

Appendix 2

Asia and the Pacific

Appendix 2.1

Practical means to lessen/contain the impact of factors identified as negative for past and future aquaculture development

	Practical means
Stringent trade barriers, rules and regulations	<p>Ensure fairness in trade between North and South through third parties (WTO)</p> <p>Improve quality of products</p> <p>Develop domestic and intraregional markets</p> <p>Adopt unified common standards and legislation</p> <p>Organize farmers to comply better with technical barriers to trade</p> <p>Bilateral Free Trade Agreements (FTAs) (between producing and consuming countries)</p>
Concerns with environmental destruction	<p>Develop proper regulations to protect environment</p> <p>Build capacity in environmental control</p> <p>Develop and promote best management practices and codes of responsible practices through marketing-based incentives</p> <p>Improve technology in aquaculture</p> <p>Have an effective environmental management regime which covers all activities potentially damaging to the environment</p> <p>Rehabilitate mangrove forests, natural water bodies and aquatic resources</p> <p>Conduct EIA before developing aquaculture activities</p> <p>Raise awareness of environmental impacts</p>
Difficult access to land and water resources	<p>Establish mariculture parks</p> <p>Recognize customary tenure rights</p> <p>Improve access to land and water resources, through adequate irrigation infrastructure</p> <p>Proper planning of access to land and water resources so that acceptable areas (both for farmers and those with other interests/uses for the resource) are identified</p> <p>Ensure strict enforcement of laws and regulations governing property use and access</p>

	Practical means
Difficult access to land and water resources (cont.)	<p>Establish access rights systems while defining land and water laws</p> <p>Establish water legislations</p> <p>Ensure better coordination between aquaculture and other sectors dependent on land and water resources</p> <p>Ensure more cooperation amongst stakeholders</p> <p>Establish and prioritize zoning for development</p> <p>Identify availability and constraints</p>
Poor farmer training	<p>Extension services to improve farmers' training in collaboration with local communities</p> <p>Conduct demonstrations at successful farms for extension field staff, and prospective investors, as well as coastal fishermen</p> <p>Industries and science institutions to address training and extension, including basic literacy and sciences</p> <p>International organizations in collaboration with in-country major/influential stakeholders and educational institutions to define training packages and strategies</p> <p>Increase farmers' scientific consciousness</p> <p>Make creative use of information technology in complement with other media</p> <p>Governments to support knowledge and new technologies in aquaculture</p> <p>Public sector to increase funding for farmers' training activities</p> <p>Develop commercial incentives for better advisory services to farmers</p> <p>Strengthen training capability of aquaculture extension organizations at grass-root level</p> <p>Strengthen farmers' associations (no consensus was reached here)</p>

	Practical means
Genetic degradation/ unfavourable alterations to genetic diversity	<p>Strengthen breeding programmes in aquaculture seed production</p> <p>Carefully plan enhancement and restocking programmes</p> <p>Establish gene banks</p> <p>Increase research efforts geared towards genetic improvement of cultured species and knowledge of aquaculture genetics</p> <p>Conduct Research and Development (R&D) on genetic improvement and biodiversity</p> <p>Accredit system in aquaculture seed production and distribution</p> <p>Put proper regulations in place to preserve genetic diversity</p> <p>Institutions to share information towards improving genetics in breeding (ensure close cooperation between those who have the information and those who need the information)</p>
Overexploitation of coastal resources	<p>Raise public awareness</p> <p>Provide education, incentives and other packages that would maintain continuity of educational and compliance programmes</p> <p>Establish fishing seasons to protect the propagation and development of juveniles</p> <p>Establish property rights for aquaculture</p> <p>Zone and assess the carrying capacity of each zone</p> <p>Effective coastal zone management plans</p> <p>Mangrove reforestation and conservation</p> <p>Land reforms in coastal areas (no consensus reached)</p>

	Practical means
Poor government policies	<p>Clarify government short and long-term objectives and strike a balance between short and long-term interests</p> <p>Credible institutions like the UN to assist or intervene in order to improve policies</p> <p>Ensure advocacy alliances among stakeholders other than government, e.g. farmers' associations</p> <p>Ensure stronger stakeholders' participation in planning and policy development including government agencies (local as well as central), private sector, local communities and fish farmers</p> <p>Use proven past events/experiences of other countries</p> <p>Decentralize policy making processes</p> <p>Aquaculture to be given higher profile (i.e. not to be subsidiary to fisheries or agriculture policies as is often the case)</p>
Lack of domestic feed industries	<p>Utilize local ingredients where cost effective</p> <p>Import feed on the basis of comparative advantage</p> <p>Create more supportive environment for domestic feed industry development</p> <p>Provide more support to R&D activities for aquaculture feed development</p> <p>Switch to or develop and promote herbivorous species</p> <p>Concerned authority or organization to do some of the followings: (1) investigate the causes for the lack of domestic feed industries, (2) conduct feasibility studies on developing domestic feed mills and (3) call for external assistance and investment with appropriate packages</p> <p>Develop local domestic feed industry through joint ventures with more developed countries</p> <p>Establish small scale (village size) feed-mill factories</p> <p>Create financing mechanisms for the domestic feed industry (no consensus)</p> <p>Encourage the growth of commercial fish and shrimp farming (no consensus)</p>

	Practical means
Sensationalist media	<p>Ensure that dialogue occurs</p> <p>More scientific outreach activities</p> <p>Incorporate social responsibility (i.e. avoid social conflicts by distributing benefits of development equitably) in industry strategies</p> <p>Improve science and communicate scientific results</p> <p>Have sound information available</p> <p>Improve communication with public media</p> <p>Farmers and industry associations to improve image and credibility of the industry (e.g. by promoting science-based debates on issues and creating alliances with scientific community)</p> <p>Develop farmer's news and demonstrations on television, farmers' networks and farmer websites</p> <p>Governments and the industry to organize proactive media campaign</p> <p>Strengthen the advocacy of aquaculture sector</p> <p>Communicate concerns to media on sensationalist news coverage and their negative impacts on the industry</p> <p>Sanction irresponsible lobby groups propagating incorrect information</p> <p>Ensure that governance processes are open and informed (this helps maintain an informed public or section of the public)</p>
Biosecurity risks	<p>Stakeholders to comply with biosecurity measures through relevant and appropriate incentive trade packages</p> <p>Train technical staff in risk assessment</p> <p>Raise public awareness (improve education)</p> <p>Provide more training and adopt proper regulations</p> <p>Provide (more) training in disease management</p> <p>Develop more practical precautionary regulations/codes of conduct for good aquaculture practices</p> <p>Fisheries (aquaculture) agencies to be staffed with agriculture officers (for quarantine) and veterinarians (for fish disease)</p>

	Practical means
Biosecurity risks (cont.)	<p>Apply import risk analysis models (quarantine protocols)</p> <p>Promote organic farming</p> <p>R&D</p> <p>Better enforcement/implementation of precautionary regulations/codes of conduct in aquaculture practices</p> <p>Universities, IUCN (International Union for the Conservation of Nature and Natural Resources), relevant government departments, etc., to suggest remedial measures</p> <p>Bring to an end the use of harmful chemicals/drugs in aquaculture</p> <p>Stakeholders to improve availability of information on biosecurity</p>
Poorly planned aquaculture enterprises	<p>Include subjects related to aquaculture and fisheries in education curricula</p> <p>Public sector to provide better information services and technical support to private sector in establishing aquaculture businesses</p> <p>Lending/funding institutions should require fund recipients to do proper planning and to comply with sustainable practices as part of loan conditions</p> <p>Access to better information and advice in developing business plans</p> <p>Establish aquaculture development committees</p> <p>Train farmers and entrepreneurs in developing business plans</p> <p>Fisheries departments to hold seminars/workshops to train large, medium, and especially small farmers in aquaculture farm planning</p> <p>Improve planning tools, especially financial and economic packages</p>

Lack of financial resources	Practical means
	Convince governments and investors on the profitability of aquaculture projects
	Public sector (government) to play a leading role in improving access of aquaculture businesses to investment at the early development stage of the industry
	Aquaculture associations to provide funds to rural farmers (start up grants, revolving funds)
	Financial institutions and farmers to cooperate more
	Government to provide support and show commitment
	Involve financial institutions in training of farmers and entrepreneurs
	Educate financial (bank) loan officers
	International agencies such as FAO, ADB, UNDP to provide support
	National development banks to provide soft loans to rural farmers who live far way from lending institutions and have no collateral
	Governments/consultants to help farmers/investors prepare bankable projects (good business plans)
	Concerned authorities to assist in outsourcing financial loans. For instance, after screening appropriate recipient farmers or developers, governments or related institutions may serve as guarantors for loan repayment based on the project development scheme, financial profile and assessment done by a credible independent body
	Lending institutions such as SMEDA (Small and Medium Enterprise Development Authority), industrial and agricultural banks to introduce small-farmer investor-friendly policies, with loan facilities available at the village level
	Local community groups to pool funds and provide cheap loan schemes to rural farmers (no consensus)

Appendix 2.2

OTHER FACTORS WHICH MIGHT CONTRIBUTE TO REDUCE AQUACULTURE DEVELOPMENT IN THE REGION AND PRACTICAL MEANS TO LESSEN/CONTAIN THE LIKELIHOOD OF OCCURRENCE OF THESE FACTORS

Other factors	Practical means
<p>Limited water, i.e. frequent draughts</p>	<p>Develop mariculture, where applicable</p> <p>Develop integrated farming systems</p> <p>Adopt mixed farming practices such as silvo fisheries to reduce evaporation from pond water (co-culture with some aquatic plants that have minimum impact on pond dynamics)</p> <p>Better manage water – irrigation and delivery systems</p> <p>Introduce appropriate culture practices such as waste (including or especially wastewater) reclamation and reuse (W2R2) system, zero discharge system to minimize use of water</p> <p>Adopt lower cost recirculation technologies</p> <p>Exert controls of excessive use by other sectors – agriculture, tourism</p> <p>Carefully plan and prioritize water availability</p> <p>Develop well management for water use</p> <p>Set up user-pay policy</p>
<p>Diseases</p>	<p>Assurance of health of broodstock or seed</p> <p>More responsible introductions of species</p> <p>Establish effective and safe disease prevention, diagnosis, control and treatment measures</p> <p>Establish good biosecurity systems at the border and in farms within a country. Some planning and sharing of management practices are important</p> <p>Prompt information dissemination on outbreak of diseases</p> <p>Farmers' adoption of best management practices (BMPs) on health management</p> <p>Employ services from livestock veterinary officers</p> <p>Educate farmers on diseases</p> <p>Widespread application of the concept that prevention is better than cure in aquaculture</p> <p>Promote ecosystem-friendly culture practices</p> <p>Improve disease resistance of cultured species through genetic improvement</p> <p>Introduce disease resistance species</p> <p>Put robust biosecurity programmes in place</p>

Other factors	Practical means
Industrial – Toxic metal pollution	<p>Carefully select aquaculture sites</p> <p>Aquaculture stakeholders to actively promote the environment/voluntary monitoring and surveillance of illegal waste discharged from the industry</p> <p>Raise public awareness</p> <p>Introduce early warning systems</p> <p>Better control water exchanges with outside</p> <p>Set up zoning systems</p> <p>Set up monitoring and response systems</p> <p>Promote organic farming</p> <p>Governments to regulate, control or prohibit the use of heavy metals</p>
Increasing energy costs (high oil prices)	<p>Use market incentives for development and adoption of alternative energy sources such as biodiesel/biofuels (gasohol), solar energy, fuel cells, wind mills and wave energy</p> <p>R&D on energy saving culture systems</p> <p>Higher technical efficiency in the use of energy (modify existing aquaculture systems/models with less power input)</p> <p>Governments to assist farmers in utilizing renewable energy</p> <p>Switch to less energy-intensive farming systems and species (no consensus)</p>
Poor economic efficiency of traditionally cultured species	<p>Improve cultured species</p> <p>Develop/research new cultured species with larger economic potential</p> <p>Introduce improved culture technologies</p> <p>Switch to other species</p> <p>Promote value addition of aquaculture products</p> <p>Develop new techniques which can improve efficiency and bring down costs</p> <p>Give priority to genetic improvement programmes such as breeding</p> <p>Place emphasis on improvement of species with high market potential (no consensus)</p>

Other factors	Practical means
Poor economic efficiency of aquaculture practices	<p>Provide technical and management training</p> <p>Introduce new technologies</p> <p>Improve culture efficiency through better management and production techniques</p> <p>Provide adequate extension services to producers</p> <p>FAO/NACA/STREAM, etc. to advise</p> <p>Develop high efficiency aquaculture systems</p> <p>Develop new technologies</p> <p>Promote value addition of aquaculture products</p>
Resource use conflicts (e.g. land and water) coupled with bad planning	<p>Place aquaculture in the context of multiple users/ integrated management</p> <p>Adopt land and water use zoning</p> <p>Develop sound planning processes and ensure the creation of incentives which discourage excessive (poor) resource use</p> <p>Involve stakeholders' in conflict resolution</p> <p>Adopt and enforce appropriate legislations</p> <p>Adopt planning tools, e.g. GIS, zoning schemes</p> <p>Increase consultation with the public through public forums to allow inputs of stakeholders in land use planning</p> <p>Design local government committees and collaborate with them in developing regulations</p> <p>Concerned stakeholders to conduct proper feasibility studies to reduce resource users conflict</p> <p>Improve coordination with other sectors relying on the same resources</p>
Public opposition to occupation of space in coastal areas by aquaculture	<p>Effectively promote sustainable resource sharing in media and public forum</p> <p>Place aquaculture in the context of coastal multiple use (integrate aquaculture into other coastal developments)</p> <p>Improve public awareness on the advantage and importance of coastal/marine aquaculture (through pilot demonstrations for example)</p> <p>Improve coastal/marine aquaculture and reduce its impacts on the environment</p> <p>Use of integrated coastal area management in concerned development agencies</p>

Other factors	Practical means
Public opposition to occupation of space in coastal areas by aquaculture (cont.)	<p>Conduct credible studies to demonstrate cost-benefits to community of aquaculture projects in the area</p> <p>Design local government committees to plan for and determine the use of space including coastal stakeholders (district local councils)</p> <p>Set up public relations campaigns</p>
Weak or lack of environmental controls and enforcement	<p>Institutional capacity building, support of regulations and development of guidelines</p> <p>Aquaculture stakeholders to actively participate in monitoring, control and surveillance of pollution (through local government committees for example)</p> <p>Legalize environmental regulations</p> <p>Federal and provincial environment protection agencies to enforce measures to control/reduce industrial pollution such as sugar mills, tanneries, textile, auto batteries, pulp-paper, refinery, seaport and city sewage</p> <p>Voluntary adoption of BMPs and Codes of Conduct</p> <p>Stronger farmers' associations for self-policing</p> <p>Educate decision-makers or concerned authorities</p> <p>Use international trade incentives as persuasive schemes to effectively control and enforce regulations</p> <p>Governments to improve enforcement</p> <p>Close cooperation with environmental advocates/NGOs to highlight wrong doers</p>
Poor planning and lack of management skills	<p>Develop long-term management strategies</p> <p>Strengthen the training and education of farmers (for example through in-country or across-borders farmers exchanges and visits) and of relevant personnel</p> <p>Governments to provide support for knowledge and new technologies</p> <p>Improve extension services</p> <p>Promote sustainable commercial aquaculture development</p> <p>Fisheries departments to be reorganized, restructured, adequately staffed with sufficient financial budgeting for planning</p>

Other factors	Practical means
Lack of international codes on movements of live fish and introductions of exotic species	<p>Better regional coordination in common issues of interest</p> <p>Set up and enhance quarantine systems</p> <p>Develop a national strategy on movements and introductions of species (such as codes, fish health certificates)</p> <p>Fisheries departments to study, submit draft for legislation by government</p> <p>Put in place a comprehensive extension system</p> <p>Raise farmers' awareness and disseminate information on the consequences (pros and contras in monetary and environmental terms) of such movements without careful management</p>
Lack of clear legal frameworks regulating site use	<p>Develop model legislation</p> <p>Governments to set up legal frameworks in consultation with province and district councils</p> <p>Learn from other countries' laws and regulations</p> <p>Offer training on legal issues</p> <p>Allow flexibility and modification of codex that are not workable</p>
Compliance with International Code of Conduct and Code of Practices	<p>Utilize intergovernmental fora to increase pressure for compliance</p> <p>Elaborate technical guidelines for governments and farmers</p> <p>Provide market incentives for products produced in compliance with international codes</p> <p>FAO to increase vigilance and take corrective actions</p> <p>Create incentives for voluntary adoption of BMPs</p> <p>Government to create awareness on International Code of Conduct and Code of Practices in workshops with stakeholders</p> <p>Strengthen farmer associations</p> <p>Fairness in trade issues</p> <p>Provide training on International Code of Conduct</p> <p>Modify international codes for better adaptation to local conditions</p>

Other factors	Practical means
Excessive enforcement of aquaculture-related regulations by concerned authorities	<p>Raise awareness on the long-term benefits of such regulations</p> <p>Balance regulations with market incentives and codes of practice</p> <p>Provide adequate staffing, transport facilities and financial means to fisheries departments</p> <p>Provide education and incentives to regulation enforcement officers</p> <p>Actors (e.g. farmers, suppliers, buyers) to better cooperate in the market chain (self regulation)</p> <p>Strong enforcement through high penalties and charges</p>
Non-integrated planning	<p>Provide appropriate training to concerned parties</p> <p>Adopt better planning processes including participation of all stakeholders and integration of aquaculture in rural development schemes</p> <p>Enhance cooperation between different organizations</p> <p>Use of planning tools such as GIS, zoning schemes</p> <p>Provide integrated plans to prospective investors on sustainable aquaculture projects including information on feasibility, land leases, microfinancing, farm design, training, etc.</p> <p>Promote integrated large-scale aquaculture</p> <p>Develop a nationwide integrated plan</p>
Change in peoples' eating habits (food preferences)	<p>Allow flexibility in the industry so as to quickly adjust to consumer preferences</p> <p>Promote food safety scheme from farm to table</p> <p>Improve the post-harvesting and processing of aquaculture products</p> <p>Provide public education and scientific extension</p> <p>Conduct advertising campaigns highlighting the nutritional benefits, wholesomeness and good taste of aquaculture products</p> <p>Promotion of aquaculture products using effective mass media</p>

Other factors	Practical means
Low prices caused by oversupply	<p data-bbox="601 213 1058 244">Farmer associations to moderate supply</p> <p data-bbox="601 265 1146 358">Effective production planning through farmers' association, organizations in collaboration with stakeholders</p> <p data-bbox="601 379 1139 410">Work on developing new or expanded markets</p> <p data-bbox="601 430 1179 503">Advertise and improve distribution and marketing channels of aquaculture products</p> <p data-bbox="601 524 896 555">Diversify cultured species</p> <p data-bbox="601 576 1233 669">Maintain good balance in supply and demand of aquaculture products through good market studies and better functioning of farmers' associations</p>
Public concerns on the sanitary conditions of aquaculture products	<p data-bbox="601 689 1243 793">Educate producers towards improving the quality of aquaculture products through the adoption of drug-free production systems, Code of Conduct and BMPs</p> <p data-bbox="601 814 1282 876">Educate consumers through public campaigns and effective media</p> <p data-bbox="601 897 1243 1000">Promote quality products by encouraging production methods in compliance with international standards and requirements</p> <p data-bbox="601 1021 951 1052">Promote aquaculture products</p>