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Organization of the
United Nations

Regional strategy and action plan for sustainable intensification of aquaculture in the Asia-Pacific region



Regional strategy and action plan for sustainable intensification of aquaculture in the Asia-Pacific region

**REGIONAL OFFICE FOR ASIA AND THE PACIFIC
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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Table of Contents

| | <i>Page</i> |
|--|-------------|
| Preparation of the document | vi |
| Abbreviations and acronyms | vii |
| Executive summary | ix |
| 1 Background | ix |
| 2 Objective | x |
| 3 Process | x |
| 3.1 Background review for drafting the strategy and the action plan framework | x |
| 3.2 Regional consultation | xi |
| 3.3 Finalization of the strategy and action plan | xi |
| 4 Summary of the regional strategy | xi |
| 5 Summary of the regional action plan | xiii |
| Regional strategy for the sustainable intensification of aquaculture in the Asia-Pacific region | 1 |
| 1 Background | 1 |
| 2 Purpose | 2 |
| 3 The present situation | 2 |
| 4 The challenge | 3 |
| 5 Vision | 3 |
| 6 Goals for the strategy | 3 |
| 7 Strategic framework | 4 |
| Strategic objective 1. Establish an enabling environment | 4 |
| Strategy 1.1 – Develop and implement appropriate aquaculture policy and strategy | 4 |
| Strategy 1.2 – Strengthen institutional capacity and arrangements | 4 |
| Strategy 1.3 – Develop and enforce effective regulations | 4 |
| Strategy 1.4 – Develop and implement responsible aquaculture planning | 5 |
| Strategy 1.5 – Improve access to markets and trade | 5 |
| Strategy 1.6 – Strengthen regional and private sector collaboration and cooperation .. | 5 |
| Strategic objective 2. Establish good governance, effective planning and management | 5 |
| Strategy 2.1 – Establish and implement aquaculture registration and licensing | 5 |
| Strategy 2.2 – Promote and monitor responsible production management | 5 |
| Strategy 2.3 – Establish and implement appropriate certification and standards | 6 |
| Strategy 2.4 – Improve farmer access to finance, credit and insurance | 6 |
| Strategy 2.5 – Promote the organization of small-scale producers | 6 |
| Strategic objective 3. Improved management along the aquaculture value chain | 6 |
| Strategy 3.1 – Improve management practices in production and distribution of aquaculture seeds | 6 |
| Strategy 3.2 – Improve production and distribution of quality aquaculture feed | 6 |
| Strategy 3.3 – Improve productivity and economic efficiency | 6 |
| Strategy 3.4 – Improve management of post-harvest processing and marketing | 6 |
| Strategy 3.5 – Establish effective supply chains and improve management | 7 |

| | |
|---|-----------|
| Strategic objective 4. Improve supporting services | 7 |
| Strategy 4.1 – Strengthen training and build capacity | 7 |
| Strategy 4.2 – Strengthen research and development..... | 7 |
| Strategy 4.3 – Improve information exchange and communication | 7 |
| Strategic objective 5. Increase social responsibility and ensure equitable benefits | 7 |
| Strategy 5.1 – Enhance social responsibility | 7 |
| Strategy 5.2 – Promote equitable access to opportunities and benefits | 7 |
| Strategy 5.3 – Promote and practice gender integration | 7 |
| Strategic objective 6. Strengthen focus on increasing resilience of aquaculture farmers | 8 |
| Strategy 6.1 – Address climate change and natural disasters more effectively | 8 |
| Strategy 6.2 – Develop a more selective approach to the identification and pursuit of the best opportunities for addressing emerging issues | 8 |
| Regional action plan for the sustainable intensification of aquaculture in the Asia-Pacific regional | 9 |
| 1 Background | 9 |
| 2 Purpose | 10 |
| 3 Impact..... | 10 |
| 4 Preparation of the action plan | 11 |
| 5 The action plan | 14 |
| Outcome 1. Enabling environment established | 14 |
| Output 1.1 – Appropriate aquaculture policy and strategy developed and implemented | 14 |
| Output 1.2 – Institutional capacity and arrangements strengthened | 16 |
| Output 1.3 – Effective regulations in place and enforced..... | 17 |
| Output 1.4 – Responsible aquaculture plan developed and implemented | 20 |
| Output 1.5 – Market access and trade improved | 23 |
| Output 1.6 – Regional and private sector collaboration and cooperation strengthened..... | 25 |
| Outcome 2. Effective management of the aquaculture sector | 27 |
| Output 2.1 – Aquaculture registration and licensing established and/or implemented | 27 |
| Output 2.2 – Responsible production management promoted and monitored | 28 |
| Output 2.3 – Appropriate certification and standards established and implemented ... | 30 |
| Output 2.4 – Farmer access to financing, credit and insurance improved | 31 |
| Output 2.5 – Organization (clusters, cooperative, associations etc.) of small-scale producers promoted | 32 |
| Outcome 3. Improved management along the aquaculture value chain | 33 |
| Output 3.1 – Management practices in production and distribution of aquaculture seeds improved | 33 |
| Output 3.2 – Production and distribution of quality aquaculture feed improved | 35 |
| Output 3.3 – Productivity and economic efficiency improved | 35 |
| Output 3.4 – Management of post-harvest processing and marketing improved | 37 |
| Output 3.5 – Effective supply chain established and management improved | 38 |
| Outcome 4. Improved capacity for supporting services | 40 |
| Output 4.1 – Training and capacity building strengthened | 40 |
| Output 4.2 – Research and development strengthened | 42 |
| Output 4.3 – Information exchange and communication improved..... | 44 |

| | |
|--|-----------|
| Outcome 5. Increased social responsibility and equitable benefits | 45 |
| Output 5.1 – Social responsibility enhanced | 45 |
| Output 5.2 – Equitable access to opportunities and benefits promoted | 47 |
| Output 5.3 – Gender integration promoted and practiced | 48 |
| Outcome 6. Increased resilience of farmers | 50 |
| Output 6.1 – Climate change and natural disasters effectively addressed | 50 |
| Output 6.2 – Other emerging issues addressed | 53 |
| Annex 1. Regional Consultation on Strategy and Action Plan for Sustainable Intensification of Aquaculture in the Asia-Pacific region | 55 |
| Annex 2. Participants list: Regional Consultation on Strategy and Action Plan for the Sustainable Intensification of Aquaculture in the Asia-Pacific region | 60 |

Preparation of the document

This document is the product of a regional process supported by the FAO regional initiative on sustainable intensification of aquaculture (SIA) for blue growth in the Asia-Pacific region. A comprehensive review of relevant regional and global processes and relevant documents produced in the past decade was conducted and this contributed to a background document and a draft regional strategy and action plan for SIA in the Asia-Pacific region. A regional consultation was conducted to formulate the final version of the regional strategy and complete the action plan. Forty representatives of the governments of 16 countries in Asia, five regional and international organizations and five development agencies (donor agencies) participated in the consultation. Plenary and working group sessions were convened to modify and elaborate the structure and text of the regional strategy and action plan based on the draft documents prepared before the consultation. A special effort was made to get direct inputs to the action plan from the concerned national authorities of all the member governments of the Network of Aquaculture Centres in Asia-Pacific (NACA). The inputs received from the government authorities were synthesized and incorporated into the action plan matrixes. The regional strategy and action plan were finalized jointly by FAO and NACA.

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The completion of the regional strategy and action plan for sustainable intensification of aquaculture in the Asia-Pacific region is primarily attributed to all the country governments, regional and international organizations and development agencies who participated in and contributed to the regional consultation for formulating the regional strategy and action plan documents. Special thanks to Cherdasak Virapat, Director General of NACA and the Secretariat Staff of NACA for their efforts in soliciting specific country government inputs to the action plan and for their contributions to the finalization of the documents. Many thanks to Patrick White for his great contribution to the development of the regional strategy and action plan, particularly in conducting the background review, drafting the strategy and the action plan documents and facilitating the regional consultation. Many thanks also to Brian Davy for his help in synthesizing contributions and incorporating the specific inputs from country governments into the action plan matrixes and to Chanphen Bhawangkananth for facilitating the publication of this document.

Simon Funge-Smith, Senior Fishery Officer, FAO Marine and Inland Fisheries Branch is gratefully acknowledged for his technical advice and important contribution to the development of the document.

Abbreviations and acronyms

| | |
|---------|--|
| WTO | World Trade Organization |
| ADB | Asian Development Bank |
| AFFS | Aqua farmer field schools |
| APFIC | Asia-Pacific Fishery Commission |
| APRC | Asia and the Pacific Regional Conference |
| AOD | Aquaculture Department |
| BGI | Blue growth initiative |
| BMPs | Better management practices |
| CBF | Culture-based fisheries |
| CC | Climate change |
| CEO | Chief Executive Officer |
| DoF | Department of Fisheries |
| DRM | Disaster risk management |
| EAA | Ecosystem Approach to Aquaculture |
| EIA | Environmental impact assessment |
| FAO | Food and Agriculture Organization of the United Nations |
| FCR | Feed conversion ratio |
| GAAP | Global Aquaculture Advancement Partnership |
| GAqPs | Good aquaculture practices |
| ICT | Information and communication technology |
| ILO | International Labour Organization |
| IMTA | Integrated Multi-Trophic Aquaculture |
| IT | Information technology |
| ITK | Indigenous technical knowledge |
| MOU | Memorandum of Understanding |
| NACA | Network of Aquaculture Centres in Asia-Pacific |
| NTBs | Non-tariff barriers |
| NGOs | Non-governmental organizations |
| OIE | The World Organisation for Animal Health |
| R&D | Research and development |
| RCFM | Regional Consultative Forum Meeting |
| SEA | Strategic environmental assessment |
| SEAFDEC | Southeast Asia Fisheries Development Center |
| SIA | Sustainable intensification of aquaculture |
| SPS | Sanitary and phytosanitary standards |
| TCPF | Technical Cooperation Programme Facility |
| TG | Technical guidelines |
| UNESCAP | The United Nations Economic and Social Commission for Asia and the Pacific |
| WB | The World Bank |

Executive summary

1 Background

Intensification of aquaculture has been an ongoing process in the Asia-Pacific region. Its aim is to increase the productivity and economic efficiency of aquaculture production through the intensified use of inputs (materials, energy and investment) and resources (water, feed ingredients), and the application of new technologies and improved management practices.

Intensification of aquaculture has been a major contributor to the rapid aquaculture production growth in the Asia-Pacific region in the past two decades (nearly 10 percent annually), which has contributed significantly to food and nutrition security and livelihoods in the region. The region has constantly contributed over 90 percent of the world aquaculture production for decades. Aquaculture currently supplies 50 percent of food fish for the world and in Asia, aquaculture supplies over 60 percent of food fish, comprising over 20 percent of total animal protein intake by the Asian population. However, the impacts of intensification have attracted considerable public concern regarding the long-term sustainability of the sector.

Being the most populous region of the world with heavy demands on natural resources, Asia will face great challenges to maintain the growth of its aquaculture sector and to meet the increasing demand for fish inside and outside the region in the coming decades. It is estimated that fish consumption in the Asia-Pacific region will increase by 30 percent by 2030. With capture fish production stagnant, it is estimated that aquaculture production will need to increase by 50 percent by 2030 from the current level. At the same time, the aquaculture sector is facing serious challenges, the foremost being the impact of climate change and variability, urbanization and related social and economic changes, increasing intra-regional trade and increasing public concern over the environment and food safety.

Working with limited natural resources and in light of the various challenges, the only way to meet the increasing demand for fish is to promote the **sustainable intensification of aquaculture (SIA)**, which means “to produce more with less.” In other words, to increase the productivity and efficiency of aquaculture production while reducing the consumption of resources and the negative environmental and social impacts through improved governance, management practices and the adoption of innovative technologies.

The need for sustainable intensification of aquaculture production together with the application of the ecosystem approach to aquaculture has been the subject of several international fora and among the priority recommendations emerging from the work of FAO and from regional bodies such as the Network of Aquaculture Centres in Asia-Pacific (NACA) and Asia-Pacific Fishery Commission (APFIC) and the Phuket Consensus emanating from the Global Conference on Aquaculture in 2010. The Ministerial Meeting on Aquaculture for Food Security, Nutrition and Economic Development in July 2011 in Sri Lanka has further identified four basic tenets of a sustainable aquaculture strategy: (1) responsible access to and use of aquatic genetic resources and genetic improvement; (2) sustainable farming systems; (3) aquatic animal health, including responsible transboundary movement of aquatic animals; and (4) appropriate responses to climate change impacts. In order to promote the sustainable intensification of aquaculture, FAO supported a joint APFIC/NACA regional consultation on the sustainable intensification of aquaculture production in the Asia-Pacific region (held in Bangkok, Thailand, October 2012). The consultation provided a good platform for the wide exchange and sharing of scientific knowledge and practical experiences related to SIA and identified the needs for scientific research and technology

development to support SIA. To promote SIA, the Thirty-second FAO Asia and the Pacific Regional Conference (APRC) convened in 2014 included a working paper “Meeting farmers’ aspirations in the context of green development” that highlighted “sustainable production intensification” and an information paper “Sustainable intensification of aquaculture for food and nutritional security in the Asia-Pacific region.”

As the follow up to earlier FAO initiatives promoting SIA, the Fifth Regional Consultative Forum Meeting (RCFM) of APFIC (held in Hyderabad, India from 19 to 21 June 2014) included an individual aquaculture session titled “Promoting sustainable intensification of aquaculture for food and nutritional security in the Asia-Pacific region.” The RCFM acknowledged that a transition to sustainable intensification of aquaculture should focus on ensuring the prosperity of farming and rural communities, while addressing key sustainability issues related to the management of land and water resources. The RCFM put forward a complete set of recommendations on priority actions in five major areas related to the sustainable intensification of aquaculture in the region, which was presented to and endorsed by the Thirty-third Session of APFIC.

In order to provide more substantial support to member countries in promoting sustainable intensification of aquaculture, the SIA has now been included as the Asia-Pacific regional initiative of FAO’s global blue growth initiative (BGI).

Although FAO and other regional and international organizations have launched various initiatives to raise awareness and identify priority actions related to SIA and although efforts have been made by international/regional organizations, country governments, civil society organizations and the private sector to achieve sustainable intensification of aquaculture on the ground, **there is a lack of a well articulated regional strategy and a comprehensive action plan** to guide and support the concerted efforts of different stakeholders to support the sustainable intensification of aquaculture in the region. Therefore, the Thirty-third Session of the Asia-Pacific Fishery Commission recommended **further regional consultation to prioritize necessary actions at regional and national levels and to develop a strategic action plan for supporting sustainable intensification of aquaculture in the region.**

2 Objective

The development of the regional strategy and action plan is intended to promote the concerted efforts of member governments, regional and international organizations, donor and development agencies and the industrial sector to support the sustainable intensification of aquaculture in the region. As such, the well articulated regional strategy and action plan sets a clear vision and goals for the development of the aquaculture sector, an appropriate strategy and an implementable action plan defining the roles of different stakeholders in supporting sustainable intensification of aquaculture.

The widely endorsed regional strategy and action plan can guide government policy adjustment and facilitate the mobilization of investment needed to support the sustainable intensification of aquaculture in the region.

3 Process

3.1 Background review for drafting the strategy and the action plan framework

A comprehensive review of regional and global processes related to promoting the sustainable growth of aquaculture and of the documents produced was conducted as the basis for drafting the regional strategy and action plan. The reviewed documents included the Phuket Consensus from the

Global Aquaculture Conference held in October 2010 in Phuket, Thailand, the recommendations from the first Ministerial Meeting on Aquaculture for Food Security, Nutrition and Economic Development in July 2011 in Sri Lanka and the report of the Thirty-third Session of the Asia-Pacific Fishery Commission (APFIC) in June 2014 and other relevant documents produced by regional organizations such as the Network of Aquaculture Centres in Asia-Pacific.

3.2 Regional consultation

A regional consultation was convened by FAO in November 2014 in Bangkok, Thailand for finalizing the regional strategy document and developing the complete regional action plan. Forty representatives of the governments of 16 countries in Asia, five regional and international organizations and five development agencies (donor agencies) participated in the consultation. The background review and the draft regional strategy and action plan framework were introduced at the consultation for general comments and possible improvement. A number of working group sessions was convened to finalize the structure and content of the regional strategy and to develop a well articulated comprehensive action plan. The regional consultation also made suggestions about how to proceed to finalize the action plan and disseminate the final strategy and plan documents.

3.3 Finalization of the strategy and action plan

Following the recommendation of the regional consultation, FAO and the NACA Secretariat jointly reviewed and finalized the revised regional strategy. FAO and NACA worked jointly in finalizing an action plan matrix for each identified output, including the activities, indicators, time frame and leadership in the implementation. At the same time, a request was sent to all NACA member governments for their specific inputs with respect to country relevance, target for each output activity, estimated requirement of resources for supporting the implementation and likely source of the resources. Feedback was received from 16 country governments out of 18 NACA member governments. Most information received from the country governments was synthesized and incorporated into the action plan, but some of the inputs on country output targets and resource requirements were incomplete and too diversified in format to be synthesized into meaningful results and thus were not included in the final action plan.

4 Summary of the regional strategy

Continuing aquaculture growth in the Asia-Pacific region is considered vital to meeting the increasing demand for fish inside and outside the region over the coming decades. Sustainable intensification of aquaculture (SIA) is now recognized as the major approach to achieve the sustainable growth of aquaculture in the region. SIA has now been identified as the Asia-Pacific regional initiative in support of the FAO's global blue growth initiative (BGI).

Strategic objective 1. Establish/maintain enabling environment

A conducive enabling environment created and maintained for sustainable growth of the sector comprising a mix of economic, legal, social and physical components, combined with fair access to resources, access to credit and markets ensured, and the striking of a balance between the promotion for development and growth and the need for management and control.

Recommended strategies include:

- develop and implement appropriate aquaculture policies and strategies;
- strengthen institutional capacity and related supporting arrangements;
- develop and enforce more effective regulations;

- develop and implement more responsible aquaculture planning;
- improve access to markets and trade; and
- strengthen regional and private sector collaboration and cooperation.

Strategic objective 2. Establish good governance, effective planning and management

Effective governance developed, mainstreamed and implemented through sound policies, strategies and action plans incorporating the principles of an ecosystem approach to aquaculture and more effective linkages between government policies and sustainable management of aquaculture. Capacities strengthened and built within institutions and more effective mechanisms of governance developed, including rules and regulations, planning and management together with voluntary codes of practices, and responsible self-management.

Recommended strategies:

- establish and implement aquaculture registration and licensing;
- promote and monitor responsible production management;
- establish and implement appropriate certification and standards;
- improve farmer access to finance, credit and insurance; and
- promote the organization of small-scale producers.

Strategic objective 3. Improve management along the aquaculture value chain

Implement effective “good management” by all stakeholders along the aquaculture value chain, which covers good production practices, quality control and performance assessment for all upstream inputs, production and downstream outputs, emphasizing efficient resource use, improved productivity and economic efficiency and sound social and environmental benefit in the process of intensification.

Recommended strategies:

- improve management practices in production and distribution of aquaculture seeds;
- improve production and distribution of quality aquaculture feed;
- improve productivity and economic efficiency;
- improve management of post-harvest processing and marketing; and
- establish effective supply chains and improve management.

Strategic objective 4. Strengthen supporting services

Strong and effective supporting services are critical to future aquaculture success. This objective outlines strategies to improve capacity for supporting services needed for sustainable intensification of aquaculture. Focal services include targeted research and technology development and strengthened dissemination, effective training and capacity building, and effective information flow and communication (e.g. related to natural disaster mitigation, preparedness/response/relief and climate change impacts). Development of adaptation measures and building capacity specifically focusing on key emerging issues (details follow in the text) and overall targeting critical needs to assist/create more resilient aquaculture farmers.

Recommended strategies:

- strengthen training and build capacity;
- strengthen research and development; and
- improve information exchange and communication.

Strategic objective 5. Increase social responsibility and equitable benefits

Increased social responsibility and improved equity in participation and benefit distribution, emphasizing women's rights and small-scale farmers' benefits along the whole value chain through increased awareness and specially focused interventions.

Recommended strategies:

- enhance social responsibility;
- promote equitable access to opportunities and benefits; and
- promote and practice gender integration and a broader understanding of gender issues.

Strategic objective 6. Strengthen focus on increasing resilience of aquaculture farmers

Resilience of farmers and other stakeholders in the process of intensification is significantly increased through increased preparedness of both farmers and other stakeholders in handling natural disasters and socio-economic risks, effective mechanisms for public warning, response and relief from emergencies and strengthened capacity for managing natural disaster risks (and where possible mitigating impacts of climate change).

Recommended strategies:

- focus on strengthening farmer/stakeholder preparedness/resilience;
- effectively address climate change and natural disasters; and
- identify where possible and address other critical emerging issues.

5 Summary of the regional action plan

In order to promote the sustainable growth of the aquaculture sector for meeting future fish demand, generating more livelihood opportunities and contributing to overall economic growth through sustainable intensification and the potential expansion of aquaculture in the Asia-Pacific region, there needs to be a practically implementable action plan for implementing the regional strategy.

The action plan is expected to achieve the following major outcomes through effective implementation with concerted efforts of different players, including but not limited to country governments, different stakeholders along the aquaculture value chain, concerned international and regional organizations and donors and development agencies inside and outside the region.

Outcome 1: A conducive enabling environment comprising inclusive economic, legal, social and physical components and fair access to resources, access to credit and markets, which strikes the balance between the promotion of sustainable intensification of aquaculture for development and growth and ensuring good management and control is effectively established for the sustainable growth of the aquaculture sector.

Outcome 2: Effective governance through sound policies, strategies and action plans incorporating the principles of an ecosystem approach to aquaculture and good linkages between government policies and sustainable management of aquaculture. Institutions strengthened, capacity improved and more effective mechanisms of governance developed, including rules and regulations, planning and management together with voluntary codes of practices, and responsible self-management.

Outcome 3: Good management is effectively implemented by all stakeholders along the aquaculture value chain, which covers good production practices, quality control and performance assessment

for all upstream inputs, production and downstream outputs, emphasizing efficient resource use, improved productivity and economic efficiency and sound social and environmental benefits in the process of intensification.

Outcome 4: Improved supporting services for sustainable intensification of aquaculture through strengthened targeted research and technology development and dissemination, effective training and capacity building, and effective information flow and communication.

Outcome 5: Increased social responsibility and improved equity in participation and benefit distribution, emphasizing women's rights and small-scale farmers' benefits along the whole value chain through increased awareness and specially focused interventions.

Outcome 6: Increased resilience of farmers and other stakeholders in the process of intensification through their increased preparedness to handle natural disasters and social risks, through effective public warning, response and relief mechanisms for emergencies and strengthened capacity for managing natural disaster risks and mitigating the impacts of climate change.

The action plan includes expected outcomes and outputs with clearly identified indicators, targets, required actions, indicative financial resource requirement, time frame and responsible institutions. The details of the action plan were developed through a regional consultation attended by government delegates from 16 countries, representatives from major regional and international organizations related to aquaculture, development/foreign aid agencies of important donor countries and the private sector. The action plan is presented herein as a modified logical framework matrix.

Regional strategy for the sustainable intensification of aquaculture in the Asia-Pacific region

1 Background

The intensification of aquaculture has been an ongoing process in the region for decades with the aim being to increase the productivity and economic efficiency of aquaculture production through the efficient use of inputs (materials, energy and investment) and resources (water, feed ingredients), and the application of innovative technologies and optimized management practices. Aquaculture intensification has contributed significantly to the fast growth of the aquaculture industry in the Asia-Pacific region, and has contributed to food security and nutrition, rural livelihoods and economic development across the region.

Although the continuing aquaculture growth in the Asia-Pacific region is considered vital to meeting the increasing demand for fish inside and outside the region over the coming decades, Asian aquaculture is also facing significant challenges that must be addressed if its growth is to be maintained. Such challenges include the impact of climate change and variability, urbanization and related social and economic changes, increasing intra-regional trade and widespread public concern over the environment and food safety. Sustainable intensification, i.e. “to produce more with less”, is now recognized as the major approach to achieve the sustainable growth of aquaculture in the region. In order to provide more substantial support to member countries in promoting sustainable intensification of aquaculture (SIA), SIA has now been identified as the Asia-Pacific regional initiative in support of the FAO’s global blue growth initiative (BGI).

As aquaculture involves both men and women across the value chain and related activities, gender crosscuts many of the sector’s strategic issues. FAO has reported that giving the same access to men and women to agricultural resources will result in increased agricultural production in developing countries by 2.5 percent to 4 percent. In addition, the High Level Panel of Experts on Food Security and Nutrition recommended that gender dimensions in fisheries and aquaculture policies and actions be addressed seriously. In the action plan, gender-related outcomes and actions are detailed under “Social responsibility and equitable benefits” and it is expected that these will provide a more gender-sensitive implementation of the regional strategy.

In order to support country governments, international and regional organizations, donor and development agencies and the private sector in their concerted efforts to promote sustainable intensification of aquaculture, the Thirty-third Session of the Asia-Pacific Fishery Commission (APFIC) recommended further regional consultation to prioritize necessary actions at regional and national levels and to develop a strategic action plan for supporting SIA in the region. Therefore, an FAO regional Technical Cooperation Programme facility (TCPF) project was developed to support a regional consultation on Strategy and Action Plan for SIA in Asia-Pacific from 27 to 28 November 2014 in Bangkok, Thailand.

The objective of this consultation was to develop a regional strategy for SIA along with a practical and implementable regional action plan. This regional strategy and the action plan seek to set a clear vision, goals and specific strategies up until 2030, as well as detailed action plans, including short-term (1 to 2 years) and medium-term (7 to 8 years) and long-term (10 to 15 years) for SIA in the Asia-Pacific region. It is expected that the strategy and the action plan will receive, at least partly, the financial support of donors and international organizations for their implementation.

The review of the sustainable intensification of aquaculture in the Asia-Pacific region identified 20 key areas to be addressed as follows:

| | |
|----|---|
| 1 | Governance, planning and management |
| 2 | Regional cooperation and collaboration |
| 3 | Genetics, breeding and seed production |
| 4 | Biosecurity and health management |
| 5 | Nutrition, feed and feeding |
| 6 | Sustainable aquaculture production and technology |
| 7 | Environmental management |
| 8 | Stock enhancement and CBF (culture-based fisheries) |
| 9 | Efficient use of land, water and energy resources |
| 10 | Aquaculture business and livelihoods |
| 11 | Climate change and natural disasters |
| 12 | Value chain management |
| 13 | Trade and marketing |
| 14 | Certification and standards |
| 15 | Food safety and quality |
| 16 | Social responsibility and gender equity |
| 17 | Small-scale producers |
| 18 | Emerging issues |
| 19 | Education and training |
| 20 | Information and communication |

These issues were then incorporated into a proposed framework that would ensure continued sustainable expansion and intensification of aquaculture in the Asia-Pacific region as follows:

- An enabling environment
- Good governance
- Management along the aquaculture value chain
- Supporting services
- Social responsibility and equitable benefits
- Resilient farmers

2 Purpose

The strategy was developed to address regional priority issues in development and management of aquaculture for sustainable growth in the Asia-Pacific region. It sought to address those issues that are common to the region as well as those that are more specific to the subregions and countries of the region.

3 The present situation

Future fish supplies will be dominated by aquaculture systems, mainly influenced by the following considerations:

- Fish provides essential nutrition for over one billion people, including at least 50 percent of animal protein for 400 million people from the poorest countries.

- Over 200 million people in developing countries depend on fisheries and aquaculture for their livelihoods.
- Fish products are among the most widely traded foods – nearly 40 percent (by volume) of world fish production is traded internationally.
- The value of the global fish trade exceeds the value of international trade in all other animal proteins combined.
- Over 75 percent of the world's fisheries is considered fully exploited or overexploited leaving little room for increased harvest from wild stocks.
- Habitat degradation in the coastal zone and other critical areas such as coral reefs is reducing carrying capacity and biodiversity.
- One-half of all food fish supply comes from aquaculture.
- Aquaculture is the world's fastest growing food production system, increasing at a rate of 8 percent annually, but its growth has undergone some dramatic boom and bust cycles.
- Good governance of inland and ocean resources will enhance food security, nutrition, biodiversity, gender equity and community resilience, and mitigate climate change.
- Future fish supplies will be dominated by aquaculture systems.
- Feed conversion rates for many farmed fish are more efficient than those of land-based animal production, and aquaculture is an efficient user of water.
- Aquaculture has the greatest opportunity for increased growth in supply and production efficiency improvement through expansion and intensification.

4 The challenge

Aquaculture development in many countries is characterized by relatively weak governance. The United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) defined governance as “the process of decision-making and the process by which decisions are implemented.” Good governance was described by the World Bank as involving at least eight major characteristics: participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive, and follows the rule of law.

Poor governance results in poor planning, poor management and in some cases boom/bust cycles often leading to serious events such as major fish kills. Fish products have also become the object of extensive international trade, most of it from poor countries to wealthier ones. Today, a substantial opportunity presents itself to increase the supply from aquaculture systems. Capitalizing on this opportunity can create livelihoods and improve food security and nutrition for hundreds of millions of people.

5 Vision

The suggested vision for aquaculture is:

“Create a conducive and enabling environment for sustainable intensification of aquaculture development within the carrying capacity of aquatic ecosystems, leading to enhancement of its contribution to global food production and the prosperity of the peoples of the Asia-Pacific region.”

6 Goals for the strategy

Because aquaculture development is natural resource based, and the majority of stakeholders are small-scale, marginal and resource-constrained producers that typically share similar goals when addressing the major issues. These are:

- To provide an enabling environment with conducive legislation, policies on resource allocation, access to investment and good access to markets.
- To ensure good planning and governance through national aquaculture plans, zoning for aquaculture development, farm registration/licensing, quality control of inputs, and good management and control of production.
- To ensure cost-effective and environment-friendly, productivity enhancement technologies so that economic development is not a threat to natural biodiversity.
- To ensure good governance and management along the aquaculture value chain covering inputs manufacture, farm production, health management, environmental monitoring, processing and marketing.
- To provide sufficient supporting technologies and services including seed, feed, health management and waste treatment.
- To ensure good social responsibility and economic performance through equitable benefit distribution, gender participation and social acceptance.
- To ensure resilience of aquaculture farmers through addressing climate change and climate variability, natural disasters, market volatility and other emerging issues effectively.

7 Strategic framework

To support the vision and goals, the proposed framework is built around six main strategic objectives:

Strategic objective 1. Establish an enabling environment

A conducive “enabling environment” created and maintained for sustainable growth of the sector comprising economic, legal, social and physical components, fair access to resources, access to credit and markets ensured, while striking a balance between the promotion for development and growth and the need for management and control.

Strategy 1.1 – Develop and implement appropriate aquaculture policy and strategy

Develop, mainstream and effectively implement appropriate aquaculture policies and strategies at national and local levels to enable responsible and sustainable intensification of aquaculture. Increase awareness of the importance of sustainable intensification of aquaculture. Ensure that stakeholders are consulted in policy development and decision-making.

Strategy 1.2 – Strengthen institutional capacity and arrangements

Improve capacity and strengthen institutional arrangements of the competent government agencies for aquaculture planning, management, monitoring and control in supporting sustainable intensification of aquaculture. Improve cooperation between those agencies responsible for aquaculture, fisheries, environment, food safety, etc. and ensure no/few gaps, conflicts or overlaps in agency jurisdiction.

Strategy 1.3 – Develop and enforce effective regulations

Develop effective regulations that facilitate sustainable intensification and responsible aquaculture development. Establish coherent regulations, harmonized and appropriate procedures for legitimate use of land, water and other resources for sustainable intensification of aquaculture. Empower competent agencies and strengthen capacities for effective enforcement of planning and management measures and regulations.

Strategy 1.4 – Develop and implement responsible aquaculture planning

Clarify long-term allocation and permission for coastal land, access to water supplies and aquaculture zones so that investors can have confidence in their investment. Ensure responsible planning to facilitate the sustainable intensification of aquaculture by using an ecosystem approach to establish aquaculture zones using appropriate technologies. Undertake Strategic Environmental Assessment (SEA) for large aquaculture developments and undertake Environmental Impact Assessment (EIA) for large aquaculture projects with a high risk of environmental and social impact. Encourage efficient resource use for existing and new aquaculture production and develop stock enhancement and culture-based fisheries further. Use underutilized water resources (e.g. via CBF, stock enhancement) or for other more appropriate secondary uses.

Strategy 1.5 – Improve access to markets and trade

Improve access of farmers to domestic, regional and international markets through the development of strong marketing mechanisms, market facilities, market information systems and aquaculture certification, which contribute to improved economic efficiency in aquaculture intensification and make it a more attractive livelihood option. Facilitate access to markets and improve market information and marketing especially for small-scale farmers. Address non-tariff barriers (NTBs) to trade that have no economic or scientific rationale and reinforce efforts to improve trade facilitation, revise as appropriate trade-impeding regulatory barriers to minimize adverse effects.

Strategy 1.6 – Strengthen regional and private sector collaboration and cooperation

Strengthen regional cooperation and increase synergies with the private sector, donor and development agencies, NGOs and other national and regional institutions which will facilitate SIA related training, capacity building, demonstration projects, R&D, etc. Improve collaboration and networking between regional organizations to ensure synergy and coherence. Facilitate the involvement of the private sector in decision-making and partnership with government and universities for responsible commercialization of the industry.

Strategic objective 2. Establish good governance, effective planning and management

Effective governance developed, mainstreamed and implemented through sound policies, strategies and action plans incorporating the principles of an ecosystem approach to aquaculture and good linkages between government policies and sustainable management of aquaculture. Capacity strengthened and built within institutions and more effective mechanisms of governance developed, including rules and regulations, planning and management together with voluntary codes of practices, and responsible self-management.

Strategy 2.1 – Establish and implement aquaculture registration and licensing

Develop or improve appropriate systems and measures for the registration and licensing of aquaculture to ensure farms at all scales are registered and operate within the legal system.

Strategy 2.2 – Promote and monitor responsible production management

Promote and monitor responsible production management of the environment, diseases and farm genetic resources to ensure sustainable aquaculture intensification. Implement appropriate monitoring, reporting systems and control measures to ensure good stewardship and to build public acceptance of the industry.

Strategy 2.3 – Establish and implement appropriate certification and standards

Establish appropriate national and regional certification schemes, standards and good aquaculture practices and effectively implement them with provisions for recognition of equivalency to improve the sector's sustainability.

Strategy 2.4 – Improve farmer access to finance, credit and insurance

Provide financing and infrastructure support to aqua-farmers and producer organizations to enable compliance with regulations and the practice of responsible aquaculture. Develop micro-financing mechanisms that assist marginal farmers to gain access to financial credits.

Strategy 2.5 – Promote the organization of small-scale producers

Encourage the establishment of groups, clusters and associations for small-scale farmers and provide assistance to organize training in management and technical skills and in better management practices (BMPs) in sustainable intensification of aquaculture, certification, environmental standards, food safety standards, traceability etc. Develop farmer groups, including encouraging clusters of small-scale farmers and the adoption of relevant BMPs and where appropriate cluster certification.

Strategic objective 3. Improve management along the aquaculture value chain

Implement effective good management by all stakeholders along the aquaculture value chain, which covers good production practices, quality control and performance assessment for all upstream inputs, production and downstream outputs, emphasizing efficient resource use, improved productivity and economic efficiency and sound social and environmental benefit in the process of intensification.

Strategy 3.1 – Improve management practices in production and distribution of aquaculture seeds

Establish appropriate mechanisms for good practice, quality control and monitoring of aquaculture seed production. Develop a national programme for the genetic selection and management of broodstock.

Strategy 3.2 – Improve production and distribution of quality aquaculture feed

Establish a national mechanism for feed quality control and the use of alternative protein sources to use fishmeal and fish oil in aquaculture more efficiently. Ensure the use of efficient feeding strategies by farmers.

Strategy 3.3 – Improve productivity and economic efficiency

Facilitate the improvement of farmer profitability and farm productivity through improved methodologies, health management and feeding practices and intensified assistance to small-scale farmers, recognizing that they are the most vulnerable to the impacts of natural and economic risks. Facilitate the efficient transfer of appropriate sustainable technologies. Reduce the risk at the farm level through responsible health management, biosecurity and environmental management plans.

Strategy 3.4 – Improve management of post-harvest processing and marketing

Establish appropriate mechanisms for improved efficiency, quality control and monitoring of all downstream inputs along the aquaculture value chain to support the value-added processing and product innovation necessary to create additional onshore jobs and supply chain activities.

Strategy 3.5 – Establish effective supply chains and improve management

Develop and implement measures that improve the value chain to infuse social responsibility, provide added value and increase efficiencies and incomes along the chain including better targeting of small producers and processors.

Strategic objective 4. Improve supporting services

Improve capacity of supporting services for sustainable intensification of aquaculture through targeted research and technology development and strengthening dissemination, effective training and capacity building, and effective information flow and communication. Effectively address natural disaster mitigation, preparedness, response and relief and similarly for climate change. Develop adaptation measures and build capacity to deal with emerging issues and target critical needs to create resilient aquaculture farmers.

Strategy 4.1 – Strengthen training and build capacity

Strengthen supporting services for sustainable production through the improvement of education, training and capacity building, targeted research and development, and effective information exchange and communication. Promote aqua-farmer field schools and exchange programmes.

Strategy 4.2 – Strengthen research and development

Support relevant and quality scientific research and technological development and encourage coordination and collaboration among regional/national R&D entities in areas such as genetics, nutrition, fish health. Develop a regional R&D plan and foster cooperation and collaboration on R&D.

Strategy 4.3 – Improve information exchange and communication

Develop efficient communication strategies, infrastructure and information databases. Support information exchange and communication activities that would allow for effective information sharing to a wide audience in key languages.

Strategic objective 5. Increase social responsibility and ensure equitable benefits

Increase social responsibility and improve equity in participation and benefit distribution, emphasizing women's rights and small-scale farmers' benefits along the whole value chain through increased awareness and specially focused interventions.

Strategy 5.1 – Enhance social responsibility

Promote good company and family farm social responsibility and implement good employment practices and health and safety procedures. Establish and adopt effective mechanisms for conflict resolution.

Strategy 5.2 – Promote equitable access to opportunities and benefits

Promote equitable opportunities for benefits and rights along the value chain, especially for women, and poor and marginalized groups.

Strategy 5.3 – Promote and practice gender integration

Promote and mainstream gender equality as an integral part of regional aquaculture development policies and programmes in line with the globally accepted dimensions of gender equality and women's empowerment.

Strategic objective 6. Strengthen focus on increasing resilience of aquaculture farmers

Resilience of farmers and other stakeholders in the process of intensification is significantly increased through increased preparedness of farmers and other stakeholders in handling natural disasters and socio-economic risks, effective mechanisms for public warning, response and relief from emergencies and strengthened capacity for managing natural disaster risks, including mitigating the impacts of climate change.

Strategy 6.1 – Address climate change and natural disasters more effectively

Identify and facilitate cost-effective adaptation measures for climate change and effective mechanisms to respond to disaster emergencies through concerted national efforts and intensified regional and international co-operation.

Strategy 6.2 – Develop a more selective approach to the identification and pursuit of the best opportunities for addressing emerging issues

Increase capacity and mechanisms of national governments and regional organizations for effectively assessing, managing and responding to various emerging natural, biological and socio-economic risks and complex global and regional interactions.

Regional action plan for the sustainable intensification of aquaculture in the Asia-Pacific region

1 Background

Fish and other aquatic animals play an important role in global food security and nutrition by providing low-cost animal protein, healthy fats and other micronutrients to people. Fish play an important, even vital, role in the diet of people in least developed countries. Fish are often one of the few affordable sources of animal protein available to poor and nutritionally challenged people and can account for more than half the dietary protein intake in some countries.

Asia's population is forecasted to grow by more than 700 million by 2030. This population growth and economic development are expected to result in significant increases in the global demand for fish in the coming decades. FAO has estimated that by 2030, the world will require at least another 23 million tonnes of aquatic animal food above the current production level to sustain the current per capita level of fish consumption. Asia is expected to make major contributions to meeting the increased global demand for fish through further aquaculture growth (APFIC 2012), especially through the intensification of aquaculture.

Intensification of aquaculture aims to increase the productivity and economic efficiency of aquaculture production through intensified use of inputs (materials, energy and investment) and resources (water, feed ingredients), application of new technologies and new management practices while minimizing social and environmental impacts and conflicts with other users of the resources.

Improving production efficiency is a major challenge for Asia, which has far less per capita availability of natural resources (especially land and water) than the global average. Asia also faces intense population pressures and consequent competition for land, water and feed resources to support these growing populations. This will further challenge aquaculture production to use resources (particularly land and water) more efficiently and to justify its production against competing demands from agriculture, livestock and urban and industrial development.

Sustainable intensification is now recognized as the major approach to achieve the sustainable growth of aquaculture in the region. In order to provide more substantial support to member countries in promoting sustainable intensification of aquaculture (SIA), SIA has now been identified as the Asia-Pacific Regional Initiative in supporting the FAO's Global Blue Growth Initiative (BGI).

In order to support the concerted efforts of country governments, international and regional organizations, donor and development agencies and the private sector to promote sustainable intensification of aquaculture, the Thirty-third Session of the Asia-Pacific Fishery Commission recommended further regional consultation to prioritize necessary actions at regional and national levels and to develop a strategic action plan for supporting SIA in the region. Therefore, an FAO regional TCP facility project was developed to support a regional consultation on Strategy and Action Plan for SIA in Asia-Pacific from 27 to 28 November 2014 in Bangkok, Thailand.

The objective of this consultation was to develop a regional strategy for SIA including a practical and implementable regional action plan. This regional strategy and the action plan seek to set a clear vision, goals and strategic plans up until 2030, as well as detailed action plans, including short-term (1 to 2 years), medium-term (3 to 5 years) and long-term (more than 5 years) plans for SIA in the Asia-Pacific region. It is expected that the strategy and the action plan will receive the financial support of donors and international organizations for their implementation.

The regional strategy framework and action plan were developed to ensure sustainability of ongoing intensification and potential expansion of aquaculture in the Asia-Pacific region by addressing the following strategic areas:

- Effective enabling environment;
- Good planning and governance;
- Good management along the aquaculture value chain;
- Improved supporting services for sustainable intensification of aquaculture;
- Strengthened social responsibility and equitable benefit sharing among different stakeholders; and
- Increased resilience of farmers and other stakeholders.

The action plan will include a set of strategically identified outcomes that determine the desired outputs with defined indicators, targets, specific actions, timeframe, indicative financial resource requirement, source of funding and leadership.

2 Purpose

Although FAO and other regional and international organizations have launched various initiatives to raise awareness and identify priority actions related to the sustainable intensification of aquaculture and efforts have been made by international/regional organizations, country governments, civil society organizations and the private sector to achieve sustainable intensification of aquaculture on the ground, there is a lack of a well-articulated regional strategy and comprehensive action plan to guide and support the concerted efforts of different stakeholders.

This regional strategy should set clear vision, goals and strategies towards 2030, and the action plan should detail implementable activities with indicators of success, time scale for implementation for sustainable intensification of aquaculture in Asia.

It is expected that the implementation of the strategy and the action plan will be supported financially by donor agencies and international organizations. The consultation will also assist in promoting the coordinated and concerted efforts of member governments, regional and international organizations, donor and development agencies and the industrial sector to support the sustainable intensification of aquaculture in the region.

3 Impact

The impacts that are expected to be achieved by the successful implementation of the action plan are meeting the increasing demand for fish as a source of people's nutrition, significantly increased employment and a source of income for people engaged in the aquaculture sector and making a contribution to local and national economic growth through the sustainable growth of the aquaculture sector supported by sustainable intensification.

The successful implementation of the action plan will rely on achieving the following outcomes:

Outcome 1: A conducive "enabling environment" comprising inclusive economic, legal, social and physical components and fair access to resources, access to credit and markets that strikes the balance between the promotion of the intensification of aquaculture for development and growth and ensuring good management and control is effectively established to ensure the sustainable growth of aquaculture.

Outcome 2: Effective governance through sound policies, strategies and action plans incorporating the principles of an ecosystem approach to aquaculture and good linkages between government policies and the sustainable management of aquaculture. Institutions strengthened, capacity improved and more effective mechanisms of governance developed, including rules and regulations, planning and management together with voluntary codes of practices, and responsible self-management.

Outcome 3: Good management is effectively implemented by all stakeholders along the aquaculture value chain, which covers good production practices, quality control and performance assessment for all upstream inputs, production and downstream outputs, emphasizing efficient resource use, improved productivity and economic efficiency and sound social and environmental benefit in the process of intensification.

Outcome 4: Improved supporting services for sustainable intensification of aquaculture through strengthened targeted research and technology development and dissemination, effective training and capacity building, and effective information flow and communication.

Outcome 5: Increased social responsibility and improved equity in participation and benefit distribution, emphasizing women's rights and small-scale farmers' benefits along the whole value chain through increased awareness and specially focused interventions.

Outcome 6: Increased resilience of farmers and other stakeholders in the process of intensification through increased preparedness of farmers and other stakeholders in handling natural disasters and social risks, effective public warning, response and relief mechanisms for emergencies and strengthened capacity for managing natural disaster risks and mitigating the impact of climate change.

4 Preparation of the action plan

A two-day regional multi-stakeholder consultation was undertaken with stakeholders on the proposed strategy and action plan in Bangkok from 27 to 28 November 2014. The consultation was funded and organized by FAO in collaboration with the Network of Aquaculture Centres in Asia-Pacific, the Asia-Pacific Fishery Commission and Department of Fisheries of Royal Thai Government (Thai DOF).

The participants included representatives from member countries, major regional and international organizations, civil society organizations, private and industrial sector representatives, and some donor and development agencies.

The consultation also assisted in promoting coordinated and concerted efforts of member governments, regional and international organizations, donor and development agencies and the industrial sector to support the sustainable intensification of aquaculture in the region.

Six outcomes were identified in the strategy and for each outcome there were a number of outputs.

The work team of FAO and NACA further worked on modification of the regional strategy and action plan after the regional consultation. Efforts were made to solicit direct inputs from the national governments in the region on indicators, relevance, targets, resource requirement and the likely sources, implementation and who would take the leadership etc. Some of the country inputs were synthesized and included in the action plan framework.

Table 1. Identified outcomes and outputs

| Outcome 1. Enabling environment established | Outcome 2. Management of the aquaculture sector strengthened |
|--|--|
| Output 1.1 Appropriate aquaculture policy and strategy developed and implemented | Output 2.1 Aquaculture registration and licensing established and/or implemented |
| Output 1.2 Institutional capacity and arrangements strengthened | Output 2.2 Responsible production management promoted and monitored |
| Output 1.3 Effective regulations in place and enforced | Output 2.3 Appropriate certification and standards established and implemented |
| Output 1.4 Responsible aquaculture plan developed and implemented | Output 2.4 Farmer access to financing, credit and insurance improved |
| Output 1.5 Market access and trade improved | Output 2.5 Organization (cluster, cooperative, association etc.) of small-scale producers promoted |
| Output 1.6 Regional and private sector collaboration and cooperation strengthened | |
| Outcome 3. Management along the aquaculture value chain | Outcome 4. Supporting services |
| Output 3.1 Management practices in production and distribution of aquaculture seeds improved | Output 4.1 Training and capacity building strengthened |
| Output 3.2 Production and distribution of quality aquaculture feed improved | Output 4.2 Research and development strengthened |
| Output 3.3 Productivity and economic efficiency improved | Output 4.3 Information exchange and communication improved |
| Output 3.4 Management of post-harvest processing and marketing improved | |
| Output 3.5 Effective supply chain established and management improved | |
| Outcome 5. Social responsibility and equitable benefits | Outcome 6. Resilience of farmers |
| Output 5.1 Social responsibility enhanced | Output 6.1 Climate change and natural disasters effectively addressed |
| Output 5.2 Equitable access to opportunities and benefits promoted | Output 6.2 Other emerging issues addressed |
| Output 5.3 Gender integration promoted and practiced | |

The action plan was developed using a modified logistic framework matrix to define outcomes, outputs and activities. For each activity there are indicators in measurable or objectively verifiable terms, indicative time scale and indicative resource requirement.

Following the regional consultation, a clean version of the regional strategy and action plan prepared by the FAO and NACA teams will be circulated to country government authorities through NACA for further validation and filling any country information gaps. The final strategy and action plan will be

produced after synthesis and incorporation of country comments and information provided. The final regional strategy and action plan will be distributed to country governments, concerned regional and international organizations and potential donor agencies and foundations for developing country and regional programmes and mobilizing resources for implementation.

Table 2. Legend for the modified logistic framework

| Indicative timeframe | Years required to implement |
|-----------------------------|------------------------------------|
| Short-term | 1 to 2 years |
| Medium-term | 3 to 5 years |
| Long-term | 5+ years |

5 The action plan

Outcome 1. Enabling environment established

A conducive “enabling environment” comprising inclusive economic, legal, social and physical components and fair access to resources, access to credit and markets that strikes a balance between the promotion of sustainable intensification of aquaculture for development and growth and ensuring that good management and control is effectively established for the sustainable growth of the aquaculture sector. The outcome is to be achieved through the delivering of the following outputs and activities.

Output 1.1 – Appropriate aquaculture policy and strategy developed and implemented

Appropriate aquaculture policies and strategies are developed, mainstreamed and effectively implemented at national and local levels to enable responsible and sustainable intensification of aquaculture. Awareness of the importance of sustainable intensification of aquaculture is increased. Stakeholders are consulted in policy development and decision-making.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|--|---|--------------|-------------------------|--|---|
| 1.1.1 Conduct aquaculture sector evaluation at national and regional levels. Make this information readily available to decision-makers | Evaluation reports on contribution (to economy and nutrition) of the aquaculture available | Widespread and strong interest apparent; 13 of 16 countries indicated that this outcome was very relevant | 1 to 2 years | National and regional | Mainly national budget but varied sources in different countries | National government leading, regionally NACA, FAO |
| 1.1.2 Increase awareness of the potential for sustainable intensification of aquaculture, based on facts | Sector advocacy products for responsible development available | Most countries indicated SIA relevant and most incorporating a variety of SIA techniques and programmes | 3 to 5 years | National | Mainly national | |
| 1.1.3 Develop indicator system for sectoral performance (e.g. benefit, efficiency, impacts) monitoring, assessment and reporting focusing on sustainable intensification of aquaculture at national and regional levels | Indicator and assessment system Assessment report | Most countries felt indicator system relevant; 5 countries at present do not and waiting to see progress in more aquaculture advanced countries first | 1 to 2 years | National and regional | National | |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|---|--------------|----------------------------|--------------------------|---|
| 1.1.4 Review and amend relevant national laws governing fisheries and aquaculture development | Appropriate provisions that define the legitimate position of aquaculture development and sustainable development | Most indicated this issue is a priority; majority of countries presently working on legal review | 3 to 5 years | To be decided by countries | Mainly national | National government |
| 1.1.5 Develop conducive policies, strategies and plans to ensure that aquaculture intensification is sustainable and to allow the legitimate use of water, land and other resources for aquaculture development addressing food security, poverty, etc. | National aquaculture development policy, Strategy and action plan documents for sustainable intensification | Wide relevance apparent. Most working on policy in near term; e.g. Thailand has a master plan; others not yet into planning phase | 3 to 5 years | National | Mainly national | |
| 1.1.6 Conduct analysis on resource use efficiency for the main species and culture systems and identify areas for improvement and good practices/ systems to promote | Reports on resource use efficiency cited as key indicator | Most indicated this issue is relevant | 1 to 2 years | National and sectoral | National | National/ NACA with FAO/NACA support |
| 1.1.7 Develop and implement mechanism to include representatives of all stakeholders especially small scale producers in policy development and in decision-making | Provisions in government legislation mandating participation of small-scale farmer groups in aquaculture policy consultation and development. | Very relevant, e.g. 27 types of relevant government Legislation likely in Indonesia | 3 to 5 years | National | National government | National government and NACA |

Output 1.2 – Institutional capacity and arrangements strengthened

Capacity and institutional arrangements of competent government agencies to coordinate and collaborate for aquaculture planning, management, monitoring and control significantly improved for supporting sustainable intensification of aquaculture.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|--|---------------------|--|---|---|
| <p>1.2.1 Strengthen capacity for generating scientific knowledge – to facilitate the formulation and implementation of evidence-based policy and management measures</p> | <p>Number of national public and private R&D entities strengthened in human capacity and facilities</p> <p>Number of current staff with upgraded qualification and recruited new staff who received postgraduate education</p> <p>Appropriate funding mechanism for aquaculture R&D and reasonable size fund mobilized to support R&D related to SIA (key commodities)</p> | <p>Very relevant for most countries, but still early stage for more detailed definition.</p> | <p>3 to 5 years</p> | <p>National</p> | <p>National funding, and donors</p> <p>National agencies and donors</p> | <p>National government</p> |
| <p>1.2.2 Develop sufficient capacity in the competent agencies for aquaculture sector planning, management and regulation [includes adequate staffing and specific training in sector administration/management and planning – possibly based on modules, both technical and management]</p> | <p>Number of Administration/management and planning training programmes implemented for competent agency staff</p> | <p>All countries indicated it is very relevant and have specific plans for staff development</p> | <p>3 to 5 years</p> | <p>National agencies and regional organization (e.g. NACA)</p> | <p>National agencies and donors</p> | <p>Fishery universities</p> <p>Regional training institutions</p> |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|---|--|--------------|-------------------------|--------------------------|---------------------|
| | Agency staffs receive defective training and gain accreditation or certificates of competence Capacity assessment report on competent government agencies | | | | | |
| 1.2.3. Improve inter-agency cooperation to ensure no gaps, conflicts or overlaps in agency jurisdiction (aquaculture, fisheries, environment, food safety, etc.) | Report on institutional analysis for aquaculture governance completed and documented Inter-departmental/ministerial committee/mechanisms addressing sustainable aquaculture development issues | Most indicated very relevant Most indicated very relevant | 3 to 5 years | National | National budget | National government |

Output 1.3 – Effective regulations in place and enforced

Legislation and regulations that facilitate sustainable intensification and responsible aquaculture development, and planning processes using an ecosystem approach are in place and effectively enforced. Coherent regulations harmonized and appropriate procedures established for legitimate use of land, water and other resources for sustainable intensification of aquaculture. Competent agencies empowered and capacities strengthened for effective enforcement of planning and management measures and regulations.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|---|--|--------------|-------------------------|---|-----------------------------|
| 1.3.1 Review national aquaculture legislation and regulatory framework including put forward recommendations for the streamlining of procedures, and clarification of processes | Report reviewing national aquaculture legislation and regulatory framework and recommending reform or revision is available | All countries except 2 indicated relevant | 1 to 2 years | National | Most via national budget but some countries project need for external funding | National aquaculture agency |
| 1.3.2 Timely update and streamlining of laws and regulations | There is an established procedure for periodic review of aquaculture legislation and regulation | Most countries indicated yes relevant but 5 indicated not relevant | 3 to 5 years | National | National budget | National aquaculture agency |
| 1.3.3 Revise existing aquaculture regulations and management measures for coherence and comprehensiveness and address management needs of the sector including best management practices, biosecurity, health management, environmental protection, biodiversity management, post-harvest practices and food safety etc. | Regulations revised and management measures developed and implemented | Most indicated relevant | 3 to 5 years | National | National budget | National aquaculture agency |
| 1.3.4 Establish and implement a science-based permitting and licensing system for aquaculture operations | Effective aquaculture registration and licensing systems Assessment report on current permitting procedures Permitting procedures developed for the | Most indicated relevant but 4 indicated not relevant | 3 to 5 years | National | National budget | National aquaculture agency |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|---|---|--------------|-------------------------|--|-----------------------------|
| | allocation of natural resources (water, land etc.) on a long term basis | | | | | |
| 1.3.5 Empower the competent agencies and strengthen their capacities for effective enforcement of management measures and regulations | Aquaculture management units with more clearly legally defined authority in competent government agencies Increased resources allocation to management units to better perform their functions | Most indicated relevant but some key countries indicated not relevant | 3 to 5 years | National | National budget but less developed countries hope for external funding | National aquaculture agency |
| 1.3.6 Develop and implement human resource development programme to build capacity in lead agency to implement legislation and regulations for SIA | Aquaculture management units strengthened in competent government agencies Agency staff trained (accredited) | Relevant for most countries; 3 countries indicated not relevant | 3 to 5 years | National | | National aquaculture agency |
| 1.3.7 Review national legislation and regulations for harmonization of key measures to ensure their alignment with global standards including WTO, CODEX and OIE etc., and to avoid potential trade barriers | Review reports Harmonization process initiated within regional economic group task force | Relevant for most countries, but 4 indicated not relevant | 3 to 5 years | National and regional | | National aquaculture agency |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|--|--------------|-------------------------|---|-----------------------------|
| 1.3.8 Assess national land and aquatic property rights and identify measures to strengthen long-term rights for aquaculture use | Legal instruments strengthening property and water rights and length of land and water lease tenure for aquaculture | Relevant for most countries (but 5 indicated not relevant) | 3 to 5 years | National | Most national but some less developed countries hope for external funding | National aquaculture agency |

Output 1.4 – Responsible aquaculture plan developed and implemented

Long-term allocation and awarding of permits clarified for coastal land, access to water supplies and aquaculture zones so that investors can have confidence in their investments. Responsible planning to facilitate the sustainable intensification of aquaculture using an ecosystem approach to establish aquaculture zones using appropriate technologies. Strategic Environmental Assessment (SEA) undertaken for large aquaculture developments and Environmental Impact Assessment (EIA) undertaken for large aquaculture projects with a high risk of environmental and social impact. Efficient resource use encouraged for existing and new aquaculture production. Further development of stock enhancement and culture-based fisheries. Use underutilized water resources (e.g. CBF, stock enhancement) or for secondary use.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|---|-------------------------------|--------------|-------------------------|---------------------------------------|--|
| 1.4.1 Develop appropriate plan for aquaculture intensification for key commodities, aquaculture systems or sub-national areas and update when necessary | Specific aquaculture intensification plans for key commodities, aquaculture systems or sub-national areas | Most countries state relevant | 3 to 5 years | National and sectoral | | National aquaculture agency |
| 1.4.2 Develop capacity of government agencies for responsible planning (site selection and zoning, carrying capacity estimation, etc.) especially in countries with present low aquaculture production and countries with high potential for future growth | Number of advanced training programmes available Number of staff trained | Most countries state relevant | 3 to 5 years | National | National and international (e.g. FAO) | National aquaculture agency, FAO, NACA |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|--|--------------|-------------------------|--|-----------------------------|
| 1.4.3 Develop training programmes on aquaculture planning based on Ecosystem Approach to Aquaculture (EAA) and organize the training at regional and national levels | Number of training programmes Number of people trained Number of aquaculture management agencies capable of using EAA as a planning tool | Most indicated relevant (only 2 indicated not relevant) | 3 to 5 years | National and regional | National, but external funds needed in less advanced countries | National aquaculture agency |
| 1.4.4 Build capacity within the line agencies to utilize tools for planning including: a) Build capacity within the line agencies for aquaculture planning for the identification of zones and sites using spatial planning tools b) Establish site selection criteria c) Use of EIA, SEA or appropriate environmental assessment for large projects that have a high risk of environmental and social impact d) Build capacity within the line agencies for aquaculture planning for environmental carrying capacity modeling to establish limits for aquaculture zones/farming areas | Number of agencies using of planning tools | Most indicated relevant, but 5 said not relevant | 3 to 5 years | National | National budget and external funds (e.g. from TCPF and government) | National government |
| 1.4.5 Establish maximum production limits in production areas and waterbodies based on an evaluation of their environmental and social carrying capacity by local competent agencies | Limits for maximum production/culture area for specific area/waterbody established and enforced | Most indicated relevant, but 5 said not relevant, including some leading aquaculture countries | 3 to 5 years | National | National budget and donors | National aquaculture agency |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|--|---|--------------|-------------------------|---|-----------------------------|
| 1.4.6 Identify suitable new areas (including marine area) using GIS mapping and resources for potential expansion of aquaculture production | New areas and resources identified National plans for sustainable growth of aquaculture taking into account of possibilities for intensification and use of existing resources | Relevant for most, but 5 indicated not relevant | 1 to 2 years | National | National budget and donors | National aquaculture agency |
| 1.4.7 Conduct analysis of potential and constraints for SIA development, including planning especially in countries with low aquaculture production at present and/or high potential for further growth | Number of countries that conducted analysis of sustainable intensification of aquaculture opportunities and challenges Number of countries that developed national action plans for SIA | Most say relevant but 5 countries indicated not relevant | 1 to 2 years | National | National governments and international donors (FAO) | NACA |
| 1.4.8 Assess potential of increasing fish production through expansion and improvement of culture-based fisheries and implement pilot projects to improve CBF | Assessment reports pilot projects implemented | Most say relevant but 5 countries indicated not relevant | 3 to 5 years | National | National budget and donors | National aquaculture agency |
| 1.4.9 Increase capacity for identification of existing aquaculture production and production statistics gathering, processing, analysis to support informed planning | Relevant databases established/improved Information management systems established/strengthened | Most say relevant, but 5 countries indicated not relevant | 3 to 5 years | National | Most external funding to be sought | National aquaculture agency |

Output 1.5 – Market access and trade improved

Increase access of farmers to domestic, regional and international markets significantly through well-established marketing mechanisms, market facilities, market information systems and aquaculture certification. All of these contribute to improved economic efficiency in aquaculture intensification and make it an attractive livelihood option. Facilitate access to markets and improve market information and marketing especially for small-scale farmers. Address non-tariff barriers (NBTs) to trade that have no economic or scientific rationale and reinforce efforts to improve trade facilitation, revise, as appropriate, trade-impeding regulatory barriers to minimize adverse effects.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|---|--------------|-------------------------|----------------------------|-----------------------------|
| 1.5.1 Improve access to markets, especially for small-scale to medium-scale farmers through establishing effective marketing channels and facilities | Number/percentage of small and medium sized producers organized to collaborate on distribution to markets | Most indicated relevant, but 5 of 16 countries indicated not relevant | 5+ years | National | National budget and donors | National aquaculture agency |
| 1.5.2 Enable small and medium sized producers to participate in development of policy related to market access | Platforms/mechanisms to enable small and medium sized producers to participate in development of policy related to market access developed | Most indicated relevant, but 6 indicated not relevant | 3 to 5 years | National | National budget and donors | National aquaculture agency |
| 1.5.3 Conduct market research and development for the main cultured species, including high value niche markets | Study reports on local and export market volume and price for key cultured species conducted, regularly updated and disseminated | Majority indicated relevant, but 3 countries indicated not relevant | 1 to 2 years | National and sectoral | National budget and donors | National aquaculture agency |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|---|------------------------------|----------------------------|--|---|
| 1.5.4 Assess the present capacity and services of national and regional fish trade information organizations and build their capacity where necessary | Capacity needs assessment reports Number of organizations identified and strengthened for supporting information needs of producers, in particular small-scale farmers | Most indicated relevant, but 4 indicated not relevant including some large aquaculture producer countries | 3 to 5 years 3 to 5 years | National National | National budget and donors National budget and donors | Fish trade organizations National aquaculture agency |
| 1.5.5 Analyze non-tariff barriers (NTBs) imposed by importing countries and develop counteracting measures to minimize the impact | Reports on non-tariff barriers identifies measures to reduce and finally eliminate the trade impeding NTBs | Most countries indicated relevant; 5 indicated not relevant | 3 to 5 years | National and regional | National budget; international agencies | National aquaculture agency |
| 1.5.6 Analyze tariff measures and ensure that they comply with regional and WTO obligations | Reports on compliance with regional and WTO obligations | Most countries indicated issue relevant, but 5 indicated not relevant | 3 to 5 years | National and International | Mostly national budget; some external donors | National aquaculture agency |
| 1.5.7 Analyze national food safety, sanitary and quality standards and ensure that they comply with international standards | Analysis and monitoring reports on compliance with the standards | | 3 to 5 years | National and International | National budget; some from donors | National aquaculture agency |
| 1.5.8 Build capacity in competent authority in support of compliance with sanitary and phytosanitary standards (SPS) and food safety standards | Number/percentage of competent authority and relevant agencies accredited | Most indicated relevant, but 3 indicated not relevant | 3 to 5 years | National | National budget; donors | National aquaculture agency |

Output 1.6 – Regional and private sector collaboration and cooperation strengthened

Strengthened regional cooperation and increased synergies among the private sector, donor and development agencies, NGOs and other national and regional institutions that will facilitate SIA related training, capacity building, demonstration projects, R&D, etc. Improved collaboration and networking between regional organizations to ensure synergy and coherence. Involvement of the private sector facilitated in decision-making and partnership with government and universities for responsible development of the industry, e.g. through the development of producer organizations and roundtables.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|--|--|------------------------------|-------------------------|--|--|
| 1.6.1 Form a regional federation of producers' organizations as a stronger single voice for the sector | A regional federation of producer organizations formed | Most countries interested, but 6 not interested, including some larger aquaculture countries | 3 to 5 years | Regional | Government and donors | NACA/private sector |
| 1.6.2 Prepare a regional research and development plan and delegate the research to specific institutions | Needs assessment report of regional R&D undertaken and prioritized Number of specific research programmes delegated | Most countries interested but 6 not interested, including some larger aquaculture countries Most countries interested but 6 not interested, including some larger aquaculture countries | 1 to 2 years 3 to 5 years | Regional Regional | External External | SEAFDEC – AQD SEAFDEC – AQD & NACA |
| 1.6.3 Develop and strengthen the network of regional training and education providers | A regional network of training and education providers developed | Most countries interested, but 5 are not interested, including some larger aquaculture countries | 3 to 5 years | Regional | Of the few countries that provided data most hoping for external funds | SEAFDEC – AQD & NACA |
| 1.6.4 Mobilize funding for development assistance from donors and international development organizations | Assessment report on present donor funded projects and funding Number of new projects formulated for future donor funding | No response from the governments | 3 to 5 years | Regional | No response from the governments | NACA, donors and international organizations |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|---|---|--------------|-------------------------|--|--|
| 1.6.5 Strengthen links and consultation between private sector and government and service providers to improve understanding of their needs and encourage their engagement in planning, R&D, training, information delivery and other support services | Frequency/numbers Private sector involvement in decision-making process Presence of private sector in decision-making bodies | All countries indicated relevant but 3 countries indicated not relevant | 3 to 5 years | National | National budget and/or donors funds | National aquaculture agency and producer organizations |
| 1.6.6 Review and update policies to encourage private sector investment into aquaculture | Review reports Number of policies updated Increased Investment from private sector | All but 3 countries indicated relevant | 1 to 2 years | National | National budget; with donors/ private sector in some cases | National aquaculture agency and producer organizations |
| 1.6.7 Develop partnerships to identify and address key issues of the sector for sustainability | Number of MOU and other forms of partnerships established | All but 5 countries indicated relevant | 3 to 5 years | National and regional | National budget and donors | National aquaculture agency and NACA |
| 1.6.8 Connect private sector to global innovation networks such as Global Aquaculture Advancement Partnership (GAAP) | Substantial participation of private sector in the global innovation networks | All but 5 countries indicated relevant | 1 to 2 years | National and regional | National budget and donors | Producer organizations and NACA |

Outcome 2. Effective management of the aquaculture sector

Effective governance through sound policies, strategies and action plans incorporating the principles of an ecosystem approach to aquaculture and good linkages between government policies and sustainable management of aquaculture. Institutions strengthened, capacity improved and more effective mechanisms of governance developed, including rules and regulations, planning and management together with voluntary codes of practices, and responsible self-management.

Output 2.1 – Aquaculture registration and licensing established and/or implemented

Appropriate systems and measures developed and capacity built for the enforcement of the registration and licensing to ensure farms at all scales operate within the legal framework.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|---|--------------|-------------------------|----------------------------|---|
| 2.1.1 Develop systems for registration and licensing of aquaculture farms including establishing databases and monitoring procedures | Farm database established Farms licensed Farm monitoring system established | Most indicated relevant using all 3 indicators; only 2 countries indicated not relevant Malaysia has established a farm self-monitoring system | 3 to 5 years | National | National budget and donors | National aquaculture agency |
| 2.1.2 Train staff in relevant authorities in the registration and licensing of farms | Number of staff trained Farm registration and licensing system established and in operation | Most indicated relevant; only 2 countries indicated not relevant | 3 to 5 years | National | National budget and donors | National aquaculture agency and SEAFDEC-AQD |

Output 2.2 – Responsible production management promoted and monitored

Responsible management of husbandry, environment, biosecurity and farm genetic resources promoted to ensure sustainable aquaculture intensification. Appropriate monitoring, reporting systems and control measures implemented to ensure good stewardship and to build public acceptance of the industry.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|--|--------------|-------------------------|-----------------------------------|--|
| 2.2.1 Promote management through “farm clusters” or other arrangements of farms | Farm area/cluster management Agreements for biosecurity and environmental protection in operation | All except 3 countries indicated relevant | 3 to 5 years | National | Government; FAO and donors | National aquaculture agency |
| 2.2.2 Develop and implement voluntary codes of practices for responsible self-management | Voluntary codes of practices developed Farmers implementing voluntary codes of practices | Most countries indicated relevant but 7 indicated not relevant | 3 to 5 years | National | Most government and donor funding | National aquaculture agency |
| 2.2.3 Establish/strengthen national and regional fish health monitoring, warning and response systems for major and emerging diseases | Monitoring, warning and response systems in operation at the regional and national levels Zonal management of Biosecurity in operation Notification network for occurrence of notifiable diseases established | All except 2 countries indicated relevant | 5+ years | National | No response from the governments | National aquaculture agency and animal health agency |
| 2.2.4 Develop regional collaboration and cooperation or aquatic animal health management | Regional aquaculture biosecurity plans developed and implemented | All except 3 countries indicated relevant | 5+ years | National | National budget and donors | National aquaculture agency and regional organizations |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|---|--------------|-------------------------|----------------------------|--|
| 2.2.5 Develop/enforce the regulations on the introduction and transfer of aquatic organisms, including the risks of escapees (alien/invasive, or domesticated, release of gametes e.g. bivalves) | National quarantine system in place or strengthened Transboundary movements monitored and controlled Risk assessments tools available for introductions/movements and escapees Health certification for live fish transfers and imports implemented | All except 2 countries indicated relevant; 2 suggested it is not relevant to their needs/plans | 5+ years | National | National budget and donors | National aquaculture agency and environmental agency |
| 2.2.6 Develop and promote better practices for environmental management | Better practices for environmental management developed and implemented | All except 2 countries indicated relevant | 3 to 5 years | National | National budget and donors | National aquaculture agency and NACA |
| 2.2.7 Develop and implement environmental management plans based on the environmental impact assessment studies | Environmental management plans implemented Reports on environmental monitoring surveys | 5 of 16 countries indicated not relevant; 11 indicated relevant | 3 to 5 years | National | National budget and donors | National aquaculture agency and environmental agency |
| 2.2.8 Develop and implement farm effluent discharge standards especially for intensive aquaculture based on an EAA approach | Standards for farm effluent discharge established and enforced | Most countries indicated relevant; 3 indicated not relevant | 3 to 5 years | National | National budget and donors | National aquaculture agency and environmental agency |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|---|---|-------------------------|--|--|
| 2.2.9 Monitor environmental impact of aquaculture on environment and develop and enforce mitigation measures to reduce impact of aquaculture areas/farms on environment | Monitoring reports on environmental impacts of aquaculture Mitigation measures developed and applied | Most countries indicated relevant; 4 indicated not relevant | 3 to 5 monitoring reports; 1 to 3 mitigation measures | National | National budget and donors | National aquaculture agency and environmental agency |
| 2.2.10 Develop and disseminate guidelines for promotion of Integrated Multi-Trophic Aquaculture (IMTA) and integrated agriculture-aquaculture systems) | Pilot demonstration projects implemented Guidelines developed and disseminated | Most countries indicated relevant; 3 suggested not relevant | 3 to 5 years | National and regional | National, private sector, international donors | NACA and national research agencies |

Output 2.3 – Appropriate certification and standards established and implemented

Appropriate national and regional certification schemes, standards and best practices are established and effectively implemented with provisions for recognition of equivalency to improve sectoral sustainability.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|---|---|--------------|-------------------------|----------------------------|-----------------------------|
| 2.3.1 Develop and implement national schemes for Good Aquaculture Practices (GAQPs) for key culture systems/commodities consistent with FAO TG for aquaculture certification | National GAQPs or equivalent implemented National GAQPs standards harmonized at regional level | All countries indicated relevant | 3 to 5 years | National and regional | National budget + donors | National aquaculture agency |
| 2.3.2 Conduct benchmarking of existing aquaculture certification schemes and standards for common commodities/systems using FAO evaluation framework for mutual recognition | National certification schemes and standards benchmarked on their conformity with FAO TG | All countries except 4 indicated relevant | 3 to 5 years | National | National budget and donors | National aquaculture agency |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|---|--------------|-------------------------|----------------------------|---|
| 2.3.3 Develop and implement systems for accreditation of input suppliers and service providers | Input suppliers accredited/certified | Many countries suggested relevant, but 6 indicated not relevant | 1 to 2 years | National | National budget and donors | National aquaculture agency |
| 2.3.4 Develop/promote group certification for clusters of small-scale farmers | Farmer groups/clusters certified | Most countries suggested relevant, but 4 indicated not relevant | 3 to 5 years | National | National budget and donors | National aquaculture agency |
| 2.3.5 Promote organic farming and related certification | Certification schemes available for organic products | Most countries suggested relevant, but 4 indicated not relevant | 3 to 5 years | National | National budget and donors | National aquaculture agency, soil association |

Output 2.4 – Farmer access to financing, credit and insurance improved

Financing and infrastructural support provided to aqua-farmers and producer organizations to enable compliance with regulations and the practice of responsible aquaculture. Micro-financing mechanisms developed to help marginal farmers gain access to financial credits.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|--|---|--------------|-------------------------|----------------------------|--|
| 2.4.1 Provide information on technical and economic feasibility and risk related to intensified aquaculture to banks/loan providers | Banks/loan providers capable of assessing aquaculture loan applications and willing to finance intensified aquaculture based on their analysis | All but 4 countries indicated relevant | 3 to 5 years | National | National budget and donors | National aquaculture agency, Development banks, Agricultural banks |
| 2.4.2 Develop tools for assessing financial risk of farm borrowing for intensified aquaculture | Tools available | Most countries indicated relevant; 6 indicated not relevant | 3 to 5 years | National/regional | National budget and donors | National and regional organization |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|--|--------------|-------------------------|----------------------------|--|
| 2.4.3 Make loans available to small-scale aquaculture farmers through collateral guarantees | Farmers accessed loan through collateral guarantees | Most countries indicated relevant; 4 indicated not relevant | 3 to 5 years | National | National budget and donors | National aquaculture agency, Insurance companies |
| 2.4.4 Make stock insurance schemes available for small to medium sized farmers. | Stock insurance schemes developed and readily available | Most countries indicated relevant; only 3 indicated not relevant | 3 to 5 years | National | National budget and donors | National government and insurance |

Output 2.5 – Organization (clusters, cooperatives, associations etc.) of small-scale producers promoted

Establishment of farmer groups, clusters and associations encouraged and assistance provided to organize training in management and technical skills and in better management practices (BMPs) in sustainable intensification of aquaculture, certification, environmental standards, food safety standards, traceability etc. Development of farmer groups encouraged for clusters of small-scale farmers and the adoption of relevant BMPs and possibly cluster certification.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|--|--|--------------|-------------------------|---------------------------------|--|
| 2.5.1 Adopt existing guidelines for the formation and management of farmer groups | Guidelines and administrative procedures developed Farmer associations and number of farmer groups formed according to guidelines | Most countries indicated relevant; only 3 indicated not relevant | 3 to 5 years | National | National and farm organizations | National and local government and NGOs |
| 2.5.2 Support farmer organizations in implementation of BMPs certification and marketing collectively | Farmer groups developed and/ improved according to guidelines to implement BMPs, product certification and collaborative marketing | Most countries indicated relevant; 4 indicated not relevant | 3 to 5 years | National | National and farm organizations | National and local government and NGOs |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|---|---|-------------------------|---|--|
| 2.5.3 Promote technology transfer and adoption, information dissemination, and training through farmers organizations | Technologies transferred and adopted through farmer organizations Types of information disseminated through farmer organizations Training programmes on aquaculture operations conducted through farmer organizations | Most countries indicated relevant; but 5 indicated not relevant | Medium to long term (depends on level of aquaculture development in each country) | National and regional | National governments private sector, donors | National and local government and NGOs FAO/NACA |

Outcome 3. Improved management along the aquaculture value chain

Good management is effectively implemented by all stakeholders along the aquaculture value chain, which covers good production practices, quality control and performance assessment for all upstream inputs, production and downstream outputs, emphasizing efficient resource use, improved productivity and economic efficiency and sound social and environmental benefit in the process of intensification.

Output 3.1 – Management practices in production and distribution of aquaculture seeds improved

Appropriate mechanisms for good practice, quality control and monitoring of aquaculture seed production established. National programme for the genetic selection and management of broodstocks developed.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|---|-----------|-------------------------|------------------------------------|-----------------------------|
| 3.1.1 Facilitate good genetic management of broodstocks and effective distribution of improved broodstock | National programmes for broodstock genetic management developed and implemented | Most countries indicated relevant; 3 indicated not relevant | 5+ years | National | National budget and external funds | National aquaculture agency |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|---|---|--------------|-------------------------|--|--|
| 3.1.2 Facilitate the introduction and effective management and distribution of genetically improved strains | Systems for maintenance and effective distribution of genetically improved strains in place | Most countries indicated relevant; 3 indicated not relevant | 5+ years | National | National budget, private sector and external funds | National aquaculture agency |
| 3.1.3 Establish regional and national networks for broodstock improvement comprising of government institutions, commercial/private sector, hatcheries at various scales | National network of broodstock centres established | Most countries indicated relevant; 4 indicated not relevant | 3 to 5 years | National | National budget and external funds | National aquaculture agency |
| 3.1.4 Promote and enable public private partnership (PPP) in genetic improvement of broodstock in aquaculture | PPP for broodstock improvement established | Most countries indicated relevant; 5 indicated not relevant | 3 to 5 years | National | National budget, private sector and external in some cases | National aquaculture agency and producer organizations |
| 3.1.5 Develop certification scheme for broodstock, seed and hatcheries | Certification schemes for broodstock, seed and hatcheries established and implemented Hatchery guidelines developed Hatcheries/nurseries upgraded Hatchery/nursery staff trained | Most countries indicated relevant; 5 indicated not relevant | 3 to 5 years | National | National budget and donors | National aquaculture agency |
| 3.1.6 Ensure sufficient production of good quality seed | Hatchery guidelines developed Hatcheries/nurseries upgraded Hatchery/nursery staff trained | Most countries indicated very relevant; only 1 country indicated not relevant | 5+ years | National | National budget and donors | National aquaculture agency and producer organizations |

Output 3.2 – Production and distribution of quality aquaculture feed improved

A national mechanism established for feed quality control and to promote the use of alternative protein sources to reduce dependence on fishmeal and fish oil in aquaculture.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|---|--------------|-------------------------|---|--|
| 3.2.1 Establish national mechanism for feed quality control | National feed standards developed and implemented Regulation system in place | Relevant for most countries; 5 suggested not relevant | 3 to 5 years | National | Government and external funds | National aquaculture agency |
| 3.2.2 Promote use of alternative protein sources to reduce the dependence of aquaculture on fishmeal and fish oil | Reduction of use of fishmeal | Relevant for most countries; 3 suggested not relevant | 5+ years | National | Government, private sector and external funds | National aquaculture agency and feed millers |

Output 3.3 – Productivity and economic efficiency improved

Facilitate improved farmer profitability and farm productivity through improved methodology, health management and feeding practice and intensify assistance to small-scale farmers, recognizing that they are the most vulnerable to impacts of natural and economic risks. Efficient transfer of appropriate sustainable technologies. Reduce risk at the farm level through responsible health management, biosecurity and environmental management plans.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|--|--------------|-------------------------|--|------------|
| 3.3.1 Develop appropriate technology and production methodology and find efficient methods for technology transfer | Appropriate technologies developed and adapted by small-scale farms Pathways for transfer of technologies and incentives for innovation at local level identified | This activity relevant for most countries; 3 suggested not relevant | 3 to 5 years | National | National governments with private sector support | NACA |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|--|--------------|-------------------------|--|-----------------------------|
| | Improved technology transfers documented and disseminated in SIAs | | | | | |
| 3.3.2 Document Indigenous Technical Knowledge (ITKs) for wide dissemination | Indigenous Technical Knowledge (ITKs) captured and documented | Relevant for 9 countries; 7 suggested not relevant | 5+ years | National | National governments with external support | National R&D institutions |
| 3.3.3 Promote good aquaculture management practices for improved production efficiency, health, biosecurity and environmental benefit and updated regularly, including use of good quality feed and efficient feeding strategies/practices | GAQPs for major aquaculture commodities developed and implemented Guidelines on improved feeding management developed and implemented Farmers trained FCR reduced | Relevant for 14 countries; only 2 suggested not relevant | 5+ years | National | External funding | National aquaculture agency |
| 3.3.4 Promote the responsible use of fertilizers and biocides in pond preparation | Guidelines on improved fertilizer use and pond preparation and management developed | Relevant for 11 countries; 5 suggested not relevant | 3 to 5 years | National | National governments with external support | National aquaculture agency |
| 3.3.5 Support and encourage application of farm business planning and management, and record keeping | Farmers trained in farm planning and management and record keeping Business training modules developed | Relevant for most countries; only 2 indicated not relevant | 3 to 5 years | National | National governments with external support | National aquaculture agency |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|---|--|-----------|-------------------------|--|---|
| 3.3.6 Facilitate the transfer and adoption of sustainable aquaculture technologies | Pathways of sustainable aquaculture technologies for small-scale fish farmers identified and promoted | Relevant for most countries; only 3 indicated not relevant | 5+ years | National | National governments with external support | National aquaculture agency and SEAFDEC/AQD |
| 3.3.7 Upgrade culture facilities to improve production and increased productivity | Farms with facilities upgraded | Relevant for most countries; only 3 indicated not relevant | 5+ years | National | National governments with external support | National aquaculture agency |

Output 3.4 – Management of post-harvest processing and marketing improved

Appropriate mechanisms established for improved efficiency, quality control and monitoring of all downstream inputs along the aquaculture value chain to support the value-added processing and product innovation necessary to create additional onshore jobs and supply chain activities.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|---|-----------|-------------------------|---------------------------------|---|
| 3.4.1 Improve farm handling and cold chain management to reduce post-harvest losses and ensure food safety | Major causes of post-harvest loss identified Guidelines developed to reduce loss Stakeholders trained | Most countries indicated relevant; 4 indicated not relevant | 5+ years | National | Government and external funding | National aquaculture agency and SEAFDEC/AQD |
| 3.4.2 Improve product quality preservation (such as icing and refrigeration) and make accessible to farmers | Improved supply of ice Increased number of refrigerated transport and storage facilities | Most countries indicated relevant; 6 indicated not relevant | 5+ years | National | Government and external funding | National aquaculture agency |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|---|-----------|-------------------------|---------------------------------|-----------------------------|
| 3.4.3 Reduce negative impacts of processing wastes and promote value recovery from wastes | Impacts from post-harvest processes identified Appropriate remedial technologies adopted Value-added products developed | Most countries indicated relevant; 4 indicated not relevant | 5+ years | National | Government and external funding | National aquaculture agency |

Output 3.5 – Effective supply chain established and management improved

Measures developed and implemented to improve the value chain to infuse social responsibility, provide added value and increase efficiencies and incomes along the value chain including small producers and processors.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|----------------------------------|-----------|-------------------------|----------------------------------|-----------------------------|
| 3.5.1 Improve efficiency along the value chain such as technical and economic inefficiencies in feed and seed production and distribution and in farm production and product marketing and distribution in order to improve the profitability of farmers | Areas for improvement identified Guidelines developed Stakeholders trained | No response from the governments | 5+ years | National | No response from the governments | National aquaculture agency |
| 3.5.2 Streamline logistics to improve access of farmers to inputs of sufficient quantity and quality | Availability of goods improved Farms with improved accessibility | No response from the governments | 5+ years | National | No response from the governments | National aquaculture agency |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|---|----------------------------------|--------------|-------------------------|----------------------------------|-----------------------------|
| <p>3.5.3 Assess the access of small-scale producers to local markets and processors and middleman mark-up profits and recommend collaborative measures</p> | <p>Assessment reports</p> <p>Farmers with improved access to markets and market information</p> <p>Market information channels and service established in countries</p> <p>Small-scale farmers with improved profit margin through changing from price-takers to price-setters</p> <p>Farmers' cooperatives formed for marketing and input sourcing</p> <p>Farmers benefited from organized marketing of products (farmers' cooperative with traders, government)</p> | No response from the governments | 3 to 5 years | National | National governments | National aquaculture agency |
| <p>3.5.4 Promote value-added products to create industries and employment</p> | <p>Percentage of products with value added</p> <p>Additional employment especially for women</p> | No response from the governments | 5+ years | National | No response from the governments | National aquaculture agency |

Outcome 4. Improved capacity for supporting services

Improved capacity for supporting services to sustainable intensification of aquaculture through strengthened targeted research and technology development and dissemination, effective training and capacity building, and effective information flow and communication. Natural disaster mitigation, preparedness and response and relief and climate change effectively addressed. Adaptation measures developed and capacity built to deal with emerging issues and critical needs targeted to create resilient aquaculture farmers.

Output 4.1 – Training and capacity building strengthened

Improve supporting services to sustainable production through improved education, training and capacity building, targeted research and development, and effective information exchange and communication. Aqua-farmer field schools and exchange programmes promoted.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|---|---|---------------------|------------------------------|--|--|
| <p>4.1.1 Review current training practices and determine ways to provide and improve access for small-scale farmers such as through IT</p> | <p>Report on training needs assessment</p> <p>Training courses implemented</p> <p>User friendly training materials developed</p> <p>Small-scale farmers with improved farming practices</p> | <p>Most countries indicated all relevant; only 3 suggested not relevant</p> | <p>1 to 2 years</p> | <p>National</p> | <p>Government and donors</p> | <p>National aquaculture agency and SEAFDEC/AQD</p> |
| <p>4.1.2 Develop training materials and training courses especially for small-scale farmers relevant to SIA</p> <p>Train trainers and make training materials widely available</p> <p>Improved production methodology, farm management, business development and food safety requirements for better market access</p> | <p>Training modules in specific topics developed</p> <p>Trainers' pool established</p> <p>Small-scale farmers received training</p> | <p>Almost all countries indicated relevant; only 1 suggested not relevant</p> | <p>3 to 5 years</p> | <p>National and regional</p> | <p>Donors with national counterparts</p> | <p>National fisheries agency in partnership with vocational and technical institutes</p> |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|--|--------------|-------------------------|-----------------------------------|---|
| 4.1.3 Improve capacity for scientific and vocational training | Number of personnel trained | Most countries indicated relevant; only 3 suggested not relevant | 5+ years | National | Donors with national counterparts | National universities |
| 4.1.4 Strengthen training for all stakeholders along the value chain in good aquaculture/manufacture practices (GAQPs) | Training materials developed Trainers trained Stakeholders trained | Almost all countries indicated relevant; only 2 suggested not relevant | 5+ years | National | Donors with national counterparts | National aquaculture agency and SEAFDEC/AQD |
| 4.1.5 Prepare extension materials on sustainable intensification and make them widely available in key languages | Extension materials and training courses available for extension officers Number of languages | Most countries indicated all relevant; only 3 suggested not relevant | 5+ years | National and regional | Donors with national counterparts | National extension service and NACA |
| 4.1.6 Promote farmer exchange programmes to encourage transfer of knowledge and experience | Number of exchanges programmes implemented | Almost all countries indicated relevant; only 2 suggested not relevant | 5+ years | National and regional | Donors with national counterparts | National aquaculture agency and NACA |
| 4.1.7 Upgrade national aquaculture educational programmes | Curricula and facilities improved | Most countries indicated relevant; 4 suggested not relevant | 5+ years | National | Donors with national counterparts | National universities |
| 4.1.8 Conduct targeted training and build capacity for countries with present low aquaculture production | Institutions with strengthened capacity for planning and management through targeted training | Most countries indicated relevant; but 7 suggested not relevant | 3 to 5 years | National | Donors with national counterparts | SEAFDEC/AQD |
| 4.1.9 Establish aqua farmer field schools (AFFS) focusing on SIA | Increased number of small-scale farmers participating AFFS | 8 countries indicated relevant and 8 indicated not relevant | 3 to 5 years | National | National governments with donor | NACA |

Output 4.2 – Research and development strengthened

Relevant and quality scientific research and technological development supported, and coordination and collaboration among regional/national R&D entities encouraged in areas such as genetics, nutrition, fish health etc. A regional R&D plan developed and cooperation and collaboration on R&D fostered.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|--|--------------|-------------------------|---------------------------------|---|
| 4.2.1 Develop and implement genetic selection programmes for key production species to improve production performance | Genetic selection programmes developed and implemented Number of species/strains improved | Most countries indicated relevant; only 3 suggested not relevant | 5+ years | National | National government with donors | National aquaculture agency and WorldFish |
| 4.2.2 Support research on hatchery production and culture systems for species with high potential for aquaculture | Number of species successfully developed | Most countries indicated relevant; only 3 suggested not relevant | 5+ years | National and regional | National government with donors | National aquaculture agency and SEAFDEC/AQD |
| 4.2.3 Support research on improving feed formulation, feed quality and feeding strategies | Number of feeds available with reduced FCR Number of new feeds developed | Most countries indicated relevant; only 2 suggested not relevant | 5+ years | National and regional | National government with donors | National aquaculture agency and SEAFDEC/AQD |
| 4.2.4 Support continued research for developing suitable alternative protein sources that will reduce the dependence on fishmeal and other fish-based products | Number of new protein/lipid resources made available | Most countries indicated relevant; 4 suggested not relevant | 5+ years | National and regional | National government with donors | National aquaculture agency and SEAFDEC/AQD |
| 4.2.5 Support research on the detection and treatment of diseases and development of vaccines and other alternative to veterinary drugs | New rapid diagnostic methods available New vaccines for important diseases developed New effective and safe treatments available | Most countries indicated relevant; 3 suggested not relevant | 3 to 5 years | National and regional | National government with donors | National aquaculture agency, NACA and SEAFDEC/AQD |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|---|--------------|-------------------------|---------------------------------|---|
| 4.2.6 Improve tools and use of tools for aquaculture sector management e.g. carrying capacity, disease risk, etc. for sustainable intensification of aquaculture | Aquaculture management tools adapted for Asia Tools used by aquaculture planners and managers | Most countries indicated relevant; 4 countries suggested not relevant | 5+ years | National and regional | National government with donors | National aquaculture agency and SEAFDEC/AQD |
| 4.2.7 Consult the private sector on R&D needs and possible joint funding of research | Reports on needs assessment study R&D programs developed and implemented based on R&D needs assessment | Most countries indicated relevant; 3 suggested not relevant | 1 to 2 years | National and regional | National government with donors | National aquaculture agency and SEAFDEC/AQD |
| 4.2.8 Develop a regional R&D plan Promote cooperation and coordination among regional and national aquaculture R/D entities | Regional and national network of research and development entities established Regional and national R&D plans developed | Most countries indicated relevant; 3 suggested not relevant | 5+ years | National and regional | National government with donors | National aquaculture agency and SEAFDEC/AQD |
| 4.2.9 Develop technologies that reduce the carbon footprint and environmental performance as well as environmental management tools (e.g. carrying capacity) to contribute to a more sustainable industry | New technologies available Carbon footprint reduced by unit area/production | Most countries indicated relevant; 3 suggested not relevant | 5+ years | National and regional | National government with donors | National aquaculture agency and SEAFDEC/AQD |
| 4.2.10 Target research and technology transfer programmes for countries with present low aquaculture production | Research and technology transfer programmes developed | Most countries indicated relevant; 3 suggested not relevant | 5+ years | National and regional | National government with donors | National aquaculture agency and SEAFDEC/AQD |

Output 4.3 – Information exchange and communication improved

Efficient communication strategies, infrastructure and information databases developed. Information exchange and communication activities that would allow for effective information-sharing to a wide audience in key languages supported.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|--|---|--------------|-------------------------|-----------------------------------|---|
| 4.3.1 Develop national and regional outreach strategies that encompass all aspects of sustainable aquaculture growth and target key stakeholders and countries | Number of strategies implemented | Most countries indicated relevant; 4 suggested not relevant | 3 to 5 years | National and regional | Donors with national counterparts | National aquaculture agency, NACA and SEAFDEC/AQD |
| 4.3.2 Develop communication strategies for engaging various players including policy-makers, private sector, gender advocacy groups and civil society organizations | National aquaculture information system established Number of farmers who have good access to key aquaculture information | Most countries indicated relevant; 4 suggested not relevant | 3 to 5 years | National and regional | Donors with national counterparts | National aquaculture agency, NACA and SEAFDEC/AQD |
| 4.3.3 Produce and distribute publications relevant to sustainable intensification of aquaculture in key languages | Number and coverage of publications | Most countries indicated relevant; 3 suggested not relevant | 5+ years | National and regional | Donors with national counterparts | National aquaculture agency, NACA and SEAFDEC/AQD |
| 4.3.4 Promote dissemination of relevant information through ICT and social media | Number of knowledgeable farmers Number of downloads of relevant information from Internet Community information centres established and number of farmers linked | Most countries indicated relevant; 2 suggested not relevant | 5+ years | National and regional | Donors with national counterparts | National aquaculture agency, NACA and SEAFDEC/AQD |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|--|---|-----------|-------------------------|-----------------------------------|----------------------|
| 4.3.5 Allocate resources for translation of information packages into local languages | Number of information products translated and made available | Most countries indicated relevant; 3 suggested not relevant | 5+ years | National and regional | Donors with national counterparts | NACA and SEAFDEC/AQD |

Outcome 5. Increased social responsibility and equitable benefits

Increased social responsibility and improved equity in participation and benefit distribution, emphasizing women's rights and small-scale farmers' benefits along the whole value chain through increased awareness and specially focused interventions.

Output 5.1 – Social responsibility enhanced

Good company and family farm social responsibility promoted and good employment practices and health and safety procedures implemented. Effective mechanisms for conflicts resolution established and adopted.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|--|---|--|-------------------------|--------------------------|--|
| 5.1.1 Promote good and appropriate employment practices in accordance with national laws and regulation, if available | Report on assessment on present employment practices for aquaculture Guidelines on good and legal employment practices including measures to protect migrating laborers Consultations with participating countries on guidelines | Most countries indicated relevant; but 5 suggested not relevant | 1 to 2 years 1 to 2 years 1 to 2 years | National | National and external | Relevant national authorities Regional organization, FAO, ILO |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|--|---|-------------------------|-----------------------------------|---|
| <p>5.1.2 Farmers made aware of and comply with national labour laws and provide workers with adequate work and on-site living conditions to assure their health and the safety of lives and property etc. and offer them training and skills development related to safety and health in work</p> | <p>Assessment reports on present employee health and safety including identification of key risks for aquaculture</p> <p>Guidelines on good and legal practices</p> <p>Training courses including on first aid</p> <p>Availability of related tools/equipment</p> | <p>Most countries indicated relevant; but 6 suggested not relevant</p> | <p>1 to 2 years</p> <p>1 to 2 years +5 years</p> | <p>National</p> | <p>National and external</p> | <p>Competent national authorities</p> <p>Regional organizations, FAO, ILO</p> |
| <p>5.1.3 Develop and adopt mechanisms for conflicts resolution to ensure local social acceptance. Document and share existing good practices for conflict resolution</p> | <p>Reports (possibly web-based reporting of good case studies)</p> <p>Draft regional guidelines</p> <p>System for periodic monitoring and evaluation in place</p> | <p>Most countries indicated relevant; but 7 suggested not relevant</p> | <p>1 to 2 years</p> <p>1 to 2 years 3 to 5 years</p> | <p>National</p> | <p>National and some external</p> | <p>Competent national authorities</p> <p>Regional organization, FAO</p> |

Output 5.2 – Equitable access to opportunities and benefits promoted

Equitable opportunities for benefits and rights along the value chain, especially for women, poor and marginalized groups promoted.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|---|--------------|-------------------------|--------------------------------|---|
| 5.2.1 Improve the value chain to better respond to externalities such as globalization, price fluctuations, climate change/variability and other natural hazards | Analysis reports on the impact of globalization, food price fluctuations and climate change on small-scale operators Measures to enhance livelihoods of different groups identified and implemented | Most countries indicated relevant; but 6 suggested not relevant | 3 to 5 years | National | National plus external funders | Competent national authorities and relevant institutions ADB, WB etc. |
| 5.2.2 Promote fair and improved access of different groups to resources (land, water, energy, credit, information and training etc.) in aquaculture business | Analysis report on the status of access to resources Measures to ensure fair access identified | 8 countries indicated yes relevant and 8 suggested not relevant | 1 to 2 years | National | National plus external funders | Competent national authorities and relevant institutions Regional organizations |
| 5.2.3 Improve the distribution of benefits along the value chain and identify entry points to enhance benefits along the value chain | Analysis of the distribution of profits along the value chain and identify entry points along the value chain that enhance profits Regional workshop conducted | Most countries indicated relevant; but 6 suggested not relevant | 3 to 5 years | National | National plus external funders | Competent authorities, private sector and relevant institutions Regional organizations |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|------------|---|--------------------------|-----------|-------------------------|--------------------------|------------|
| | Pilot projects on selected commodity value chains implemented Pilot projects evaluated | | | | | |

Output 5.3 – Gender integration promoted and practiced

Gender equality promoted and mainstreamed as an integral part of regional aquaculture development policies and programmes in line with the globally accepted dimensions of gender equality and women's empowerment.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|--|--------------|-------------------------|--|------------------------------------|
| 5.3.1 Assess the present gender policies and programmes for aquaculture Gaps and weaknesses identified | Aquaculture policy documents and interventions incorporating relevant gender equality dimensions | 9 countries indicated relevant and 7 suggested not relevant | 2 to 5 years | National | National governments with some donor funds | NACA with WorldFish |
| 5.3.2 Strengthen gender mainstreaming policies and programmes through recommendations, advocacy, campaigns, lobbying and working with national and regional women/gender groups/networks | Regional policy dialogues and organizations with balanced gender participation Increased number of women in decision-making bodies including NACA Governing Council, SEAFDEC, FAO, WorldFish etc. | 7 countries indicated relevant and 9 suggested not relevant | 2 to 5 years | National | National governments with some donor funds | FAO, NACA, SEAFDEC, WorldFish etc. |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|--|--|---------------------|-------------------------|---|--|
| <p>5.3.3 Analyze causes of discrimination that marginalizes women's involvement in aquaculture, and identify measures to reduce this such as through educational awareness campaigns</p> | <p>Reduced factors of discrimination including cultural taboos causing marginalization of women</p> <p>Increased participation/voice of women in decision-making in aquaculture operations and management</p> <p>Increased number of women entrepreneurs along the aquaculture value chain</p> <p>Women with authority to sign documents such as for financial and property transactions</p> | <p>9 countries indicated relevant and 7 suggested not relevant</p> | <p>5+ years</p> | <p>National</p> | <p>National governments with some donor funds</p> | <p>National social ministries with fisheries</p> |
| <p>5.3.4 Develop training courses targeted at women for farm management, book keeping, accounting, food safety, marketing etc.</p> | <p>Increased capacity building activities including training courses for women (at least 50% women participants)</p> <p>Increased number of women as managers and CEOs</p> | <p>All countries indicated relevant</p> | <p>2 to 5 years</p> | <p>National</p> | <p>Donor with national counterpart</p> | <p>NACA</p> |

Outcome 6. Increased resilience of farmers

Resilience of farmers and other stakeholders in the process of intensification is significantly increased through increased preparedness of farmers and other stakeholders in handling natural disasters and socio-economic risks, effective mechanisms for public warning, response and relief to emergencies and strengthened capacity for managing natural disaster risks and mitigating the impacts of climate change.

Output 6.1 – Climate change and natural disasters effectively addressed

Identify and facilitate cost-effective adaptation to climate change and the impact mitigation measures and effective mechanisms to respond to natural disasters through concerted national efforts and intensified regional and inter-regional co-operation.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|---|---|--------------|-------------------------|--|---|
| 6.1.1 Develop and implement climate change adaptation and mitigation measures | Review reports on biophysical and socio-economic impacts of past climate change events on aquaculture | Most countries indicated relevant; but 5 suggested not relevant. | 2 to 5 years | National | National government and external sources | National aquaculture agency and climate change agency |
| | Key potential climate change impacts affecting different aquaculture systems identified and prioritized | Note considerable country variation depending on the issue (see below) | | | | |
| | Risk mapping undertaken and most vulnerable aquaculture areas and systems identified | As above; some gave a positive response on relevance but not planning risk mapping e.g. Nepal | 2 to 5 years | National | National government and external sources | National aquaculture agency and climate change agency |
| | Climate smart adaptation and mitigation measures developed | As above e.g. Sri Lanka planning in all districts; others more selective | 5+ years | National and regional | National government and external sources | National aquaculture agency and NACA |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|---|---|---|--------------|-------------------------|--|---|
| | Gap analysis undertaken to assess national capacity in dealing with climate change impacts National institutions with developed capacity to respond to climate change impacts Science and technology measures identified for adaptation and mitigation Research and development plans developed to address the needs | As above | 2 to 5 years | National and regional | National government and external sources | National aquaculture agency and universities |
| 6.1.2 Integrate climate change adaptation and mitigation measures into the economic and social development policy framework | Key measures on aquaculture adaptation and mitigation integrated into national climate change policy and action plans Natural calamity insurance extended to aquaculture and make available for key climate change risks | Most countries indicated relevant; but 4 countries suggested not relevant | 5+ years | National | National government and external sources | National aquaculture agency and climate change agency |
| 6.1.3 Integrate climate change adaptation and mitigation measures on aquaculture into overall disaster risk management (DRM) | | Most countries indicated relevant; but 5 countries suggested not relevant | 5+ years | National | National government and external sources | National aquaculture agency and development bank |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|---|---|--------------|-------------------------|---|--|
| | Assessment report on DRM capacity Capacity strengthened in aquaculture areas that are vulnerable to climate change variability | Most indicated relevant | 2 to 5 years | National | No response received from the governments | National aquaculture agency and DRM agency |
| | A decision support system developed for implementing climate change adaptation and DRM | Most indicated relevant | | National | No response received from the governments | Universities |
| | Government agencies and institutions collaborating in the integration of CC adaptation and DRM in the country and in the region | Most indicated relevant | 2 to 5 years | National | No response received from the governments | National aquaculture agency, climate change and DRM agencies |
| 6.1.4 Increase the preparedness of farmers to respond to different risks and disasters | Farm risk management programmes developed Farmers trained Networks established | Most countries indicated relevant; but 4 countries suggested not relevant | 5+ years | National | National government and external sources | National aquaculture agency |
| 6.1.5 Foster regional and national cooperation for climate change adaptation and disaster impact mitigation, preparedness, response, and recovery | Regional approach developed for aquaculture to mitigate and adapt to climate change impacts | Most countries indicated relevant; 4 countries suggested not relevant | 2 to 5 years | National and regional | National government and external sources | National aquaculture agency, climate change agency and NACA |

Output 6.2 – Other emerging issues addressed

Capacity and mechanism of national governments and regional organizations increased for effectively assessing, managing and responding to various emerging natural, biological and socio-economic risks and complex global and regional interactions.

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|--|--|--------------|-------------------------|----------------------------------|---|
| 6.2.1 Assess present regional and national policies and strategies for dealing with critical emerging issues affecting aquaculture (economic including changing markets, new diseases, transboundary diseases, political crisis, food shortage, man-made disasters, etc.) | Assessment report published and disseminated to relevant authorities Preparedness and capacity of country governments to deal with shocks | Most countries indicated relevant; but 3 suggested not relevant | 1 to 2 years | National and regional | National government and external | National aquaculture agency and NACA |
| 6.2.2 Develop a mechanism that regularly assesses potential emerging risks and reports to the relevant agencies | Coordinating unit or centre based at an existing government office established (to monitor, inform and mobilized other units) for regional and national coordination | Most countries indicated relevant; only 2 suggested not relevant | 1 to 2 years | National and regional | National government and external | National aquaculture agency, WorldFish and NACA |
| 6.2.3 Undertake regular identification of emerging issues and assessment of risks at regional and national levels | Emerging issues prioritized and cost effective management measures developed | Most countries indicated relevant; but 5 suggested not relevant | 3 to 5 years | National and regional | National government and external | National aquaculture agency, WorldFish and NACA |
| 6.2.4 Develop coordination mechanism to monitor and address emerging issues at both regional and national levels with a timely response | Regional emergency response coordination centre established | Most countries indicated relevant; but 6 suggested not relevant | 3 to 5 years | National and regional | National government and external | National aquaculture agency, WorldFish and NACA |

| Activities | Indicators | Relevance to the country | Timeframe | Level of implementation | Likely source of funding | Leadership |
|--|--|--|---------------------|------------------------------|--|--|
| <p>6.2.5 Develop and implement a mechanism to delegate responsibility to institutions to find solutions to high risk issues</p> | <p>Emergency response mechanism with delegated institutions to respond to specific new emerging issues, for example disease</p> | <p>Most countries indicated relevant; but 4 suggested not relevant</p> | <p>3 to 5 years</p> | <p>National and regional</p> | <p>National government and external</p> | <p>National aquaculture agency, WorldFish and NACA</p> |
| <p>6.2.6 Identify funding for research for addressing emerging issues</p> | <p>Proposals developed and submitted to potential donors for funding</p> <p>Increased allocation for research within the national budgets to support SIA research on relevant emerging issues</p> <p>Mechanisms for cooperation among countries in Asia-Pacific region in place</p> <p>Increased investment in research collaboration on emerging issues of common interests in the region</p> | <p>Majority of countries indicated relevant; only 2 suggested not relevant</p> | <p>3 to 5 years</p> | <p>National and regional</p> | <p>National governments international donors, private sector</p> | <p>National governments, NACA, WorldFish</p> |

Annex 1. Regional Consultation on Strategy and Action Plan for Sustainable Intensification of Aquaculture in the Asia-Pacific region

Royal Orchid Sheraton Hotel, Bangkok, Thailand

27-28 November 2014

Background

Intensification of aquaculture has been an ongoing process in the region with the aim being to increase the productivity and economic efficiency of aquaculture production through intensified use of inputs (materials, energy and investment) and resources (water, feed ingredients), and the application of new technologies and improved management practices.

Intensification of aquaculture has been a major contributor to the rapid aquaculture production growth in the Asia-Pacific region in the past two decades (nearly 10 percent annually), and this has significantly contributed to food and nutrition security and livelihoods in the region. The region has constantly contributed over 90 percent of the world's aquaculture production for decades. Aquaculture currently supplies 50 percent of the world's food fish and in Asia aquaculture supplies over 60 percent of the region's food fish, comprising over 20 percent of total protein intake by the Asian population. However, the adverse impacts of intensification have attracted considerable public concern, especially regarding the long-term sustainability of the sector.

Being the most populous region of the world with heavy demands on natural resources, Asian aquaculture will face great challenges to maintain its growth, and to meet the increasing demand for fish inside and outside the region over the coming decades. It is estimated that fish consumption in Asia and the Pacific will increase by 30 percent by 2030. This implies that aquaculture production will need to increase by 50 percent by 2030. At the same time, the aquaculture sector is facing serious challenges, such as the impact of climate change and variability, urbanization and related social and economic changes, increasing intra-regional trade and increasing public concern over the environment and food safety.

Working with limited natural resources and various challenges, the only way to meet the increasing demand for fish is to promote the **sustainable intensification of aquaculture (SIA)**, which means "to produce more with less", or in other words to increase the productivity and efficiency in aquaculture production with reduced consumption of resources and negative environmental and social impacts through improved governance, management practices and adoption of innovative technologies.

The need for sustainable intensification in aquaculture production together with the application of an ecosystem approach to aquaculture has been a subject of several international fora and among the priority recommendations of FAO and regional bodies such as the Network of Aquaculture Centres in Asia-Pacific (NACA), the Asia-Pacific Fishery Commission (APFIC), and the Phuket Consensus emanating from the Global Conference on Aquaculture in 2010. The Ministerial Meeting on Aquaculture for Food Security, Nutrition and Economic Development in July 2011 in Sri Lanka further identified four basic tenets of a sustainable aquaculture strategy: (i) responsible access to and use of aquatic genetic resources and genetic improvement; (ii) sustainable aqua-farming systems; (iii) aquatic animal health including responsible transboundary movement of aquatic animals; and (iv) adaptive responses to climate change impacts. In order to promote SIA, FAO supported a joint APFIC/NACA regional consultation on Sustainable Intensification of Aquaculture Production in

Asia-Pacific (held in Bangkok, Thailand in October 2012). The consultation provided a good platform for the wide exchange and sharing of scientific knowledge and practical experiences related to SIA and identified the needs for scientific research and technology development to support SIA. FAO has done much to promote SIA, and the Thirty-second FAO Asia and the Pacific Regional Conference (APRC) convened in 2014 included a working paper on “Meeting farmers’ aspirations in the context of green development” that highlighted “sustainable production intensification” and an information paper on “Sustainable intensification of aquaculture for food and nutritional security in the Asia-Pacific region.”

As the follow-up to earlier FAO initiatives promoting SIA, the Fifth Regional Consultative Forum Meeting (RCFM) of APFIC (held in Hyderabad, India from 19 to 21 June 2014) included an individual aquaculture session on “Promoting sustainable intensification of aquaculture for food and nutritional security in the Asia-Pacific region.” The RCFM acknowledged that a transition to sustainable production intensification in aquaculture should focus on supporting the prosperity of farming and rural communities and address key sustainability issues related to the management of land and water resources. The RCFM put forward a complete set of recommendations on priority actions in five major areas related to sustainable intensification of aquaculture in the region, which was presented to and endorsed by the Thirty-third Session of APFIC.

In order to provide more substantial support to member countries in promoting sustainable intensification of aquaculture, the SIA has now been included as the Asia regional initiative of FAO’s global blue growth initiative (BGI).

Although FAO and other regional and international organizations have launched various initiatives to raise awareness and identify priority actions related to SIA and efforts have been made by international/regional organizations, country governments, civil society organizations and the private sector to achieve sustainable intensification of aquaculture on the ground, **there is a lack of a well articulated regional strategy and a comprehensive action plan** to guide and support the concerted efforts of different stakeholders. Therefore, the Thirty-third Session of the Asia-Pacific Fishery Commission recommended **further regional consultation to prioritize necessary actions at regional and national levels and to develop a strategic action plan for supporting sustainable intensification of aquaculture in the region.**

Purpose

The purpose of the regional consultation is to finalize the regional strategy for the sustainable intensification of aquaculture and develop a practical and implementable regional action plan. This regional strategy and the action plan should set a clear vision, goals and strategies towards 2030, as well as a detailed action plan, including short-term (1 to 2 years) and medium-term (towards 2030) action, for sustainable intensification of aquaculture in the Asia-Pacific region. It is expected that the implementation of this strategy and action plan will be financed, at least partially, by donors and international organizations. The consultation will also assist in promoting coordinated and concerted efforts of member governments, regional and international organizations, donor and development agencies and the industrial sector in support of the sustainable intensification of aquaculture in the region.

Organizers

This regional multi-stakeholder consultation is funded and organized by FAO in collaboration with the Network of Aquaculture Centres in Asia-Pacific, the Asia-Pacific Fishery Commission and the Department of Fisheries (DoF) of the Royal Thai Government. The participants comprise representatives from member countries, major regional and international organizations, civil society

organizations and the private sector, as well as representatives from the industrial sectors and some donor and development agencies. This two-day consultation is held in Bangkok from 27 to 28 November 2014.

Preparatory activities

A regional Technical Cooperation Programme Facility (TCPF) project has been initiated to review recent regional and international policy and strategy related to sustainable development and intensification of aquaculture as well numerous documents prioritizing the sustainable intensification of aquaculture. This review will lead to the preparation of a draft document entitled **Regional Strategy for Sustainable Intensification of Aquaculture in Asia-Pacific**, which will be presented to the regional multi-stakeholder consultation planned for 27 and 28 November 2014. This strategy document is expected to enhance the awareness of country governments, regional and international organizations, industrial sectors and donor and development agencies with respect to the sustainable intensification of aquaculture in Asia and the Pacific and their commitment to it.

Expected outputs

The consultation is expected to produce the following outputs:

1. A Regional Strategy for Sustainable Intensification of Aquaculture discussed, elaborated and finalized on the basis of comments and inputs provided by the participants.
2. An Action Plan for the Sustainable Intensification of Aquaculture including short-term (initial 1 to 2 years) and medium-term (2015–2030) actions discussed and agreed on (with responsible institutions and initial estimates of resource requirements indicated).
3. A regional level coordination mechanism discussed and agreed on.
4. A meeting report produced containing conclusions, recommendations and outputs 1 and 2 (above) in annexes.

Programme of Regional Consultation on Strategy and Action Plan for Sustainable Intensification of Aquaculture in the Asia-Pacific region

Royal Orchid Sheraton Hotel, Bangkok, Thailand

27-28 November 2014

| 26 November 2014 | |
|-------------------------|--|
| Arrival of participants | |
| 27 November 2014 | |
| 08.00–09.00 | Registration and assembly |
| 09.00–09.30 | Opening Session: Welcome/opening remarks by: <ul style="list-style-type: none"> • Director General, NACA • Representative of Director General, Department of Fisheries, Thailand • Deputy Regional Representative on behalf of Assistant Director General, FAO-RAP |
| 09.30–09.45 | Introduction to the consultation (FAO) |
| 09.45–10.15 | Group photo and coffee break |
| 10.15–10.45 | Presentation of Review of policy and strategy recommendations related to sustainable development and intensification of aquaculture from recent regional and global events (Consultant) |
| 10.45–11.15 | Plenary discussion on the review |
| 11.15–11.30 | Presentation by WorldFish on its ongoing work supporting sustainable growth of aquaculture |
| 11.30–12.00 | Draft regional strategy for sustainable intensification of aquaculture in Asia-Pacific (presented by consultant) |
| 12.00–12.30 | Plenary discussion on the draft regional strategy (focus on framework and key elements) |
| 12.30–13.30 | Lunch break |
| 13.30–13.45 | Introduction to working group session on the regional strategy |
| 13.45–15.45 | Working group session on the draft regional strategy (suggested revisions directly on the document) (3 groups and each to cover two strategic objectives) |
| 15.45–16.00 | Coffee break |
| 16.00–17.30 | Presentation of working group discussion outputs (only the suggested revisions) Plenary discussion (follow each presentation) |
| 18.00 | Reception dinner |

| 28 November 2014 | |
|-------------------------|---|
| 08.30–09.30 | Presentation on draft regional action plan supporting sustainable intensification of aquaculture in Asia-Pacific Plenary discussion on the draft regional action plan (general comments) |
| 09.30-09.40 | Introduction to working group session on the regional action plan |
| 09.40–10.00 | Coffee break |
| 10.00–11.45 | Working group session I on the regional action plan (3 or 4 groups based on the structure of the action plan) |
| 11.45–12.30 | Presentation of working group discussion outputs Plenary discussion (follow each presentation) |
| 12.30–13.30 | Lunch break |
| 13.30–15.30 | Working group session II on the regional action plan (3 or 4 groups based on the structure of the document) |
| 15.30 –16.00 | Coffee break |
| 16.00-17.00 | Presentation of working group session II outputs Plenary discussion (follow each presentation) |
| 17.00–17.30 | Discussion on how to promote concerted efforts and coordination Closing session |

Annex 2. Participants list: Regional Consultation on Strategy and Action Plan for the Sustainable Intensification of Aquaculture in the Asia-Pacific region

Royal Orchid Sheraton Hotel, Bangkok, Thailand

27-28 November 2014

| Bangladesh | |
|--|---|
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