

Report of the

**FAO/SPC REGIONAL SCOPING WORKSHOP:
DEVELOPMENT OF A PACIFIC AQUACULTURE REGIONAL
COOPERATIVE PROGRAMME**

Nadi, Fiji, 11–14 October 2011



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PREPARATION OF THIS DOCUMENT

This document is the final report of the FAO/SPC Regional Scoping Workshop: Development of a Pacific Aquaculture Regional Cooperative Programme held in Nadi, Fiji, on 11–14 October 2011.

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ABSTRACT

The FAO/SPC Regional Scoping Workshop: Development of a Pacific Aquaculture Regional Cooperative Programme held from 11 to 14 October 2011 in Nadi, Fiji was convened to engage high level discussions between national governments and international development partner organizations on the need to provide more attention to aquaculture development to small island developing states including the Pacific Island Countries and Territories (PICTs).

Fifty five experts representing 17 PICTs, representatives from the private sector, eight international and regional institutions, and SPC and FAO staff participated in this regional scoping workshop whose overall objective was to assess the needs and map out a coordinating strategy and actions for the development of aquaculture in the Pacific region. To this end, a Pacific Regional Aquaculture Strategy was drafted with a vision of a sustainable aquaculture sector that meets food security and livelihood requirements based on economically viable enterprises supported by enabling governance arrangements.

The overall outcomes of the strategy are envisioned to include: (1) successful, competitive and biosecure aquaculture enterprises, using and adapting proven technologies to meet local requirements (technical, social and environmental); (2) recognition of the actual and potential contributions of the aquaculture sector towards regional livelihoods and food security (in response to the pressures of population growth, depleted/overfished inshore fisheries resources and climate change); and (3) framework for aquaculture development that builds cooperation among PICT government aquaculture institutions, national, regional and international agencies, farmer groups/associations, and other stakeholders.

To meet these objectives, the strategy proposes six broad programme elements including biosecurity, capacity building, feasibility assessment, statistics and data, markets and trade and technology transfer and improvement.

CONTENTS

	Page
BACKGROUND	1
OPENING OF THE WORKSHOP	2
PURPOSE OF THE WORKSHOP	2
WORKSHOP PARTICIPATION	3
WORKSHOP PROCESSES	3
PRESENTATION HIGHLIGHTS AND DISCUSSIONS (SESSION 1)	3
WORKING GROUP'S (SESSION 2) AND PLENARY SESSION'S (SESSION 3) HIGHLIGHTS	11
Working Group Session (Session 2)	11
Plenary Session (Session 3)	18
CONCLUSIONS AND THE WAY FORWARD	19
CLOSING	19
APPENDIX 1: Welcome statement	20
APPENDIX 2: Workshop agenda	22
APPENDIX 3: List of participants	27
APPENDIX 4: Draft Pacific Regional Aquaculture Strategy	34
APPENDIX 5: Closing remarks	48
APPENDIX 6: Workshop photograph	50

BACKGROUND

1. The physical, natural, environmental, cultural and demographic endowments of the vast Pacific region have been a source of comparative advantage or cause of limited success in the region's aquaculture development projects and enterprises. The initial efforts by Pacific island nations and territories to develop aquaculture industries were led by a number of key nations including French Polynesia, New Caledonia, Cook Islands and Fiji. These efforts were initially supported by the FAO Regional Aquaculture Development Programme (GCP/RAS/116/JPN) which ran from the late 1980s to the 1990s.
2. The Secretariat of the Pacific Community (SPC) Aquaculture Programme was established in the early 2000s to provide technical services, coordinate capacity building and a clearing house for information. The SPC's work programmes aim to develop technical assistance, professional, scientific and research support and planning and management capability building.
3. The efforts by national fisheries administrations, SPC and FAO have been augmented by those of other technical agencies including the Australian Centre for International Agricultural Research (ACIAR), the WorldFish Center (WFC), the Pacific Islands Development Programme (PIDP), and Japan International Cooperation Agency (JICA). For the most part, these activities lacked formal coordination mechanisms at a regional level.
4. On 23 September 2010, during the FAO Global Conference on Aquaculture in Thailand, an informal «Evening on Pacific Aquaculture» meeting organized by FAO and SPC was held with five Pacific island countries namely Cook Islands, Fiji, Nauru, Papua New Guinea and Tonga. The meeting was also attended by representatives from other fisheries organizations and educational institutes including ACIAR, Aquaculture Without Frontiers, Ghent University (GU), JICA, the Network of Aquaculture Centres in Asia and the Pacific (NACA) and the WFC.
5. Discussions considered three major points of interest including: (1) history and status of aquaculture development in the Pacific; (2) persistent and emerging issues on aquaculture development in the region; and (3) national aquaculture aspirations and constraints in the five Pacific countries present at the meeting.
6. The meeting recommended three strategic actions namely: (1) further assistance in developing a biosecurity policy for the Region; (2) organization of a regional aquaculture development workshop in the Pacific to assess needs and develop cooperative programmes; and (3) exploring the feasibility of a regional networking arrangement.
7. Further, it was decided that the islands of the Pacific deserved special attention, being among the 'least aquaculturally developed' regions of the world. The twenty-ninth session of the FAO Committee on Fisheries (COFI) held from 29 January to 4 February 2011 in Rome, Italy, on the recommendation of the fifth session of the COFI Sub-Committee on Aquaculture held from 27 September to 1 October 2010 in Phuket, Thailand, placed on record its recognition of this need to provide more attention to aquaculture development in small island developing states including the Pacific Island Countries and Territories (PICTs).
8. These were the broad justification for FAO and SPC's decision to organize the Regional Scoping Workshop on Pacific Aquaculture to assess the needs and map out a coordinating strategy and action plan for all major and international agencies and other relevant stakeholders working on aquaculture development in the region.
9. The meeting was held in Nadi, Fiji from 11 to 14 October 2011.

OPENING OF THE WORKSHOP

10. The meeting was opened with a prayer led by Mr Jacob Wani (Papua New Guinea).
11. Mr Jiansan Jia, Chief, Aquaculture Service (FAO), on behalf of FAO Director-General Jacques Diouf, welcomed the participants to the workshop which he called a “stock-taking exercise” that will look into the current status of regional aquaculture. He hoped that the workshop would serve as a catalyst for a cooperative programme to facilitate a regional aquaculture development strategy. The welcome statement of Mr Jia can be seen as Appendix 1.
12. Mr Mike Batty (SPC) speaking on behalf of the Director General of SPC said the region has been slow to turn “potential” into “production” and stressed this was not due to the lack of support from donors. He observed that a number of barriers to export clearly exist, but it should also be possible to reduce imports as a counter measure. He felt that too many research and development and investments had focused on fish and not enough on people, noted that there had not been enough emphasis on private sector participation in the sector, and thought that sufficient effort had been spent on trying to understand better the local communities, markets, fish farmers and the private sector.
13. The Honorable Jokatani Cokanasiga, Ministry of Primary Industries, Fiji, formally opened the workshop. The Minister expressed his hope that existing cooperation between member countries and development partners would be strengthened by more effective coordination between regional aquaculture stakeholders. The workshop was requested to balance three crucial factors particularly those relating to ecological, economic and social issues and to tailor the strategy and plan to the needs of the Pacific.
14. Mr Masanami Izumi (FAO Subregional Office for the Pacific Islands, Samoa) provided a background to the workshop, describing its development through a series of global and regional meetings. Mr Izumi outlined the objectives and expected outcomes of the workshop and the procedure that would be followed during the four-day workshop.
15. The workshop agenda is attached as Appendix 2.

PURPOSE OF THE WORKSHOP

16. The overall objective of the regional scoping workshop was to engage the governments of PICTs and development partners in assessing the needs and mapping out a coordinating strategy and actions for the development of aquaculture in the Pacific region. The specific objectives were to:
 - understand past and recently completed activities, on-going national and regional strategies/development plans and the current status of aquaculture in the region, including an analysis of its progress;
 - identify emerging issues, opportunities and required support for the sector’s continued development;
 - exchange lessons and good practices based on the work of development partners, inspire fresh thinking and innovative initiatives; and
 - build and support a potential regional aquaculture development framework and programme or roadmap for aquaculture development for PICTs.

WORKSHOP PARTICIPATION

17. Fifty-five experts representing 17 PICTs (American Samoa, Cook Islands, Fiji, Federated States of Micronesia (FSM), French Polynesia, Guam, Kiribati, Republic of the Marshall Islands (RMI), Nauru, New Caledonia, Palau, Papua New Guinea (PNG), Tonga, Tuvalu, Samoa, Vanuatu and Wallis and Futuna Islands), representatives from the private sector (Vate Ocean Gardens Ltd [VOG] and Pacific Seaweed Ltd [PS]), eight regional institutions (ACIAR, Freshwater Fisheries Research Center, Chinese Academy of Fishery Sciences [FFRC-China], JICA, Kasetsart University [KU], Queensland University of Technology [QUT], NACA, Aquaculture Department of the Southeast Asian Fisheries Development Center [SEAFDEC-AQD], and WFC-Solomon Islands), and SPC and FAO staff participated in this regional scoping workshop. See Appendix 3 for a list of participants and Appendix 6 for a group photo.

WORKSHOP PROCESSES

18. The workshop was divided into three sessions.

The first session was primarily an information session which generated better understanding of past and recently completed activities, on-going national and regional strategies/development plans and the current state of the status of aquaculture in the region, including an analysis of their progress. A total of 14 informational/experiential presentations and an additional six institutional presentations were provided, with opportunities for participants to question speakers and debate on issues arising. This session consisted of two parts:

- national and regional aquaculture aspirations and constraints and presentations from institutions working in the region, including their mandates, ongoing work in the Pacific region and interests for future cooperation; and
- thematic presentations on issues relevant to aquaculture development.

19. The second session comprised of working group discussions, based on the information sessions and national experience/exchanges. The outcomes were reported back to the plenary and discussed.

20. The final session focused on developing the draft Pacific Regional Aquaculture Strategy (RAS) and agreeing on the way forward.

PRESENTATION HIGHLIGHTS AND DISCUSSIONS (SESSION 1)

Session 1.1 National and regional aquaculture aspirations and constraints, institutional presentations (mandates, ongoing work in the Pacific region, and interests for future cooperation)

21. Mr Pedro Bueno (FAO Consultant) looked into the historical overview of aquaculture in the region, drawing lessons from a recently concluded review of aquaculture experiences and lessons in eight PICTs. It was noted that despite a relatively good level of investment in research in the region, and a number of systems and species that have shown technical feasibility, few have achieved commercial success. A common constraint is the availability of farm inputs (feed, seed, and capital), limited local demand and distant export markets. These issues remain challenging and will remain so while demand is low due to the infancy of the aquaculture sector.

22. The prospects for aquaculture development in the Pacific, specifically the upscaling of technically feasible systems to commercial level, increasing competitiveness but avoiding environmental and biodiversity impacts, were discussed. The more than 80 years (since the 1930s, although it has only been 40 years in most Pacific islands) of research, development, training and facility development in the region in general, as well as movement around and introduction of species into the region, have provided a good

foundation for current and future development efforts in terms of people, infrastructure, knowledge, experiences and lessons.

23. The current status of aquaculture development in the Pacific where issues have moved from technical success to economic viability, increasing competitiveness while avoiding environmental and biodiversity impacts was discussed. Progress was noted wherein facilities are now established, people trained and lessons learned both from the region and outside.

24. Persistent and emerging issues on aquaculture development in the region relate to, e.g., an appropriate role for government, biosecurity risks, technical resources, attracting (and retaining) private sector investment and working effectively within the region's social and cultural settings.

25. Mr Hugh Govan (SPC Consultant) presented the findings from the SPC economic study of the mariculture sector in the region. Mariculture is risky and technically demanding. It also takes time to establish a mariculture enterprise and in the end margins are slim because economy of scale is difficult to achieve. Success has been limited by inappropriate project design from inadequate or no feasibility studies, poor social and cultural fit and a lack of monitoring in terms of practical and commercial performance. Constraints (feed, seed, logistics, skills, finance and environmental) were balanced with a presentation of opportunities (sites, disease-free environment and small-scale livelihoods). Attention was drawn to the enormous variation in potential between countries, the vital need to undertake adequate economic and market analysis and involve the private sector and, most importantly, to apply the lessons learned.

26. Mr Govan said that his stressing the importance of feasibility studies and business skills did not mean he was advocating the need for more consultants. Relatively simple approaches to feasibility and the development of business skills are available. Secondly, in relation to restocking, the consultants were having considerable difficulty finding adequate feasibility assessments for this process.

27. Discussions pointed towards the general lack of understanding by financial institutions about aquaculture, which has given rise to difficulties faced by small farmers in obtaining loans. There has been substantial work on research and development but inadequate attention devoted to the commercial aspects of aquaculture and in developing the range of financial advice that should be available to prospective farmers and lenders in the Pacific. There is need to strengthen the capacity in aquaculture business planning and economic feasibility evaluation in both the aquaculture sector and lending institutions.

28. It was also stressed that aquaculture data and statistics are inadequate, making it difficult to develop realistic plans or track progress and to put together for decision makers convincing arguments on the need to support aquaculture development.

29. The representative from Tuvalu expressed its pressing need for assistance in helping the country to revitalize the aquaculture development in the country which was positively responded by a FAO/SAP officer and SPC.

30. The representative from Cook Islands confirmed that there were pearl farmers who began as part-time operators but ceased their operations as disease struck their farms. A number of individuals have been holding leases on areas where there has been no production. The revised management plan sets out the process of mapping farms using GPS, the review and issue of annual licenses and the intention to reclaim unused licenses.

31. Fiji participants indicated that they have indeed learned a number of significant lessons. They felt that food security as a primary objective for mariculture in Fiji may not be compatible with the

profitability objective. Fiji has placed priority on restocking of reefs to assure coastal communities a future supply of protein.

32. The representative from the Marshall Islands said that they had successfully bred and distributed juvenile clams under an Overseas Fishery Cooperation Foundation (OFCF) project. When the project concluded, the interest that it had created intensified the demand and therefore competition for juveniles among atoll communities. As the hatchery production was less than the demand and therefore had to be equitably allocated, the strong demand from some communities was soon accompanied by political pressure.

33. Representatives from Kiribati noted that they are adopting a private sector approach to clam farming and that there is a commercial company currently engaged in the activity. The question was raised as to the possibility of financing assistance along with technical assistance from SPC or FAO to the private sector.

34. The representative from Nauru indicated interest in sea cage farming given the availability of resource and using studies that assess the feasibility of that activity. It was noted that the cost of production might be quite high given that production should be export oriented. Although Nauru does not currently have a bank, there is an Entrepreneurs Centre that can provide co- financing.

35. The presentation of Mr Robert Jimmy (SPC) focused on the production characteristics of key commodities produced by aquaculture sector, drawing on a report by Ponia (2010)¹, and a number of case studies. The drivers of growing domestic markets, increasing need for food security and aspirations to improve trade balances were highlighted. In some PICTs, food security commodities have become livelihoods opportunities, e.g. "lead farmers" of tilapia.

36. Re-stocking activities are widespread and hatcheries are expensive to operate and are unproven in terms of results. The link to sound in-shore fisheries management, essential for successful restocking initiatives, was highlighted. The reservations about reef re-stocking were acknowledged during the discussions but there was some support (Fiji) to re-stock marine protected areas (MPAs) which could yield some valuable results.

37. The danger of overfishing sea cucumber was highlighted and caution advised against excessive collection of broodstock to support aquaculture ventures. SPC has developed guidelines to assist countries to screen such proposals and weed out those that are not operating ethically, and can provide advice on these issues. Political issues and linkages with investors have been an issue in the past.

38. Aquaculture governance in the form of legislation, policies and plans has been weak but is improving. There are gaps in technical skills across all levels. This is being addressed by a range of tertiary and other programmes including short course workshops, trainings and project attachments. However, capacity-building to date has been somewhat *ad hoc* in the absence of national manpower development policies.

39. The state of infrastructure and facilities is highly variable among PICTs and facilities are generally primitive due to the difficulty for donors to fund "bricks and mortar" projects. Biosecurity, economics,

¹ Ponia, B. 2010. A review of aquaculture in the Pacific Islands 1998–2007: Tracking a decade of progress through official and provisional statistics. SPC Aquaculture Technical Papers/ Secretariat of the Pacific Community, ISSN: 1683-7568.

climate change, poor disease reporting to the World Organisation for Animal Health (OIE), and feed and seed supply were also presented as key issues to be addressed.

40. Key concluding points included the danger of over harvesting of wild stocks in the guise of aquaculture, the importance of statistics to measure performance and justify political and other support, understanding industry need, understanding the development aspirations of member countries, communication of findings to decision-makers, national political commitment, and partnerships.

41. Discussions arising from the presentation stated the need for farmers to be sure where they put their time and energy. Aquaculture has to blend with their lifestyle in order to be sustained.

42. In relation to aquatic biosecurity regional arrangements, SPC advised that it will be seeking the support of other agencies to join SPC in a subregional meeting to develop a roadmap for aquatic biosecurity, including needed infrastructure and facilities to implement. In the meantime, an inventory of capacities will be compiled. FAO noted that it can provide assistance in this area if it is a regional priority and governments request it.

43. Mr Jacques Patrois and Dr Tim Pickering (SPC) presented a status and analysis of progress in shrimp aquaculture in the PICTs. The issue is to determine how other PICTs can best learn from those that are successful and what regional support should be given to shrimp aquaculture. Shrimp industries in New Caledonia, Guam, Commonwealth of the Northern Mariana Islands, French Polynesia, Fiji and Vanuatu were described and a number of critical success factors identified.

44. These factors relate to the use of captive/domesticated broodstock, biosecurity, stock intensification and economic viability. Successful on-going production have domesticated broodstocks (combination of local or imported species which were maintained as captive broodstock) to ensure good supply of post larvae (PLs). Sufficient investment and hatchery capacity for captive brooders and well-trained personnel are essential. It was pointed out that, even if it were possible to have captive brooders, it may well not be viable to set up an industry if the industry required continuing subsidy. Finally, regional cooperation has much to offer particularly in capacity building. Increasing the capacity of biosecurity measures, providing strong economic and technical analysis and advice to modernise the culture systems will increase production efficiency and competitiveness.

45. Biosecurity remains a challenge. Disease in shrimp is a major threat; FAO alerts included the recent outbreak of an unknown disease in Viet Nam affecting *Penaeus monodon* and *Litopenaeus vannamei*, the cause or causes of which are yet unknown. The Infectious Myonecrosis Virus (IMNV) in Indonesia might have been brought in from specific pathogen free (SPF) imports from Brazil. Further, the white spot virus (WSV) disease is now present in Mozambique shrimp, an indication of its rapid spread and global threat. It is critical to have the appropriate biosecurity measures backed by regulation and good management practices.

46. Lessons from the New Caledonian experience include the importance of undertaking marketing studies to decide what each market demands, e.g. red-legged prawns for Australia and white prawns for Japan, before selecting species for farming. There is also a need to remain adaptive to the market; marketing strategies should be updated at least every five years. Given the high cost of SPF PLs, closed systems are likely to be necessary, and genetic variability will be an ongoing challenge for Pacific aquaculture.

47. Other issues raised during the discussion include the need for market studies (to know which products are demanded by the market, dynamism of the market requiring constant revision of plans and production, as well as marketing strategies). The need for highly skilled scientific and technical support

for the industry and assistance to producers to get over the crisis and to compete in the world market were likewise highlighted.

48. Mr Paul Ryan (VOG) presented tilapia production in Vanuatu. Market identification, selection of cage culture through pilot trials and readily available stock, equipment, and locally produced feed ingredients, combined with the support of government, were the requisites to establishing a viable enterprise.

49. Development issues included delays in import protocols and permission to develop breeding facilities, staff skills, costs associated with the remote location, and nuisance species. Over time, the business successfully adapted to tackle these challenges including the development and implementation of staff training, putting up good farm infrastructure, implementation of promotional activities, bulk importation of seed as well as feed, and the production of local feed.

50. Recommendations for other similar operations in the Pacific included the importance of utilising probe on species and strains, methods of culture, production regime and suppliers. It is vital to match the scale of production with individual country demand, recognising tilapia as an inexpensive protein source. Finally, it is important to ensure a consistent and predictable supply to the market and to secure appropriate funding and knowledge to offset risks and implement contingency arrangements.

51. Ms Shamron Pickering (PS Ltd.) presented their experiences in seaweed production in Fiji. A locally owned company, PS Ltd, specializes in the production, first stage drying and export of tropical seaweed (*Eucheuma cottonii* or *Kappaphycus alvarezii*) for refinement into carrageenan. In addition to the development of new methods and techniques and improved strains, there are a number of other suggestions for improving the prospect of seaweed culture in Fiji. These include improvements and lower cost of inter-island shipping, post-harvest training to farmers, a change in mindset away from government dependence by producers, determination of the true market prices and government concessions including tax and duty exemptions.

52. The prospect of a regional processing plant to reduce costs and increase economic viability was raised. It was noted that a previous study had been done by the Fédération Française d'Aquaculture (FFA) which indicated that a relatively high threshold quantity is required to undertake primary processing. In addition, secondary processing is potentially polluting because of the chemicals used for extracting the colloid. It is believed that the volume of raw material needed for economic operation of a processing plant cannot be met by the current production levels from seaweed producing countries such as Fiji, Solomon Islands and Kiribati.

53. Dr Satya Nandlal (QUT) presented the outcomes and recommendations from two ACIAR projects, on the improvement of culture, stock quality and nutrition of freshwater prawn in Fiji and the assessment of genetic introgression in exotic culture stocks of tilapia in the Pacific. The outcomes included: quarantine facility built at Naduruloulou Research Station (NRS) in Fiji and three Asian giant freshwater prawn (GFP) strains were introduced and screened; GFP culture strains were introduced from Indonesia, Viet Nam and Malaysia; 12 experimental ponds were built at NRS; and training provided to NRS fisheries staff.

54. Relevant ACIAR projects were described including its fisheries programme projects in the Pacific, Papua New Guinea, Laos, Viet Nam and the Philippines. ACIAR's fisheries programme comprised of 30 projects covering capture fisheries (30 percent) and aquaculture (70 percent). The major goal of the programme was to improve the productivity and sustainability of fisheries and aquatic farming systems in partner countries and Australia through international research partnerships.

55. Mr Min Kuanhong (FFRC-China) introduced FFRC, its duties/programmes including aquaculture research, national education and international training and technology transfer and rural extension.

56. Mr Minoru Tamura (JICA) introduced JICA's cooperation programme on aquaculture development in the Pacific region by describing the various projects and programmes that JICA has implemented. He also explained the mechanisms for assistance which included technical cooperation (technical cooperation projects, development studies, providing long-term/short-term experts); training; grassroots technical cooperation; grants-in-aid and technical service of volunteer experts.

57. Mr Cletus Pita Oengpepa (WFC) introduced the lessons learned from projects undertaken in the Solomon Islands and its interest in future cooperation. Through an initiative funded by ACIAR, WFC will collaborate with Solomon's Ministry of Fisheries and Marine Resources and SPC to support the development of freshwater aquaculture with the aim of: identifying potential local fresh water and brackish water species (herbivorous/omnivorous); identify potential centers of production and work with communities in these areas to improve techniques in fish production for food security; improve technologies to suit local situation; strengthen freshwater aquaculture regulations; and facilitate training and capacity building within the fisheries sector.

58. Dr Jobert Toledo (SEAFDEC-AQD) introduced the Aquaculture Department's thematic programmes for 2011, which include quality seeds for sustainable aquaculture; healthy and wholesome aquaculture; meeting socio-economic challenges; maintaining environmental integrity through responsible aquaculture; and climate change in aquaculture.

59. Mr Jamie Whitford (ACIAR) described the pearl industry development in the Pacific Islands which supports the largest single aquaculture product in the Pacific. Fiji has a relatively well-developed and expanding industry with a good reputation for high quality pearls, close ties with local villages and a growing number of smaller operations. Research areas have included the disease and genetic implications of stock movements, adoption of contemporary culture methods, capacity building, branding and the development of handicraft opportunities. Tonga has adopted a different approach based on the winged oyster (*Pteria penguin*) which offers the opportunity for product diversification, quality improvement, and value adding for export.

60. Development will require a secure supply of oysters to produce quality products and adequate training and capacity building to support value adding and higher value products. Based on these opportunities and products, the project has developed a range of objectives including development planning, production and business capacity, product qualities and market structures. Further, the project builds on prior research, includes researchers from the region and involves SPC, the University of the South Pacific (USP) and the pearl industry.

Session 1.2 Thematic presentations

61. Dr Reantaso (FAO) in her presentation on biosecurity issues for sustainable aquaculture development explained biosecurity in aquaculture as a collective term referring to the concept of applying appropriate measures, e.g. proactive risk analysis, to reduce the probability of a biological organism or agent spreading to an individual, population or ecosystem, and to mitigate the adverse impacts that may result.

62. Various biosecurity issues facing aquaculture include transboundary aquatic animal diseases (TAADs); public health risks on the use of veterinary medicinal products; food safety and zoonoses (transmission between humans and animals); biological invasions; and climate change. Dr Reantaso's

presentation focused on the first two issues, namely TAADs and public health risks on the use of veterinary medicines.

63. Dr Reantaso concluded her presentation by citing the benefits of improved biosecurity such as its positive effect on animal and human health; a strategy to stimulate market supply and private investments; and an enabling environment that allows developing countries to efficiently grow more food (leading to increased income). The outlook for the sector including fisheries growth based on aquaculture was highlighted.

64. Dr Ruth Garcia Gomez (SPC) presented biodiversity issues for sustainable aquaculture with particular attention on the responsible use and control of introduced aquatic species. Maintaining biodiversity in ecosystems is essential in ensuring the world's food and agriculture production, including those from aquatic environments. Aquaculture is the fastest-growing animal food producing sector. While the benefits of this increase are well known, intensification of aquaculture may have undesirable impacts on the resilience of socio-ecological systems which, in turn, could undermine the productivity and sustainability of aquaculture sector growth.

65. The key drivers for species introductions are commercial/economic, ease of working with many introduced species, food security and rural development, and biological control. To minimise undesirable risks from the introduction of new species, information is key in reducing uncertainties and unknowns. SPC is able to provide a range of advice on request from the PICTs for information about the possible impacts of the introduction of aquatic fish species such as tilapia, cobia and fish and improved *Eucheuma* spp. strains.

66. Effective policies and plans are necessary to ensure responsible management of aquatic biodiversity particularly since the practice of using species outside their natural range to increase production or profitability can be expected to continue. It is thus necessary to assess the associated risks and benefits and as appropriate, develop and implement a plan for the responsible use of alien species rather than simply banning them. The establishment of a regional framework for management of aquatic biosecurity in support of sustainable aquaculture development could be a possible approach.

67. Answering a question regarding the protocol for reporting aquatic animal diseases to OIE, FAO said there is a standard procedure and obligation for OIE members to report to OIE the occurrence of any OIE-listed notifiable disease as well as any outbreak of diseases of aquatic animals; information on this is available on the OIE web site.

68. French Polynesia has been regularly reporting to OIE, and has established a monitoring system for pearl oyster and developed a special platform for aquatic animal health management. There are regulations to prohibit introduction of oysters from New Zealand, prohibit use of natural pearl nucleus material coming from outside and to protect shrimp brooders. It was noted that it would be more appropriate to develop biosecurity training in the region to reduce the need to send trainees to Australia or elsewhere.

69. Dr Ambekar Eknath (NACA) presented his view of networking to support sustainable aquaculture drawing from NACA's experience. After introducing NACA as an intergovernmental organization including its mandate, structure, history and major components, he described the organization's major work programmes, namely, sustainable farming systems, aquatic animal health, food safety and quality, genetics and biodiversity, and response to climate change. In addition there are two crosscutting programmes: education and training and communications.

70. The keys to NACA's success have been its being able to engage in a participatory way all stakeholders in the development and implementation of a regional work programme and having a large network of collaborating research centres throughout the region. Member governments address issues of common interest through consensus and collaboration. Lastly, it has an open philosophy of collaboration with external partners.

71. NACA is continually looking for ways to improve through greater ownership of its network and activities, a reduced dependence on donor funding, a better distribution of benefits, and attracting more experienced staff.

72. Since SPC is an associate member of NACA, there are a number of potential areas of collaboration including the transboundary movement of aquatic animals, disease surveillance and reporting, preparedness, conservation and sustainable use of genetic resources, impacts of climate change and training, education and study tours.

73. Mr Pedro B. Bueno (FAO Consultant) then presented the theme on «farmer clusters: their formation and management». Defining clusters as a group of farmers found within a given geographical area with a common water source, he then provided a number of reasons and benefits for forming clusters. There are economies of scale, stronger transaction power, and better compliance with regulations, standards, and voluntary management arrangements. The discussion arrived at a broad consensus that around 10–15 farmers would make an effective cluster and that clusters larger than this would be difficult to manage while smaller ones would be inefficient.

74. The adoption of best management practices (BMPs) has provided considerable benefits for aquaculture farmers in Southeast Asia. It has been found that better managed operations improve returns and fewer impacts, reduce environmental and social impacts, and increase profits. BMPs are also effective in reducing the risk of (e.g. in shrimp) health problems well as improve food safety and quality of products.

75. Clusters can exert greater influence on government decision-makers. Potential exists for the application of clusters in the Pacific among pearl farmers in Cook Islands, giant clam growers in Kiribati and RMI, shrimp farmers in New Caledonia and freshwater fish farmers in PNG and Fiji. In establishing clusters, it is important to give consideration to effective leadership, capacity building, and establishing effective contractual relationships between farmers and the hatcheries, feed and other input suppliers, processors/exporters and buyers.

76. Opportunities were explored, during the discussion, for fish farmers in PICTs learning from cluster operations in Southeast and South Asia and having some capacity building activities for cluster formation and management.

77. Mr Weimin Miao (FAO Regional Office for Asia and the Pacific) introduced the theme on aquaculture statistics and information for cultured species unique to the Pacific region. He described some important issues that need to be addressed in aquaculture statistics in the Pacific. These included capacity building in aquaculture statistics, collection and reporting (including the development of national data collection and reporting mechanisms and standards). Some discrepancies exist in the data, e.g. PNG's production level is considered to be under reported/estimated, seaweed production being reported in dry weight instead of live weight bracket; significant inconsistency in the records of French Polynesia in the FAO database with respect to pearl oyster shell quantity and value. Nine of the 15 species important for the Pacific Islands have achieved significant and steady growth globally – suggesting good potential for increased production of the species.