

## Appendix 1

# Africa

**APPENDIX 1.1****Unavailability of, and difficult access to, capital**

Constraint	Possible mitigating strategy
<b>Shortage of financial resources for investment in aquaculture</b>	<p>Governments to set up special development funds for private and public investment in aquaculture</p> <p>Assess the potential importance of aquaculture in national economies and advise governments to contact financial institutions on this basis</p> <p>Improve investment climate through political stability, stabilization of macro economic structural policies, and better and realistic incentives to attract foreign capital/ investment for aquaculture</p> <p>Assist producers to elaborate good business plans to convince lenders</p> <p>Encourage “mother-infant” operations for small-scale farmers so they can access technology, marketing, etc., from the larger farms (large farms generally have easier access to loans)</p> <p>If business plans are solid, provide government loan guarantees. Get pre-financing from donors</p> <p>Encourage large-scale (corporations) type of investments/ enterprises to facilitate access to loans</p> <p>Promote producer cooperatives to facilitate access to loans</p> <p>Establish an incentive scheme to attract foreign investments. To prevent sector domination, a minimum national participation could be required</p> <p>Introduce contract farming through fish processors and exporters (fish marketers)</p> <p>Let the private sector handle large investment projects; successful demonstrations will not only convince lenders, but also attract capital</p> <p>Create trust funds or credit lines</p> <p>Governments to develop microfinance institutions</p>

Constraint	Possible mitigating strategy
<b>High risk of failure</b>	<p>Reduce aquaculture business risks by improving seed, feed and by providing reliable technical information</p> <p>Train/help potential farmers to conduct good feasibility studies</p> <p>Excepting for the largest farms, ensure that there is a reliable domestic urban market, and that any produce will be competitively priced</p> <p>Diversify activities to minimize risks</p>
<b>Reluctance of financial institutions to support aquaculture as a commercial enterprise</b>	<p>Create awareness among managers through training and visit tours; select demonstration farms</p> <p>Sensitize and convince financial institutions through documented success stories on aquaculture as a business (opportunities, potential, economic evaluation)</p> <p>Train reliable fish farmers to establish business plans</p> <p>Have the public sector (governments) and financial institutions/bankers conduct joint studies on the commercial viability of the various aquaculture enterprises to convince lenders</p> <p>Work with medium-scale producers</p> <p>Governments could borrow from international funding agencies to provide capital to private entrepreneurs</p> <p>Adopt a manpower-based development approach, thereby reducing dependency on lending institutions</p> <p>Mobilize funds locally</p> <p>Educate credit institutions (bankers) on aquaculture potential and risks</p> <p>Assist producers to elaborate good business plans to convince lenders</p>
<b>Lack of credibility of the industry</b>	<p>Disseminate information concerning some good examples of successful aquaculture industries (e.g. Nigeria, Madagascar, Zambia, Mozambique, etc.)</p> <p>Organize visits of successful ventures for lenders</p> <p>Conduct studies on previous experiences and find out reasons for failure</p> <p>Sensitize financial institutions on the profitability of aquaculture industries (select certain operations as demonstration farms)</p>

## Appendix 1.2

**POOR CAPACITY**

Constraint	Possible mitigating strategy
<b>Shortage of human capacity and poor technical expertise at both the administration and farm levels</b>	<p>Short and long-term on-the-job training (apprenticeships) of all stakeholders (farmers, farm managers, extension workers, researchers and technical staff at the department level) on existing privately managed commercial or demonstration farms would seem the most cost-effective</p> <p>Organize field visits for farmers, farm managers and local technical staff in countries with similar history and good progress in aquaculture development</p> <p>Introduce vocational training for fish farming at secondary and high school level</p> <p>WorldFish Centre and FAO to disseminate the best techniques for different species and size of farms</p> <p>Encourage and support use of foreign workers qualified in aquaculture production (including volunteers)</p>
<b>Poor capacity of key staff</b>	<p>Inform civil servants in <b>short</b> bulletins on the potential of aquaculture and possible policies in each country, i.e. what has worked elsewhere</p> <p>Strengthen the government's capacity in aquaculture research and policy management</p> <p>Provide, <b>in user-friendly form</b>, information on the importance of aquaculture, how to approach aquaculture and any significant research findings</p>
<b>Entrepreneurial skills: limited expertise of technical staff in developing business plans</b>	<p>Through formal and informal training, strengthen entrepreneurial capacity of farmers and farm managers</p> <p>Government and donors should invest in high-quality <b>training for farm managers, not extension agents or researchers.</b></p> <p>Government and donors to organize workshops for extension workers</p> <p>Government and donors to organize workshops in appropriate areas to train all stakeholders (farmers, farm managers, extension workers, researchers and technical staff at the department level) in basic business skills</p> <p>Import professional expertise and establish more linkages</p>
<b>Poor capacity affects extension advice</b>	<p>There is a need for assessment and reform of the agricultural/aquaculture/fisheries advisory services at the national, provincial and local level</p> <p>Government to form linkages and ensure that there is technology transfer and support to develop aquaculture</p>

## Appendix 1.3

**FEED RELATED CONSTRAINTS**

<b>Constraint</b>	<b>Corrective measures</b>
<b>Lack of a feed industry</b>	<p>Governments to encourage other feed production sectors to provide aquaculture feeds</p> <p>Development of small-scale techniques for on-farm production of feeds (or coops)</p> <p>Government could provide tax or other incentives for the development of these secondary industries</p> <p>Create conditions to establish fish feed industries</p> <p>Encourage animal producers to diversify</p>
<b>Lack of access to reliable good quality and cost-effective fish feed</b>	<p>Support and attract private sector investment in fish feed production as a business</p> <p>Encourage feed producers for poultry and other animals to diversify</p> <p>Public/private sector investment in research to identify appropriate, high-quality and readily available feed</p> <p>Encourage conversion of pond extensive to semi-intensive systems</p> <p>Consider possibilities and opportunities for regional and/or subregional subsidiaries of multinational fish feeds companies</p> <p>Support and facilitate research in production of fish feeds from locally available materials/ingredients</p> <p>Support business development in aquaculture feeds</p> <p>Encourage large-scale farmers to produce feed</p> <p>Producers could form coops to produce feed or animal feed producers could be encouraged to diversify</p> <p>Incentives for feed industry</p> <p>Establish pilot project of fish feed production with local ingredients</p>

## Appendix 1.4

**SEED CONSTRAINTS**

Constraint	Corrective measures
<b>Limited access to reliable good quality and cost-effective fish seed</b>	<p data-bbox="465 327 1062 395">Develop and train hatchery operators in broodstock management and improvement</p> <p data-bbox="465 416 1119 484">Initiate pilot profitable private fish seed production units and duplicate them in other areas of the country/region</p> <p data-bbox="465 505 1143 573">Encourage and support private hatchery operators through incentives and technical assistance</p> <p data-bbox="465 594 1051 663">Boost public and private sector investments in seed production research</p> <p data-bbox="465 683 1143 752">Put in place fish seed quality assurance systems monitored by producer organizations and enforced by public agencies</p> <p data-bbox="465 772 996 801">Support and facilitate research in fish breeding</p> <p data-bbox="465 822 1108 890">Privatize public hatchery facilities where it has not been done yet</p> <p data-bbox="465 911 1096 1006">Develop and disseminate economic models for commercially viable hatcheries to help seed production flourish as a business</p> <p data-bbox="465 1027 1058 1056">Encourage specialization in private seed production</p> <p data-bbox="465 1077 1086 1120">Disseminate information on seed availability (through internet for example)</p>

## Appendix 1.5

**LIMITED AND INAPPROPRIATE TECHNOLOGIES**

<b>Constraint</b>	<b>Corrective measures</b>
<b>Aquaculture limited to few fish species (i.e. tilapia)</b>	Adaptive research to bring in new (indigenous) species Promote aquaculture of other fish species Use of introduced, better performing and commercial high value species
<b>Poor water distribution plus unreliable weather</b>	Survey, identify, map and zone areas that are appropriate for aquaculture Adopt culture systems that fit the historical weather patterns Develop water-efficient culture systems

When asked about mitigating strategies that might reverse the effects of poor management practices in aquaculture, experts suggested the following ways to improve technological performance in the region.

<b>Factor</b>	<b>Practical means</b>
<b>Develop codes for small fish hatchery management</b>	Learn from other parts of Africa and elsewhere where such guidelines already exist Support from FAO and other international development and research institutions Regional collaboration Consultative processes led by the lead public agencies
<b>Focus on improving performance of farmed fish</b>	Have producer organizations demonstrate “best practices” and learn from them Train selected farmers in efficient seed production and hatchery management and monitor the performance of their farms Government to undertake or support applied breeding research programmes
<b>Establish management programme of threats to production</b>	Not a problem yet. But in the future conduct farmers on-site training programmes First, undertake investigation on how the programme can be established (feasibility study, define criteria for selection of the site/country, set pilot project)

## Appendix 1.6

**POOR EXTENSION SERVICES AND INADEQUATE RESEARCH**

<b>Constraint</b>	<b>Corrective measures</b>
<b>Inadequate government-supported extension services</b>	<p>Build capacity</p> <p>Open extension to private sector</p> <p>Decentralize extension services to local levels and operate through NGOs, farmers and private sector</p> <p>Improve interagency coordination including NGOs</p> <p>Train and expose more graduates in practical business-oriented aquaculture</p> <p>Include aquaculture extension courses in university curricula</p> <p>Have technical information disseminated by feed suppliers or universities</p> <p>Organize farmers in viable producer groups/associations to allow for joint procurement of technical and extension services</p> <p>Improve budgets for extension services</p>
<b>Inadequate research-farmer linkages</b>	<p>Change mandate of research to be more impact oriented</p> <p>Encourage on-farm research</p> <p>Support and facilitate participatory research (farmer-researcher partnership approach) and on-farm trials of research findings</p> <p>Establish demonstration centres as close to the farmers as possible</p>
<b>Limited research information from which new investors/interested parties could learn</b>	<p>Produce and facilitate acquisition of commercial aquaculture documentation</p> <p>Create subregional and regional networks for scientific and technical research exchange</p> <p>Support and facilitate south-south information exchanges, study tours and research collaborations</p> <p>Support and encourage publication of research and technical findings</p> <p>Create and operate producers' database</p> <p>Have responsible government agencies prepare short bulletins summarizing major research findings which could be distributed through producer organizations</p>

Constraint	Corrective measures
<b>Inadequate aquaculture extension systems</b>	<p data-bbox="601 213 948 244">Train more extension workers</p> <p data-bbox="601 265 1036 296">Improve salaries of extension workers</p> <p data-bbox="601 317 1033 348">Provide adequate working equipment</p> <p data-bbox="601 368 1053 399">Improve inter-institutions coordination</p> <p data-bbox="601 420 993 451">Use NGOs to deliver information</p> <p data-bbox="601 472 1262 607">Identify best examples of extension services in the region, adapt them to a particular country and include resulting extension programme in the National Aquaculture Development Strategy</p> <p data-bbox="601 627 1272 721">Decentralize extension systems while ensuring the participation of all stakeholders in the process so that they can suggest best ways to do it (the extension)</p>



## Appendix 1.7

**OTHER FACTOR-INPUT RELATED CHALLENGES**

<b>Constraint</b>	<b>Corrective measures</b>
<b>Limited physical resources (water, land)</b>	<p>Adopt integrated planning and coastal management</p> <p>Adopt intensive production system</p> <p>Adopt low technology, high volume production systems</p>
<b>Deterioration of national economies in general and agriculture sectors in particular</b>	<p>Undertake business-friendly economic reforms</p> <p>Create tax incentives in agriculture</p> <p>Undertake macroeconomic structural adjustments and stabilization reforms</p> <p>Discourage embezzlements of public funds from poor to rich countries</p> <p>Increase budgetary allocations for agriculture sector</p>
<b>Poor macroeconomic situations</b>	<p>Loans and grants to be mobilized within and from outside</p> <p>Promote efficient use of available resources and set up a realistic aquaculture development plan</p>
<b>HIV/AIDS</b>	<p>Encourage ongoing projects addressing HIV/AIDS to direct interventions to aquaculture potential areas</p> <p>Obtain correct information on the impact of HIV/AIDS on aquaculture workforce</p> <p>Sensitize communities; integrate HIV/AIDS awareness aspect in aquaculture extension.</p>
<b>Climate change</b>	<p>Mitigation measures should accompany aquaculture development efforts in an area, e.g. alternative sources of water by pumping should be at reach in an area where commercial aquaculture depends on natural water supply</p> <p>Higher taxes on fuel that have to be invested in alternative energy production and energy savings</p> <p>Provide information on good management of water resources and land use</p>

## Appendix 1.8

**MARKET ISSUES**

<b>Constraint</b>	<b>Corrective measures</b>
<b>Lack of reliable markets for aquaculture products</b>	<p>First explore markets before investing in aquaculture</p> <p>Governments to develop marketing physical infrastructures such as roads, rural electrification</p> <p>Open and streamline subregional and intra regional market opportunities</p> <p>Minimize initial investments to avoid oversupply (produce what you can sell)</p> <p>Develop capacity of producers to process, store and market jointly through producer organizations</p> <p>Develop an effective market intelligence and information system</p> <p>Focus on domestic urban markets and/or markets in adjacent countries</p> <p>Encourage big investors</p>
<b>Poor roads limit access to markets</b>	<p>Identify and zone appropriate areas with good infrastructure for aquaculture development (make a good site selection)</p> <p>Locate farms near markets and procurement centres (good site selection)</p>
<b>Cost and difficulty in meeting HACCP</b>	<p>Educate and train producers, extension officers and fish handlers</p> <p>Avail HACCP information to producers, extension officers and fish handlers</p> <p>Encourage major investors. They will establish standards that others can benefit from</p> <p>Temporarily avail public funding to support HACCP and other quality assurances measures beyond the farm gates</p>
<b>Competition from capture fisheries</b>	<p>Explore and disseminate information on potential markets for aquaculture products outside the production point</p> <p>Avoid harvest at peak of fisheries landings</p> <p>Improve the quality of aquaculture products (size of fish, taste, etc.) by application of required techniques</p>
<b>Consumer preference for marine capture fish</b>	<p>New markets and develop value addition</p> <p>Improve quality of farm products/delivery of fresh products to the market (marketing strategy)</p> <p>Organize aqua products fairs</p>

<b>Constraint</b>	<b>Corrective measures</b>
<b>Low incomes</b>	Find new market options Identify production systems which fit within socio-economic environment
<b>Consumer preference for meat</b>	Advertisements and explore markets with different consumers Explain the nutritional importance of fish (not really a problem in Africa region)
<b>Lack of markets for commercial farmers</b>	Market surveys and advertisements, cooperatives and linkages with other farmers with established markets Organize national, subregional and regional markets as well as international

When asked about mitigating strategies that might reverse the effects of poor management practices in aquaculture, the experts suggested the following ways with respect to the marketing of aquatic products in the region.

<b>Help farmers develop international markets for tilapia and catfish</b>	Support organized and producer-led fish marketing Facilitate the establishment of strong and legally recognized national fish farmers organizations which can be internationally linked to others Promote intraregional trade first to obviate HACCP standards and transport costs, and to increase access to information such as prices Support farmers to synchronize fish production to guarantee regular supply
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## Appendix 1.9

**GOVERNANCE ISSUES**

<b>Constraint</b>	<b>Corrective measures</b>
<b>Weak governments, weak local farmers' and development institutions.</b>	<p>Reform public institutions to steer towards support and promotion, rather than engaging in production directly</p> <p>Shift government support of aquaculture institutions from subsistence aquaculture systems to business-oriented private sector aquaculture enterprises</p> <p>Support emergence of viable producer organizations</p> <p>Establish and support inter-agency committee for aquaculture management and promotion</p> <p>Training in the public sector, development institutions and farmer organizations</p> <p>Encourage community development with cooperatives and producer organizations for mutual support.</p>
<b>Lack of interagency coordination</b>	<p>Establish and support inter-agency committee for aquaculture management and promotion</p> <p>Have one lead agency with a mandate to promote and coordinate the sector</p>
<b>Corruption</b>	<p>Clear policies and transparency in contracts/transactions, etc.</p> <p>Less bureaucracy and one central point for applying licences</p> <p>Suppliers and project developers should be made accountable for money obtained from donors</p> <p>A strong, commercial aquaculture group that can lobby effectively</p> <p>The real impact of corruption needs to be assessed at all levels. It can occur even at international institutions, which nevertheless benefit from accurate anti-corruption services (e.g. reforming UN agencies and organization) due to their democratic nature. Measures recommended are: implementation of an international anti-corruption system for multilateral and bilateral funding; development of national anticorruption systems; support to national institutional reforms (decentralization) in order to strengthen the role of a healthy public sector. Fighting corruption at every level and defending an efficient public sector by all means is a guarantee of sustainable development</p>

Constraint	Corrective measures
<b>Corruption</b> (cont.)	1. Reduce regulations where possible, and make regulatory processes transparent; 2. Empower economic police (as in Botswana); 3. Designate an independent Auditor-General; 4. If an environmental impact statement (EIA) is required for a minimum-size farm, there should not be a perception that it will be needed even for smaller farms (i.e. Zambia); 5. Develop a register of those competent to undertake an EIA. This register should not include government officials because then there is an incentive to insist on an EIA to generate income (Zambia); 6. Property rights/leases should be transparent and free from political influence
<b>Ideological aversion to free markets by some government officials</b>	Create more awareness of the benefits of free markets for aquaculture Provide workshops on basic economics aimed at the youngest policy-makers
<b>Existence of civil conflicts in many countries</b>	Government policies to guarantee security of aquaculture properties

## Appendix 1.10

**POOR INFORMATION AND COMMUNICATION**

Aggravating factors	Mitigation strategy
<b>Lack of political commitment to aquaculture development in most African countries</b>	<p>Provide documentation on the importance of aquaculture for income generation and food security</p> <p>Organize exchange visits for policy-makers in countries where aquaculture is well developed</p> <p>Regularly document (through policy and legislation updates) policy makers' commitment to aquaculture development and request action from them</p> <p>Major development agencies to tone down environmental concerns, tone down grassroots approach and get governments to promote their countries for major aquaculture investments</p> <p>Support local experts to undertake in-country time-bound aquaculture assignments with additional or better remuneration</p> <p>Encourage trained staff to become farmers themselves</p> <p>Undertake civil service reforms to ensure better working conditions for well trained staff</p>
<b>Lack of awareness of the importance of aquaculture at decision-making level</b>	<p>Generate and disseminate more success stories in the sector</p> <p>Assess the contribution of aquaculture to national and regional economies and disseminate information at the decision-making level</p> <p>Conduct workshops on technical and economic viability of aquaculture investments</p> <p>FAO to play a major role in raising awareness of aquaculture benefits, instruct major donor governments</p>
<b>Lack of information on aquaculture strategies in other countries in Africa</b>	<p>Establish one lead agency for the sector</p> <p>Establish policy, regulatory and strategy frameworks for sustainable aquaculture development</p> <p>Establish incentives to attract investments to commercial aquaculture</p> <p>Initiate pilots – demonstration farms for commercial aquaculture</p> <p>Take advantage of the political will demonstrated through a reduction of government's role in production, inputs dealing and supply, and through the public funding of private aquaculture businesses and enterprises to attract international support to the sector</p>

Aggravating factors	Mitigation strategy
<b>Lack of information on aquaculture strategies in other countries in Africa</b> (cont.)	<p>Undertake regional reviews and advocacy through intra regional bodies</p> <p>Promote legislation which actualizes ‘political will’ by ratifying international, regional and subregional conventions, protocols and other undertakings relating to aquaculture</p> <p>Recognize that foreign investors can contribute to develop aquaculture</p> <p>Improve regulatory procedures so that investors face fewer hurdles and less permit time (e.g. one-stop shops, one lead institution)</p> <p>Use FAO to collect and disseminate ‘Best Practices of Political Will’</p>
<b>Increased focus on high quality information delivery between research, extension and farmers</b>	<p>Focus on high-potential areas</p> <p>FAO and WorldFish Center could summarize major research findings and disseminate them on the Web. Where the internet is unavailable, short summaries could be made available.</p> <p>Increase the private sector’s role and introduce competition in service delivery, research and extension</p> <p>When possible, have researchers and extension workers jointly deliver information to farmers</p> <p>Develop systems (database) for information requests and delivery</p> <p>Develop aquaculture extension manuals which can be readily understood by farmers</p>
<b>Inform women about aquaculture activities and facilitate their access to land</b>	<p>Specific programmes aimed at women and land policies</p> <p>Use various channels to inform women about aquaculture activities and land use legislation</p>
<b>Inappropriate technical information packages</b>	<p>Instruct researchers to work with the private sector to capture best practices</p> <p>Establish regional centres to include demonstrations of viable aquaculture production systems and to serve as outlets for technical information</p>

Experts thought that an unexplored opportunity related to the dissemination of technical and marketing information was using local farmers as information agents. Farmers have common backgrounds and interests; policy-makers could take advantage of this to improve communication channels. Suggestions are presented below.

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**Encourage cooperation among farmers**


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Unexplored opportunity	Action
<b>Use common background of farmers</b>	<p data-bbox="601 296 1272 362">Encourage/promote producers' organizations as a tool for availing information on seed, feed and markets</p> <p data-bbox="601 383 1272 449">Document good examples (success stories) and share them with other farmers</p> <p data-bbox="601 470 1272 536">Use the experiences of outstanding farmers for technical assistance in other countries</p> <p data-bbox="601 557 1272 590">Exchange visits among farmers in the region (network)</p> <p data-bbox="601 611 1272 706">Organize farmers into producer groups and coordinate and synchronize production to meet demands of specific markets</p> <p data-bbox="601 727 962 760">Production for specific markets</p> <p data-bbox="601 781 1272 876">First conduct work with one species until its farming becomes commercially viable, and then avail funds to producers/universities to experiment with other species</p> <p data-bbox="601 897 1272 957">Facilitate exchange journeys among farmers, aimed primarily at promising producers</p>

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