

PART 1

Report of the FAO Expert Workshop on Methods and Indicators for Evaluating the Contribution of Small-scale Aquaculture to Sustainable Rural Development

24–28 November 2008

Nha Trang, Viet Nam

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BACKGROUND

The contribution of small-scale aquaculture (SSA) to global aquaculture production as well as rural livelihood development is generally recognized.¹ These include providing livelihoods and income generating opportunities for rural communities, enhancing food security, improving social equity and enhancing the quality of life of rural poor communities.

In the past, a number of projects/studies² attempted to assess and review the current status of small-scale (or rural) aquaculture at the country level as well as the various issues (potential, limitations, constraints) affecting the sector. In addition, some methods/frameworks (e.g. rapid rural appraisal, participatory rural appraisal, impact assessment, etc.)³ for assessing the impact of small-scale rural aquaculture projects on poverty alleviation and food security, useful tools for sectoral planning and development, have been presented.

¹ FAO. 2002. "The role of aquaculture in rural development". Working Paper No. COFI:AQ/1/2002/3 prepared for the First Session of the Sub-Committee on Aquaculture, Beijing, China, 18-22 April 2002; IBRD/WB. 2007. Changing the face of the waters: The promise and challenge of sustainable aquaculture. The World Bank Agriculture and Rural Development Conference Edition. Washington, D.C. 163 pp.

² Edwards, P. and Demaine, H. 1997. Rural aquaculture: overview and framework for country reviews. RAP Publications 1999/36. Regional Office for Asia and the Pacific. FAO, Bangkok, Thailand. 61 pp.; Edwards, P., Little, D.C. and Demaine, H. (eds.). 2002. Rural aquaculture. UK: CABI Publishing. 358 p.; Halwart, M., Kuman, D. and Bondad-Reantaso M.G. (comps). 2005. Papers presented at the FAO/NACA Consultation on Aquaculture for Sustainable Rural Development, Chiang Rai, Thailand. 29-31 March 1999. FAO Fisheries Report No. 611. Rome. FAO. 282 p.; Arthur, J.R., Phillips, M.J., Subasinghe, R.P., Bondad-Reantaso M.G. and MacRae, I.H. (eds.). Primary aquatic animal health care in rural, small-scale aquaculture development. Technical proceedings of the Asia Regional Socping Workshop. Dhaka, Bangladesh, 27-30 September 1999. FAO Fisheries Technical Paper No. 406. Rome, FAO. 2002. 382 p.; IBRD/WB. 2007. Changing the face of the waters: The promise and challenge of sustainable aquaculture. The World Bank Agriculture and Rural Development Conference Edition. Washington, D.C. 163p.; Bondad-Reantaso M.G. (ed.). 2007. Assessment of freshwater fish seed resources for sustainable aquaculture. FAO Fisheries Technical Paper No. 501. Rome, FAO. 628 p.

³ Townsley, P. 1996. Rapid rural appraisal, participatory rural appraisal and aquaculture. FAO Fisheries Technical Paper. No. 358. Rome, FAO. 109 pp.; Gupta, M.V. and Dey, M.M. 1999. A framework for assessing the impact of small-scale rural aquaculture projects on poverty alleviation and food security. FAO Aquaculture Newsletter (23): 22-25.

However, there has not been a systematic assessment of how much and how small-scale aquaculture is contributing to aquaculture and rural livelihood development. Assessment indicators will help measure the sector performance and will assist local, regional and national policy-makers to account for the level of performance of the sector (good or poor), understand the risks and the threats and thereby assist in determining appropriate interventions (e.g. highlighting the positive aspects, preventing or mitigating the negative aspects), and aid in setting priorities and allocating resources.

This project on Methods and Indicators for the Appraisal and Evaluation of the Contribution of Small-scale Aquaculture to Sustainable Rural Development is being carried out by the Aquaculture Management and Conservation Service (FIMA) of the Department of Fisheries and Aquaculture of the Food and Agriculture Organization of the United Nations (FAO) through a combination of commissioned thematic review papers, expert workshops and implementation of case studies.

The FAO Expert Workshop on Method and Indicators for Assessing the Contribution of Small-scale Aquaculture to Sustainable Rural Development was held from 24 to 28 November 2008 and hosted by the Nha Trang University. The outcomes of the expert workshop are highlighted in this report.

OPENING OF THE WORKSHOP

The workshop, moderated by Dr Huu Dung Nguyen of Nha Trang University (NTU), was officially opened by Prof. Mr Hoang Hoa Hong, Vice-Rector of the university. He appreciated FAO for the opportunity that it offered to the university to collaborate in the organization of the workshop. He said that the recent progress in Viet Nam aquaculture development, including the measures that it had taken to address the sustainability problems associated with its rather rapid growth, might be able to provide the expert meeting some instructive examples for its deliberations and recommendations.

Dr Melba G. Bondad-Reantaso, Fishery Resources Officer (Aquaculture), FIMA, welcomed the participants on behalf of FAO. She conveyed the appreciation of FAO's Department of Fisheries and Aquaculture to the Government of Viet Nam and the Nha Trang University for hosting the workshop and to the participants for their time and contributions. She briefly described the background and explained the purpose of the workshop.

The participating experts provided a short self-introduction of their current affiliations, responsibilities and interest in the subject of the workshop.

PURPOSE OF THE WORKSHOP

The aim of the expert workshop was three-fold: (i) to better understand small-scale aquaculture (SSA) and their contribution to rural development; (ii) develop a list of indicators and a procedure to measure the contributions; and (iii) develop the steps that will test the validity and the suitability of indicators through case study concepts.

The expert workshop agenda is attached as Appendix 1.

WORKSHOP PARTICIPATION

The workshop was provided technical guidance by a Project Team consisting of three FAO professional staff members. A total of twenty experts whose fields of expertise or disciplinary specializations include aquaculture, aquatic animal health, ecology, sociology, human geography, law, economics and information participated in the expert workshop. The list of participants and expert profile are presented as Appendixes 2 and 3, respectively.

WORKSHOP PROCESS

The workshop was divided into three sessions, namely: Session 1 – Setting the scene; Session 2 – Preparation of an indicator system for measuring the contribution of SSAs; and Session 3 – Preparation of case study concepts. Each session, with an elected Chairperson and Rapporteur, had a specific objective and expected outcomes. Each session was followed by working group break-out sessions (with same or multiple tasks) and a presentation. A plenary concluding session presented the achievements and conclusions of the workshop and the way forward.

WORKSHOP HIGHLIGHTS

Technical sessions

Session 1

Eleven papers (commissioned and contributed papers) were presented in plenary to achieve the objective of Session 1 of setting the scene in order to have a broader understanding of the general concepts and principles of sustainability, indicators and sustainable development indicators (SDI), SSA and sustainable livelihoods (SL) and broad considerations concerning the application of sustainability indicators to SSA (general principles, context, terminologies, and scale of operation).

Dr Victoria Espaldon, in her presentation on “Key concepts and principles in developing indicators for sustainable rural development” (i) reviewed the following concepts: sustainable development and how they have developed; sustainable development indicators (SDI), system and trends, how they are approached in theory and practice; (ii) reflected on the various SDI systems; and (iii) offered a set of options for developing an SDI system for sustainable rural development (SRD). She concluded her presentation with an emphasis on the definition of sustainable development according to the Brundt Report which sought to address the twin concerns of development and environment. SDI is part and parcel of ensuring the right path of sustainability which is anchored on three pillars of sustainable development, i.e. economic, social and environmental – three pillars which cannot be separated and must be taken as a whole.

Dr Harvey Demaine, in his presentation on “Rural aquaculture: reflections ten years on” reviewed the experience which led to views expressed in a previous FAO monograph on rural aquaculture ten years on. The presentation revisited the definition of rural aquaculture and classifications of SSA set against those outlined in the monograph. Experiences from two projects, the Aqua Outreach Programme of the Asian Institute of Technology in mainland Southeast Asia and the Greater Noakhali Aquaculture Extension Project and its successor, the Regional Fisheries and Livestock Development Project in Bangladesh – illustrated the nature of the farming systems approach advocated in the FAO monograph at two levels: the farm system and the wider regional support system. The presentation was concluded with a brief discussion of the implications for methods and indicators for assessing the contribution of rural aquaculture in SRD, stressing the importance of measuring human and institutional capacity.

Dr Premachandra Wattage, in his presentation on “MDGs and aquaculture: indicators to evaluate the conservation of resource base for poverty reduction” emphasized the role of environmental sustainability as the foundation on which strategies for achieving all Millennium Development Goals (MDGs). Environmental degradation is causally linked to problems of poverty, hunger, gender inequality and health. Therefore, protecting and managing the natural resource base that supports

aquaculture is essential for economic and social development in rural Asia. As well, integrating the principles and practices of environmental sustainability into country policies and planning programmes are key to successful poverty reduction strategies. The presentation provided some suggestions on methods and approaches (e.g. benefit assessment methods) to identify and quantify the environmental and socio-economic values of aquaculture measurements which could be used to develop indices for evaluating performance.

Dr Curtis Jolly, in his presentation on “Small-scale aquaculture: a fantasy or economic opportunity”, presented doubts and questions concerning the contribution of SSA to economic development despite its obvious contribution to local protein consumption in developing countries. He reported that attempts to measure societal and economic values of SSA have mixed results. Uncertainties have been raised concerning the actual contribution and the measures used. He emphasized the need for the use of more holistic approach using participatory methods and that measures of economic, social and environmental evaluation, while considered useful, are not universal. He used a specific example (smoked catfish in the United States of America) to demonstrate that measures are appropriate when examined in a dynamic setting.

Drs Susana Siar and Percy Sajise in their presentation on “Access rights for sustainable small-scale aquaculture and rural development” examined the resources under different property regimes (communal, private, state-property, open access) that SSA use. Close scrutiny of access rights to resources and assets will help analyse what is needed to support their sustainability. The Sustainable Livelihoods (SL) framework is a useful tool which provides an understanding as to why and how small-scale aquaculturists do what they do to generate income, create livelihoods for food security and improve their well-being. The presentation was concluded with a statement that following the SL and rural sustainability frameworks, access to the resource base is a necessary condition to enhance sustainability; however, it is not a sufficient condition by itself.

Dr Le Xuan Sinh, in his presentation on “Social impacts of coastal aquaculture in the Mekong Delta” presented the important positive impacts of coastal aquaculture in terms of improving household income which lead to better opportunities for education, health care and entertainment to communities, improvement in the status of women and children and decrease in conflicts at both family and community levels. However, the sector also faces a number of risks due to many factors such as low profits and other social impacts. The presentation provided perspective on how improving and strengthening linkages among relevant stakeholders through appropriate planning and organization at village and district levels in association with availability and suitability of investment and support from both public and private sectors can be used for long-term development of coastal aquaculture in the Mekong Delta.

Dr Mark Prein, in his presentation on “Assessment of aquaculture adoption by smallholder farms using sustainability indicators”, presented the rationale for, and the mechanics within, an approach to introducing integrated agriculture-aquaculture (IAA) for smallholder farm development and for measuring the impact on whole farms using a standardized tool package that was first developed at ICLARM (now the WorldFish Center) since the early 1990s termed RESTORE. A systems approach is used, going far beyond the simple unidirectional link, e.g. from livestock manure to a fish pond. It is a participatory process involving the entire smallholder farming system with its natural resources, probing farmers about opportunities for diversification of enterprises and

subsequently about possible integration linkages involving recycling flows suitable to their context, both on-farm and between-farms. It is hypothesized that integrated smallholder farming systems which have an aquaculture component and reuse unused waste materials are more sustainable than less-integrated or monoculture-dominated ones. With the research tool, the farm household is accompanied over several years and whole-farm data is collected and analysed, producing economic and biological performance metrics and a set of sustainability indicators, for interannual and between-farm comparisons. The impact assessment tool has been applied in numerous countries in Asia, Africa and Latin America, and over a range of farming systems and farmer livelihoods contexts, from which experiences were presented.

Mr Alvin Morales, in his presentation on “Special evaluation study of small-scale freshwater aquaculture development for poverty reduction”, reported on the outcomes and recommendations of a special evaluation study (SES) conducted by the Asian Development Bank (ADB) based on case studies in Bangladesh, the Philippines and Thailand as well as lessons and experiences drawn from evaluation of ADB-financed operations in freshwater aquaculture development. The SES recognized the importance of access to capital assets in five dimensions (human, social, natural, physical and financial capitals), and key transforming processes, including (i) markets; (ii) public and private institutions; (iii) facilities, infrastructure and services; (iv) legal framework and development policies; (v) aquatic resources management and the environment; and (vi) various safeguards, including biosafety and aquatic health. The SES also recognized seasonality, shocks and trends that influence outcomes.

Dr Nathanael Hishamunda, in his presentation on “Summary of the FAO Expert Consultation on Socio-economic Impacts of Aquaculture: Identification and Assessment Methods” highlighted the major outcomes of this expert consultation held from 4 to 8 February 2008 in Ankara, Turkey. The positive and negative impacts of aquaculture include those on land and land-based habitats, water and wild species, the downstream and upstream industries of aquaculture, infrastructure, incomes, employment, food supply, food quality and safety, food access, food stability, human health, education and training, population and demography, and community and social order. The consultation emphasized that these impacts have profound interdependence and socio-economic implications which make the task of assessing them challenging. The consultation identified a number of potentially useful measurement techniques such as Multi-Criteria Decision-making (MCDM), Analytical Hierarchy Process (AHP), Cost-Benefit Analysis (CBA).

Dr Victoria Espaldon, in her presentation on “Theory and practice of sustainable livelihood development” provided a historical account of the origins of the concept of SL from community development theories to ecosystem approach. The livelihood approach framework was fully elaborated in terms of principles, features and characteristics. A very important consideration of the SL approach is the vulnerability context, e.g. shocks, trends and seasonality which are beyond the control of households, and which are influenced by the transforming structures and processes. The presentation provided examples of application to recent approaches to SRD especially in the agriculture and forestry sectors as well as recent endeavours of converging these concepts with natural resources management. Examples from national and local programmes for rural development were provided.

Although not included in the original agenda, Dr Flavio Corsin made a brief presentation on “Indicators and standards for responsible aquaculture production”,

which described the processes involved in roundtable discussions called Aquaculture Dialogues, used by the World Wide Fund for Nature as a way of involving the various aquaculture stakeholders such as farmers, retailers, non-governmental organizations, scientists and others in developing indicators and standards for responsible aquaculture.

Following the above technical presentations, the experts were divided into two working groups which tackled terminologies and general principles concerning sustainability, indicators and SSA. The outcomes of Session 1 are described in detail in the following sections.

Session 2

Mr Pedro Bueno, in his presentation on “Indicators of sustainable small-scale aquaculture development” proposed and described indicators of a sustainable SSA farm system under the three broad goals of economic viability, social responsibility and environmental sustainability and linked with the fundamental goals of a farmer, which are higher yields, lower cost, better economic returns and less risk. The sustainable livelihoods approach (SLA) framework was used as the basis for developing the sustainability indicators for small farms. A list of possible measurement and data sources for each proposed indicator was provided. The presentation emphasized that sustainability indicators provide a holistic view and understanding of the sustainability of an entity such as a farm, a farming community or a commodity industry sector and therefore can guide an integrated approach to problem solving and aid a holistic policy and development planning approach focused on SSA.

The above commissioned paper, complemented by other background papers and, informed by the wide range of disciplinary specializations of experts, became the basis for deliberation during Session 2 whose objective was to draw a list of indicators to assess the contribution of SSA to SRD. As in Session 1 experts were divided into two working groups to develop the indicator system that will measure the contribution of SSA to SRD. The outcomes of Session 2 deliberations are presented in the section below.

Working group sessions

Session 1

Session 1 whose objective was to set the scene of the workshop, used 11 presentations which prepared the participants for sessions 2 and 3. Session 1 reviewed key concepts, principles and definitions pertaining to sustainability, indicators, sustainable development indicators, sustainable livelihoods, poverty and resilience.

A major outcome was characterization of the various features (through examples of positive contribution and negative impacts) of SSA and an agreed working definition based on scope, scale (typology), objectives and characteristics, as follows:

Small-scale aquaculture (SSA) is a continuum of:

- 1) systems involving limited investment in assets, some small investment in operational costs, including largely family labour and in which aquaculture is just one of several enterprises (known in earlier classifications as Type I or rural aquaculture); and*
- 2) systems in which aquaculture is the principal source of livelihood, in which the operator has invested substantial livelihood assets in terms of time, labour, infrastructure and capital (this was labeled as Type II SSA system).*

Session 1 also deliberated on a number of terminologies and some considerations in their definitions and developed some guiding principles for sustainable aquaculture development as relevant to SSA in terms of goals, context, sustainability and measure of success.

Session 2

The main outcome of Session 2 was the development of an indicator system that will measure the contribution of SSA to SRD. The process and the series of steps used in the development of the indicator system was an important achievement of the workshop. These steps include: (1) understanding the subject of measurement; (2) identifying an analytical framework; (3) developing a list of contributions of SSAs; (4) categorizing the contributions; (5) devising the indicators of contribution; and (6) measuring the indicators.

The sustainable livelihood approach (SLA) was selected as the appropriate analytical framework that can guide the development of the indicator system. The SLA reflects the primary objective of an SSA system which is to balance the use and/or build up of the five livelihood assets (natural, physical, human, financial and social) so that the system continues to enjoy the flow of services and benefits from these assets. Only if it is sustainable itself can SSA contribute to sustainable aquaculture and rural development.

The SLA model enables a clear classification of the elements of a farming system that should be measured. It also shows the linkages and interactions of these elements and how these interactions could make or break the sustainability of the system. This holistic perspective that it gives is useful to development planning; it enables systematic rather than piecemeal problem diagnosis and therefore also a systematic development of a solution.

Using the SLA framework and the modified SMART (specific, measurable, attainable, relevant and timely) criteria using only accurate, measurable and efficient (AME), the experts narrowed down to some 20, from a freelisting of some 50, indicators which were deemed appropriate to assess the contribution of SSA to sustainable rural development.

The experts agreed by consensus that the 20 potential indicators include: (1) flows/enterprises; (2) off-farm nutrient use/farm products (input/output ratio); (3) enterprises' contribution to cash income; (4) productive use of pond water; (5) return to land capital and labour; trends in physical asset used for SSA; (6) income from SSA and derived from SSA; (7) SSA contribution to GDP; (8) farmers who are members of active farmer associations or community organizations, (9) household consumption of fish; (10) seasonal distribution of fish consumption; (11) women access to resources and benefits of SSA; (12) women engaged willingly and as active decision-makers in SSA (including post-harvesting); (13) batch testing for banned chemicals or poor quality aquatic products aquatic; (14) farmers adopting Better Management Practices (BMPs); (15) farmers involved in traceability system; (16) export earnings; (17) employment generation; (18) disease; (19) vulnerability; and (20) resource use conflicts.

The experts recommended that the indicator list be further developed after the workshop and elaborated to include a detailed description as well as information on its importance and relation to sustainability, what it measures and how it can be measured based on workshop discussions (see Bondad-Reantaso *et al.*, 2009, this volume).

Session 3

The outputs from Session 3 include: (i) development of generic survey design table of contents to include background, objectives, methodology, results, analysis, conclusions, recommendations on the adoption of indicators and future work; and (ii) approaches and criteria to identify and select the SSA systems and the possible sites for the pilot tests.

Through intensive working group discussions, the workshop came up with a short list of potential SSAs which may be considered for pilot testing of the indicators. These include the following:

Philippines

- tilapia cage culture
- seaweed culture

Thailand

- *Clarias* sp. pond culture
- Mixed finfish species culture in trench (orchards and gardens)

Indonesia

- shrimp culture in ponds

Bangladesh

- rice-freshwater prawn-carps, vegetables
- rice-fish rotational systems in seasonally flooded rice fields

Viet Nam

- lobster cage culture
- marine finfish and penaeid shrimp integrated farming
- pond/orchard ditch; rice-fish/shrimp
- small scale pond (shrimp and others)
- mud-flat culture of mollusc
- *Pangasius* sp. culture

WORKSHOP OUTCOMES

The detailed outcomes of the workshop will be presented in the FAO Fisheries and Aquaculture Technical Paper No. 534, which will contain the following: (i) Workshop report (this document); (ii) 10 technical papers (commissioned and contributed papers presented during the workshop) and an additional paper which provides a detailed account of the processes undertaken in the development of an indicator system to measure the contribution of SSA to SRD.

CONCLUSION AND THE WAY FORWARD

The final plenary session summarized the achievements (Table 1) of the workshop and recommended measures (Table 2) to carry forward the initiative, as follows:

TABLE 1
Summary of outputs

Session	Objectives	Outcomes
1	Setting the scene	<ul style="list-style-type: none"> • Considerations of terminologies • Definition of small scale aquaculture (SSA) • General principles for developing small-scale aquaculture in the context of sustainable rural development (SRD)
2	Indicator system to measure contribution of SSA to sustainable rural development	<ul style="list-style-type: none"> • Framework for measuring the contribution of SSA to sustainable rural development with the sustainable livelihood approach (asset pentagon) as the analytical framework and the 3 pillars of sustainable development, namely, economic, social and environmental, as the overarching objectives. • An initial free listing of over 50 indicators • Criteria for evaluating good indicators with the revised SMART criteria (AME - Accuracy, Measurability, Efficiency) • Shortlisting of indicators to 20; with 15 receiving consensus and 5 under consideration.
3	Country case study concepts	<ul style="list-style-type: none"> • Broad outline and a generic guideline for the pilot study (Session 3 Group 1) • Detailed information for a pilot study in Viet Nam (Session 3 Group 2)

TABLE 2

Recommended measures to follow up the expert consultation with provisional schedule and designated focal points of responsibility for specific actions

Activity	Target time-frame	Responsibility
General Survey Questionnaires (general guiding questions pertaining to the indicators to be tested; specific example of more detailed questions based on Thailand case study)	Third week of January 2009 (for circulation)	FAO with inputs from participants
Finalize survey questionnaires and methods for selected countries agreed by commissioned authors through e-mail correspondence	Mid-February 2009	FAO and commissioned authors
Workshop Report	End of 2009	FIMA
Fisheries and Aquaculture Technical Paper 11 papers	End of 2009	Secretariat, contributors Espaldon, Bueno, Siar, Demaine, Sinh, Corsin, Curtis, Siar, Prein, Wattage
Pilot testing of case studies	First half of 2009 Selected countries	Contracts for the studies
Follow-up Workshop: • presentation of outcomes of pilot test • validation and cross country analysis • refining • replication of case studies to selected regions (Asia, Latin America, Africa??)	Third to fourth quarters of 2009	FAO/experts
Submission of outcomes for information and/or consideration during COFI/SCAV/Millennium+10 global conference	2009–2010	FAO
Additional information for an improved aquaculture data collection	To be presented to CWP	FAO

CLOSING OF THE WORKSHOP

The closing activity was held on the morning of Friday 28 November. The planned field trip to aquaculture projects and farms was cancelled because of a very adverse weather system that made it hazardous to undertake the visits.

A vote of thanks by FAO and the participants was given to NTU, especially to Dr Huu Dung Nguyen and the secretariat staff for the efficient organization of the consultation and the warm hospitality accorded to the participants. FAO thanked the participants for their valuable contributions to the consultation. FAO assured that in view of the high priority that the governments have given to the sustainable development of SSAs, it shall endeavour to find the resources to carry out the pilot projects. Many of the experts appreciated the stimulating discussions from the multidisciplinary group that was assembled for the workshop.

Appendixes

APPENDIX 1 EXPERT WORKSHOP AGENDA

Date and time	Activities
23 November, Sunday: Arrival of participants	
24 November, Monday	
09.00–09.30	Registration
09.30–10.00	Welcome address from Vice-Rector of Nha Trang University (Prof Mr Hoang Hoa Hong) Opening remarks from FAO (Dr Melba G. Bondad-Reantaso) Self-introduction of participants (Moderator: Dr Huu Dung Nguyen)
10.00–10.20	Coffee break
10.20–10.45	Workshop objectives (Dr Melba G. Bondad-Reantaso, FAO) Election of session Chairs (3) and Rapporteurs (3)
	Introduction to Session 1 Objectives of the session – To set the scene of the workshop Expected outcomes of the session – Broader understanding of the general concepts and principles of sustainability, indicators and sustainability indicators, small-scale aquaculture and sustainable livelihoods – Broad considerations concerning the application of sustainability indicators to small-scale aquaculture (general principles, context, terminologies, scale of application, others)
10:45–11:30	Presentation 1: Key concepts and principles in developing indicators (SDI) for sustainable rural development (Dr Victoria Espaldon)
11.30–12.00	Presentation 2: Rural aquaculture: Reflections 10 years on (Dr Harvey Demaine)
12.00–12.20	Presentation 3: Millennium Development Goals and aquaculture (Dr Premachandra Wattage)
12.20–12.40	Presentation 4: Small-scale aquaculture: a fantasy or economic opportunity (Dr Curtis Jolly)
12.40–13.00	Presentation 5: Access rights for sustainable small-scale aquaculture and rural development: Is it a sufficient requirement? (Dr Susana V. Siar)
13.00–14.30	Lunch break

14.30–14.50	Presentation 6: Social impacts of coastal aquaculture in the Mekong Delta – Viet Nam (Dr Le Xuan Sinh)
14.50–15.10	Presentation 7: Assessment of aquaculture adoption by smallholder farms using sustainability indicators (Dr Mark Prein)
15.10–15.30	Presentation 8: An evaluation of small-scale freshwater rural aquaculture development for poverty reduction: an ADB special evaluation study (Mr Alvin Morales)
15.30–15.50	Presentation 9: Summary of the FAO Expert Consultation on Socioeconomic Impacts of Aquaculture: Identification and Assessment Methods (Dr Nathanael Hishamunda)
15.50–15.35	Presentation 10: Theory and practice of sustainable livelihoods development (Dr Victoria Espaldon)
15.35–16.00	Coffee Break
16:00–16.45	Discussion
16.45–17.00	Session 1 Working Group guidelines
25 November, Tuesday	
08.30–10.00	Session 1: Working Group discussion
10.00–10.30	Coffee Break
10.30–11.30	Session 1: Working Group discussion
11.30–12.00	Session 1: Working Group presentation
12.00–12.30	Conclusions and recommendations of Session 1
12.30–14.00	Lunch break
14.00–14.15	Introduction to Session 2
	Objectives of the session: – To review the working document on sustainability indicators for small-scale aquaculture Expected outcome of the session: – A list of sustainable development to assess the contribution of small-scale aquaculture to sustainable aquaculture and to rural livelihood development
14.15–15.00	Presentation 11: Indicators of sustainable small-scale aquaculture development (Mr Pedro Bueno)
15.00–15.30	Discussion
15.30–15.45	Session 2: Working Group Guidelines
15.45–16.15	Coffee break
16.15–17.45	Session 2: Working Group Discussions
19.00	Dinner
26 November, Wednesday	
08:30–10.00	Session 2: Working Group Discussions (continued)
10.00–10.30	Coffee break
10.30–11.30	Session 2: Working Group Progress Presentation and Discussion
11.30–13.00	Session 2: Working Group Discussions (continued)
13.00–14.30	Lunch break
14.30–15.30	Session 2: Working Group Discussions (continued)
15.30–16.00	Coffee break
16.00–17.30	Working Group final presentations and discussion

27 November, Thursday	
08.30–08.45	Conclusions and recommendations of Session 2
08.45–09.00	Introduction to Session 3
	Objectives of the session: – To prepare case study concepts considering the agreed scales of small-scale aquaculture Expected output of the session: – 3-4 case study concepts
09.00–12.00	Working Group discussions (Case study concepts)
12.00–13.30	Lunch break
13.30–18.00	Field trip
28 November, Friday	
08.30–10.00	Working Group discussions (Case study concepts) and preparation of presentations
10.00–10.30	Coffee break
10.30–11.30	Presentation of case study concepts
11.30–12.30	Discussion Conclusions and recommendations of Session 3
12.30–16.00	Lunch break/Free time
16.00–17.00	Presentation of the outcomes of the workshop/core messages Presentation of follow-up actions
17.00–17.30	Closing ceremonies

APPENDIX 2 LIST OF PARTICIPANTS

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APPENDIX 3 EXPERT PROFILE

BOSMA, Roel (Mr). Project Manager INREF-POND (Livestock Research for Development), Aquaculture and Fisheries Group, AFI, Department of Animal Sciences, Wageningen University. Graduated MSc in Tropical Animal Husbandry (1979) and PhD in Animal Sciences (2007) both at Wageningen University (WU). From 1980 to 1999, he was active in livestock research system research, university education, farmer's training and rural development in Burkina Faso, Ivory Coast and Mali. From 2000 to 2005, he assisted in the development of new courses at WU, assessed the benefits of new forage technologies in Indonesia, Philippines and Viet Nam, and evaluated EU-funded livestock research programme in six West African countries. Since 2003, he is research/project-manager at the Aquaculture and Fisheries group of WU and is involved in coastal zone management, sustainable aquaculture, environmental impact analysis and institutional capacity development, for which he travels frequently to Benin, Indonesia, Philippines, Thailand and Viet Nam. He acquired experience in participatory research and development programmes and project management. His main research interest is in integrated production systems and in motives of farmers and fishermen to comply with the certification criteria for social, economic and ecological sustainability.

BRIONES, Roehlano (Mr). Senior Research Fellow, Philippine Institute for Development Studies (PIDS). Economist, experienced in research and consultancy. Track record in international peer-reviewed publications. Expertise in rural development, impact assessment, economics of agriculture and natural resources. Specializes in policy evaluation, modeling, econometrics. BSc, MSc and PhD degrees in economics from the University of the Philippines.

BUENO, Pedro (Mr). Retired NACA Director-General. Former director general of NACA (2001–2006), former information specialist of the UNDP/FAO NACA Project and Regional Seafarming Development Project (1987–1991) and the NACA Organization (1992–2000). Was assistant scientist working in farming systems socio-economics research and training at the International Rice Research Institute (1984–1987), communications specialist or manager of SEARCA, SEAFDEC Aquaculture Development, technical services manager and researcher of the Forest Research Institute, Philippines (now ERDB), programme specialist (for Socio-economics) and Information Specialist under the Technical Services Division of the Philippine Council for Agricultural Research and Resources Development, faculty member of the University of the Philippines at Los Baños and visiting lecturer in communications at the Institute of Mass Communications University of the Philippines and the UP Visayas (1966–1987). Had been consultant in information, rural development, aquaculture development and management, aquaculture network development, and training in rural development for ADB, FAO, NACA, UNDP/UNOPS, UNESCO and the World Bank. Now a free lance worker in aquaculture and rural development, based on Bangkok. Had worked in Uzbekistan, Eritrea, Aceh in Indonesia, Malaysia and Myanmar.

CORSIN, Flavio (Mr). Senior Aquaculture Advisor, WWF. Sustainable aquaculture and aquatic animal health specialist, coordinating aquaculture activities for WWF in Viet Nam and supporting sustainable aquaculture initiatives for a wide range of international organizations. Graduated with a M.Sc. in Aquaculture from the University of Stirling, he initiated a Ph.D. in aquatic epidemiology with the University of Liverpool with research in rural areas in Viet Nam and India. He conducted post-doctoral research in

North Carolina State University, United States of America, before deciding to move to a more applied and development-oriented position. Worked for NACA for 3 years, during which he coordinated several projects aimed at developing, disseminating and implementing strategies for sustainable aquaculture development in Viet Nam, Iran, Indonesia and other Asia-Pacific countries. He is currently playing an active role in reviewing aquaculture certification schemes and in developing standards for sustainable aquaculture. Member of the OIE ad hoc group on aquatic surveillance he also supports several FAO activities aimed at controlling aquatic animal epidemics and at improving the sustainability of the aquaculture sector in Asian and African countries. He is also involved in supporting the development of sustainability strategies for several governments and in reviewing fish welfare issues for the European Food Safety Authority.

DEMAINE, Harvey (Mr). Senior Advisor, Regional Fisheries and Livestock Development Project, Noakhali Component, Agricultural Sector Programme Support, Danida, Bangladesh. Harvey Demaine holds a Ph.D. degree in Agricultural Geography from the School of Oriental and African Studies, University of London. He has worked in agricultural, rural and regional development planning and management in Southeast and South Asia since 1971. He has been involved in small-scale aquaculture development since 1988, initially as socio-economist, then as coordinator of Asian Institute of Technology's Aqua Outreach programme in mainland Southeast Asia. He is the co-author and co-editor of a FAO monograph and collection of papers on "Rural Aquaculture". For the last five years he has been involved in DANIDA's Agricultural Sector Programme Support in Noakhali, Bangladesh, searching for a sustainable model for aquaculture and animal husbandry development for the rural poor. This has involved a major thrust in small-scale freshwater prawn culture.

GRIFFITHS, Don (Mr). Senior Aquaculture Adviser (Danida), Ministry of Agriculture and Rural Development (MARD). Has over 25 years experience in fresh, brackish and marine aquaculture development and extension primarily in Asia (Bangladesh, Cambodia, India, Lao PDR, Malaysia, Thailand, Viet Nam), but also Fiji, Lesotho and Mozambique, working for a variety of donor agencies including Overseas Development Agency (ODA), United Kingdom Department for International Development (DFID), Danida, United States Agency for International Development (USAID), the European Union (EU) and Mekong River Commission. Currently working as the Senior Advisor for the Government of Viet Nam-DANIDA funded Sustainable Development of Aquaculture (SUDA) component under the Fisheries Sector Programme Support Phase II (FSPS II). FSPS II runs to end of 2010.

HANH, Chau Thi Tuyet (Mr). Government officer, Aquaculture Department – Viet Nam's Ministry of Agriculture and Rural Development. Focal point for sustainable development of aquaculture. With Master in Aquaculture degree from Wageningen University (1999–2001). Lecturer and researcher of aquaculture faculty (Hue University of Agriculture and Forestry, 1994–2006) and consultant for Center for Rural Development in central Viet Nam. Participated in many development projects funded by IDRC-Canada, IMOLA, WB, DANIDA. Interest and expertise on community-based coastal management, livelihood analysis, and participatory researches.

JOLLY, Curtis (Mr). Professor and Chair, Agricultural Economics of the Department of Agricultural Economics and Rural Sociology, Auburn University. Before assuming the position of chair of his department he was assistant, associate and full professor in the department where he conducted research and taught in the areas of Economics of Aquaculture, International Trade and Development. He has published a number of scientific journal articles on aquaculture and trade and he is the co-author of the

book on the Economics of Aquaculture. Dr. Jolly has worked in over 15 African and Caribbean countries on various projects. Dr. Jolly served as advisor of the director of the Institut sénégalais de recherche agricole from 1982 to 1985 and as Farming Systems Economist at the Institut de l'économie rurale in Mali from 1985 to 1986. He works in the areas of Economics of Aquaculture, Agricultural Marketing, Agricultural Trade, and Project Planning and Sector Analysis. Recently he has concentrated his efforts on studying the effects of aflatoxin on the marketing of peanuts in Ghana and Benin. He is the member of the Board of Directors of the Auburn University Credit Union, and he has received a number of awards for his work on research and teaching.

MORALES, Alvin. Evaluation Officer, Operations Evaluation Department of the Asian Development Bank (ADB). He obtained his BS and MS degrees in Agricultural Economics from the University of the Philippines. He also earned a post-graduate degree (Master in Development Planning) from the University of Queensland, Australia. Prior to joining ADB, Mr Morales was engaged in research and consulting work for projects funded by various bilateral and multilateral donor agencies. The projects were mostly related to natural resources and fisheries economics. His current involvement includes the conduct of evaluations of ADB projects on agriculture, natural resources, and water supply and sanitation.

NGUYEN, Lam Anh (Mr). Lecturer, Faculty of Aquaculture, Nha Trang University. MSc in Aquaculture and Aquatic Resource Management from Asian Institute of Technology (AIT), Thailand. Eighteen years experience as a researcher and lecturer of Nha Trang Institute of Oceanography, Research Institute of Marine Fisheries (Hai Phong) and Nha Trang University. Has been involved in a number of projects pertaining to aquatic resources management and aquaculture, including projects at international level such as DANIDA, SEAFDEC, NACA/FAO, UNU-FTP, and national, ministry and provincial levels. Two years (2000–2001) participation in the Working Group on Fisheries Policy in SEAFDEC Secretariat (Bangkok, Thailand) as a representative of Ministry of Fisheries of Viet Nam. Joined project of College of Agriculture and Forestry – Hue University/IDRC on environmental management of shrimp culture area based on local community at Ninh Thuan Province (2004-2005). Has gained significant knowledge and experiences with regard to seed supply network of freshwater fish species through a collaborative project with NACA/FAO on market chain of not-so-high value species in 2007.

NGUYEN, Thi Kim Anh (Mrs). Dean, Faculty of Fisheries Economics, Nha Trang University. Lecturer and researcher (1985–2003), senior lecturer from 2004, Vice Dean of the Faculty of Fisheries Economics (2003). Masters degree in Economics (Thesis: “The assessment of efficiency and economic performance of the small and medium scale enterprises: A case study in seafood processing industry, Nha Trang City, Khanh Hoa province, Viet Nam”, National University of Economics, Hanoi, 1995-1997). PhD degree in Economics (Thesis: “The economic strategies for seafood export industry of Khanh Hoa Province, Viet Nam”, National University of Economics, Hanoi, 2003). In addition, with relevant experience in rural development and community-based management for DANIDA, PACCOM. Worked on a number of development projects on fisheries and aquaculture management, marketing of agricultural and aquatic products.

NGUYEN, Thi Bich Thuy (Ms). In-charge of Information and International Cooperation, Research Institute for Aquaculture No. 3. Has 24 years experience in artificial rearing of crustacean seed and aquaculture research. Lead investigator of 16

larviculture, aquaculture and resource management projects, including 6 international projects with IFS, IDRC, DANIDA and ACIAR funding. Completed PhD and MSc theses on spiny lobsters in Viet Nam.

NGOC, Son Pham (Mr). Aquaculture Specialist, Department of Aquaculture, MARD, Viet Nam. With MSc degree in aquaculture. Served as lecturer from 1979 to 2002 at the University of Fisheries (Nha Trang University); extension staff of SUMA project in Nghe An Province from 2002 to 2005. Expertise include culture of *Macrobrachium rosenbergii*, *Penaeus monodon* and freshwater fish, participatory rural appraisal, project evaluation and monitoring, extension, training of trainees.

ORTEGA-ESPALDON, Victoria (Ms). Professor and Dean, School of Environmental Science and Management, University of the Philippines at Los Baños. With post graduate degree in Geography (PhD Geography (Rural Resource Assessment and Environmental Analysis) from the University of Guelph, Ontario, Canada through a fellowship grant of the Canadian International Development Agency (CIDA) and UPLB; a fellow of the Beahrs Environmental Leadership Program of the University of California Berkeley where a broad range of community and environment development theories and issues were staples of the training curriculum, including sustainable development indicators. Background degrees are MS Forestry (Social Forestry) and BS Biology (Program in Ecology) taken at the University of the Philippines Los Baños (UPLB). Natural interest in human-environment interactions and the promotion of human well-being through a framework of community participation and empowerment has taken her to various rural communities in Asia-Philippines, Viet Nam, Indonesia, Myanmar, Bhutan. Sustainable agriculture in the uplands became one of her professional engagements, working with international research institutions like IRRI and SEARCA; and directly with local communities upon request as part of the university's mandate to extend extension services. She is one of the pioneers in the literature of community based natural resources management in the early 1990s in the Philippines when this model was not that popular in the country. This commitment to engage communities in the determination of their own development path has led to her involvement in the study of sustainability of community based natural resource management approaches and related rural development programmes in the Philippines, Viet Nam, Myanmar, Bhutan and Indonesia. At present, she is a professor at and Dean of the School of Environmental Science and Management- UPLB. On top of her R&D activities, and administrative responsibilities, she continues to teach both graduate and undergraduate students in environmental science; and agricultural systems and extension.

PONGTHANAPANICH, Tipparat (Ms). Assistant Professor of the Department of Agriculture and Resource Economics, Faculty of Economics, Kasetsart University. Obtained a Ph.D. in Environmental Economics from University of Southern Denmark (SDU), where she also took part in teaching economics courses. Her recent publications in international journals include the application of Pigouvian tax on shrimp production and the effectiveness of infusing environmental responsibility in shrimp farming through voluntary and self-governance instruments. Her doctoral study focused on the development of policy tools to attain environmental benefits, using mathematical programming. A case of Krabi's coastal land use was studied. Her masters thesis was on mangrove valuation and use optimization while her undergraduate study, which was on fisheries, provides the basic technical foundation for her research in environmental as well as resource economics. She had contributed to national and regional assessments on the interactions of aquaculture and the environment while working as research associate in the intergovernmental organization of the Network of Aquaculture Centres

in Asia-Pacific and later with the Thailand Development Research Institute. She has recently done a review of coastal habitat valuation in Thailand for the “Mangrove for the Future Project” of IUCN. She is involved in a programme for the systematic integration of alternatives in sustainable land use and natural resource management and a study to guide the formulation of Thailand’s development strategy and policy commissioned by the Office of the National Economic and Social Development Board 2007–2008. She currently lectures at the Department of Agricultural and Resource Economics, Faculty of Economics of Kasetsart University. She is also editor of the Kasetsart University Journal of Economics.

PREIN, Mark (Mr). Consultant – Aquaculture for Development. MSc and PhD in Fisheries Biology from Kiel University (Institute for Marine Sciences), Germany, on quantitative analyses of the performance and efficiency of fish production in integrated aquaculture systems for rural development in the Philippines, Zambia and Peru, and aquaculture production efficiency in Israel. Joined ICLARM in 1991 with posting in Ghana leading a research project on developing appropriate aquaculture systems for poverty-oriented development. From 1994 posting at ICLARM headquarters in Manila as leader of research project on sustainability indicators for integrated aquaculture-agriculture systems. From 1996 to 2004 as Senior Scientist and Program Leader for integrated aquaculture-agriculture systems and freshwater resources research, with interim posting as officer-in-charge in ICLARM-Bangladesh office. In 2000 relocation of headquarters to Penang with renaming to WorldFish Center, main focus of work has been on research into the introduction and diffusion of integrated aquaculture-agriculture systems into traditional smallholder farming systems in Asia and Africa, with field activities in Bangladesh, India, the Philippines, Viet Nam, Malawi, and Cameroon covering ponds, ricefields, seasonal floodplains and small waterbodies. Since 2006 consultant on aquaculture development issues including sustainability and energy efficiency of small scale shrimp farms (Thailand), export marketing and organic aquaculture for development (Thailand), and on aquaculture development strategies and information networks for Africa.

SAJISE, Percy (Mr). Percy E. Sajise served as Regional Director for Asia, the Pacific and Oceania Office of Bioversity International from January 2000 to March 2008. Prior to this he served in the following capacities: Director of the Southeast Asia Ministers of Education Organization (SEAMEO) Regional Center for Graduate Study and Research in Agriculture (SEARCA) from 1994–1999; Dean of the University of the Philippines at Los Banos (UPLB) College of Human Ecology, Dean of the College of Arts and Sciences, Director of the University-wide Program on Environmental Science and Management and Department Chairman of Agricultural Botany between 1976–1991; and Research Fellow at the Environment and Policy Institute, East-West Center, Hawaii from 1992–1994. He is a plant ecologist by training and has a PhD in Plant Ecology from Cornell University. His research involvement is in grassland ecology, plant succession and in interdisciplinary and human ecological approach to upland development in general. He has directed and managed large interdisciplinary teams working on upland hydroecology, community-based forest management and in setting up an environmental program and academic curriculum for MSc and PhD programs at the University of the Philippines at Los Baños. He was also one of the original initiators of a regional network of academic institutions in Southeast Asia involved in collaborative and interdisciplinary methodology development for human ecology studies – the Southeast Asian Universities Agroecosystem Network (SUAN). He became a member of the prestigious World Academy of Science and Arts in 2001. He has written and co-edited eight books and published more than 150 papers and articles.

SEN, Sevaly (Ms). Director, Fisheries Economics, Research and Management (Australia). MSc in Marine Economics, Policy and Planning from London School of Economics, LLB(Hons) from University of London. Twenty-five years experience as an economist/socio-economist in aquaculture and fisheries development in Africa and Asia, predominantly as a consultant for international agencies including FAO, IFC, DFID, DANIDA and the EU. Socio-economist for the FAO Aquaculture for Local Community Development Programme in southern Africa 1992–1994. Since 1999 based in Australia as a consultant on fisheries and aquaculture industries in Australia. Professional focus has been on resource allocation issues, cross-border management issues across steep socio-economic gradients, economics of marine protected areas, co-management and evaluation of aquaculture research.

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VU, Dzung Tien (Mr). Aquaculturist, Department of Aquaculture under Viet Nam’s Ministry of Agriculture and Rural Development (MARD). Currently acting as Permanent National Component Deputy-Director of the Sustainable Development of Aquaculture (SUDA) component of the Government of Viet Nam and Danida Fisheries Sector Programme Support 2nd Phase (FSPS II). Has a B.Sc. in Biology and Ph.D. in aquaculture (1974–1984). Worked for the Institute of Marine Research (Now Oceanography Institute) from 1984 to 1999; technical staff of the National Aquaculture Service Company from 1999 to 2006 and the Department of Aquaculture (DAQ)/Ministry of Fisheries from 2002 to 2003; member of the SEAFDEC Secretariat, Bangkok, Working Group from 2006 to present.

WATTAGE, Premachandra (Mr). Senior Research Fellow, Centre for the Economics and Management of Aquatic Resources (CEMARE), Department of Economics, University of Portsmouth, UK. Received MSc from the Australian National University, Canberra, Australia and PhD in Natural Resources Economics from the Iowa State University, Iowa, United States of America. As a Senior Research Fellow at the CEMARE, he is responsible in developing, facilitating and managing multidisciplinary aquatic research projects considering the aspects of environment and sustainability. Previously he has worked on several aquatic resources research projects as team leaders, scientific coordinators and partners. He has published in peer reviewed journals based on his most recent research. Prior to the University of Portsmouth he has worked at the Iowa State University, University of Leeds, California State University and California Conservation Corps. In addition to academic work he has worked as a consultant on numerous development projects funded by the DFID, World

Bank, Asian Development Bank, and the UNDP. He has enhanced his postgraduate education with more than ten years of teaching and research experience in the area of Agricultural Development Economics including fisheries in developing countries. Over the last twenty years, he has gained experience and knowledge in the areas on fisheries and aquaculture, environment valuation, environment cost-benefit analysis, modelling, environment and social impact assessment and sustainability in the United Kingdom, United States of America and the European Union.