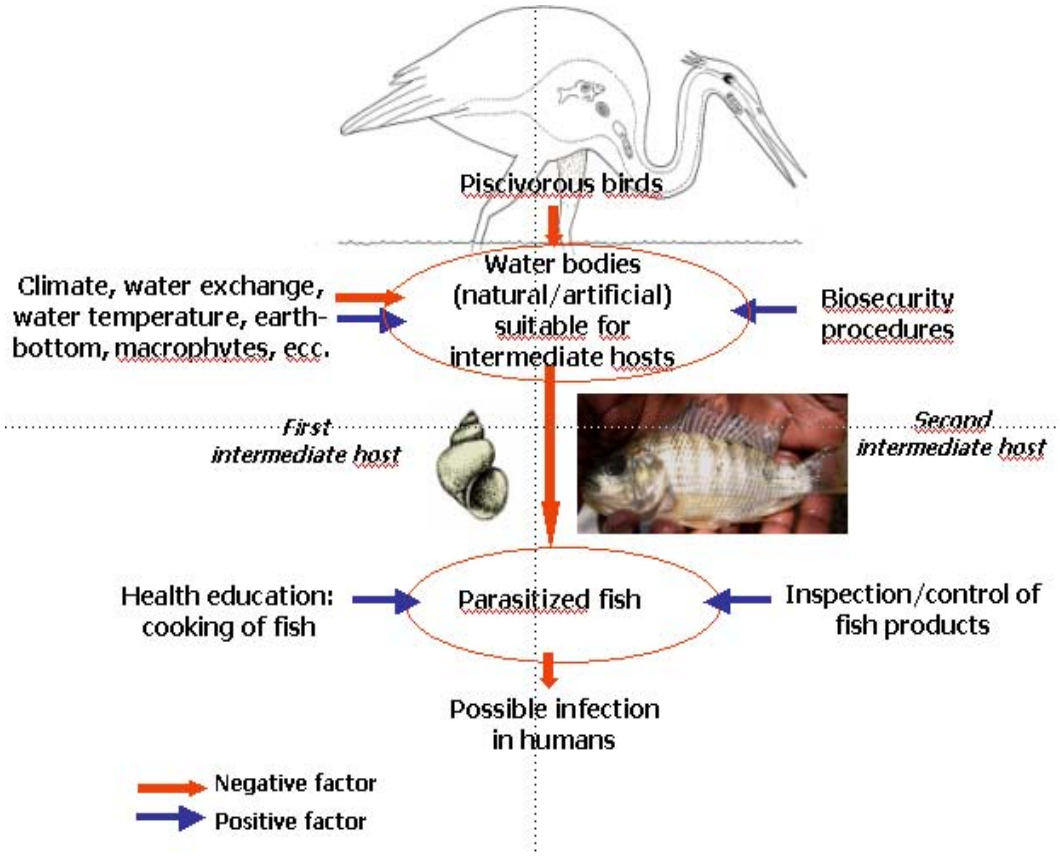

Figure 4: Factors influencing the completion of the life cycle of *Clinostomatid* parasites and their transmission to humans

RECOMMENDATIONS

Some general remarks should be taken into consideration for a wider application of the BOMOSA system in Eastern Africa.

1. Up scaling of BOMOSA system to a wider scale should abide by pertinent legislative documents existing in each country. The project has to consider legislations, proclamations, regulations and directives enforced in each country with respect to issues related to land and water ownership and uses, environmental impact assessment, transfer of fish, and veterinary and health aspects of fish etc. The Pan-African NEPAD Action Plan and the FAO's Special Programme for Aquaculture Development in Africa (SPADA) formally recognizes the vital contributions by African fisheries and aquaculture to food security and to poverty reduction and economic development in the continent. They should be strongly implemented and followed by all the African countries in order to develop a sustainable aquaculture.
2. In Kenya and Uganda there are more comprehensive legal and policy documents issued which are pertinent to aquaculture and fisheries. In Ethiopia, there exists general legislation that may be vital for the fishery and aquaculture sub-sector. However, specific regulations and directives which are critically important in the implementation processes are either absent or in progress now. Hence, the Ministry of Agriculture and Rural Development (MoARD) should consider this policy gap and take measures to solve the problem.
3. The organizational set up of the fisheries and aquaculture has been recently elevated to the Ministry level in Kenya. In Uganda, the fishery and aquaculture is established at Department level. In both countries the sector has been given attention and priority. However, the situation in Ethiopia is the reverse and the sub-sector has been down sized and today the fishery and aquaculture is represented only within the Department of Extension at the Federal level. Considering the huge water resources and aquaculture potential of the country, the fishery and aquaculture institutional framework should be upgraded in the future in Ethiopia.
4. Proper implementation and scaling up of the BOMOSA cage farming system requires active participation of several stakeholders, actors and the local community. Key institutions such as the Ministry of Agriculture and Rural Development (MoARD), Environmental Protection Authority (EPA, Ethiopia), the National Environment Management Authority (NEMA, Uganda and Kenya), etc. should integrate and work in close collaboration for a better achievement.
5. The success of BOMOSA technology is measured by its contribution in providing safe and quality fish protein to the local community. This can be achieved by the active participation and involvement of the community itself. Thus, as one of the main stakeholder, the role of the community should be spelled out in the up scaling of BOMOSA.

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5 LIST OF FIGURES