



**Food and Agriculture
Organization of the
United Nations**

NFIAN/R1431 (En)

FAO
Fisheries and
Aquaculture Report

ISSN 2070-6987

Report of the

**EXPERT WORKSHOP ON THE DEVELOPMENT OF THE
AQUACULTURE CO-MANAGEMENT GUIDEBOOK**

Manila, the Philippines, 9–11 October 2023

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Required citation:

FAO. 2024. *Report of Expert Workshop on the Development of the Aquaculture Co-management Guidebook. Manila, the Philippines, 9–11 October 2023*. FAO Fisheries and Aquaculture Report, No.1431. Rome. <https://doi.org/10.4060/cd0328en>

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ISSN 2070-6987 [Print]
ISSN 2707-546X [Online]

ISBN 978-92-5-138699-6

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PREPARATION OF THIS DOCUMENT

This document provides a summary of the presentations, discussions, conclusions and recommendations of the Food and Agriculture Organization of the United Nations (FAO) Expert Workshop on the Development of the Aquaculture Co-management Guidebook held in Manila, the Philippines from 9 to 11 October 2023. The workshop was prepared and coordinated by the FAO Fisheries and Aquaculture Division with the support of the FAO representation in the Philippines.

ABSTRACT

The Expert Workshop on the Development of the Guidebook on Aquaculture Co-Management was held in Manila, the Philippines, from 9 to 11 October 2023. Fourteen experts from eleven countries, including Bangladesh, China, Kenya, the Kingdom of the Netherlands, Nigeria, the Philippines, Madagascar, Senegal, Uganda and the United States of America, attended the workshop.

The journey towards co-management in aquaculture began with the FAO Expert Workshop on Aquaculture Co-Management held in a hybrid format from 8 to 10 June 2022 in Kigali, Rwanda. The outcomes of that workshop paved the way for the three-year FAO project titled “Development of the Aquaculture Co-Management System for Sustainable Aquaculture”, which was funded by the Korea Maritime Institute of the Republic of Korea. This project aims to produce knowledge products on aquaculture co-management and to develop a framework for the application of co-management as an aquaculture governance instrument, with the aim of enabling aquaculture to contribute effectively to the achievement of the Sustainable Development Goals in the long term and move towards Blue Transformation. Knowledge products will include a guidebook and an e-learning course for establishing aquaculture co-management systems, and case studies looking across the breadth of aquaculture production systems.

The main objectives of the workshop were to (i) enhance understanding of aquaculture co-management; (ii) identify key aquaculture co-management best practices, models and case studies; and (iii) undertake a thorough review and validation of the background document *Guidebook for developing aquaculture co-management systems*. During the workshop, participants were presented with the proposed content of the background document that was shared ahead of the event. They were then invited to discuss the content, validate it and provide input on a revised text. The expert input will be taken forward into the final draft of the Guidebook.

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ACKNOWLEDGEMENTS

The experts are acknowledged for their efforts, contributions and active participation during the workshop discussions. The presenters and facilitators, Mr Simon Bush, Mr KwangSuk Oh, Ms Elisabetta Martone and Ms Yumi Son were critical to the delivery of the workshop and Ms Vanessa Lodi, Ms Lisa Falcone, Ms Paola Magarini, Ms Turan Rahimzadeh, Ms Zoe Brandizzi and Ms Ava Razmjoo provided indispensable support to its organization and delivery. Acknowledgment and gratitude are extended to the FAO Representation in the Philippines, especially Mr Lionel Dabbadie (FAO Representative) and Ms Nikki DeVera, for their invaluable support in coordinating and executing the workshop.

This workshop was supported by the Korea Maritime Institute of the Republic of Korea through the FAO project “Development of the Aquaculture Co-Management System for Sustainable Aquaculture” (GCP/GLO/1049/ROK).

ABBREVIATIONS

ACM	aquaculture co-management
BFAR	Bureau of Fisheries and Aquatic Resources
EAA	ecosystem approach to aquaculture
FAO	Food and Agriculture Organization of the United Nations
GSA	Guidelines for Sustainable Aquaculture
MEL	monitoring, evaluation and learning
SDG	Sustainable Development Goal

BACKGROUND

1. Co-management is a broad concept that has been advanced in several sectors that require collaboration between resource users and the government. The aquaculture sector has not explicitly applied co-management to date, but there are many examples of aquaculture systems on land and at sea that collaboratively manage shared risks and use common resources (e.g. water, land and feed) or output flow (e.g. effluent, escapees and land-water quality) in line with the ecosystem approach to aquaculture (EAA) of the Food and Agriculture Organization of the United Nations (FAO).

2. FAO also recognizes that better implementation of the EAA requires management models that provide guidance to governments and the private sector alike. Collaborative management models are needed for the implementation of the upcoming FAO Guidelines for Sustainable Aquaculture (GSA). Aquaculture co-management (ACM) can also bridge the growing range of private sector attempts to guide beyond farm sustainability, including private standards, and integrated jurisdictional approaches that bring together producers, buyers, financiers and governments to promote regional-scale sustainability improvements.

3. The journey towards co-management in aquaculture began with the FAO Expert Workshop on Aquaculture Co-Management which was held in a hybrid format from 8 to 10 June 2022 in Kigali, Rwanda. The outcomes of that workshop paved the way for the three-year FAO project titled “Development of the Aquaculture Co-Management System for Sustainable Aquaculture” which was funded by the Korea Maritime Institute of the Republic of Korea. This project aims to produce knowledge products on ACM and to develop a framework for its application as an aquaculture governance instrument, with the aim of enabling aquaculture to contribute effectively to the achievement of the Sustainable Development Goals (SDGs) in the long term and move towards Blue Transformation. Knowledge products will include a guidebook and an e-learning course for establishing ACM systems, and case studies looking across the breadth of aquaculture production systems.

4. The Expert Workshop on the Development of the Aquaculture Co-Management Guidebook was held in Manila, the Philippines, from 9 to 11 October 2023. The workshop was attended by 14 experts from Bangladesh, China, Kenya, Madagascar, the Kingdom of the Netherlands, Nigeria, the United States of America, the Philippines, Senegal and Uganda (Appendix 1).

5. The specific goals of the workshop were to: (i) enhance understanding of ACM; (ii) identify key aquaculture co-management best practices, models and case studies; and (iii) undertake a thorough review and validation of the background document “*Guidebook for developing aquaculture co-management systems*”.

OPENING

6. Mr Lionel Dabbadie, FAO Representative in the Philippines, welcomed the participants and provided an overview of the history and current challenges of aquaculture development in the Philippines, and the significance of developing a coherent approach to co-management in the aquaculture sector. This was followed by the address of Mr Atty Demosthenes R. Escoto, Director of the Bureau of Fisheries and Aquatic Resources (BFAR) in the Philippines, who provided a word of welcome to participants before elaborating on the importance of co-management to the further development of the aquaculture sector in the Philippines, as the country’s government strives to develop a national Aquaculture Development and Management Plan. Finally, Ms Drusila Esther E. Bayate, Undersecretary for Fisheries of the Department of Agriculture in the Philippines, provided further details on the contribution of the aquaculture sector to the Philippines, explained the goals of the workshop and officially opened it (Appendix 2).

AGENDA

7. After the opening ceremony, Ms Elisabetta Martone, Fishery Officer, FAO, presented the workshop's background, objectives, expected results and agenda (Appendix 3).

8. Mr Simon Bush of Wageningen University provided an overview of the Background Document *Guidebook for developing aquaculture co-management systems* (Appendix 4). He outlined the structure of the background document and explained to participants that the workshop was structured around the various sections of the document with the goal of reviewing and validating its content. He also explained that the report will be divided into five sessions: (1) ACM definition and goals; (2) ACM good practices; (3) ACM implementation; (4) ACM monitoring, evaluation and learning; and (5) identification of potential case studies as a basis for further empirical development of the *Guidebook for developing aquaculture co-management systems*.

AQUACULTURE CO-MANAGEMENT DEFINITION AND GOALS

Presentation

9. Mr Bush presented an overview of the justification for ACM, as developed in the first Expert Workshop in Rwanda in 2022 and reported in the background document. He emphasized the relevance of co-management to the aquaculture sector when addressing shared resources and production risks between farms and explained the difference between open and closed forms of aquaculture. These risks, however, remain relevant to any form of aquaculture that is open to the surrounding environment, or relies on any form of input to production (including water, feed and seed). He explained that to address these shared risks and resources, the limitations of farm level policies and standards must be overcome. He also explained that existing policy and regulation used for the aquaculture sector tend to focus on spatial zoning and planning, with limited consultation with producers and other actors in the sector.

10. Mr Bush expanded on the definition of shared risks and resources elaborated in the background document. He presented Table 1 of the background document (adapted from Partelow *et al.*, 2022) which distinguishes six types of examples of these shared risks and resources including: (i) water quantity and availability, (ii) water quality; (iii) physical space; (iv) inputs, including seed, juveniles, eggs or feed; (v) genetic diversity; (vi) mitigating infectious diseases; and (vii) earth system and climate stability. In doing so, he stressed the challenge of shared management of these risks and resources, and the potential benefits of collective action to mitigate their impact on production and the ongoing sustainability of the aquaculture sector.

11. Mr Bush also presented a review of supporting FAO documentation for justifying the elaboration of a *Guidebook for developing aquaculture co-management systems*. In doing so, he emphasized key paragraphs and articles from the FAO Code of Conduct for Responsible Fisheries, the FAO EAA, the FAO Blue Transformation and the FAO GSA.

12. Mr Bush then presented the definition of ACM developed at the Expert Workshop on Aquaculture Co-Management, held in Kigali, Rwanda in 2022:

Aquaculture co-management is a set of strategic and operational collaborative approaches that enable decision making between public agencies and producers, as well as civil society, supporting services, and other stakeholders along the value chain. These actors share responsibility, rights and benefits over how, where and when the management of shared resources and risks are practiced (FAO, 2023).

13. Mr Bush outlined the scope of this definition, saying that it covers: (i) the variation in intensity and “openness” of aquaculture production systems; (ii) both private and communal forms of ownership

over the key inputs or means of aquaculture production; (iii) all forms of individual and collective decision-making between producers on shared risks beyond the scale of the farms; (iv) various policy arrangements for sharing rights and responsibilities between producers and the state; and that it (v) extends beyond producers to reflect the rights and responsibilities of value chain actors in the shared management of shared risks and resources in the aquaculture sector.

14. Finally, Mr Bush defined and outlined the strategic and operational goals of ACM as presented in the background document. He asked the participants to confirm the clarity and scope of strategic goals, which relate to the governance of systemic (and less measurable) issues related to the environmental and social transformation of aquatic food systems. He also asked for validation of the definition and scope of operational goals because those focus on improving the conduct and performance of the day-to-day management of aquaculture. He explained that this validation is necessary to justify the scope of subsequent ACM practices.

15. With reference to the background document Mr Bush asked the participants to reflect on three questions, namely: (i) Is the justification for collaborative management clear and convincing?; (ii) Are the strategic and operational goals clear, and the ambition level realistic? and (iii) Is the definition clearly stated and does it reflect the wider ambitions of the EAA, GSA and Blue Transformation?

Plenary discussion

16. The participants agreed with the justification for collaborative management. Feedback was given to clarify who the beneficiaries of co-management are. Suggestions were made to more explicitly present how ACM is linked to not only shared decision-making, but also to individual decision-making in individual production units. However, it was also suggested that the background document should stress that individual performance is linked to the collective management of risks and resources. Participants also highlighted the variety of potential co-management arrangements in response to various kinds of shared risks and resources. For example, the co-management arrangements that manage the impacts of environmental risk may be different to those that manage the quality of inputs such as feed and seed. Finally, they suggested it should be made clear that co-management is relevant for all intensities of production.

17. A discussion unfolded over the key terminology used in the background document. Particular attention was given to clarifying the difference between “stakeholders” and “participants”. It was suggested that not all stakeholders relevant to the management of shared risks and resources are necessarily participants in co-management arrangements.

18. The workshop participants also pointed out the lack of attention to social inclusion and equity in the preamble to the definition. They suggested that social inclusion should be defined clearly in the preamble and brought into the definition of ACM. They further suggested that the social inclusion of ACM should be extended to a clearer framing of “affected communities”, i.e. those communities that are not directly involved in the aquaculture sector but may be negatively affected by it.

19. The definition of ACM was generally accepted by the workshop participants. The only suggestion was to include wording on social equity – for instance, the shared but differentiated responsibilities of various stakeholders and collaborators to engage in co-management. This would, it was argued, bring the definition further in line with FAO’s Blue Transformation. Similarly, the participants argued that a clearer link could be made to the SDGs.

Session conclusions

20. Based on the discussion and feedback, participants concluded that the following changes would be made to the next draft of the Guidebook.

21. The introduction should be revised to more explicitly highlight the link between ACM and the individual performance of producers, and that the performance of these producers can also benefit from the collaborative management of shared risks and resources. This paragraph should also highlight the range of existing organizational forms that reflect collaborative ways of managing aquaculture but are not explicitly referred to as ACM.

22. Section 2 of the Guidebook should be titled “Challenges and opportunities in aquaculture management” and should be revised to highlight the link between individual farm performance and the collective management of risks and resources. In addition, a box should be included to highlight the diversity of the aquaculture sector (in terms of intensity and scale of production) and the relevance of ACM across this diversity.

23. Table 1 in the Guidebook should be adjusted by adding a new column that highlights the potential benefits to producers engaging in ACM. Here, attention should be given to the interrelated nature of, for example, managing shared environmental risks leading to reduced production risk that can in turn support improved food and income security in the longer term. The table should support a new paragraph that presents the ways in which co-management is fundamental to the commercial success of aquaculture businesses because it (i) supports increased economic efficiency of resource and risk mitigation; (ii) enables market access by meeting social and environmental assurance and enhances cooperative marketing activities; and (iii) helps aquaculture businesses to create opportunities by collectively anticipating and investing in future challenges in the industry.

24. In section 3 of the Guidebook (What is ACM?) a clearer definition of stakeholders and participants should be included in Section 2 and used consistently throughout the document. In addition, a paragraph should be included that defines social inclusion in ACM. These definitions will slightly revise the definition of ACM to:

Aquaculture co-management is a set of strategic and operational collaborative arrangements that enable shared but differentiated decision making between public agencies and producers, as well as civil society, supporting services, and other stakeholders along the value chain. These actors share responsibility, rights and benefits over how, where and when shared and equitable management of resources and risks are practiced.

25. In Section 4 of the Guidebook (Goals of aquaculture co-management) a series of minor changes should be made to the text. First, the strategic goals 4.1.i (Contribution to sustainable aquatic food systems) and 4.1.ii (Enabling circular food systems) should be combined into one goal entitled “Sustainable aquatic food systems”. Second, strategic goal 4.1.iii (Climate change adaptation) should be extended to include mitigation. Third, the importance of the shared management of water resources should be made explicit in strategic goal 4.1.iv (Ecosystem carrying capacity). Fourth, strategic goal 4.1.vi (Social license to operate) should more explicitly refer to cross-sector collaboration. Fifth, a box should be added linking ACM to the SDGs. Sixth, food and income security should be made more explicit throughout the strategic and operational goals.

AQUACULTURE CO-MANAGEMENT GOOD PRACTICES

Presentation

26. Mr Bush described three general models or types of ACM before presenting the good management practices of ACM, as reported in the background document.

27. Mr Bush emphasized that the good management practices presented in the background document are fundamental for the implementation of ACM. He explained that the good management

practices are organized into three levels (based on Pomeroy *et al.*, 2022): (i) external practices that create the enabling conditions necessary for ACM; (ii) internal practices central to the establishment and functioning of ACM; and (iii) individual practices of individual participants that contribute to the ongoing performance of ACM. He also said that the content and structure of these good management practices form the basis for the design of a system of monitoring and evaluation.

28. Mr Bush then presented each of the 32 “good practices” across three levels, as described in the background document.

With reference to the background document, Mr Bush asked the participants to reflect on the three questions: (i) Do the models of co-management represent the breadth of good practices presented? (ii) Are the three dimensions of good practices clear? (iii) Is the content of the external, internal and individual good practices clear and complete?

Plenary discussion

29. Participants agreed with the structure and scope of the good practices. The plenary discussion focused on improving the clarity of the best practices to ensure they can be clearly communicated and acted upon.

30. More specifically, the participants discussed the terminology used in the text relating to the role of the state versus producers and other participants in ACM. The participants argued that clearer language could be included in the introductory sections for each of the good practices. They also advised that a more explicit role of the state could be brought into the text to better: (i) describe how the state defines and maintains spatial boundaries for the area under co-management; (ii) highlight the need to empower public authorities to enhance support for ACM; and (iii) distinguish the role of the state vis-à-vis private rule-making authorities such as voluntary standards.

31. The participants also discussed the need for clearer guidance on the development of the co-management plan and agreement as good practices. A co-management agreement should be explicitly stated and, the participants argued, be written by participants, including the state. It should indicate the mode of collaboration and the conditions for ending the agreement, including sanctions for non-collaboration. The participants also discussed whether the agreement should be legally binding or not. Agreement was reached that the co-management agreement is not legally binding but is self-regulatory on the part of stakeholders who impose voluntary sanctions for violations.

32. The participants also discussed the need for greater clarity on the various terms linked to the conduct of ACM. They suggested that more consistent use of the term “legitimacy” should be made throughout the good practices. They also suggested the term “transparency” needs an improved explanation and more precise use, as do the various goals of transparency, e.g. information versus coordination versus decision-making). The participants suggested that the term “leadership” should be brought into the text more consistently and extended to the subject of conflict resolution. They suggested that good practices related to “knowledge” should be made clearer and they emphasized the importance of “social equity” being made clearer as a good practice throughout the text – including gender, vulnerable groups and Indigenous Peoples. They also argued that support for social equity should be distinguished from holding groups to account for a lack of social equity.

33. Finally, the participants agreed to the addition of governance capabilities as a new set of good practices that extend beyond the practices identified by Pomeroy *et al.* (2022). They suggested extending these practices to include what they termed “organizational capacity” and “reflexivity”. They also discussed the need for clarity on the other governance capabilities, both in terms of wording and with the addition of illustrative examples.

Session conclusions

34. The session concluded that the following changes should be made to the Guidebook.
35. In the preamble to section 6.1 (External good practices – Enabling environment and institutional fit) the text should include a clearer description on the rights and responsibilities of participants in ACM, as well as clearer language on how co-management can empower authorities to support improvements in the aquaculture sector. Examples should also be provided to enable readers to better define the role of the state versus other co-management participants. Related to this, the preambles to each set of good practices should be aligned with the definitions of stakeholders and participants, as outlined above.
36. The title of paragraph 6.1.ii should be changed from “Define boundaries” to “Support the alignment of co-management boundaries”. The supporting text should also be amended to make the creation of spatial boundaries more explicit. Here too, text should be added to more explicitly define the role of the state and other participating actors in the creation and maintenance of spatial boundaries defining the area under co-management.
37. Throughout section 6.1 the text should be amended to explicitly emphasize the importance of identifying laws and regulations that support the development of ACM. Language should also be introduced to highlight the need to empower public authorities to enhance support for ACM.
38. Throughout section 6.1 the text should be adjusted to better reflect the role of both public regulation and private rules and standards. These edits should more directly support the definition of ACM as extending beyond states and producers to other value chain-related actors.
39. The preamble to 6.2 (Internal good practices of the co-management system) should be revised to include a brief definition of what a co-management plan is and how the design of the arrangement follows from the assessment carried out through the good practices outlined. Examples should also be inserted that can help readers define the scope of the aquaculture management plan and the role of participants. A clearer distinction should be made between the co-management plan and the co-management agreement by adding a new best practice to section 6.2.2. (Leadership, rules and conflict resolution). Similarly, paragraph 6.2.3.i outlining best practice for the development of a co-management plan should be expanded to include the formulation of issues, goals and objectives.
40. To better reflect the normative goal of legitimacy in co-management, the title of representative organization 6.2.1.v should be changed to “Legitimate representation of ACM arrangement”. Similarly, paragraph 6.2.2.ii should be edited to clarify that leadership also refers to conflict resolution. In addition, paragraph 6.2.2.ii should be adjusted to make an explicit link between leadership and legitimate representation.
41. Reflecting on the need for greater precision in the use of the word “transparency”, two changes should be made to the text. The title of 6.2.1.iv should be changed to “Transparency of information” and a new best practice should be inserted entitled “Transparency of decision-making”.
42. The concept of social equity should be added to relevant paragraphs. For instance, paragraph 6.2.1.vi, “Equitability” and the preamble to section 6.3, should be edited to make explicit reference to gender, vulnerable groups and Indigenous Peoples. In addition, 6.3.iii Equitability should be changed to a more precise definition of equitability, and a new good practice entitled “social accountability” should be inserted to better reflect the wording of the EAA and GSA.
43. Finally, the following changes should be made to 6.2.4 (Enhancing governance capabilities). A new good practice should be added on “Organizational capacity” which stresses the importance of working coherently beyond the basic issues and engaging with subjects over and above business-related structural issues that affect the direction of the industry. A new good practice on “Reflexivity” should

also be added that emphasizes the importance of building capacity to act upon information and develop co-management. In addition, 6.2.4.i (Agility) should be edited to better reflect the engagement of state actors for long term change. Here an example of One Health could be added to the text for illustration purposes. Lastly, 6.2.4. iii (Innovation drive) should be edited to reflect institutional entrepreneurial behaviour within standards and government regulation.

AQUACULTURE CO-MANAGEMENT IMPLEMENTATION

Presentation

44. Mr Bush presented the overall framework for implementing ACM which (as advised at the Expert Workshop on Aquaculture Co-management in Kigali [FAO, 2023]), was based on the *Guidebook for evaluating fisheries co-management effectiveness* (Pomeroy *et al.*, 2022).

45. In this session of the workshop, Mr Bush presented three stages of implementation, namely – pre-implementation, implementation and post-implementation. The details on monitoring and evaluation (under post-implementation) were discussed in a subsequent session (see below).

46. The 11 steps of the pre-implementation stage, eight steps of implementation and four steps of the post-implementation stage were presented by Mr Bush, with emphasis on their order and the translation of these steps from fisheries to aquaculture. He stressed that some of the steps of the pre-implementation stage were generic and applicable to co-management in any sector, such as (Step i) identifying a lead actor or organization and (Step ii) identify resource and/or input constraints. However, he also emphasized the need for pre-implementation steps tailored to ACM, such as (Step iii) identifying social and/or environmental risks and (Step vii) identifying the scale of management needed.

47. Mr Bush then asked the participants to discuss the implementation steps outlined in the background document by addressing the question: Are the implementation steps translated from the *Guidebook for evaluating fisheries co-management effectiveness* relevant to aquaculture and clearly stated?

Plenary discussion

48. Participants agreed with the structure and scope of the three steps of ACM implementation. The plenary discussion was focused on improvements to the clarity of the text.

49. The participants agreed that the introductory text to each of the implementation steps should be adjusted to indicate: (i) the decision to engage in co-management is an outcome of assessment – meaning that a decision not to engage in co-management is also a possibility; and (ii) the decision to write a co-management agreement only comes after a preliminary co-management plan has been described. Similarly, the participants discussed the need for a flow diagram to indicate the order and logic of the three phases of implementation and their respective steps more clearly.

50. The participants agreed on the steps under pre-implementation. They discussed the need for clarification on the reasons co-management would be the most effective arrangement for resolving shared resources and risks. They also discussed the need to clarify that a lead actor or organization should be identified in the design and implementation of ACM.

51. The participants generally agreed on the steps under implementation. They identified two additional steps to add to the text: (i) Establish conflict resolution mechanisms with graduated penalties; and (ii) Benefit sharing should be changed to also include costs.

52. In their discussion on the post-implementation stage, the participants identified two changes. First, the text for step 7.3.i (Implement ex-ante evaluation) should be adjusted to include explicit text indicating the goal of adaptive management. Second, the text for step 7.3.v (Reflect on the need to scale up or scale down) should be adjusted to include the institutionalization of the co-management agreement with actors at different levels and the spatial boundaries of the agreement.

Session conclusions

53. The session concluded that the following changes should be made to the Guidebook.

54. The texts of the preamble to each section should be adjusted. The preamble of 7.1 (Pre-implementation) should include text to the effect: the pre-assessment can lead to the implementation of co-management or a decision not to implement co-management. Alternative co-management can be used to improve existing relations in the industry as well as anticipate issues in the future. The preamble to 7.2 (Implementation) should include text that clarifies the difference between a co-management plan and agreement.

55. Two new points should be added to 7.1 (Implementation): (i) Identify and justify why co-management would be the most effective arrangement for resolving those resource constraints and risks; and (ii) Identify a lead actor or organization.

56. A flow diagram (or other visualization) that clearly illustrates the steps of implementation should be included in the Guidebook.

57. Three new steps should be added to the implementation stage: (i) the formation of a co-management organization, or the development of a lead organization; (ii) agreement on the co-management plan; and (iii) establishment of a conflict resolution mechanism with graduated penalties. Furthermore, in the step 7.2.i (Jointly draft an aquaculture co-management partnership agreement) the text should be edited to clarify whether an agreement is legally binding, or whether agreements can be governed by a non-binding covenant that is time bound and responds to issues identified throughout the lifetime of the agreement.

58. In the post-implementation phase, the following changes should be made to the text. First, a new step should be added on undertaking an ex-ante evaluation to enable adaptive management of the co-management system (reflecting the ambitions of Section 4 of the background document). Second, the text of 7.3.iv (Reflect on the capabilities of actors) should be adjusted to highlight capabilities for engaging in co-management. Third, the text of 7.3.v (Reflect on the need to scale up or scale down) should be adjusted to be more explicit about the need to institutionalize the agreement and engage with actors at diverse levels, reflecting the spatial boundaries of the arrangements.

AQUACULTURE CO-MANAGEMENT MONITORING, EVALUATION AND LEARNING

Presentation

59. Mr Bush presented the overall framework of monitoring, evaluation and learning (MEL) which, as advised in the Expert Workshop on Aquaculture Co-management in Kigali (FAO, 2023), was based on the *Guidebook for evaluating fisheries co-management effectiveness* (Pomeroy *et al.*, 2022).

60. Mr Bush presented the four key goals of MEL for ACM: (i) provide a systematized collection and evaluation of relevant data to enable the assessment of the co-management system; (ii) enable the assessment of both the conduct and performance of co-managers and the co-management system; (iii)

enable the achievement of the goals and objectives of the co-management plan; and (iv) enable co-managers to reflect and learn from past actions and adapt goals, rationales, rules and arrangements.

61. Mr Bush then presented three key design considerations for a MEL system for ACM: (i) making explicit the external or internal determination of the goals and objectives of monitoring and evaluation, as well as who evaluates these goals; (ii) the level and type of MEL should be in line with the goals of the aquaculture management arrangement and the capabilities of the participants; and (iii) the design of adaptive learning should be embedded in the design of the MEL system and reflect the acquisition of learning capacities and involvement.

62. Finally, Mr Bush presented the steps of MEL outlined in the background document: (i) planning the content, goals and design of an evaluation; (ii) compiling information; (iii) measuring and analysing indicators for evaluation; and (iv) validating and communicating the results of the evaluation.

63. Based on his presentation, Mr Bush then asked the participants to reflect on whether the MEL steps translated from the *Guidebook for evaluating fisheries co-management effectiveness* are relevant for aquaculture and if they are clearly stated.

Plenary discussion

64. The participants agreed with the structure and scope of the MEL framework outlined in the background document. They had no points for discussion or suggestions for changes to the text.

Session conclusions

65. The MEL section of the background document can be adopted as presented in the next version of the Guidebook.

CASE STUDIES SHOWCASING AQUACULTURE CO-MANAGEMENT SYSTEMS

Presentation

66. The aim of this final session was to identify potential cases that could be reported on in the next phase of developing the Guidebook.

67. Mr Bush presented the models of aquaculture from Section 5 of the background document. In doing so he asked the participants to use these models as ideal types that can help identify a wide range of cases of ACM. He also asked the participants to recall from their earlier discussions that while there may not be any examples of collaborative management that are currently labelled “aquaculture co-management”, there may be cases that exhibit key characteristics of ACM.

68. In addition to the models, Mr Bush asked the participants to consider the breadth of strategic and operational goals for ACM presented in Section 4 of the background document. He also asked them to consider a diversity of species and production systems (e.g. ponds, cages and recirculation systems across inland, coastal and marine habitats).

69. To further stimulate the participants, Mr Bush offered four examples of cases that could be considered: (i) low trophic aquaculture management in Chile; (ii) climate adaptation and shrimp farming in Bangladesh; (iii) tank systems in Sri Lanka; (iv) bay area management in Scotland salmon; and (v) tilapia reservoir production in Colombia, Indonesia and the Philippines.

70. To facilitate an inclusive process of deliberation, the participants were divided into four subgroups, considering both geographical distribution and a diverse mix of expertise. These groups were tasked with identifying at least five cases, while considering the dimensions of variation presented above.

Group discussion

71. The groups presented a total of 20 cases which represented a broad geographical spread, a full spread of co-management models and covered a range of strategic and operational goals, as outlined in the background document.

72. The geographical spread of these cases is as follows: 14 from the Asia-Pacific region, three from sub-Saharan Africa, two from Europe and one each from North America and Latin America and the Caribbean.

73. The cases cover the following organisms: shrimp, tilapia, pangasius, carp, seaweeds, trout, sturgeon, bivalves and catfish.

74. The cases also cover strategic goals, including climate change resilience, food and livelihood security, biodiversity, cultural heritage, water–energy–food nexus, environmental carrying capacity and international market access.

75. Finally, they cover a range of operational goals for co-management, including disease management; enhanced productivity and profitability; partnerships and investment opportunities; procedural efficiency; social well-being; and environmental stewardship. A full list of the potential case studies cases presented in plenary are reported in the paragraphs below.

76. **Tilapia cage culture in Taal lake, the Philippines** – experts introduced a case that involves 4 000 tilapia cages in a volcanic lake. They highlighted that there is an existing association with links to area-based management by the local governments around the lake. According to the experts' analysis, the major issues managed in this system are environmental carrying capacity and risk management due to upwelling.

77. **Traditional seaweed and bivalve hanging culture in Japan** – experts highlighted that local/traditional rights enable producers to culture the seabed and water column. Aquaculture is demarcated based on rights from the state. This case could potentially provide valuable insights into traditional systems linked to food production and cultural heritage.

78. **Indigenous Peoples' trout production in Idaho in North America** – experts presented a traditional system of water management of Indigenous Peoples in both the United States of America and Canada, as applied to trout culture. They explained that traditional spiritual systems are used for managing water, setting standards for aquaculture. In the discussion, it was emphasized that this case may offer an example of indigenous tenure and management systems recognized by the state.

79. **Sturgeon aquaculture in the highlands of Viet Nam** – experts presented a case study in which production is managed by a producers' association which holds rights to manage water and other inputs to production. During the discussion, it was highlighted that collective action by producers enables them to also manage market access. This case could illustrate an example of highland aquaculture based on direct support from the state.

80. **Clam culture in the Ben Tre and Ca Mau provinces of Viet Nam** – experts introduced a system based on wild-caught and hatchery-produced spat under the control and management of a producer association. They explained that the production areas are also managed by the association, in

collaboration with the local community and government. This case could offer an example of ACM with market, spatial management and links to fisheries.

81. **Sea cucumber stock enhancement in Sri Lanka** – experts shared a case study showcasing government-led and community-led enhancement of sea cucumber stocks and demonstrating strong involvement from government in supplying seed from a state-run hatchery. They explained that local farmers are organized into an association to manage the coastal habitat and restocking initiatives and that they also harvest and market sea cucumbers collectively. This case may offer an example of state–producer collaboration around the management and enhancement of sea cucumber for food and environmental goals.

82. **Tilapia production in Guinea** – a case study was presented in which production is organized around cooperative value chains, where a producer association manages water resources and establishes a marketing outlet to sell its fish. The case involves men, women and youth and is part of a wider FAO project supporting inclusive value chains. This case might demonstrate an example of social inclusion as a strategic goal of collaborative management along a domestic value chain.

83. **The Republic of Korea flounder and rock fish culture** – experts introduced a case study about the production of flounder and rock fish for domestic markets, with strong collaboration between a producer cooperative and the Korean Government to manage a range of production risks, including disease and environmental carrying capacity. They explained that the state also safeguards the interest of producers by coordinating with buyers in the domestic market. This case could be an example of state intervention in domestic value chains to support innovation and development of niche aquaculture production systems.

84. **Tilapia production in the Tomasian City hydropower reservoir, Madagascar** – experts discussed a case study related to a producer association established to grow tilapia in cages in a hydropower reservoir. They explained that the production is for domestic consumption and the case includes an important food security dimension. The cooperative produces tilapia for the region and other regions, overseeing the entire value chain, with profit distributed to the associations. The case may offer insights into shared water management with energy production that is significantly important for food security.

85. **Regional management of tilapia cage culture in Lake Victoria** – experts introduced a regional case of managing aquaculture development between Kenya, Rwanda and Burundi. They explained that the case involves a series of partnerships between national government and the private sector for developing Tilapia and catfish production for food security and local tourism in the region. The case also brings in a regional dimension through the TRUE FISH project that links the Lake Victoria Fisheries Organization with multiple users of the lake, including fishers and communities.

86. **Mangrove shrimp production in Ca Mau, Viet Nam** – experts shared a case study about extensive shrimp production that involves collective management of water resources and both production and conservation of mangrove forests. They explained that the case involves producers' associations, the Forest Management Bureau and processing companies. It also features collaboration in establishing climate-resilient aquaculture systems and linking high quality products to international markets through certification.

87. **South Sulawesi Eco-Shrimp Aquaculture Improvement Project** – experts introduced a case study involving market-led improvement of shrimp production, working with a local producers' association under a regionally developed code of conduct. They explained that the case covers a range of environmental and social issues related to coastal shrimp production, including restoration of habitats and improved resilience to disease. The case could also highlight the potential for co-managed market-oriented standards.

88. **Shrimp production in Banyuwangi, Indonesia** – experts introduced an example of a jurisdictional approach to the management of shrimp aquaculture, linking a non-governmental organization (NGO)-led collaboration between provincial government, a shrimp association and buyers to support a range of environmental and social issues related to coastal shrimp production, including restoration of habitats and improved resilience of production to disease.

89. **Seaweed culture in Chile** – experts presented a case study concerning an area-based approach to aquaculture management that is coordinated by the state and organized by producer associations. They explained that the spatial management of aquaculture is divided into zones and neighbourhoods based on carrying capacity and the social development ambitions of coastal communities.

90. **Coastal mussel production in the Kingdom of the Netherlands** – experts discussed a case study that involves the management of the collection of sea mussel spat from the UNESCO-listed Wadden Sea by the Dutch Mussel Association and the provincial and national government of the Kingdom of the Netherlands. The case could provide an example of co-management involving biodiversity and cultural heritage in Europe.

91. **Scottish salmon bay area management** – experts introduced a case study about the collaborative management of salmon cage culture based on disease and carrying capacity risk. They explained that the case demonstrates how aquaculture management areas are designed using fallowing systems, licensing, and an alert system to ensure risks are reduced. The case study also involves industry-led management of these areas with the support of the Scottish Government.

92. **Khulna Bangladesh shrimp culture** – experts presented a case study that involves large clusters of 40 000 farmers in the management of shared water bodies for shrimp production. They explained that the case includes the food and livelihood ambitions of the farmers and manages multiple demands on water resources, including water required for rice production. This case study also involves collaboration between large-scale associations representing family-scale farms within multiple provincial governments.

93. **Nigerian catfish production** – while lacking elements of co-management, this case study focuses on an important case of African aquaculture. Experts explained that the key issues of wastewater in common water bodies, fish feed and poor fingerling quality are managed through the Catfish Association. The Association has agreements to upgrade the skills of producers to engage in integrated wastewater management. Furthermore, they aspire to define and manage aquaculture zones to minimize the environmental impacts of production.

94. **Carp cooperatives in Wuxi** – experts presented this case involving cooperatives of producers managing disease and water quality in eastern China. They explained that farmers also work in a cooperative to stock and collectively purchase feed and that the state supports these producers with technical input and expertise.

95. **Milkfish aquaculture in Alabat Island, the Philippines** – experts shared a case study involving the engagement of a private company to organize producers of milk fish. They explained that the company, together with the state, supports the revival of idle shrimp ponds and recovery plans for coping with increasingly prevalent storms. The case could provide a perspective on the restoration and recovery of coastal aquaculture.

Session conclusions

96. Mr Bush concluded the session by explaining that the case studies will form the basis of the next phase of the project. He emphasized the importance of having a rich and diverse set of case studies, which provide insight into the diversity of systems that exhibit elements of ACM, but may not currently be referred to as such. During the next phase, five to six case studies will be selected for elaboration,

with the aim of validating the definition of ACM and providing further input to the refinement and development of good ACM practices.

CONCLUSIONS AND WAY FORWARD

97. In the final session of the workshop Mr Bush summarized the main contributions provided by experts to update the background document. He outlined, page by page, the changes that will be made to the background document that will form the basis of the next draft of the Guidebook. He also asked the participants to remain involved in the next phases and to actively contribute to the development of the case studies.

98. Mr Oh presented the next steps of the ACM project. He reiterated the long-term goal of this project is to implement ACM systems to contribute to poverty eradication and enhance food security and nutrition. He also invited the participants to continue contributing to the Guidebook and case studies development in the project's coming years.

99. Closing remarks were made by Mr Oh and Ms Elymi-Ar-J Tuñacao, Chief Aquaculturist, BFAR (Appendix 5). Ms Tuñacao thanked everyone for their contribution to the Guidebook. She stressed the potential importance of ACM for the ongoing development of aquaculture in the Philippines and beyond.

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APPENDIX 1 – LIST OF PARTICIPANTS

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APPENDIX 2 – OPENING STATEMENTS

WELCOME REMARKS BY MR LIONEL DABBADIE, FAO REPRESENTATIVE IN THE PHILIPPINES

*Ms Drusila Esther E. Bayate, Undersecretary for Fisheries of the Department of Agriculture,
Mr Atty Demosthenes R. Escoto, Director of the Bureau of Fisheries and Aquatic Resources,
Esteemed partners,
Fellow FAO colleagues from Rome and Manila,
Ladies and gentlemen,*

Magandang umaga po sa ating lahat! Good morning to everyone!

A warm welcome to the Expert Workshop on the Development of the Aquaculture Co-Management Guidebook. It is an honour to be in the midst of such a distinguished group of experts and stakeholders gathered here today for this important activity.

I would like to first thank the Bureau of Fisheries and Aquatic Resources, represented here by Director Escoto, for their generous support and cooperation in hosting this workshop. I would also like to acknowledge the presence of Undersecretary Bayate of the Department of Agriculture. Your attendance at this event is an attestation of the commitment of the Philippine government to the sustainable development of aquaculture in the region.

This workshop marks a crucial milestone in our collective efforts to advance the concept of co-management in aquaculture. While co-management has long been practiced in fisheries, its application in the aquaculture sector is still in its infancy. The potential benefits of co-management in aquaculture are vast, ranging from improved resource management to enhanced social capital and knowledge-sharing.

In the Philippines, aquaculture is a significant contributor and factor in the development of the fisheries sector. For example, in 2021, aquaculture's share of the total fisheries production volume was pegged at 52.88 percent, accounting for 42.50 percent of the total fisheries production value. In the same year, seaweed was the top producing aquaculture species contributing 31.63 percent to total fisheries production. For the last decade as well, the Bangsamoro was the top producing region in terms of volume, while Region 3 was the top contributor in terms of value. Out of the 2.25 million metric tonnes production of aquaculture in 2021, 2.20 million metric tonnes came from five priority commodities, while 62.69 percent of the total production was produced in mariculture parks. Sadly, however, the overall growth of aquaculture in the country has been sluggish in the past decade, posting an average annual growth rate of -1.43 percent.

Despite this, aquaculture in the Philippines is largely thriving thanks to the strong implementation of supportive policies and monitoring by the national government, the support of the private sector, and the contribution of small-scale fisherfolk.

The journey towards co-management in aquaculture began with the FAO Expert Workshop on Aquaculture Co-Management held in Kigali, Rwanda in 2022. The outcomes of that workshop paved the way for the three-year project titled "Development of the Aquaculture Co-Management System for Sustainable Aquaculture," which is generously funded by the Korea Maritime Institute of the Republic of Korea. This project aims to produce invaluable knowledge products, including the aquaculture co-management guidebook and an e-learning course, to support the effective implementation of an aquaculture co-management system.

At this workshop, we will work together to elucidate the concept of aquaculture co-management, identify good practices, discuss the implementation of aquaculture co-management, explore monitoring

and evaluation and learning methods, explore collaborative management models, and brainstorm on potential case studies. The outputs of this workshop will significantly contribute to the finalization of the *Guidebook for developing aquaculture Co-management systems*.

With such a wide, diverse and deep array of experts in fisheries and aquaculture co-management, economics, governance and climate change in attendance here today, I am extremely confident that we will achieve the objectives of this important workshop and, by extension, influence the future of aquaculture co-management. To this end, your active engagement and sharing of knowledge, perspectives, experience and expertise will ensure the success of this event.

Before I conclude, I would like to thank each one of you for your dedication to the sustainable development of aquaculture. The journey ahead is both challenging and exciting, but together we can unlock the potential of co-management in aquaculture for the benefit of our communities, our environment and our shared future.

I wish you all a great day and a productive and successful workshop ahead.

Thank you. *Maraming salamat po at mabuhay!*

WELCOME REMARKS BY MR ATTY DEMOSTHENES R. ESCOTO, DIRECTOR OF THE BUREAU OF FISHERIES AND AQUATIC RESOURCES, PHILIPPINES

We are here today as we share a sense of purpose binding us in this pivotal moment of collaboration and knowledge exchange. As we know, in the fisheries sector, co-management is inherent to sustainable resource governance. It is a mode where resource users and government collaborate, sharing responsibilities and authority, creating a harmonious balance. However, in aquaculture, this concept is still relatively new and unlocking its potential is crucial for the sector's development.

In 2020, the Food and Agriculture Organization, with the support of the Ministry of Oceans and Fisheries of the Republic of Korea and the Korea Maritime Institute, embarked on projects to design and implement fisheries co-management systems. This initiative, while familiar in fisheries, is groundbreaking in aquaculture, reflecting a proactive approach to unleash the sector's capabilities.

Co-management as an instrument, leads in a more sustainable approach to aquatic resources. It is not just about power sharing; it is a mechanism for building institutions, enhancing trust and social capital, solving problems collaboratively, sharing knowledge and fostering social learning. Recognizing its potential, FAO now aims to extend the co-management model to aquaculture systems.

As we move towards implementing the ecosystem approach to aquaculture, management models become crucial guidance for governments and the private sector. Collaborative management models are essential for upcoming guidelines, such as the FAO Guidelines for Sustainable Aquaculture.

The FAO Expert Workshop on Aquaculture Co-management in Kigali was a significant step in this direction. It aimed at exploring the new concept, discussing implementation steps, and envisioning the role of aquaculture co-management in the sector's global development. The outcomes of this workshop laid the foundation for the three-year project, "Development of the Aquaculture Co-management System for Sustainable Aquaculture."

This project seeks to produce knowledge products that include a guidebook and an e-learning course for establishing aquaculture co-management systems. These tools, along with case studies spanning the entirety of aquaculture, aim to provide a framework for applying co-management as a governance instrument. The objective is clear – to enable aquaculture to contribute effectively to the Sustainable Development Goals and move towards the Blue Transformation.

In the Philippines, we welcome this initiative wholeheartedly. As we strive to craft our Aquaculture Development and Management Plan (ADMP), the discussion on aquaculture co-management and investment practices is timely and relevant. The outputs of this workshop will serve as a valuable reference document in shaping our ADMP.

Enhancing aquaculture governance is not just a goal; it is a necessity for inclusive sustainable development. As we explore potential models of aquaculture co-management, we embark on a journey to determine what model suits best in different situations. Let us work towards a future where aquaculture thrives sustainably, contributing significantly to global development. Thank you for being part of this journey.

Mabuhay po kayo at mabuhay ang sektor pangisdaan ng Pilipinas!

OPENING REMARKS BY MS DRUSILA ESTHER E. BAYATE, UNDERSECRETARY FOR FISHERIES OF THE DEPARTMENT OF AGRICULTURE, PHILIPPINES

Ladies and gentlemen,

Aquaculture is the fastest-growing form of food production in the world. It is also the source of half the world's seafood.

Here in the Philippines, aquaculture accounts for a steadily increasing share of the total fish harvest. Our record of achievements in aquaculture research and innovation over the past few decades speaks for itself.

Up until the 1950s, total fisheries production throughout this country was limited to less than 250 000 metric tonnes a year.

By the 1970s, increased government spending on aquaculture research and fisheries development had helped to increase our overall fish production to over a million metric tonnes a year.

Since the 1970s, our aquaculture production has increased many times over – from less than 200 000 metric tonnes a year to 2.3 million metric tonnes last year alone.

We continue to expand, perfect and build on our national aquaculture development programme as the demand for fish throughout our island continues to grow.

We distributed 140 million high-quality fingerlings and broodstock among 21 800 aquaculture farmers and 900 rural organizations between January and June of this year alone.

The distribution initiative was well-served by the completion of 12 new hatcheries within the same six-month period.

Fifteen more new aquaculture hatcheries are approaching completion as I speak.

Although more widely established in Asia, aquaculture is also expanding in Africa, South America and North America.

Experts predict that the global aquaculture industry will continue to grow as the consequences of climate change become more pronounced and the world's population continues to increase.

But for continued growth, the industry will need capital investments from governments, foundations, venture capitalists and banks.

It will also require governments, aquaculture farmers and investors to form new arrangements for the management of the resources needed for sustainable expansion.

The purpose of our workshops over the next five days is therefore twofold:

- Our first task is to study and validate the proposed “Aquaculture co-management Guidebook.”
- This Guidebook will serve as a policy manual for the FAO's global project for the development of co-management systems for sustainable aquaculture.
- Second, we will share ideas on the best policies for private investments in aquaculture.
- This second round of discussions will ultimately serve as the basis for the development of a comprehensive investment guide for small- and medium-scale enterprises.

I trust that our exchange over the next five days will be both fruitful and instructive for all.

Thank you.

APPENDIX 3 – AGENDA

Monday 9 October 2023, 09:00–17:00 (Philippines time)	
08.30–09.00	Registration
09.00–10.15	Opening <ul style="list-style-type: none"> ▪ Welcome remarks by the FAO Representative in the Philippines, Mr Lionel Dabbadie ▪ Welcome remarks by the Director of the Bureau of Fisheries and Aquatic Resources, Mr Atty. Demosthenes R. Escoto ▪ Opening remarks by the Undersecretary for Fisheries, Department of Agriculture, Ms Drusila Esther E. Bayate ▪ Self-introduction of participants (facilitated by Yumi Son, FAO) ▪ Group photo
10.15–10.30	Context-setting <ul style="list-style-type: none"> ▪ Introduction of the meeting objectives and adoption of the agenda (facilitated by Elisabetta Martone, FAO)
10.30–10.45	Break
10.45–12.30	Plenary <ul style="list-style-type: none"> ▪ Overview of the background document “<i>Aquaculture co-management guidebook</i>” by Simon Bush, Wageningen University ▪ Presentation of the aquaculture co-management definition and goals, by Simon Bush, Wageningen University ▪ Discussions
12.30–14.00	Lunch break
14.00–15.30	Plenary <ul style="list-style-type: none"> ▪ Presentation of the aquaculture co-management good practices, by Simon Bush, Wageningen University
15.30–15.45	Break
15.45–16.50	Plenary <ul style="list-style-type: none"> ▪ Presentation of the aquaculture co-management good practices, by Simon Bush, Wageningen University (cont.) ▪ Discussions
16.50–17.00	Closure <ul style="list-style-type: none"> ▪ Closure of day 1 and set-up for day 2, by Elisabetta Martone, FAO
Tuesday, 10 October 2023, 09:00–17:00 (Philippines time)	
08.30–09.00	Registration
09.00–10.30	Plenary <ul style="list-style-type: none"> ▪ Presentation on aquaculture co-management implementation, by Simon Bush, Wageningen University ▪ Discussions
10.30–10.45	Break
10.45–12.30	Plenary <ul style="list-style-type: none"> ▪ Presentation on aquaculture co-management monitoring, evaluation and learning, by Simon Bush, Wageningen University ▪ Discussions
12.30–14.00	Lunch break
14.00–15.30	Plenary <ul style="list-style-type: none"> ▪ Presentation on potential models of aquaculture co-management, by Simon Bush, Wageningen University ▪ Discussions on case studies showcasing aquaculture co-management systems, facilitated by KwangSuk Oh, FAO
15.30–15.45	Break
15.45–16.50	Plenary <ul style="list-style-type: none"> ▪ Discussions on case studies showcasing aquaculture co-management systems, facilitated by KwangSuk Oh, FAO (cont.)
16.50–17.00	Closure <ul style="list-style-type: none"> ▪ Day 2 closure and set-up for day 3, by Elisabetta Martone, FAO

Wednesday, 11 October 2023, 09:00–14:00 (Philippines time)

08.30–09.00 Registration

09.00–10.30 Plenary ▪ Presentation of the updated background document (recap the workshop results) by Simon Bush, Wageningen University

10.30–10.45 Break

10.45–11.30 Plenary ▪ Presentation of the updated background document (recap the workshop results) by Simon Bush, Wageningen University (cont.)

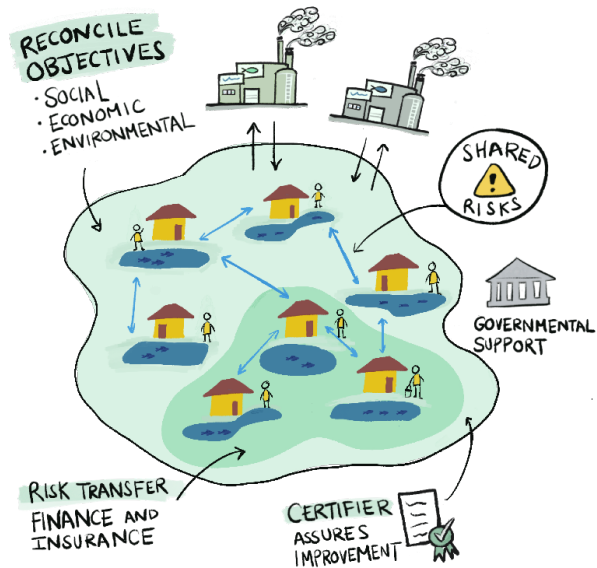
11.30–11.45 Plenary ▪ Next steps by KwangSuk Oh, FAO

11.45–12.00 Closure ▪ Closing remarks by KwangSuk Oh, FAO
 ▪ Closing remarks by Elymi-Ar-J Tuñacao, BFAR

12.00–14.00 Lunch

APPENDIX 4 – BACKGROUND DOCUMENT

**DRAFT GUIDEBOOK FOR DEVELOPING
AQUACULTURE CO-MANAGEMENT SYSTEMS**



Draft Guidebook for FAO Expert Workshop on Aquaculture Co-management
Manila, the Philippines, 9–11 October 2023

Prepared by Simon Bush
Wageningen University, Kingdom of the Netherlands

Internal document of the project “Development of Guidebook contributing to establishing the
aquaculture co-management system” (GCP/GLO/1049/ROK)

ACKNOWLEDGEMENTS

These guidelines build on an expert consultation held in Kigali, Rwanda, from 8 to 10 June 2022 in which input was received from Anton Immink, Charles Ngugi, Curtis M. Jolly, Donglim Lee, Eranga Galappaththi, Kim Anh Thi Nguyen, Michael Phillips, Robert Pomeroy, Sloans Chimatiro, Soon Choi, Sunil Siriwardena, Tony Charles, Victor Pouomogne, Zhengyong Yang, Cecille Uwizeyimana, Chantal Ingabire and Tugizimana Joas. Further input was received from Robert Pomeroy, Tony Charles and Roger Pullin, as well as KwangSuk Oh, Nathanael Hishamunda, Elisabetta Martone and Yumi Son at FAO through later rounds of editing. Research support at Wageningen University was provided by Arian van Huis and Fatime Traore. Cover art and figures by Emily Liang.

ABBREVIATIONS

ACM	aquaculture co-management
EAA	ecosystem approach to aquaculture
FAO	Food and Agriculture Organization of the United Nations
GSA	Guidelines for Sustainable Aquaculture
NAP	National Adaptation Plan
NDC	nationally determined contribution
NGO	non-governmental organization

1 INTRODUCTION

The sustainability of the global aquaculture industry is dependent on policy, regulation and management instruments that target farmers as key decision-makers over production. These instruments are commonly translated to either the ecosystem level, such as the FAO ecosystem approach to aquaculture (EAA) or to the farm level – including a range of voluntary guidelines and standards for improved farming practices (Bush and Oosterveer, 2019). At the same time, as outlined by both the FAO Guidelines for Sustainable Aquaculture (GSA) (FAO, 2023a) and the FAO Blue Transformation vision for aquatic food systems (FAO, 2022a), the sustainability of the aquaculture sector requires innovation, equitable benefit sharing and sustainable growth, underpinned by the stewardship of shared resources and management of shared social, production, market and environmental risks (Bush *et al.*, 2019; Naylor *et al.*, 2021a). Reconciling the individual performance of producers with the wider sustainability and performance of the sector therefore requires collaborative management, or co-management, that fosters joint decision-making at both ecosystem and farm scales.

Co-management, broadly defined as a collaborative approach for strategic and operational decision-making between government and diverse user groups over shared resources, has been advanced in natural resource settings (Sen and Nielsen, 1996; Berkes *et al.*, 2001). Co-management takes many different forms based on (i) the scale at which resources are managed, (ii) the range of actors that claim a stake in those resources and (iii) the degree to which rules and norms are set by states and/or resource users (Plummer and Armitage, 2007). While co-management in fisheries and forestry has been traditionally seen in terms of the relationship between states and resource users, it has also been extended to networks of resource users across river basins and landscapes dealing with connected, but non-spatially contiguous risks Carlsson and Berkes, 2005; Adger, Brown and Tompkins, 2005). Common to most, if not all co-management, is to generate legitimate decision-making processes over resource exploitation and/or wider production risks based on the inclusion of relevant stakeholders. Co-management is as such a form of public–private partnership that is focused on the devolution of rights and responsibilities for managing common risks and resources. It is distinct from public–private partnerships that focus more narrowly on private service provision and investment.

Co-management has been applied to a range of common property natural resource sectors, most notably fisheries, forestry and water (Armitage *et al.*, 2009), but also wider issues such as climate change adaptation (Baird, Plummer and Bodin, 2016). The development of co-management in the context of natural resources has been a response to weak recognition of common property institutions by government. Co-management has, as such, offered a means of enabling communities and networks for resource users to advocate for and gain greater recognition for customary and/or joint management of shared resources. Aquaculture has, in contrast, been commonly seen as a private enterprise with private tenure over the organisms grown and the land and water used to grow them. However, as recognized by the move to ecosystem forms of aquaculture management, all but a small number of recirculating aquaculture systems are reliant on common resources, including land and water, as well as ecosystems for seed, broodstock and nutrient recycling (Galappaththi and Berkes, 2015; Partelow *et al.*, 2018). There is also increasing attention paid to collective forms of sourcing key inputs for greater economic efficiency (Galappaththi, Kodithuwakku and Galappaththi, 2016). As such, aquaculture is increasingly seen as a collaborative sector requiring collaborative forms of management.

This draft *Guidebook for developing aquaculture co-management systems* provides input to the second FAO Expert Workshop on Aquaculture Co-Management held from 9 to 11 October 2023 in Manila, the Philippines. The Guidebook provides a next iteration in the implementation of aquaculture co-management (ACM). It defines co-management and outlines a set of goals under which it can be applied to different forms of aquaculture. It also provides a generic process for implementing and evaluating an ACM system in order to improve its effectiveness for contributing to the governance of positive environmental, social and economic outcomes. While co-management is generally thought of as only relevant to community and smallholder forms of production, the Guidebook is aimed at all forms of aquaculture – ranging from offshore marine cage culture to coastal, reservoir and riverine pond, cage and pen systems and terrestrial tank systems.

The document is divided into five parts. The following section presents an overview of the role of ACM in addressing key challenges to the expansion of sustainable aquaculture, following an outline of the key building blocks of ACM and a set of draft principles for ACM. Based on a review of fisheries co-management, a broad framework for implementation, monitoring and evaluation is then presented. Finally, a set of potential models of ACM based on a review of cases representative of the breadth of the global aquaculture sector, is presented. Input from workshop participants has been used to help improve and refine this document.

2 SHARED AQUACULTURE MANAGEMENT CHALLENGES

The aquaculture sector has undergone sustained growth over the past two decades, to contribute 87 million tonnes of fish and shellfish and 35 million tonnes of seaweeds in 2020 (FAO, 2022b)]. The growth in the global aquaculture sector is characterized by enormous diversity. Around 425 species of animals, plants and algae species are farmed across the world, extending across a range of offshore and inshore marine, coastal and inland habitats (Naylor *et al.*, 2021a). There is also a huge diversity of producers involved in the sector and a variety of value chains meeting demand for aquaculture products, with consumers from low- to high-income nations benefitting from greater availability and access to aquatic foods rich in protein and micronutrients, on a year-round basis (Belton, Bush and Little, 2018; Naylor *et al.*, 2012b). Continued growth of the sector is estimated to reach 106 million tonnes of production by 2030 (FAO, 2022b; FAO 2022c) and with this growth an increasingly important role in contributing nutritious aquatic food to global food systems.

Expansion and innovation in the sector remain highly uneven, with low-income countries facing great challenges to achieve their national aspirations for aquaculture development in support of national food production and employment (FAO, 2022b). Continued aquaculture production in the global South, despite the projected potential of marine production (Gentry *et al.*, 2017), will build on the freshwater systems that already deliver 75 percent of global edible aquaculture production in the foreseeable future (Naylor *et al.*, 2021a; Belton *et al.*, 2020). Overall, the sector exhibits fluctuating patterns between regions. Asia continues to dominate global production, with relatively steady production in the major producing countries, although with decreasing growth rates as overall volumes increase (FAO, 2022b; Edwards *et al.*, 2019). Other regions contribute far lower volumes of production with fluctuating or negative growth.

Realizing the remaining potential of the sector to contribute nutritious food requires that production risks are addressed to optimize production and access key resources necessary for production. In some cases, production risks both emanate and can be managed within the borders of a single farm – for instance, salinity levels of water quality in recirculation systems. However, any system that is open to the surrounding environment is subject to a range of shared systemic risks. Similarly, most production systems rely on access to production inputs, such as water and key feed ingredients, that constitute or rely on the shared or common pool resources (Table 1).

Systemic production risks affecting both quantity (farmed biomass) and quality (including physical attributes such as nutritional value and credence attributes such as sustainability) (Wessels, 2002) span the full spectrum of open and semi-closed pond, cage or tank systems. Summarizing the GSA (FAO, 2023a), these production risks include: (i) waste discharge, including from inefficient feed use on water quality, habitats and biodiversity (Naylor *et al.*, 2021a; Ahmed, Thompson and Glaser, 2019); (ii) the effect of escaped organisms on the genetics of wild populations (Clavelle *et al.*, 2019); (iii) impacts on vulnerable coastal, marine and inland habitats (Boyd *et al.*, 2020); (iv) impacts on broodstock and seed (partially) dependent on wild sources (Boyd *et al.*, 2020); (v) disease, disease transmission and indiscriminate use of pro and antibiotics (Bondad-Reantaso *et al.*, 2023); and (vi) poor labour conditions for farm workers (Ngajilo and Jeebhay, 2019). The source and mitigation of these risks are nearly all related to practices that extend beyond an individual farm to include the practices of other aquaculture farmers and other spatially adjacent sectors. In the case of key inputs such as feed, these systemic risks extend to the practices of sometimes distant suppliers and traders.

Table 1. Shared risks and resources relevant for aquaculture production

Shared risk or resource	Type of good	Governance challenge	Importance for aquaculture
Water quantity and availability	Common-pool resource and shared risk	Who has access, withdrawal, management, exclusion and alienation rights?	Aquaculture is dependent on water for production and competition can be high if water resources are limited.
Water quality	Common-pool resource and shared risk	How to reduce pollution incentives? How to increase maintenance incentives? Who has access, withdrawal, management, exclusion and alienation rights?	Aquatic organisms depend on available nutrients in the water, and this varies by species (e.g. oxygen, nitrogen, organic matter, temperature of water and salinity).
Physical space	Common-pool resource	Who has access, withdrawal, management, exclusion and alienation rights?	Aquaculture requires space, either on offshore surface water or on land, and competition and costs can be high.
Inputs – seed, juveniles, eggs or feed	Shared risk and common-pool resource	Who has access, withdrawal, management, exclusion and alienation rights? How are private goods distributed?	Inputs are needed for farming. Where they come from, how they are produced and distributed can vary substantially.
Genetic diversity	Shared risk and public good	How to increase incentives and reduce costs for maintaining species and ecosystem diversity.	Maintaining genetic diversity helps ensure future options for adaptation and innovation in food security, breeding and environmental resilience.
Mitigating infectious diseases	Shared risk and public good	How to increase incentives and reduce costs of safe aquaculture practices.	Spread of disease threatens farming livelihoods and food security. Mitigating this spread and enhancing species resilience is a social dilemma because increased stocking density, monoculture and antibiotic use may increase the economic efficiency of individual farms but increase disease and resistance risk for all.
Earth system and climate stability	Public good	Who contributes, and how, to maintaining physical earth system stability (i.e. carbon, nitrogen, climate stability, sea-level rise, rainfall patterns and storm frequency)?	Predictable and sufficient water availability and environmental conditions are essential. Coastal storms, sea level rise, ocean acidification and increasingly varied temperatures make this more difficult.

Source: Adapted from Partelow, S., Schlüter, A., Manlosa, A.O., Nagel, B. & Paramita, A.O. 2022. Governing aquaculture commons. *Reviews in Aquaculture*, 14(2): 729–750.

Aquaculture systems are also dependent on equitable access to and use of common pool or public resources for key production inputs (Partelow *et al.*, 2022). For instance, in all but closed or recirculation systems, aquaculture is fundamentally dependent on access to public water resources across inland, coastal and marine environments (Lebel, Lebel and Chuah, 2019). Aquaculture is also

dependent, despite considerable improvements in fish-in-fish-out ratios, on the use of fishery-derived sources of protein (Naylor *et al.*, 2021a). Similarly, wild-caught and managed broodstock remain important in many freshwater and coastal aquaculture systems. Maintaining access to these common property resources, while ensuring that overall carrying capacities are not exceeded, is essential for the long-term viability of production. Furthermore, shared benefits can be enhanced at ecosystem scales where aquaculture provides valuable ecosystem services, such as in low trophic bivalve and algae systems (Gentry *et al.*, 2020; Mizuta, Froehlich and Wilson, 2023).

The shared nature of key production risks and resources in the aquaculture sector means farmers can only rarely, if ever, act in isolation. The continued viability of their production, in terms of optimizing production volumes and consistently delivering key product qualities (e.g. nutritional value, taste and “sustainability”) requires management that reduces risks and maintains access to inputs beyond individual farms.

Collective action on managing shared resources and risks is inherent to various FAO guidelines (Box 1). For example, the FAO EAA calls for the integrated management of aquaculture beyond the farm scale through transparent and participatory planning with all relevant stakeholders and in line with state policy objectives (Bush and Oosterveer, 2019). Similarly, the GSA (FAO, 2023a) calls for states to ensure the effective transparent consultation between aquaculture stakeholders, as well as establishing respective rights and responsibilities, and overcome competing objectives of aquaculture development to ensure optimum utilization of resources (FAO, 2023a, p.46, 4.1.1). It also outlines the rights and responsibilities of producers to develop, with states, shared area management plans that enable “risks and risk management” and “access to land and water and conflict mitigation among resource users” (FAO, 2023a, p.49, 4.2.10), as well as collaborative “innovation partnerships” (FAO, 2023a, p.51, 5.2.3) for developing new technologies and farming practices. The EAA and GSA are supplemented by a growing shift in private or market-based forms of aquaculture governance (such as the Aquaculture Stewardship Council and the Global Seafood Alliance’s Better Aquaculture Practices) to move beyond farm level standards, to forms of zonal, area-based and/or group certification standards aimed at managing shared risks and resources.

Box 1. Supporting FAO guidelines for collaborative forms of aquaculture management

FAO Code of Conduct for Responsible Fisheries (including aquaculture)

Articles 9 and 10 outline the responsibilities of states to facilitate participation and consultation with stakeholders (those affected) in the industry to develop laws, policies and plans related to the protection, allocation and management of risks and resources. Such consultation and participation should also develop procedures and mechanisms at the appropriate administrative level to settle conflicts (FAO, 1995).

FAO ecosystem approach to aquaculture

Principle 1, 2 and 3 provide guidance on the contribution of aquaculture to ecosystem functions and services and human well-being through integrated planning and management systems that are within the ability of the aquaculture sector to change or modify. The EAA guidelines explicitly state the need for coordinated decision-making between clusters of farms that “share a common waterbody and that need a coordinated management” (Bush and Oosterveer, p.10).

FAO’s Blue Transformation vision for aquatic food systems

The guiding principles stress the need for effective aquaculture management and development and equitable access to resources to secure aquaculture-based livelihoods and resilient aquatic food systems through: (1) accountable and transparent policy and planning; (2) active, free, effective, meaningful and informed consultation and participation; and (3) the promotion of just and fair “treatment of all people and communities and implement measures to accelerate the achievement of equitable outcomes, particularly for vulnerable and marginalized groups” (FAO, 2022a p. 5).

FAO Guidelines for Sustainable Aquaculture

Sets out conditions and actions for creating “inclusive networks and dialogue platforms” involving both state and non-state actors to “foster shared understanding and negotiated solutions and facilitate policy and decision-making processes relevant to sustainable aquaculture sector development” (GSA, 4.1). Attention is also given to “clear, transparent, equitable and inclusive” processes for identifying suitable areas for aquaculture and developing “appropriate mechanisms and plans in order to monitor the impact of the operations on the environmental and social and economic sustainability” (FAO, 2023a, p.48, 4.2).

Source: Author’s compilation.

3 WHAT IS AQUACULTURE CO-MANAGEMENT?

ACM can be defined as the iterative implementation of methods, techniques and actions to produce aquatic organisms using: (i) less than perfect information on the use and costs of inputs to production and their effect on the performance of production processes; and (ii) societally agreed upon rules and norms for the environmental and socially optimal production of safe and nutritious outputs. Management refers to both on-farm decisions and practices employing labour, knowledge and technologies that seek to mitigate production risks, as well as integrated approaches for reducing wider environmental impact, conflicts over access to resources, and mitigation of social disruptions to secure the long-term sustainable contribution of aquaculture to human needs and ecosystem resilience (Phillips, Boyd and Edwards, 2001; Pullin, 1994).

Collaborative management, or co-management, is generally seen a means of improving the legitimacy and effectiveness of on-farm and integrated management systems involving at least government and resource users, but extending to adjacent sectors and affected communities (Armitage *et al.*, 2009). In fisheries and forestry, co-management has been shown to enhance trust and enable power sharing over

resource access and use. It has also enabled collaborative opportunities for knowledge sharing, leading to improved collective decision-making and action (e.g. Cundill and Fabricius, 2009).

Co-management has no single definition. Rather it is broadly understood as a set of approaches that cover the full range of collaborations through which resource users and states, with the support of “external agents”, share responsibility and authority for decisions over how, where and when management is practiced (Berkes *et al.*, 2001; Armitage *et al.*, 2009). Co-management is, as such, distinct from other forms of cooperative environmental governance such as multistakeholder arrangements, policy networks and consultation processes because it enables primary resource users (including food producers) to deliberate over their rights and responsibilities related to resource access and use (Berkes, 2009; Hasselman, 2017).

Based on the FAO definition for co-management for fisheries and other resource sectors, but reflecting the specific conditions and challenges of the aquaculture industry, ACM is defined as follows:

Aquaculture co-management is a set of strategic and operational collaborative approaches that enable decision-making between public agencies and producers, as well as civil society, supporting services and other stakeholders along the value chain. These actors share responsibility, rights and benefits over how, where and when the management of shared resources and risks are practiced (FAO, 2023b, p. 3).

1. This definition of ACM extends beyond the application of co-management in other resource sectors to recognize:
 - i. **Variation in intensity and “openness” of aquaculture production systems.** Aquaculture systems range from super-extensive non- or semi-fed systems (e.g. shrimp farms in Indonesia, pangasius *ghers* in Bangladesh and rice field systems across Asia) to open intensive systems (e.g. any form of cage culture) and closed recirculation systems. In line with the EAA, these levels of intensity and openness to the surrounding environment affect the degree to which resources and risks are shared between farms.
 - ii. **Private and communal forms of ownership over the means of aquaculture production.** Aquaculture systems can be based on both private or communal ownership over land and other technical means of production (e.g. machinery and genetic material), or communal ownership. However, many inputs to aquaculture systems are collective goods, including water (quality and quantity) and genetic resources.
 - iii. **Individual and collective decision-making between producers on shared risks beyond the farms scale.** The shared nature of many production risks (as outlined in Section 2 and both the EAA and GSA) means that farmers cannot act in isolation when trying to optimize farm productivity.
 - iv. **Sharing rights and responsibilities between producers and the state.** In line with the EAA and GSA, states maintain authority for the overall planning and regulation of the aquaculture sector. However, devolved responsibilities to producers can improve compliance and problem solving for risks and resources that affect the overall performance of the sector.
 - v. **Sharing rights and responsibilities with value chain actors.** The extension of decision-making over risks and resources beyond the farm also extends to suppliers and buyers who inputs or set market incentives for responsible or sustainable production.
2. Variation within and across these dimensions means it is unlikely that there is a single approach to ACM. They also indicate that co-management should be seen as a networked relationship, rather than limited to the role of producers and the state. A such, reflecting the early work of Sen

and Nielsen (1996) and Armitage *et al.* (2009), multiple approaches of ACM are possible based on different goals of collective action, the degree to which joint decision-making with both states and other actors is needed, and the types of production systems located in different ecosystems.

The specific type of co-management depends in large part on the actors involved, their willingness to engage in power-sharing over resource-related decisions and in doing so integrate community, regulatory and/or economic rules and management systems. Adapting Sen and Nielsen's (1996) four broad types of co-management to accommodate this wider set of actors opens up the scope of collaboration:

- i. *Instructive* forms of ACM are linked to government-led informative mechanisms for new *regulation* or production requirements, but also industry-led mechanisms for contract arrangements affecting, for instance, key inputs or market requirements.
- ii. *Consultative* forms of ACM extend from state actors consulting producers on decisions taken by government on decisions related to water, land and/or those affected by effluent.
- iii. *Cooperative* forms of ACM would include equal decision-making, not just between government and producers but also input suppliers and buyers affected by variable supply, over the management of production risks related to water management or disease.
- iv. *Delegated* forms of ACM would involve the devolution of responsibility for the management of resources and risks by the industry, with government only being informed on the decision taken.

The type of co-management that might be most relevant for aquaculture remains an open question. In closed recirculating systems, delegated co-management may be accepted by producers and governments due to the limited engagement with shared resources (e.g. Dong *et al.*, 2022). In open aquaculture systems with distributed risks, more cooperative forms of co-management may be needed to manage input use (e.g. water, land and feed) or output flow (e.g. effluent, escapees and land water quality) in line with wider ambitions of the EAA (Brugère *et al.*, 2018). Where alignment between producers, input suppliers and buyers for meeting market requirements is strong, more delegated forms of co-management may be selected. In small-scale urban and rural aquaculture, more instructive forms of co-management may be relevant for building the capabilities of producers to access knowledge on better farming practices, as well as access to key inputs, and/or negotiate tenure over land and water (e.g. Galappaththi and Berkes, 2014). And, where conservation or regenerative forms of aquaculture are being developed, habitat restoration that achieves improved ecological status (Mizuta, Froehlich and Wilson, 2023), cooperative forms of aquaculture management may be employed to align cross sectoral regulation, knowledge and incentives.

4 GOALS OF AQUACULTURE CO-MANAGEMENT

ACM can have multiple (often simultaneous) aims that are defined by the actors within or affected by the sector to different degrees. Overarching goals for ACM have already been set within the EAA and GSA, and most recently the FAO's Blue Transformations vision for "Sustainable aquaculture intensification and expansion satisfies global demand for aquatic food and distributes benefits equitably" (FAO, 2022a). Within this wider normative set of goals, more specific goals can be set that align to both states, producers and other non-state actors. For example, in instructive and consultative co-management arrangements, the aims of co-management may be influenced or even prescribed by longer-term government planning. However, in co-management arrangements where resource users are empowered to experiment, monitor, deliberate and respond to challenges with support from state or non-state actors see for example, *et al.*, 2009; Hasselman, 2017), goals may be more self-defined and iteratively defined.

Whether prescribed or self-determined, the aims of co-management should ideally contribute to the sustainable development of aquatic food systems as outlined in FAO’s Strategic Framework’s Programme Priority Areas in the Blue Transformation vision (FAO, 2021) and the United Nations’ 2030 Agenda for Sustainable Development. This can happen on two interrelated levels. First, ACM can aid in fulfilling *strategic goals* related to the governance of systemic (and less measurable) risks related to the environmental and social transformation of aquatic food systems. In doing so, ACM can enable legitimacy and participation, enabling or enhancing the role of aquaculture in providing nutritious, equitably valuable, and sustainable aquatic food. Second, ACM can assist in achieving *operational goals* related to improving the conduct and performance of the day-to-day management of aquaculture – e.g. disease, feed and water management – in sustainable farm management. ACM is, as such, also a means of linking strategic goals to operational goals through their implementation by participating state and non-state stakeholders.

4.1 Strategic goals

ACM can contribute to broad strategic goals by linking national, regional and local decision-making and practices. This strategic role may be less related to daily decision-making, and less measurable in terms of direct impact on aquaculture production. Nevertheless, co-management can be a means of facilitating changes that require longer time horizons and extend beyond the immediate remit of production and consumption. If institutionalized as a means of sector planning and management, ACM can also play a central role in creating an enabling environment for realizing FAO’s Blue Transformation as well as implementing the EAA and GSA.

Based on the FAO GSA, seven strategic goals for ACM can be identified:

- i. **Contribution to sustainable aquatic food systems.** By providing a framework for participatory decision-making, ACM can enable the improved design of an institutional framework that includes aquaculture in wider aquatic food system policies and decision-making. ACM as such can support priority actions of the FAO Blue Transformation vision (FAO, 2022a), including: (i) effective global and regional cooperation, planning, and governance enhance aquaculture development and management (Target A1); (ii) equitable access to resources and services delivers new and secures existing aquaculture-based livelihoods (Target A3); and (iii) regular monitoring and reporting of the state and the ecological, social and economic impacts of aquaculture development (Target A5). It can also, in support of the GSA (FAO, 2023a, p.48, 4.2.1), support ambitions for promoting an “holistic food system perspective” that integrates aquaculture value chain actors with other sectors “using land, water, aquatic resources and maritime space”.
- ii. **Enabling circular food systems.** ACM’s role in enabling cross-sector deliberation may extend to intersecting sectors that face their own sustainability challenges – such as water and energy (in line with EAA ambitions for nutrient reuse and under GSA guidelines 5.1.1, 5.5.1, 5.2.6 and 7.3.1 on reuse and recycling in aquatic food systems [FAO, 2023a]). By linking to these sectors, ACM may establish a role for them to enhance their contribution to aquaculture. ACM may also enable linkages to market actors, investment, finance and credit that enable risk transfer models that can generate investment in fundamentally new forms of integrated and/or circular production systems (FAO, 2022c). These circular systems can in turn enable water use efficiency, nutrient recovery and re-use and/or feed management with reduced carbon intensity (FAO, 2022c).
- iii. **Climate change adaptation.** ACM may foster decision-making at farm and regional scales that enables more timely adaptation to changing environmental conditions caused by climate change, such as acidification, salinization and temperature and precipitation changes (as stipulated in GSA 5.6 [FAO, 2023a, p.55]). Faced with these longer-term environmental risks, participants in ACM may decide on diversification strategies for production and/or adapted farming practices to create “climate-smart aqua-business” (Target A2 of the FAO Blue Transformation vision). ACM may also enable producers to contribute more directly to the formulation of National Adaptation Plans (NAPs) so that they include and support

aquaculture adaptation needs, such as the inclusion of nature-based opportunities and solutions in the nationally determined contributions (NDCs) (FAO, 2023a, p. 55, 5.6.1; FAO, 2022c). Other benefits may include the implementation of contingency planning for droughts, floods, diseases, harmful algal blooms, the adoption of more diversified and resilient production systems, integration of climate-proofing innovations such as wind turbines, and locally embedded environmental monitoring systems to strengthen aquaculture resilience and improve early warning (GSA 5.6) (FAO, 2023a, p. 55).

iv. **Ecosystem carrying capacity.** In line with the EAA (Bush and Oosterveer, 2019) this requires greater embedding of environmental objectives with wider economic and social goals “linked to and dependent on many other sectors that use the coastal and aquatic environment”. However, the EAA remains a relatively top-down planning “strategy” for, as explicitly stated, achieving “national, regional and international development goals and agreements” through consultation (FAO, 2010). ACM may enable the management of genetic resources by enhancing monitoring systems over biodiversity of aquatic organisms at risk of extinction and enable the adoption of measures to mitigate the risks (FAO Blue Transformation Target A5 and GSA 10 [FAO, 2023a, p.64]). This may include new practices that avoid habitat degradation or enabling forms of conservation aquaculture that enhance habitats and biodiversity (FAO, 2023a, p. 49, 5).

v. **Market credibility.** ACM can enable market confidence in the sustainability and/or food safety of aquaculture production. Co-management contributes to the resilience of the aquatic food system through the development of strategic partnerships between the private and public sector, better resource, economic and environmental management, strengthening of networks, and encouragement of innovation (FAO Blue Transformation Target A2). ACM can also enable farmers to make collective market claims in domestic and international markets that may in turn generate employment, higher income and technological improvements (FAO Blue Transformation Target A3 and GSA 5 and 8 [FAO, 2023a, p. 49 and p.60]). If focused on domestic markets, where such claims remain underdeveloped in many parts of the world, producers may improve returns relative to export markets (FAO, 2022c).

vi. **Social license to operate.** Co-management can enable participants to generate legitimacy for aquaculture production – at either the level of production units or sectors as a whole. Co-management can legitimize decisions over resource use and planning by facilitating some type of stakeholder arrangement, either in terms of enrolling resource users in established management systems, or through co-production via multistakeholder engagement or through joint management and planning of aquaculture when expanding to new production areas (in line with ambitions for area-based management under the EAA) see for example, Corner *et al.*, 2020. In other cases, co-management is used by communities and sectors as a means of establishing: (i) a social license to operate – that is, increasing cross-sector involvement in management in order to enhance societal recognition for activities that are additional to legal compliance (Mather and Fanning, 2019); and/or (ii) a means of avoiding or mitigating conflict over access to resources and/or space – under the assumption that *a priori* inclusion reduces the need for ongoing consultation (Sepúlveda *et al.*, 2019).

vii. **Sustainable innovation.** ACM can also, in line with the vision of FAO’s Blue Transformation (Bush and Oosterveer, 2019), “[enhance] more efficient, inclusive, resilient and sustainable blue food systems through integrated science-based management, technological innovation and private-sector engagement” (FAO, 2022a). Technological innovation through multistakeholder innovation platforms, with examples in both Europe and Asia (Bostok, *et al.*, 2016; Bush *et al.*, 2021), enable learning and enhance capacity for anticipating and responding to change but do so at a system or sector level (Schut *et al.*, 2015). Such learning and anticipation may be linked to innovations aimed at resolving production risks and/or enabling a transition to sustainable intensification (Edwards, 2015). This includes, as outlined by Naylor *et al.* (2021a), the further domestication of species, improved seed production, species selection and selective breeding, improved biosecurity and health control and the development of new feed ingredients to replace fishmeal and fish oil.

4.2 Operational goals

At the operational level, ACM can enable the improved management of shared resources, production risks, and improved compliance with state policy and legislation, and enhance the legitimacy or social licence to operate of the sector when being extended to new regions or environments – including areas identified and organized in state-led spatial planning processes (as outlined under the EAA and GSA 4 on governance and planning [FAO, 2023a, p.46]). It can also provide a means of meeting wider ambitions, as set out in the FAO Blue Transformation vision; greater social inclusion in decision-making and benefit sharing associated with the sector; knowledge exchange that enables innovation; and upgrade production performance to increase production, economic efficiency and/or regulatory compliance (GSA 4, 7 and 8 [FAO, 2023a, p.46, p.59 and p.60]). Five categories of operational goals for ACM, in line with the FAO GSA, are:

- i. **Enhanced productivity and economic performance.** A primary operational goal of producers participating in any ACM arrangement is to increase the economic performance of their production unit by reducing costs of inputs, increasing production efficiency and/or negotiating high farm gate prices. In line with the aims of economic cooperatives, ACM can enable producers to reduce the cost of feed, seed and pharmaceuticals by collectively bargaining with suppliers, and enable producers to cross-insure losses (Watson *et al.*, 2018). Such bargaining can also be linked to ensuring higher quality feed (in terms of protein content and feed conversion) and seed, e.g. leading to lower mortality rates (Bjørndal, Child and Lem, 2015). It can enable collaboration and learning between producers to improve feeding practices and gain further efficiencies in feeding (e.g. Salazar *et al.*, 2018). ACM can also create opportunities for coordinated water management in terms of timing discharges to avoid the spread of disease (Ahmad *et al.*, 2021), or staggering harvesting to maximize shared labour.
- ii. **Partnerships and investment opportunities.** ACM can enable participants to form new, strategic partnerships that encourage public and private investments, while allowing a platform for farmer organizations, cooperatives, small- and medium-sized enterprises and export-oriented enterprises to tap into the potential of the private sector (in support of GSA 7.1 guidelines on sustainable value chain development). Partnerships along the value chain also enable operational goals related to improving income, and reduced risks through improved market access (Watson *et al.*, 2018). These partnerships can also open up opportunities for contacting and negotiating investment opportunities, including public subsidies and resources and private investors in and outside value chains.
- iii. **Procedural efficiency.** ACM can contribute to enhancing procedural goals of states and/or the organization of aquaculture producers in line with wider goals of participation, transparency and accountability. Collaboration in these instances is seen as a means of enabling more equitable and efficient decision-making related to the management of key (shared) inputs such water, land use and effluent flows. By formalizing decision-making, those participating in co-management can reduce the amount of time required for consultation and negotiation, either between producers or between producers and adjacent sectors (GSA 4.1.1 [FAO, 2023a, p.46]). Formalized decision-making can furthermore enhance policy dialogue with the goal of mobilizing key stakeholders, creating decision opportunities and consultations for public investment (GSA guideline 4.1.1 [FAO, 2023a, p.46]). Co-management can also enable participants to enhance information collection, enable greater openness and accountability of government, and enable consistency and predictability to secure tenure rights in aquaculture planning, in order to foster investment (Hishamunda, Ridler and Martone, 2014; Lester *et al.*, 2022).
- iv. **Social wellbeing.** Co-management can enable participants to renegotiate their terms of inclusion in the industry and/or value chains, and in doing so enhance nutritional or livelihoods outcomes (Armitage *et al.*, 2009; FAO, 2022d). These goals are broadly aligned with guidelines for sustainable aquaculture, which focus in part on just and fair treatment in terms of equality of rights and opportunities (FAO, 2022d). ACM may also help enable voice and representation of producer organizations, and in doing so help small producers access an array of services, including improved market information, extension and collective bargaining power. Co-management may, as such, enable improved negotiation over a fairer distribution of benefits

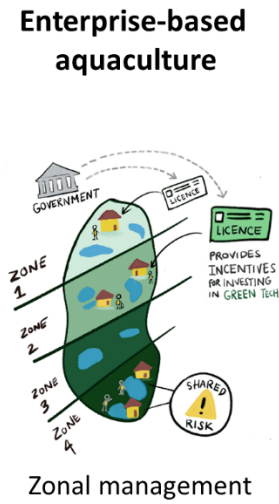
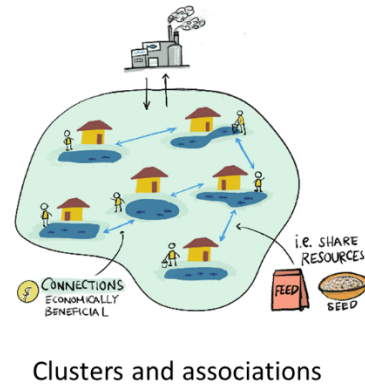
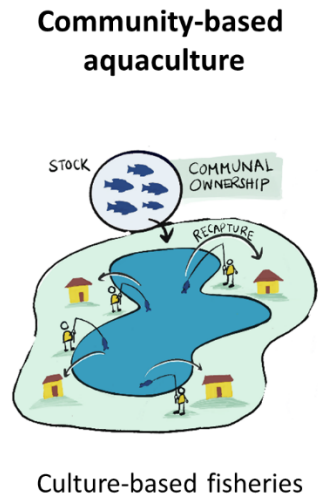
from aquaculture (Gurney *et al.*, 2021). Benefits may relate to the achievement of food security and improved nutrition, either directly or indirectly from aquatic food production (FAO, 2022c) and/or the promotion of inclusive livelihoods and economies throughout aquaculture-related value chains (see for example Hernandez *et al.*, 2018).

- v. **Environmental stewardship.** Co-management can enable improved resource use and reduce the environmental impacts of production. Environmental stewardship relates to (i) the protection, restoration, and promotion of sustainable ecosystems and (ii) the efficient use of resources to enable “more efficient, inclusive, resilient and sustainable” food systems (FAO, 2022c, p. 9). These entail both the impacts of aquaculture on the environment and the impacts of the environment on aquaculture. Central to this goal are both the implementation of sustainable aquaculture practices – including those defined by the GSA, EAA and various private standards (e.g. Aquaculture Stewardship Council and Global Aquaculture Alliance). Across these guidelines and standards is a growing recognition that “beyond-farm” environmental risks, both to and from aquaculture, require collaborative forms of management.

5 TYPOLOGY OF AQUACULTURE CO-MANAGEMENT MODELS

To illustrate the inherent in ACM, four models are presented (see Figure 1, fully elaborated in Bush *et al.* in prep.).

Figure 1. Typology of potential ACM models



Community-based production refers to a range of culture-based fisheries based on the collective use of natural and artificial water bodies with shared stocking, or management of natural recruitment. Examples include culture-based fisheries and rice–fish culture systems. There are an additional three models of enterprise-based ACM, all of which involve collective action between farms with individual or corporate ownership and decision-making over production: clusters and associations, zonal management and jurisdictional approaches.

- i. **Community-based ACM** relates to production systems that supplement, sustain, or raise the total production beyond a level which is sustainable through natural processes by stocking and recapture (Da Silva, 2003; FAO, 2015). Community-based aquaculture is defined by a collective (community or subset of households) who hold tenure over a (natural or human-built) water body and have jointly invested in stocking and post-harvest processing (Sarkar *et al.*, 2020). The role of government in these arrangements depends on ownership of the water body and/or the degree of support communities need for stocking and maintaining access over harvesting. Where public water bodies are stocked, including irrigation or hydroelectric reservoirs, government may become a primary stakeholder in negotiations over production levels and access (Galappaththi, Ford and Bennett, 2020). The operational goals for co-managing culture-based fisheries are related primarily to control and competition over the water body and technical management of stocking and harvesting to increase productivity in these systems in an integrated fashion. These co-management arrangements also have a series of strategic goals related to social license to operate, especially when water bodies cross jurisdictional boundaries. Overall, these co-management arrangements are aimed at increasing production of the water bodies in a sustainable way to deliver nutrition and/or income to the communities involved.
- ii. **Collective approaches** to aquaculture include a range of cooperatives, clusters and associations in which aquaculture enterprises compete but also cooperate. Aquaculture cooperatives tend to focus on improving the economic performance of their members, while clusters are either farmer- or government-driven attempts to organize smallholders. Associations are more formalized organizations, often representing producers and other value chains actors at the national level (Bottema, 2019). These collective approaches are designed to mitigate production and market risks, negotiate access to markets and enhance the adoption of new technologies and practices. In some instances, they also enable joint management of common water sources, joint compliance with state or market regulation, or innovation within countries or across regions as large as Europe or Southeast Asia (Bush *et al.*, 2021; Ha, Bush and van Dijk, 2013; Kassam, Subasinghe and Phillips, 2011; Umesh *et al.*, 2010; Joffre, Poortvliet and Klerkx, 2019). As such, they can all be seen as a form of collective action aligned to economic and livelihood goals, including compliance with public and private standards and best management practices at the farm level (Kassam, Subasinghe and Phillips, 2011; Umesh *et al.*, 2010), that also manage production risks (Bush *et al.*, 2019; Kassam, Subasinghe and Phillips, 2011; Joffre, Poortvliet and Klerkx, 2019).
- iii. **Zonal approaches** to ACM are a spatially explicit means of managing production risks related to carrying capacity. Zonal approaches are explicitly mentioned in the EAA as a means of incorporating an integrative and cross-sectoral approach to sustainable development, which in principle align to the goals of co-management (Brugère *et al.*, 2018). The EAA emphasizes the need to integrate farming practices into a given ecosystem and to develop aquaculture in the context of other sectors, “such that it promotes sustainable development, equity, and resilience of interlinked social-ecological systems” (Soto, Aguilar-Manjarrez and Brugère, 2008, p. 2). Zonal approaches have been used by public institutions (in Scotland, Norway and Chile) for translating ambitions for integrative and cross-sectoral management into site selection and spatial planning (e.g. Aguilar-Manjarrez, Soto and Brummett, 2017). Non-governmental organizations (NGOs), such as China Blue Sustainable Fisheries Partnership and The Nature Conservancy (see, for example, Bottema, 2019), have also advocated for a zonal approach to tilapia and shrimp production in Asia.

- iv. **Jurisdictional approaches** are collaborative arrangements aimed at reconciling competing social, economic and environmental objectives through the improved participation of state, civil society and/or private sector actors in and across sectors through formalized collaboration that affects practices and policies within a given spatial unit or jurisdiction (von Essen and Lambin, 2021; Buchanan, *et al.*, 2019; Kittinger *et al.*, 2021). In doing so they “align government-led, multistakeholder processes within provinces and districts with prospective external incentives for jurisdictional-scale performance” (Seymour, Aurora and Arif, 2020, p. 1) They align with co-management in terms of including multiple stakeholders with diverging interests and increasing the legitimacy of policy and regulation. Jurisdictional approaches also align institutional boundaries in an attempt to enable improved monitoring and enforcement – with the wider goal of enabling joint decisions that can adapt to local contexts and actors while achieving outcomes at a large scale that can contribute to “system-wide transformation” (von Essen and Lambin, 2021). They open the scope of co-management by enabling locally- and market-defined incentives and support to achieve ecosystem-based management. Jurisdictional approaches also foster multistakeholder partnerships that agree on an ACM plan or covenant stipulating the goals, responsibilities and benefits of collaboration.

6 “GOOD” AQUACULTURE CO-MANAGEMENT PRACTICES

Co-management is the outcome of deliberative processes between collaborating actors. This means there is no one-size-fits-all model for co-management. Instead, there is a range of possible forms of collaboration within which different goals – more or less in line with the strategic and operational goals outlined above – can be set and worked towards. Unlike fisheries or forestry, the actors involved in ACM may extend beyond government and producers to include other value chain actors. The specific goals may also extend to dealing with production risks and innovation, which again are not the core remit of co-management in natural resource-based sectors. Nevertheless, the practices of developing ACM are likely to align with those of other sectors (Pomeroy and Rivera-Guieb, 2005; FAO, 2022e).

Translating and building on the *Guidebook for evaluating fisheries co-management effectiveness* (FAO, 2022e), the following outlines “good” practices of ACM across three levels or dimensions (Figure 2). First, “external” good practices relate to those outside the ACM system, but affect the ways in which co-management is defined and initially implemented. Second, “internal” good practices are those related to the implementation and maintenance of the co-management arrangement. Finally, individual good practices refer to the practices of actors who individually (or collectively, e.g. in households or communities) engage in co-management. All three sets of good practices can be used as a starting point for the implementation of ACM, as well as monitoring and evaluating the ongoing performance of ACM systems, with reference to EAA and GSA.

Figure 2. External, internal and individual good ACM practices

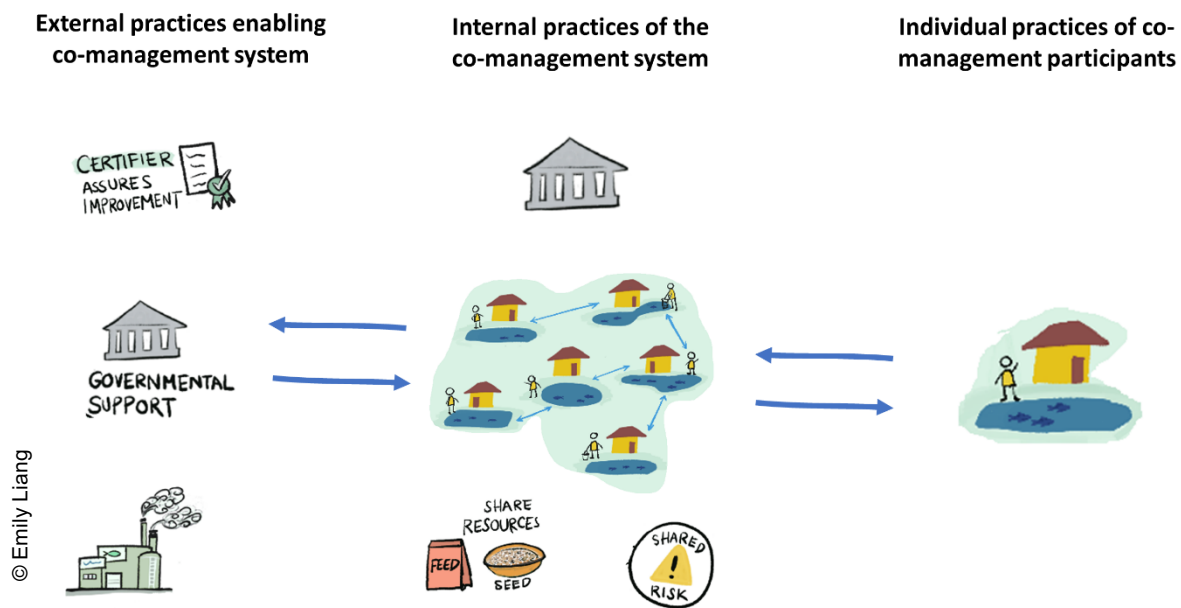


Image: © Emily Liang

6.1 External good practices – Enabling environment and institutional fit

Co-management can improve the fit of existing state and private institutions to the spatial scale of environmental and/or social issues. Improved institutional fit can be an outcome of adaptive processes of decision-making (Armitage *et al.*, 2009) that reflect the recognition by resource users, the state and/or non-state actors that spatial “jurisdictions” of rules do not align with the spatial extent of environmental risks or impacts (Bottema, Bush and Oosterveer, 2018). Creating greater institutional fit is already inherent to the EAA which explicitly aims to extend management to “ecosystems” (Brugère *et al.*, 2018). It is also taken up in models related to aquaculture management areas and zonal approaches (Henriques *et al.*, 2017). Consistent across all these approaches is a recognition of the need to move beyond the farm scale towards collaborative forms of management that extend to higher social and ecological (landscape) scales. Eight best practices for enabling environment and institutional fit can be identified:

- i. **Set “appropriate” scale:** The scale of the co-management system may vary but should be appropriate to the environmental issues pertaining to aquaculture and the actors in the industry and should relate to existing levels of management.
- ii. **Define boundaries:** The boundaries of the co-management system are defined in relation to the actors involved, the biophysical extent of the issues being managed and the jurisdiction of the different levels or executive branches of government.
- iii. **Enable policies and legislation for ACM:** Supportive legislation, policies, rights and authority structures are in place and instituted at a scale (ecosystem to farm level) congruent with key goals identified by those collaborating.
- iv. **Differentiate authority of government and producers:** Those collaborating organize and make management rules and clearly communicate these rules to all other actors in the industry.
- v. **Delineate tenure rights of aquaculture producers:** Formal and recognized rights to, for example, water, land and/or genetic material, are granted to those collaborating and the structures required for allocating use rights among participants are agreed.

- vi. **Engage support of government and political/economic elites:** Active cooperation and power sharing between producers and government actors and/or producers and other value chain actors (suppliers or buyers), and/or where relevant, adjacent land and resource users.
- vii. **Enforce management rules:** A system of self-enforced penalties is established and imposed by strong operational rules which are designed, enforced and controlled by those collaborating.
- viii. **Establish and enforce graduated sanctions:** Sanctions increase with the number or the severity of offences.

6.2 Internal good practices of the co-management system

6.2.1 Participation, transparency and equity

Co-management can enable more inclusive and fair participation in decisions pertaining to the sector. ACM arrangements can enable providers to develop collective management systems that enable exchange of information on key inputs and outputs of production, or marketing information. By enabling participation, greater transparency and access to information, equal opportunities and fair access to the inputs, technologies and markets needed for production can be enhanced.

- i. **Participation by affected parties:** The co-management arrangement includes producers, adjacent resource users and/or value chain actors involved in or affected by aquaculture production, granting them the right to participate in achieving agreed goals or resolving sector-related decisions.
- ii. **Fostering social cohesion:** Participants are defined by their use of the same or similar production systems, the species grown, the feeds sourced, their use of shared water resources or the exposure to shared risks related to disease.
- iii. **Empowerment through capacity building:** Those engaging in the co-management arrangement are supported by other participants or external parties (private sector, NGOs and government) to develop the requisite skills and knowledge for contributing to the achievement of joint goals.
- iv. **Transparent coordination:** A transparent set of rules and flow of information is established and used at predefined intervals to enable joint decision-making between government, producers and other relevant actors (value chain or affected adjacent).
- v. **Representative organization:** A legitimate organization (as recognized by actors from within the aquaculture sector) should be in place to represent the interests of producers and other key stakeholders in decision-making towards achieving shared goals.
- vi. **Equity:** The co-management arrangement should enable fair access to shared land and water resources, or distribution of responsibility for managing shared risks between producers and/or between producers and adjacent/affected groups (e.g. farmers in other food sectors).

6.2.2 Leadership, rules and conflict resolution

Co-management can mitigate conflict between actors in a single sector (Murunga, Partelow and Breckwoldt, 2021) or between sectors (Alipour and Arefipour, 2020). Conflicts may (pre)exist between competing actors or sectors, or emerge during the process of implementing co-management, or the process of expanding the aquaculture sector (Galparsoro *et al.*, 2020). Co-management may also offer a means of enabling deliberation and resolution of long-standing conflicts related to ambiguous tenure arrangements, and social and environmental impacts derived from production.

- i. **Membership and rights clearly defined:** The rules for actively contributing to the co-management arrangement are defined and made explicit. So too are the rights associated with decision-making around access to and/or use of shared resources and inputs, participation in bargaining for inputs and/or negotiation over public and private regulation.

- ii. **Conflict management mechanisms in place:** A mechanism for addressing conflict between members of the ACM arrangement is established, including rules for internal resolution or, when necessary, external adjudication.
- iii. **Accountability:** The established conflict mechanism sets out conditions for holding those in violation of shared rules to account in an open and transparent manner.
- iv. **Leadership:** The requirements for leadership of the group are set out in a co-management plan (see Section 7.1). Leadership may be granted to an individual or to a group (board) of representatives deemed legitimate by participants. A mechanism for appointing and dissolving leadership positions is made transparent.

6.2.3 Goal setting, learning and adaptation

Co-management enables adaptive decision-making by plural sets of cross-scale actors through structured learning and reflection (Carlsson and Berkes, 2005; Finkbeiner and Basurto, 2015). This learning and adaptation could be applied to any number of dimensions of aquaculture that require continued evaluation and adjusted actions – from water management to managing the quality of seed. As such, co-management is seen as a stage of development that may dissipate and be resurrected in the future when the need arises (Butler *et al.*, 2015; Cox *et al.*, 2020). The principles of adaptive learning may also be extended to the formation of aquaculture innovation and technology platforms (Bush *et al.*, 2021) – thereby giving a wider role to non-local private sector actors.

- i. **Co-management plan:** A co-management plan at the community level or a co-management agreement at the provincial level is developed and agreed by participants through an open and transparent process that enables informed input into its design.
- ii. **Clear goals and objectives from a well-defined set of issues:** Goals and objectives are collectively determined (with or without guidance from the categories outlined in sections 4.1 and 4.2) and communicated with clarity and simplicity to steer the direction of farm- and beyond farm-scale management activities.
- iii. **Regular interaction:** Participants engage in regular, active and participatory meetings with the others involved in the co-management arrangement to discuss ongoing challenges related to power-sharing, trust building and progress to achieving shared goals.
- iv. **Enhance knowledge capacity:** The co-management arrangement should enable participants to gain a greater understanding of better farming techniques (in line with, for example, the GSA, national better/best management practice standards or private sustainability standards), as well as on the cause and solutions for dealing with wider social and environmental issues related to aquaculture production.
- v. **Monitoring and evaluation system:** A system for monitoring and evaluating both the co-management plan or agreement (against the best practices outlined here) and the wider goals of the co-management system (related to for example, the goals in sections 4.1 and 4.2) is put in place (see further details in Section 7).
- vi. **Adaptive management:** The information collected through the monitoring and evaluation system is fed directly into decision-making by those participating in the co-management arrangement to adjust goals, forms of collaboration and innovation, with the goal of ensuring strategic and operational goals are achieved (sections 4.1 and 4.2).
- vii. **Mutually beneficial alliances and networks:** On the basis of new information and learning, the co-management unit seeks out new alliances and networks that can enable them to make changes, innovate and achieve strategic and operational goals.

6.2.4 Enhancing governance capabilities

Co-management can enable actors in the aquaculture sector to develop the governance capabilities to identify, define and deal with problems in ways that suit them best considering their background, ambitions or context-specific position. Co-management requires collaboration with state, market and financial actors (Termeer *et al.*, 2015). For aquaculture, co-management arrangements would enable those participating in co-management to come up with new interventions or innovations, identify strategies for advocacy or political action, or respond to changing agendas or public demands.

- i. **Agility:** The co-management arrangement enables participants to advocate for change and support when faced with major and structural changes affecting the aquaculture industry, for example changes in government, changing market demand and conditions for access, disease outbreaks or major climactic events.
- ii. **Innovation drive:** The participants in co-management are enabled to recognize the need for new products and practices and seek out new partnerships to realize them.
- iii. **Rescaling:** Participants in the co-management arrangement are able to strategically recognize the need to advocate for and/or seek support or collaboration with actors that can assist them in addressing key challenges, for example moving from local to national authorities, from global to local markets or partnerships with NGOs working across species or production systems.

6.3 Individual good practices of co-management participants

Individual good practices refer to the practices of actors who individually (or in small social groups, e.g. households) engage in co-management. In the context of ACM, individuals remain important given the importance of farms based on household ownership in smallholder aquaculture. Individual co-management practices are also important for understanding the level of engagement with the goals and implementation of the co-management system in terms of sensitization to the goals of co-management, clarity of incentives for engagement with co-management, equitability in how benefits derived from collaborative decision making are distributed, reflexivity leading to changes in farming practices and shared resource management, enhanced capacities for engaging in collective action, and/or the development of leadership and innovation.

- i. **Sensitization:** Individuals understand, identify with and actively engage with the goals underpinning the ACM system (e.g. Nowell *et al.*, 2022). For farmers this could be by extending their decision-making and farming practices to consider shared risks and resources beyond their own farm.
- ii. **Incentives:** Individuals recognize and positively respond to incentives (economic, social and political) to participate in co-management and voluntarily comply with co-management rules and decisions, while also leaving room for innovative problem solving (based on the ecosystem approach to fisheries, [FAO, 2005]). Additionally, these incentives push them to reason towards collaboration over conflict (De Pourcq *et al.*, 2015).
- iii. **Equitability:** Individuals are aware of their own responsibilities and level of accountability related to the ACM plan, as well as those of others, and deem them fair and proportionate (as outlined in both the FAO EAA and GSA). Additionally, they agree with the reasoning for benefit distribution in the co-management plan – whether based on the right, merit or needs of those involved in the co-management arrangement (Gurney *et al.*, 2021).
- iv. **Reflexivity:** Individuals seek out access to and understanding of information surrounding risks and resources through the ACM plan (Butler *et al.*, 2015). They in turn act on that information by demonstrably changing their practices to contribute to the goals of ACM plan or seek to change the plan given their own contrasting knowledge or experiences for achieving those goals.

7 IMPLEMENTING AQUACULTURE CO-MANAGEMENT

The implementation steps for ACM depend on the design of the co-management system, the implementation of the co-management plan or agreement and the national context. Despite the potential differences, it is possible to identify three generic steps of (i) pre-implementation, (ii) implementation and (iii) post-implementation. These steps, based on those set out for fisheries co-management (Pomeroy and Rivera-Guieb, 2005; Butler *et al.*, 2016; Olsson, Folke and Berkes, 2004), can be translated to ACM.

Within each of the three steps are several specific activities. For example, during pre-implementation, meetings between those engaging in collaboration can be held. During implementation the practical changes needed to manage, access resources and develop the necessary capacities for management are put in place. Nevertheless, these steps remain generic in nature because there is no blueprint or model for co-management. Instead, the design of collaborative management requires a process of design, development and implementation. As outlined above, in some cases this will mean that only producers and the government may be involved. But in other cases, a wider set of value chain actors may be involved, extending to input and service-related actors, in addition to cross sectoral actors affected by aquaculture activities.

7.1 Pre-implementation

Pre-implementation requires joint recognition, and therefore legitimacy, of co-management (Chuenpagdee and Jentoft, 2007). A rationale might be built around a shared recognition for collaborative management based on a shared resource crisis (e.g. disease or water quality) or changing policy or market access requirements. This step also requires relevant actors to clearly state their willingness to engage in ACM, including the credible intent of government to consolidate or develop supportive legislation and/or policy. Finally, past (perceived) injustices need to be identified, acknowledged and addressed to avoid an impasse at later stages of development.

In the pre-implementation phase, input should be sought from all potential participants. This phase should culminate in the formulation of an ACM plan. A co-management plan outlines the goals, objectives and activities for joint decision-making, as well as the specific strategies that address the specific needs of those participating in the co-management arrangements.

In line with Pomeroy and Rivera Guieb (2005), this pre-implementation phase involves the following practical steps:

- i. **Description of the area and resources used for aquaculture production**, including geography, demography, important resources for aquaculture production and their condition at the time of writing the report. Other social dimensions of production should also be included, such as the socio-economic status of farmers, institutions and laws, and other relevant information for management. Maps of the area in which aquaculture production is practiced could also be included – with detailed locations of resources and use patterns and existing management interventions.
- ii. **Identify a lead actor or organization** with the capacity and resources to lead the establishment of the co-management arrangement. The type of actor is key for determining the type of ACM arrangement that is finally adopted – i.e. more or less involvement and leadership from the state or producer associations or buyers. The identification of the lead actor can be driven by their own self-interest or strategic policy goals. They may also be identified through a structured negotiation if past conflicts or future benefit sharing remain contentious or are unclear to all parties involved.
- iii. **Identify resource and/or input constraints** that potential participants in ACM face. These constraints relate primarily to resources required for achieving tactical goals pertaining to access to

- suitable production sites, water, seed, feed and/or (clean) energy supplies. Attention should be given to both access and ownership rights over these resources and inputs.
- iv. **Identify collective social and/or environmental risks** through consultation with potential co-management participants, with questions focused on defining shared production risks. These risks may relate to social dimensions such as labour, weak benefit sharing in value chains or associations, or poor access to finance. Environmental risks may relate to poor water quality, weak biosecurity and/or sources of adverse chemical use.
 - v. **Identify market opportunities and constraints** that potential ACM participants can collectively address. Opportunities may emerge in response to collective bargaining around input and farm gate contracts, or access to new product categories in domestic and/or export markets. Constraints include increased market requirements from buyers or regulators, and/or increased competition.
 - vi. **Identify the innovation capacity** of potential participants to identify and resolve risks, resource constraints and markets once ACM is established. Attention should be given to expanding the group of participants to address shortfalls in capacity, and/or identify sources of technical and knowledge support for participants. Involvement in ACM should enable producers to improve their ability to access the inputs to production, e.g. new knowledge, technologies, capital and finance required for upgrading production practices for sustainable aquaculture (e.g. FAO, 2022d).
 - vii. **Assess support provided by the policy environment** for the implementation of ACM. Questions should focus on whether prevailing legislation allows for and/or provides legal tenure and decision over, for example, shared resources. An assessment of how bylaws established by the ACM unit would be supported by regulators. Attention should also be given to the political will of government authorities to implement and/or enforce rights and responsibilities.
 - viii. **Identify scale of management needed.** The level at which the scheme is organized must “fit” the ecology, management system and the people that inhabit it. The definition of socio-spatial boundaries should be based on principles of subsidiarity (Pomeroy, 1995), spatial planning aligned to the EAA (FAO, 2010) and/or defining the spatial extent of shared risks (see Lien *et al.*, 2020). Where relevant, transboundary management can be assessed to determine opportunities for regional (landscape and/or seascape) approaches for harmonizing laws and creating binding legal mechanisms across boundaries.
 - ix. **Identify key stakeholders** willing to enrol themselves in the ACM arrangement. This also involves the identification of their rights and responsibilities related to the implementation of ACM, as well as the benefits and opportunities they anticipate receiving from their ongoing involvement. Identify the motivations for joining an ACM arrangement, e.g. response to a (perceived) resource management crisis such as disease or water quality or opportunity for enhancing production performance through innovation. Attention can also be given to the stakeholders along the value chain or spatially adjacent sectors (e.g. agriculture, processing industries and fisheries) competing for resources such as land and water, in line with the EAA (FAO, 2010).
 - x. **Identify a willing investor or financier** for the establishment of the ACM arrangement. An investor may be self-evident based on those actors taking a lead in the development of the co-management initiative. However, where lead actors do not have the resources to finance the implementation of ACM, third party funders need to be found. An assessment should be made of short-term benefits vs. long-term gains to identify which (types) of investors (e.g. public, institutional and private) are most likely to engage.
 - xi. **Collect baseline data** at the start of implementation to enable post-implementation evaluation. ACM first implies the establishment of suitable and relevant indicators that are comprehensive (i.e. span ecological, institutional/governance and economic factors), but not too detailed that they go beyond the comprehension and capacity of actors. Indicators for fisheries are well-established [see for example, FAO, 2022e; Evans, Cherrett and Pems, 2011] and some may be interchangeable with aquaculture).
 - xii. **Preliminary co-management plan** reporting on the above assessments and outlining a set of goals to overcome constraints and risks and/or enhance the benefits to participants. This should include

both operational and strategic level goals and a strategy with clear activities and responsibilities for achieving those goals. The plan should also stipulate the methodology, responsibility and technologies for monitoring and evaluation, including a timeline for interactive reflection and adaptation of the ACM plan. Conflict resolution mechanisms should be established between producers, as well as producers and state and other (adjacent) sectors, to enable open access to negotiations, which in turn affects legitimacy, accountability and transparency.

Implementation

Once an ACM plan has been agreed upon and funds acquired, the ACM arrangement can be implemented. Implementation follows the agreement set out in the plan and established in the pre-implementation phase, but remains open to ongoing consultation, learning and adaptation. Key activities in this phase include the development of key norms, rules, planning and conflict resolution instruments which steer the interaction and activities of those involved. These may include:

- i. **Jointly draft an ACM partnership agreement** that provides a clear division of roles, responsibilities and rights between stakeholders. Within this agreement, key norms and rules for participation should be stipulated, including rights and responsibilities for participation and benefit sharing and procedures for conflict management. Attention should be given to effective interagency collaboration between departments because of the leases and permits necessary for operation. Producers, government and relevant private sector actors should have the opportunity to negotiate in a fair and free manner, meaning in the absence of threat, violence, and/or intimidation from others. The agreement should also outline agreements on benefit sharing. Where market assurance is required, partnership agreements (or “covenants”) should be put in place. These define roles and responsibilities, the level of self-determination (authority) and conflict resolution mechanisms in the case of disputes.
- ii. **Legitimacy of property rights and decision-making** must be clearly defined to enable fair access to key inputs to production, including space and water resources. Mechanisms for allocating use rights should be clearly established and corrected where actors feel it necessary. Producers should be supported to develop self-enforcement and monitoring of agreed upon norms, rules and/or standards related to production inputs (feed, seed and water), effluent flows and other environmental and social issues (see FAO, 2022d).
- iii. **Benefit sharing.** ACM should enable inclusive forms of collaboration where fair benefit-sharing mechanisms, including costs, risks and benefits, are shared in time and space, can be openly negotiated by participants.
- iv. **Include local, indigenous and scientific knowledge** in the development of activities designed to innovate and manage shared risks, resource constraints and/or market access. Co-management can be used to enable the transfer of material and management-related technologies pertaining to farm installation and construction, culture techniques, pond maintenance practices, disease diagnosis and reporting. The synthesis of scientific, and other (non-scientific) knowledge is important, although important co-management decisions must primarily be evidence-based.
- v. **Negotiate market conditions.** Participants can use the arrangement to strengthen cooperative and or collective action for (re)negotiating contracts for production inputs and/or farm gate prices. This can also include engaging in decision-making processes related to the allocation of resources (e.g. land, water and space), co-definition or revision of production and (domestic and global) market-related standards and requirements.
- vi. **Develop a sustainable financing strategy** that identifies either an internal membership or subsidy-based model of funding, or external source of funding based on a long-term business model. ACM can enable the design of internal risk transfer mechanisms through collective forms of insurance and cooperative lending, or access to external risk transfer through state and/or private insurance, finance and/or supply contracts. In the case of smallholders, ACM may enable innovations to be

shared among producers or enable connections to be made with service providers (e.g. information and communications technology and extension services) that address day-to-day business challenges such as production smoothing, savings and business planning (see for example, Pouw, Bush and Mangnus, 2019).

- vii. **Develop the capabilities** of those involved in the ACM arrangement to undertake activities in the plan and strategy. These capabilities may relate to knowledge and skills. However, they may also include the establishment of property rights and/or access to resources and inputs. Ongoing evaluation of the need for state and market actors to support these capabilities is needed – including the identification of constraints these actors may pose to realizing the agreed goals of co-management. Collaborative management, including sustainability partnerships with NGOs or government leading aquaculture improvement projects (see Bottema, 2019) can enable compliance with better management practices or market-based requirements in either domestic or international markets.
- viii. **Agree on a timeline for re-evaluation of the ACM agreement and strategy.** Depending on the goals of those involved in the co-management arrangement and/or demands from funders, an agreed timeline for re-evaluating the ACM agreement and strategy should be transparently established and communicated.

7.3 Post implementation

After implementation, co-management needs to be self-sustaining. In line with the potential of ACM to enable learning and adaptation, the post-implementation phase enables iterative evaluation of key objectives and opportunities for adjusting these goals (and their associated activities). This may include the following activities:

- i. **Agree on a timeline for turnover and phase-out of any external agents** that initiated the scheme to the community (if applicable). External agents ought to have a temporary relationship with the programme but should not leave entirely. During this phase-out process, the roles and responsibilities of participants may need to be renegotiated.
- ii. **(Re)evaluate the membership and role of participants** as the ACM plan and strategy is evaluated and updated. This may lead to the exit of some actors and the enrolment of new actors as new opportunities for innovation and/or risks and impacts of aquaculture are better understood.
- iii. **Implement ex-ante evaluation** of the co-management system between all stakeholders to determine the extent to which the programme has reached its goals and objectives (see Section 4). Results can be used as a reference for future planning and evaluations to measure progress through time.
- iv. **Reflect on the capabilities of actors** to shift from undesirable to desirable production and trade practices and re-evaluate and re-design norms and rules across state, market and civil society institutions to support and enhance these capabilities.
- v. **Reflect on the need to scale up or scale down** the co-management initiative by including or excluding stakeholders to reach operational and strategic goals.

8 MONITORING, EVALUATION AND LEARNING

Monitoring and evaluation systems need to be developed to determine the impact of any of the ACM models outlined above. Based on a wider set of generic monitoring and evaluation methodologies, these systems require the systematized collection and evaluation of relevant data to enable the assessment of: (i) the conduct and performance of co-managers and the co-management system; and (ii) the achievement of the co-management plan's goals and objectives. In line with wider goals of adaptive forms of co-management, these assessments should also enable co-managers to reflect and learn from past actions and adapt goals,

rationales, rules and arrangements. An evaluation may also enable donors and government policymakers to revise funding and priorities for enhancing the performance of the aquaculture industry more broadly.

Monitoring and evaluation of co-management is far more advanced in other resource sectors such as fisheries (see for example, FAO, 2022e). Generic indicators related to the evaluation of co-management plans from these other sectors are likely to be highly instructive for ACM. However, broader system-level ecological, social and economic impact indicators require specific elaboration – and potentially be linked to other impact assessment frameworks developed through third party certification. In preparation for the development of these more elaborate monitoring and evaluation indicators, the following provides a general outline of key considerations in the development of a generic approach for evaluating ACM.

8.1 Design considerations

The overall goal of monitoring and evaluation is to assess both the performance of ACM against pre-defined goals and objectives (with an applicable and relevant set of indicators) set out *a priori* in a co-management plan, and the wider impact of ACM on wider social, environmental and economic outcomes. Central to both levels of evaluation is the opportunity for those engaged in co-management to learn what is working and what can be improved so that the co-management arrangement can be adapted and improved.

Who sets the goals and objectives of monitoring and evaluation, and who evaluates them, may differ depending on the needs of either internal (e.g. resource users, collaborating state or non-state actors) or external actors (e.g. donors, buyers or auditors). Following FAO (2022e), monitoring systems and evaluation processes should be participatory and involve resource users and primary stakeholders in design, data collection and analysis. Depending on (i) the capabilities of those involved and (ii) the goals of ACM arrangements, monitoring systems can also be internal, defined and run by producers, or externally run based on intermittent sampling or auditing.

Monitoring and evaluation systems for co-management are also fundamentally oriented to enhance learning and adaptive change. Generally, evaluation within co-management improves individual and organizational learning, fosters the knowledge and skills acquisition of those involved, improves communication, and increases cohesion and self-confidence (Trimble and Plummer, 2019). These goals can be achieved by evaluating different processes of ACM design, implementation, operation and outcomes. However, reflecting the findings of co-management in other sectors, the learning potential of monitoring and evaluation is not a given (Armitage *et al.*, 2009). Instead, learning requires specific attention to developing the capacities of those who design monitoring processes and understand and respond to evaluation, as well as the establishment of incentives to encouraging learning (Armitage, Marschke and Plummer, 2008). To ensure that those engaged in learning are representative of the aquaculture sector (i.e. men and women, as well as youth and Indigenous Peoples), particular attention is needed to overcome the potential marginalization of actors and/or groups from participating in the learning processes.

Finally, consideration should also be given to balancing internal with external demands for evaluation in the form of market verification and/or assurance (Bottema, Bush and Oosterveer, 2021). If internal processes of monitoring and evaluation of either the co-management system or its impact are deemed legitimate by market or state actors, then the co-management system may be afforded high levels of self-determination. Conversely, if external evaluation needs are not met then the ACM may be deemed less credible, with higher levels of external evaluation and assurance as a consequence. This spectrum of outcomes not only reflects the range of co-management arrangements, as outlined by Sen and Nielsen (1996), but also indicates the spectrum of legitimacy and accountability for these arrangements for and to different audiences.

8.2 What to evaluate?

Monitoring and evaluation of ACM can be undertaken in relation to the practice of implementing co-management and the goals of the co-management plan established by the participants, as well as the wider strategic outcomes of the co-management system. These two distinct levels of evaluation require different methodologies for monitoring and evaluation and they can be evaluated separately. However, following FAO (2022e), evaluating both levels can provide a deeper understanding of the effectiveness of the co-management system as a whole.

8.2.1 Evaluating the co-management system

The evaluation of implementation focuses on the process of putting co-management in place and how well it performs against the good practices of aquaculture co-management outlined in Section 6.

8.2.2 Evaluating the co-management plan

Evaluation of the achievement of goals and objectives as stated in the ACM plan at the community level is to assess its performance and effectiveness against a set of criteria and standards, expressed as indicators (see an example of an assessment sheet, adapted from the *Guidelines for evaluating fisheries co-management* [FAO, 2022e] in Annex 2).

These goals may be operational in nature, meaning they are focused on the direct shared goals of improving the social and environmental performance of aquaculture production (as outlined in Section 4.2). Strategic goals (Section 4.1) may also be assessed. Indicators for these operational and strategic goals may span the spatial extent of aquaculture production (a delta or coastal area) or extend to wider coastal landscapes, seascapes or social groups, including communities of Indigenous Peoples. Government goals and policy may define these goals and therefore the evaluation strategy when these goals extend beyond those immediately involved in the aquaculture sector.

Following the *Guidelines for evaluating fisheries co-management effectiveness* (FAO, 2022e), the effectiveness of the co-management system can only be assessed if it's in place for at least two years and there is a written ACM plan, including clearly stated goals and objectives. It is still possible to conduct an evaluation if goals and objectives have not been written down, but the absence of goals and objectives means that no meaningful *ex post* evaluation can be undertaken.

8.3 Steps of monitoring and evaluation

Depending on the level of evaluation (again in line with the *Guidelines for evaluating fisheries co-management* [FAO, 2022e]), it is recommended that any of the above evaluations is undertaken in four steps: (1) planning the content, goals and design of an evaluation, including the identification of key criteria (related to the principles outlined above), and the goals and objectives as set out in the co-management plan or covenant; (2) compiling information, involving a detailed description of the context, system and design of the ACM arrangement using the selected indicators associated with the five principles outlined above; (3) analysing data, including validating and communicating the results with those involved in the ACM arrangement; and (4) communicating results to a target audience that is determined before the assessment begins.

8.4 Planning the content, goals and design of an evaluation

Establish a timeline for the evaluation. This timing would include the frequency for conducting an effectiveness evaluation, which in turn is defined by when measurable change can be observed. In line with the *Guidelines for evaluating fisheries co-management* (FAO, 2022e), it is recommended that an effectiveness evaluation be conducted every three to five years, or linked to revisions of the co-management plan. This will allow time for adjustments in co-management design and processes, and for the ACM activities to be implemented. Overall, the evaluation of ACM should be embedded within routine internal operational monitoring by those involved in the arrangement and, as such, enable adaptive management. The results of the evaluation are used by the co-managers to better understand why goals and objectives and expected impact have or have not been achieved, and to adapt co-management design, processes and actions. Evaluation will also improve knowledge of ACM more generally.

Define the co-management system. The unit of assessment needs to be determined before the evaluation begins. This may be an aquaculture community, cluster or cooperative, a geographic area defined by the government as an aquaculture management zone or area (in line with the EAA and GSA) or a partnership between producers, government and communities and private sector partners (e.g. akin to the jurisdictional approach). The evaluation should be agreed upon by those participating in the co-management arrangement – or stipulated in the co-management plan. This process enables the evaluators to determine which practices should be approached and included in the evaluation, as well as enable the scale at which performance indicators should be evaluated.

Identify indicators for assessment. Both the evaluation of the co-management system and co-management plan require indicators to be identified. Indicators for evaluation should be agreed upon in the ACM plan or negotiated by all involved stakeholders prior to the evaluation. This evaluation is an essential part of learning and adaptation by those engaged in the co-management arrangement. By better understanding how the goals, rules, partnerships and management systems in place affect the achievement of operational goals. Notably, if no goals have been set *a priori* and set out in a co-management plan then the evaluation can perform a participatory assessment to establish the values and practices adopted in the co-management system and are agreed upon, albeit *ex post*, by the participants.

Establish an evaluation team. The evaluation team is charged with carrying out the planning, collecting and evaluating information and communicating results. The expertise of the team is determined by the goals and indicators selected and the agreed outcomes and audience of the evaluation. If the evaluation is conducted for internal evaluation, either participants or external experts may be enrolled. If the evaluation is for an external audience, independent experts may be appointed. In either case the team should be legitimized by aquaculture producers, industry and/or government.

Set and secure a budget. The time and cost of the evaluation should be calculated before the evaluation. Calculating these costs should consider the scale of the co-management area, whether the evaluation is of the co-management system (practices) or performance of the co-management plan (outcomes). Relatedly it depends on the indicators selected to assess these wider goals – including the type of methodology used, access to data and the frequency data should be collected to observe effects or outcomes. If the budget is not available internally a plan for acquiring funds should be set out before the evaluation begins.

Determine the audiences for the evaluation. The audience(s) to whom the results should be reported should be identified and a communication plan developed before the evaluation begins. There may be a number of different audiences who will require different methods of communicating results. The definition of which data can be shared is dependent on the goals established in the ACM plan which guides the parameters through which an internal management system for the participants is designed. Secondary audiences can include buyers who seek greater insights on their own supply risk, or who are coordinating

certification for a group of producers – assisting for instance with auditing requirements. Government may also seek access to data to (i) assess the capacity development of producers; and (ii) gain insight into the social and environmental performance of the producers. Again, access and use of data by these actors needs to be delimited in the ACM plan.

8.5 Compiling information

Monitoring and evaluation methodologies are increasingly linked to new digital technologies that enable both near field and remote sensing. These technologies include sensors used on farm to monitor operational parameters of performance related to water quality (e.g. temperature, turbidity, dissolved oxygen, pH, solids, salinity, alkalinity, ammonia, nitrite and nitrate) salinity and temperature, providing real time or near real time feedback to producers and other value chain actors. These technologies are introduced by producers themselves, by governments or by service providers (including feed manufacturers) to monitor and advise on production focus would be very instructive (Yue and Shen, 2021). Remote sensing technologies are used to monitor larger-scale environmental impacts, including coastal water quality, land use change and temperature, to both regulate and provide early warning to farmers on conditions leading to, for example, mass mortality events (Yadav *et al.*, 2022). Other technologies provide enhanced value chain traceability (Hardt, Flett and Howell, 2017), with information in some cases returned to producers (Yadav *et al.*, 2022).

These technologies provide automated and even predictive information on operational and strategic performance that is relevant for ACM. In some instances, the information flows generated by these technologies are programmed by producers and other value chain actors seeking greater insights into production and market performance (Yue and Shen, 2021). However, the majority of these digital technologies are programmed by digital service providers to the aquaculture industry who are increasingly being considered as co-governors of the aquaculture industry (Kruk *et al.*, 2021). This implies that they should also be involved in ACM arrangements and with this involvement, enrolled in the design of co-management plans and programming of monitoring and evaluation methodologies.

8.6 Measuring and analysing indicators

A distinction can be made between the evaluation of (i) the ACM system and (ii) the co-management plan.

For the wider co-management system, the good practices outlined in Section 6 can be used to assess the enabling support provided for the development of co-management. For this, the (preliminary) key indicators are outlined in Annex 1 and can be measured based on a range of data collection methods. These methods can range from qualitative interview techniques such as interviews, focus groups and document analysis, to quantitative surveys.

The evaluation of the co-management plan should be based on indicators that are aligned to the goals and processes agreed upon by who designed and are subject to the co-management plan. It should be noted that data may already be available from baseline surveys conducted in support of monitoring and evaluation, routine monitoring of the co-management process, and from secondary data sources (such as secondary data collected in Step 2 on the co-management context and process).

Data collected are used to answer the specific questions, as expressed through the selected indicators. The indicators provided in Annex 1 provide examples of how such an evaluation could take place. Notably, such evaluation should be closely aligned with the ongoing monitoring of the co-management plan.

The analysis of indicators involves the careful consideration of information with the goal of clarifying uncertainties, identifying problems and coming to a structured set of recommendations for the next phase of co-management planning and development. To enable the comparison of the results over time, a common analytical structure is required. Such a structure will enable data to be analysed in a systematic way and allow generalizations and comparisons to be made. As explained in the *Guidebook for evaluating fisheries co-management effectiveness* (FAO, 2022e), such analysis involves the interpretation of indicators to understand the linkages and relationships between the context and process of the wider co-management system and the co-management plan under assessment. This means looking not only at the results of a given evaluation in isolation, but rather at the trends and implications of changes to both the co-management system and plan over time. Core to this analysis is to understand why the result has occurred of all the elements in the co-management system and consider how the results can best be explained (FAO, 2022e).

8.7 Validate and communicate the results

Once analysed, findings should be validated with key stakeholders involved in the ACM. Doing so enables these stakeholders to review and provide critical feedback on the accuracy, interpretation, conclusions and/or consequences of the findings before they are disseminated. This feedback should be transparently included or excluded when drafting the external evaluation report. It may also require the evaluation team reconsider certain results or findings and/or go back and re-plan and remeasure certain indicators.

In line with the *Guidebook for evaluating fisheries co-management effectiveness* (FAO, 2022e), the (revised) external evaluation report should also be reviewed by respected technical experts (scientific and policy research) and the target audience (participants, funders and/or policymakers). Comments received should then be incorporated into the report, as deemed appropriate by the evaluation team. This external review will typically improve the legitimacy, transparency and credibility of the evaluation process to key target audiences. If conflicting interpretations remain, an arbitration process can be established by an independent body to consider grievances and whether further changes or actions are needed before changes are made to the ACM plan.

8.8 Post-evaluation and adaptive management

Once an evaluation is completed, the results can be used to assess, and where necessary, adaptively change the design and/or performance of ACM. This process of adaptive management is based on a systematic process of revisiting assumptions and learning from the evaluation to improve management practices (Armitage, Berkes and Doubleday, 2010). In line with the *Guidebook for evaluating fisheries co-management effectiveness* (FAO, 2022e), adaptive management and learning post evaluation enables improvement of ACM to meet the goals set out in the management plan, as well as wider goals in the EAA, GSA and FAO Blue Transformation vision.

Lessons can be drawn, for instance, on why an ACM arrangement did not have the intended impact, or the reasons why strategic or operational goals were not reached. Such findings might reflect whether those involved in the arrangement have fulfilled the roles and activities allocated to them in the ACM plan. It might indicate that some intended participants were excluded. It might also show that the information generated in monitoring and evaluation was of such poor quality that it was difficult to derive any clear conclusions. Alternatively, the evaluation may find that there is no need for changes to be made. Knowledge, strategies and actions for correcting underperformance and improving implementation can be

identified. In all instances, lessons should be recorded in an accessible format to enable future reflection and decision-making on ACM.

Any of the above findings can be used in the post evaluation phase to revisit and adapt (where necessary) the design and implementation of (i) the external conditions or enabling environment, (ii) the internal design of co-management system, including the ACM plan, or (iii) the inclusion and incentives to individuals or households engaged in the ACM system (Figure 3).

Changes to goals, activities and practices actions should, in line with the GSA, be inclusive of all those involved in the ACM system. They should also engage a participatory approach of reviewing and revise the ACM plan, as well as the design of the system itself (including the enabling environment). Changes may include modifications to the ACM plan directly, including: who will lead the changes? What will need to be changed? How to make the changes, what resources are needed, and a timeline for making the changes” (FAO, 2022e, p. 41). Any changes should be made on a priority basis, including the degree of importance of meeting strategic and/or operational goals, and the resources available to make the changes. Responsibility for making changes to the ACM plan, system or enabling environment should also be agreed upon and specified - e.g. resource users, value chain actors, other user groups and/or the government.

Figure 3. Adaptive management and learning across three levels of ACM

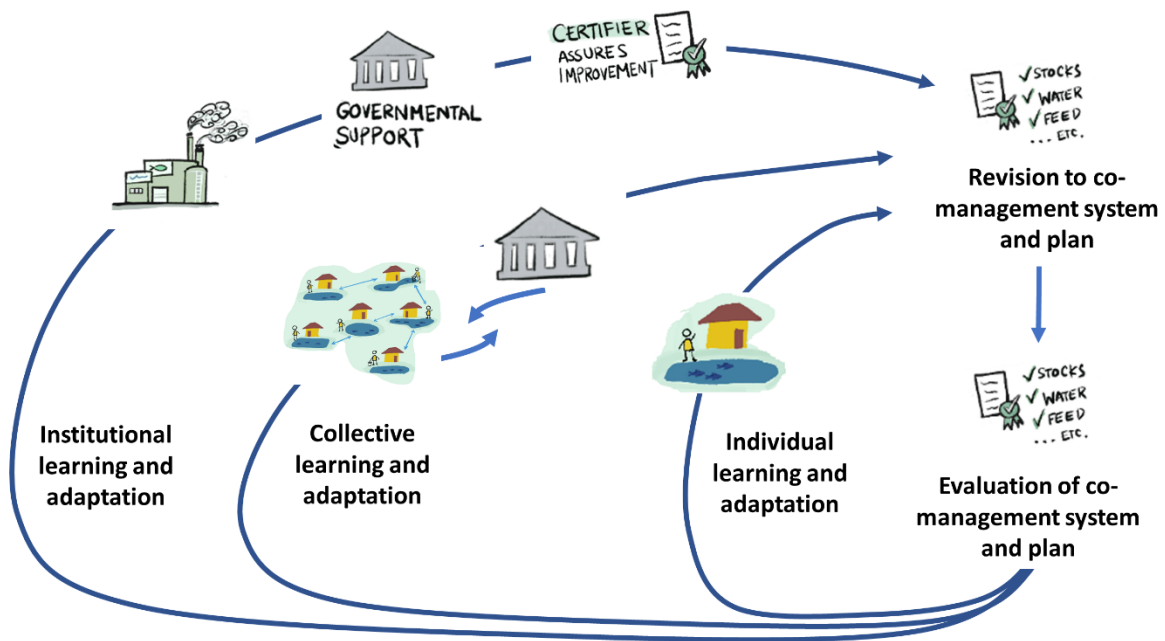


Image: © Emily Liang

9 CASE STUDY JUSTIFICATION

The next phase in the development of the *Guidebook for developing aquaculture co-management systems* is to develop a series of case studies that demonstrate the ways in which ACM has already been applied. Given that ACM is a new term, it is unlikely that these cases will explicitly refer to “co-management”. Nevertheless, the cases selected should exhibit elements of collaborative management of shared risks and resources.

A broad selection of cases is desirable to maximize the opportunity for learning about how collaborative forms of management are applied in practice and to feed these lessons back into the finalization of the Guidebook. The following provides a starting point for a list of potential case studies based on two sets of criteria.

76. First, the cases should represent the diversity of (i) intensity and “openness” of aquaculture production systems; (ii) private and communal forms of ownership over the means of aquaculture production; (iii) individual and collective decision-making between producers on shared risks beyond the farms scale; (iv) sharing rights and responsibilities between producers and the state; and (v) sharing rights and responsibilities with value chain actors. Secondly, the case studies should represent the range of strategic goals and operational goals outlined above.

77. A starting set of case studies, for discussion (and inspiration for identifying other cases) during the workshop in Manila, are as follows:

- **Low trophic aquaculture management in Chile**
Seaweed culture is developed and managed in zones or areas. At the same time, seaweed culture is affected by a range of risks related to nutrient loads. Access to sites is increasingly contested as new industries, including salmon move into coastal areas.
- **Climate adaptation and shrimp farming in Bangladesh**
Coastal erosion and engineering projects aimed at countering the loss of coastal lands directly affect shrimp production. Communities and associations of farmers are engaged in advocating for stronger and/or compensatory tenure over new and lost coastal shrimp farms. At the same time, climate change is affecting various production risks, including water quality (salinity, disease prevalence, etc.).
- **Tank systems in Sri Lanka**
Tank systems represent communal forms of aquaculture that are characterized by joint stocking, management and harvesting. These tank systems are exemplary of community-based ACM as outlined in Section 5 above.
- **Bay area management in Scotland salmon**
Bay area management in the Scottish salmon industry has been put in place to manage carrying capacity, disease transmission and water quality. Representing a form of zonal ACM, bay area management plans are established by the private sector with support from the government.
- **Tilapia reservoir production in Colombia, Indonesia and the Philippines**
Reservoir management plans, either established by the industry or by the government, represent a mix of area and/or cluster-based approaches to managing a range of carrying capacity, disease transmission and water quality issues. They also manage the allocation of water between farmers and surrounding irrigation and/or energy production.

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Annex 1 – Example of good practice indicators for monitoring and evaluation

Assessment sheet for the evaluation of the design and performance of the aquaculture co-management system

(based on the *Guidebook for evaluating fisheries co-management effectiveness*)

Name of ACM system: _____

Nr.	Good practice and indicator	Examples of approaches for measuring indicators	Scoring (existence of good practice)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
ENABLING ENVIRONMENTAL AND INSTITUTIONAL FIT – EXTERNAL GOOD PRACTICES								
i.	GOOD PRACTICE: Set “appropriate” scale: The scale of the co-management system may vary but should be appropriate to the environmental issues related to aquaculture, actors in the industry and relate to existing levels of management.							
	INDICATOR: The scale and the area of the co-managed aquaculture system have been agreed through a participatory process with concerned stakeholders	Review of co-management documentation; and Questionnaire survey (perception).						
ii.	GOOD PRACTICE: Define boundaries: The boundaries of the co-management system are defined in relation to the actors involved, the biophysical extend of the issues being managed and jurisdiction of different levels or executive branches of government.							
	INDICATOR: Boundaries of the aquaculture system to be co-managed have been demarcated, if a spatially defined area; or otherwise clearly described in a co-management agreement	Review of co-management documentation; Observation or photos of markers; Review of documentation relating to demarcation procedure; Existence of (GIS-based) maps officially endorsed by the co-management body and incorporated in the co-management agreement; and Consistency of the demarcated co-managed areas for fishing with the zones of exclusion, such as conservation areas, navigation routes, nursery grounds, etc.						
iii.	GOOD PRACTICE: Enable policies and legislation for ACM: Supportive legislation, policies, rights and authority structures are in place and instituted at a scale (ecosystem to farm level) congruent to key goals identified by those collaborating.							

Nr.	Good practice and indicator	Examples of approaches for measuring indicators	Scoring (existence of good practice)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
	INDICATOR: The legal framework gives the resource users and their representatives an equitable and clear role in developing and implementing an ACM plan	Review of legislation; Questionnaire survey (perception); and Interviews and consultations with local institutions.						
	INDICATOR: Number of co-management agreements that have been signed and approved between government and resource users/community	Review of co-management agreement or arrangements agreed by involved parties to constitute co-management.						
GOOD PRACTICE: <i>Congruence: scale and scope of rules are appropriate to local conditions</i>								
	INDICATOR: <i>There are rules and regulations for fisheries management</i>	<i>Review co-management plan.</i>						
	INDICATOR: <i>Scale and scope of rules and regulations fit local conditions and are well defined in a participatory way</i>	<i>Review of co-management plan; and Focus group discussions.</i>						
iv.	GOOD PRACTICE: Differentiate authority of government and producers: Organise and make management rules by those collaborating and clearly communicate these rules to all other actors in the industry.							
	INDICATOR: There are legal provisions for resource users to organize and register formal organizations	Review of legislation and procedures for registering an organization.						
	INDICATOR: Co-management responsibilities have been formally delegated to the co-management committee	Review of co-management agreement; Review of the charters of professional fishers' organizations; and Review of terms of reference of co-management committee partners, co-management bodies, professional organizations and executive boards.						
v.	GOOD PRACTICE: Delineate tenure rights of aquaculture producers: Formal and recognized rights to, for example, water, land and/or genetic material are granted to those collaborating and the structures required for allocating use rights among participants are agreed upon.							
	INDICATOR: Tenure and access rights are fairly and equitably allocated in a transparent and accountable manner	Review of government agreement and tenure arrangements;						

Nr.	Good practice and indicator	Examples of approaches for measuring indicators	Scoring (existence of good practice)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
		Questionnaire survey (perception) among different resource users along the value chain; Focus group discussion among resource user groups; and Consultations with organizations/ associations of resource users.						
	INDICATOR: Tenure and access rights have been adequately integrated/reflected in the ACM agreement	Review of government agreement and tenure arrangements; Questionnaire survey (perception) among different resource users along the value chain; Focus group discussion among resource user groups; and Consultations with organizations/ associations of resource users.						
	INDICATOR: All stakeholders have access to information on the tenure rights and resource allocation criteria and processes	Review of existing (legal) documentation and how it can be accessed; Stakeholder consultations; and Standardized semi-structured questionnaire as part of key informant survey, supported through focus group discussions.						
vi.	GOOD PRACTICE: Engage support of government and political/economic elites: Active cooperation and power sharing between producers and government actors and/or producers and other value chain actors (suppliers or buyers) and/or where relevant, adjacent land and resource users.							
	INDICATOR: The government supports and participates in co-management according to agreement with resource users on cooperation	Review of co-management agreement; Discussions with key informants; Interviews with local authorities (district, communal) delegated to implement co-management; Focus group discussion with co-management partners; and						

Nr.	Good practice and indicator	Examples of approaches for measuring indicators	Scoring (existence of good practice)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
		Interviews with key informants and stakeholders.						
	INDICATOR: Decision-making is shared across scales and between diverse stakeholders with an interest in the resource being co-managed	Review of co-management membership and protocols for member participation and representation on the co-management committee; and Interviews with key informants and stakeholders.						
vii.	GOOD PRACTICE: Enforce management rules: A system of self-enforced penalties is established and imposed by strong operational rules designed, enforced and controlled by those collaborating.							
	INDICATOR: Self-enforcement system of penalties is designed by resource users/co-management participants	Review of documentation on enforcement system; Focal group discussions; and Review of the mechanism of sanctioning of violations and active participation of the authorities in the process.						
	INDICATOR: There is an active patrolling and enforcement mechanism in place and operational	Review of documentation on enforcement system; Focal group discussions; and Review of the effectiveness/regularity of the patrolling routines.						
viii.	GOOD PRACTICE: Establish and enforce graduated sanctions: Sanctions increase with the number or the severity of offences.							
	INDICATOR: Sanctions are proportional to the number or severity of offences	Review of documentation on sanctions Questionnaire survey (perception).						
CO-MANAGEMENT SYSTEM – INTERNAL GOOD PRACTICES								
PARTICIPATION, TRANSPARENCY AND EQUITY								
i.	GOOD PRACTICE: Participation by affected parties: The co-management arrangement includes producers, adjacent resource users and/or value chain actors involved in or affected by aquaculture production, granting them the right to participate in achieving agreed goals or resolving sector-related decisions.							

Nr.	Good practice and indicator	Examples of approaches for measuring indicators	Scoring (existence of good practice)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
	INDICATOR: Stakeholders affected by co-management arrangements and decisions are included in the co-management committee	Review of co-management committee membership in comparison with stakeholder analysis; Focus group discussion with outsiders/excluded stakeholders' groups; and Review of mechanisms envisioned to broaden the membership into co-management organization.						
	INDICATOR: Co-management participants and committee members receive advance information before decision-making	Focus group discussions; and Review of communication mechanisms and meeting minutes.						
ii.	GOOD PRACTICE: Fostering social cohesion: Participants are defined by their use of the same or similar production systems, the species grown, the feeds sourced, their use of shared water resources or the exposure to shared risks related to disease.							
	INDICATOR: Co-management participants trust each other	Questionnaire survey (perception); Interviews with key informants						
	INDICATOR: The co-management committee members are representative of the ethnicity, religion, etc. of the resource users/co-management participants	Review of co-management committee members; Review of the election/selection mechanisms; and Review of the co-management agreement concerning social inclusion and equitable share of representation.						
	INDICATOR: Members of the co-management system work well and make decisions together	Review of co-management meeting minutes.						
iii.	GOOD PRACTICE: Empowerment through capacity building: Those engaging in the co-management arrangement are supported by other participants or external parties (private sector, NGOs, government) to develop the requisite skills and knowledge for contributing to the achievement of joint goals.							
	INDICATOR: There are active skills development programmes for enhancing capacity building for aquaculture farmers to participate in co-management activities at community level	Review of activity programme; Review of training/skills development programmes; and						

Nr.	Good practice and indicator	Examples of approaches for measuring indicators	Scoring (existence of good practice)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
		Review of training needs assessment (if any).						
	INDICATOR: There is a basic understanding among participants about the purpose and operation of the co-management system	Questionnaire survey.						
iv.	GOOD PRACTICE: Transparent coordination: A transparent set of rules and flow of information is applied to enable joint decision-making between government, producers and other relevant (value chain or affected adjacent) actors is established and used at predefined intervals.							
	INDICATOR: A forum for coordination and cooperation of government and resource users is operational	Review of institutional structures and meeting minutes; and Review on the mechanisms of horizontal and vertical coordination in place.						
	INDICATOR: There are regular meetings between government and resource users	Review of meeting minutes; and Review on the mechanisms of horizontal and vertical coordination in place.						
v.	GOOD PRACTICE: Representative organisation: Legitimate (as recognised by actors from within the aquaculture sector) organisation of representation should be in place for representing the interests of producers and other key stakeholders in decision-making towards achieving shared goals.							
	INDICATOR: A legitimate (as recognized by the local people) organization representing resource users and other stakeholders in decision-making is in place	Review of institutional structures and meeting minutes Questionnaire survey (perception) Review of formal documents/endorsement papers relating to the establishment of the organization						
vi.	GOOD PRACTICE: Equity: The co-management arrangements should enable fair access to shared land and water resources or distribution of responsibility for managing shared risks between producers and/or between producers and adjacent/affected groups (e.g. farmers in other food sectors).							
	INDICATOR: Different resource user groups have equal opportunities to participate in and benefit from the co-management system	Questionnaire survey; Focal group discussions (perceptions); and Focal group discussions with excluded/non-participating resource users/groups.						

Nr.	Good practice and indicator	Examples of approaches for measuring indicators	Scoring (existence of good practice)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
	INDICATOR: Different legitimate resource user groups, including youth, women and Indigenous Peoples, are recognized as stakeholders in the co-management and have equal opportunities to participate in the co-management arrangement	Questionnaire survey; Focal group discussions; Questionnaire survey (perception); and Focus group discussion with excluded/non-participating resource users/groups).						
LEADERSHIP, RULES AND CONFLICT RESOLUTION								
i.	GOOD PRACTICE: Membership and rights clearly defined: The rules for actively contributing to the co-management arrangement are defined, and rights associated with decision-making over access and/or use of shared resources and inputs, participation in bargaining inputs and/or negotiation over public and private regulation made explicit.							
	INDICATOR: The right to establish farming operation, to participate in management and to be a member of related organizations are agreed and clearly stated in co-management documentation	Review of co-management documentation; Interviews with key informants; and Consultations with representatives of the community or farming association on compliance with the rules and regulations by all co-management parties.						
ii.	GOOD PRACTICE: Conflict management mechanisms in place: A mechanism for addressing conflict between members of the ACM arrangement is established, including rules for internal resolution or, when necessary, external adjudication.							
	INDICATOR: Conflict management mechanism is in place, functional and documented	Review of co-management documentation; Interviews with key informants; and Consultations with representatives of the community or farming association.						
	INDICATOR: Conflicts between different resource user groups/stakeholders are resolved in a sustainable manner	Review of incident reports and complaints to police, community leaders or other instances addressing conflicts; and Interviews with conflicting parties (if any).						
iii.	GOOD PRACTICE:							

Nr.	Good practice and indicator	Examples of approaches for measuring indicators	Scoring (existence of good practice)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
	Accountability: The conflict mechanism in place sets out conditions for holding those in violation of shared rules to account in an open and transparent manner.							
	INDICATOR: Decision-making by and leadership of the co-management system is transparent and documented in committee meeting minutes available to all co-management participants	Review of co-management committee meeting minutes; and Questionnaire survey (perception).						
	INDICATOR: There is a democratically elected management committee representing resource users/user groups	Review of protocols of the election of co-management committee members.						
iv.	GOOD PRACTICE: Leadership: The requirements for leadership of the group are set out in a co-management plan (see section 6.2). Leadership may be granted to an individual or to a group (board) of representatives deemed legitimacy by participants. A mechanism for appointment and dissolving leadership positions is made transparent.							
	INDICATOR: A qualified local leader with entrepreneurial skills elected by local people to lead overall co-management activities	Review of protocols of the election of co-management committee members.						
	INDICATOR: A qualified local leader is properly working with resource users/user groups for sustainable aquaculture and community livelihoods	Questionnaire survey (perception); Focus group discussions; and Observation.						
	GOAL SETTING, LEARNING AND ADAPTATION							
i.	GOOD PRACTICE: Co-management plan: A co-management plan at the community level or a co-management agreement at the provincial level is developed and agreed by participants through an open and transparent process that enables informed input into its design.							
	INDICATOR: There is a co-management plan and it contains key provisions and clear goals and objectives	Review of co-management plan						
	INDICATOR: The co-management plan has been developed with the adequate participation of different stakeholders	Documentation of co-management plan development process; Perception survey; Interviews with key informants; and Stakeholders' focus group discussion.						
	INDICATOR: The co-management plan has been translated in the stakeholders' native languages	Review of co-management plan.						

Nr.	Good practice and indicator	Examples of approaches for measuring indicators	Scoring (existence of good practice)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
	INDICATOR: The co-management plan adequately addresses gender equity needs and reflects diversity of perspectives reflected in community/society	Review of co-management plan; and Interviews with key informants.						
ii.	GOOD PRACTICE: Clear goals and objectives from a well-defined set of issues: Goals and objectives are collectively determined (with or without guidance by the categories outlined in sections 4.1 and 4.2) and communicated with clarity and simplicity to steer the direction of farm and beyond farm-scale management activities.							
	INDICATOR: Clear and simple goals/objectives and indicators are defined in the co-management plan	Review of co-management plan; and Analysis of the extent to which objectives are SMART (specific, measurable, achievable, realistic and timely).						
iii.	GOOD PRACTICE: Regular interaction: Participants engage in regular, active and participatory meetings with the others involved in the co-management arrangement to discuss ongoing challenges related to power-sharing, trust building and progress towards achieving shared goals.							
	INDICATOR: Regular, active and participatory meetings of co-management participants are held	Review of co-management meeting minutes; Questionnaire survey (perception); and Observation of meetings.						
	INDICATOR: There is representation of men and women at meetings and active participation by both men and women	Review of co-management meeting minutes; Questionnaire survey (perception); and Observation of meetings.						
iv.	GOOD PRACTICE: Enhance knowledge capacity: The co-management arrangement should enable participants to gain a greater understanding on “better” farming techniques (in line with, for example, FAO-GSA, national better/best management practice standards or private sustainability standards), as well as on the cause and solutions for dealing with wider social and environmental issues related to aquaculture production.							
	INDICATOR: Stakeholders have a good knowledge of farming techniques	Questionnaire survey; and Focus group discussions.						
v.	GOOD PRACTICE: Monitoring and evaluation system: A system for monitoring and evaluating both the co-management plan or agreement (against the best practices outlined here) and the wider goals of the co-management system (related to, for example, the goals in sections 4.1 and 4.2) is put in place (see further details in section 8 of this document).							

Nr.	Good practice and indicator	Examples of approaches for measuring indicators	Scoring (existence of good practice)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
	INDICATOR: Continuity of monitoring and evaluation are conducted in a participatory way	Questionnaire survey (perception); Reviews of monitoring and evaluation reports and minutes; and Interviews with key informants.						
	INDICATOR: Indicators, targets and baselines are defined in a monitoring and evaluation plan in the co-management plan	Review of co-management plan.						
	INDICATOR: Number of changes/adaptations made by co-management committee based on analysis and decision-making of available monitoring and evaluation results	Review of minutes of co-management committee.						
vi.	GOOD PRACTICE: Adaptive management: The information collected through the monitoring and evaluation system is fed directly into decision-making by those participating in the co-management arrangement to make adjustments to goals, forms of collaboration and innovation with the goal of ensuring strategic and operational goals (sections 4.1 and 4.2) are achieved.							
	INDICATOR: Adjustments to the co-management have taken place based on monitoring and evaluation results	Review of co-management plan and committee meeting minutes; and Review of the monitoring and evaluation reports.						
vii.	GOOD PRACTICE: Mutually beneficial alliances and networks: On the basis of new information and learning, the co-management unit seeks out new alliances and networks that can enable them to make changes, innovate and achieve strategic and operational goals.							
	INDICATOR: Networks and alliances among various user groups/stakeholders are in place and functional	Review of registered organizations and their memberships; Questionnaire survey among stakeholders on their organizational memberships; and Focus group discussions among co-management parties/user groups and stakeholders.						
	INDICATOR: Experiences and lessons learned are shared among various stakeholder groups	Focus group discussions ; Questionnaire survey (perception).						
ENHANCING GOVERNANCE CAPABILITIES								

Nr.	Good practice and indicator	Examples of approaches for measuring indicators	Scoring (existence of good practice)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
i.	GOOD PRACTICE: Agility: The co-management arrangement enables participants to advocate for change and support when faced with major and structural changes affecting the aquaculture industry, for example, changes in government, changing market demand and conditions for access, disease outbreaks or major climactic events.							
	<i>INDICATOR: There is a special provision in the co-management plan that allows for extra measures to be taken in support of participants in the event of major and structural changes affecting the aquaculture industry</i> <i>There is a section in the co-management plan that outlines the options of participants in the event of major and structural changes affecting the aquaculture industry</i> <i>The co-management plan/process/arrangement is adaptable to support members in the event of major and structural changes affecting the aquaculture industry</i>	<i>Review of co-management plan.</i>						
ii.	GOOD PRACTICE: Innovation drive: The participants in the co-management are enabled to recognize the need for new products and practices and to seek out new partnerships to realize them.							
	<i>INDICATOR:</i> <i>What would help that? Enabled by what, whom?</i> <i>Whose responsibility is this? The plan?</i> <i>The co-management arrangement encourages the uptake of new technologies and actively aims to address barriers to it</i>							
iii.	GOOD PRACTICE: Rescaling: Participants in the co-management arrangement are able to strategically recognize the need for advocating and/or seeking support or collaboration with actors that can assist them in addressing key challenges – e.g. moving from local to national authorities, from global to local markets or partnerships with NGOs working across species or production systems.							
	<i>INDICATOR:</i>							

Nr.	Good practice and indicator	Examples of approaches for measuring indicators	Scoring (existence of good practice)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
	... Increase in level of outreach to actors across different scales? Increase in number and/or quality of networks/collaborations? ...							
CO-MANAGEMENT PARTICIPANTS – INDIVIDUAL GOOD PRACTICES								
i.	GOOD PRACTICE: Sensitization: Individuals understand, identify with and actively engage with the goals underpinning the ACM system (e.g. Nowell <i>et al.</i>, 2022). For farmers this could be by extending their decision-making and farming practices to consider shared risks and resources beyond their own farm.							
	INDICATOR: ~ <i>Reflexivity?</i>							
ii.	GOOD PRACTICE: Incentives: Individuals recognize and positively respond to incentives (economic, social or political) to participate in co-management, and they voluntarily comply with co-management rules and decisions, while also leaving room for innovative problem solving (based on the ecosystem approach to fisheries, [FAO, 2005]). Additionally, these incentives push them to reason towards collaboration over conflict (De Pourcquet <i>et al.</i>, 2015).							
	INDICATOR: Individuals have incentives (economic, social or political) to participate in co-management and voluntarily comply with co-management rules and decisions	Questionnaire survey (perception); Focal group discussions; Interviews with key informants; and Focus group discussion with excluded/non-participating user groups.						
	INDICATOR: Incentives from government are available for individuals and stakeholder groups to positively participate in co-management	Review of government programmes Questionnaire survey; and Interviews with government key informants.						
iii.	GOOD PRACTICE: Equitability: Individuals are aware of their own responsibilities and level of accountability related to the ACM plan, as well as those of others, and deem them fair and proportionate (as outlined in both the EAA and GSA). Additionally, they agree with the reasoning for benefit distribution in the co-management plan – whether based on the right, merit or needs of those involved in the co-management arrangement (Gurney <i>et al.</i>, 2021).							
	INDICATOR: <i>There is increased awareness among participants about their role in the ACM system</i>	<i>Questionnaire survey (perception); Focal group discussions; and Interviews with key informants.</i>						
	INDICATOR:	<i>Questionnaire survey (perception); Focal group discussions; and Interviews with key informants.</i>						

Nr.	Good practice and indicator	Examples of approaches for measuring indicators	Scoring (existence of good practice)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
	<i>Co-management participants understand and agree with the role of their peers and support the distribution of the benefits according to the co-management plan</i>							
iv.	GOOD PRACTICE: Reflexivity: Individuals seek out access to and understanding of information surrounding risks and resources through the ACM plan (Butler <i>et al.</i>, 2015); they in turn act on that information by demonstrably changing their practices to contribute to the goals of the ACM plan, or seek to change the plan given their own contrasting knowledge or experiences for achieving those goals.							
	<i>INDICATOR:</i> <i>The knowledge and individual capacity of participants have increased</i> <i>Individuals actively engage with the co-management plan and there is observable change in their practices</i>	<i>Questionnaire survey (perception);</i> <i>Focal group discussions; and</i> <i>Interviews with key informants.</i>						

Annex 2 – Example assessment sheet for the evaluation of the achievement of the goals and objectives of the aquaculture co-management plan

(Minimally adapted from the *Guidebook for evaluating fisheries co-management effectiveness* [FAO, 2022e])

Name of ACM system: _____

Nr.	Type of goals and objectives and indicators	Examples of approaches for measuring indicators	Scoring (achievement)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
II.1	SOCIAL GOALS AND OBJECTIVES (examples include benefits from aquaculture equitably distributed; compatibility between management and local culture maximized; environmental awareness and knowledge enhanced)							
II.1.1	INDICATOR: The co-management approach and measures represent the range of interests of different stakeholders and accommodate the full diversity of those interests	Review of management plan document; Questionnaire survey (perception); and Focus group discussions with stakeholder groups.						
II.1.2	INDICATOR: Equitable management that represents the range of interests of stakeholders and accommodates the full diversity of those interests	Questionnaire survey (perceptions); and Focus group discussions with stakeholder groups.						
II.1.3	INDICATOR: There is support for co-management among different stakeholder groups	Questionnaire survey (perceptions) among stakeholder groups; and Focus group discussions with stakeholder groups.						
II.1.4	INDICATOR: Diversity of gender, youth and ethnicity have been integrated in the co-management committee	Review co-management committee's composition and the roles/powers of different members; Review of the selection/election mechanism; and Interviews with key informants from different user groups.						

Nr.	Type of goals and objectives and indicators	Examples of approaches for measuring indicators	Scoring (achievement)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
II.1.5	INDICATOR: Tenure and access rights are fairly allocated	Review of government agreement and tenure arrangements; and Questionnaire survey (perception) among different resource users along the value chain.						
II.1.6	INDICATOR: Social learning (collective knowledge, shared values) is enhanced	Questionnaire survey; and Focal group discussions (requires a baseline to compare with, either from earlier evaluation/survey or by asking respondents to compare with how they remember the situation was earlier)						
II.1.7	INDICATOR: The co-management provides social benefits to stakeholders	Questionnaire survey (perception) covering different stakeholder groups (including, women, youth, vulnerable groups).						
II.2	ECONOMIC GOALS AND OBJECTIVES (examples include livelihoods enhanced or maintained; food security and nutrition enhanced or maintained; increased incomes)							
II.2.1	INDICATOR: Aquatic food availability and access have increased at household/community/market levels	Observation; and Focal group discussions (requires a baseline to compare with, either from earlier evaluation/survey or by asking respondents to compare with how they remember the situation was earlier).						
II.2.2	INDICATOR: Benefits of operating and maintaining co-management arrangements exceed the costs	Financial analysis based on co-management accounts.						
II.2.3	INDICATOR: There are incentives for stakeholders to support co-management	Questionnaire survey (perception); and						

Nr.	Type of goals and objectives and indicators	Examples of approaches for measuring indicators	Scoring (achievement)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
		Focal group discussions						
II.2.4	INDICATOR: Co-management has benefited stakeholders economically	Questionnaire survey; and Focus group discussions with stakeholders to aggregate data per group.						
II.2.5	INDICATOR: Aquaculture outputs have improved in the co-managed area	Aquaculture production data; and Focal group discussions (requires a baseline to compare with, either from earlier evaluation/survey or by asking respondents to compare with how they remember the situation was earlier).						
II.2.6	INDICATOR: Co-management participants have a higher level of material lifestyle (housing, household goods, etc.)	Focal group discussion; and Questionnaire survey (requires a baseline to compare with, either from earlier evaluation/survey or by asking respondents to compare with how they remember the situation was earlier)						
II.2.7	INDICATOR: Number of sick days among co-management participants	Focal group discussion; and Questionnaire survey (requires a baseline to compare with, either from earlier evaluation/survey or by asking respondents to compare with how they remember the situation was earlier).						
II.2.8	INDICATOR: Incomes/benefits are fairly distributed between men and women	Focal group discussion; and Questionnaire survey (requires a baseline to compare with, either from earlier evaluation/survey or						

Nr.	Type of goals and objectives and indicators	Examples of approaches for measuring indicators	Scoring (achievement)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
		by asking respondents to compare with how they remember the situation was in the past).						
II.3	ECOLOGICAL GOALS AND OBJECTIVES (examples include aquaculture resources exploited at sustainable levels; resilient ecosystems secure multiple services to local communities)							
II.3.1	INDICATOR: There is abundance of key focal species affected by aquaculture production	Observations (requires a baseline to compare with, either from earlier evaluation/survey or by asking respondents to compare with how they remember the situation was earlier).						
II.3.3	INDICATOR: Previously destroyed habitats show signs of recovery	Observations (requires a baseline to compare with, either from earlier evaluation/survey or by asking respondents to compare with how they remember the situation was earlier).						
II.3.4	INDICATOR: Management measures for aquaculture management are appropriate and operational	Review co-management plan (aquaculture management plan); Focal group discussions; and Review co-management operational procedures through interviews with government/management and executive/management board key informants.						
II.3.5	INDICATOR: The EAA is an integral part of the aquaculture management plan	Review co-management plan (aquaculture management plan).						
II.3.6	INDICATOR: Resource users/co-management participants take an active	Review of compliance/enforcement						

Nr.	Type of goals and objectives and indicators	Examples of approaches for measuring indicators	Scoring (achievement)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
	role in monitoring compliance with agreed regulations	arrangements (documentation in co-management plan, existing institutional structures); and Review co-management operational procedures through interviews with government/management and executive/management board key informants.						
II.4	GOVERNANCE GOALS AND OBJECTIVES (examples include effective co-management structures and strategies maintained; effective stakeholder participation and representation ensured; resource use conflicts managed and reduced)							
II.4.1	INDICATOR: Effective co-management institutions (committee, administrative team) and related important structures (professional organizations) are in place and functional	Review of co-management documentation (meeting minutes, etc.); Focal group discussions; and Questionnaire survey (perception)						
II.4.2	INDICATOR: There is a co-management plan and it contains key provisions and clear goals and objectives	Review of co-management plan.						
II.4.3	INDICATOR: The degree of legitimacy of the management system with stakeholders increased	Focal group discussions; and Questionnaire survey (perception).						
II.4.4	INDICATOR: Decision-making is transparent to all stakeholders and decision-makers are accountable	Focal group discussions; and Questionnaire survey (perception).						
II.4.5	INDICATOR: All main stakeholders are empowered and capable to actively participate in decision-making	Focal group discussions; and Questionnaire survey (perception).						
II.4.6	INDICATOR: Conflict management mechanism is in place and documented	Review of co-management documentation; and Analysis of						

Nr.	Type of goals and objectives and indicators	Examples of approaches for measuring indicators	Scoring (achievement)				Comments/explanations	Data collection method and source
			yes	partly	no	not applicable		
		formal versus informal mechanisms, traditional versus legal/modern mechanisms.						
II.4.7	INDICATOR: Conflict management mechanism is contributing to reducing the number of conflicts between different resource user groups/stakeholders	Review of incident reports and complaints to police, community leaders or other instances addressing conflicts; and Analysis of frequency (number) and type of conflicts.						
II.4.8	INDICATOR: Self-enforcement system of penalties is designed by resource users/co-management participants	Review of documentation on enforcement system; and Focal group discussions.						
II.4.9	INDICATOR: Networks and alliances among various user groups/stakeholders are in place and functional	Review of registered organizations and their memberships; and Questionnaire survey among stakeholders on their organizational memberships.						
II.4.10	INDICATOR: Different legitimate resource user groups, including youth, women and Indigenous Peoples, are recognized as stakeholders in the co-management and have equal opportunities to participate in the co-management arrangement	Questionnaire survey; Focal group discussions; and Questionnaire survey (perception).						
II.4.11	INDICATOR: There is a formal legal framework regulating ACM	Review of legislation; and Questionnaire survey (perception).						

APPENDIX 5 – CLOSING STATEMENT

CLOSING REMARKS BY MR KWANGSUK OH, SENIOR FISHERY OFFICER, FAO

Distinguished experts and participants, colleagues, guests,

On behalf of the Food and Agriculture Organization of the United Nations, I would like to extend my heartfelt gratitude to each and every one of you for your active engagement and invaluable contributions throughout this workshop. I would also like to express our sincere appreciation to Dr Simon Bush as facilitator for their unwavering support in ensuring the success of this event.

Distinguished experts and participants,

As we come to the close of the Expert Workshop on the Development of the Aquaculture Co-Management Guidebook, I would like to express my heartfelt gratitude to each one of you for your active engagement, insightful contributions, and unwavering commitment to the objectives of this workshop. I would also like to extend our sincere appreciation to our dedicated organizers, FAO staff, including FAO Representation in the Philippines, and facilitators who have played a pivotal role in ensuring the success of this event.

Distinguished experts and participants,

Throughout our time together, we have embarked on a journey to shape the future of aquaculture co-management. It is evident that co-management, a concept that has been successfully applied in capture fisheries, holds immense potential for the sustainable development of the aquaculture sector. Your expertise and collaborative spirit have been instrumental in charting this course.

Now, I would like to say that we have achieved the objectives of the Expert Workshop on the Development of the Aquaculture Co-Management Guidebook.

During the past two and half days, we:

- Reviewed and advanced the draft of the *Guidebook for developing aquaculture co-management systems*.
- Elucidated the concept of aquaculture co-management, clearly defining its goals and definition.
- Identified and engaged in discussions about the good practices based on diverse models that form the bedrock of effective aquaculture co-management.
- Engaged in meaningful dialogues concerning the practical implementation of aquaculture co-management.
- Explored various strategies for monitoring, evaluation and learning within the aquaculture co-management framework.
- Engaged in brainstorming sessions on potential case studies that serve as shining examples of the successful implementation of aquaculture co-management systems.

The fruits of our labour were instrumental in guiding the finalization of the *Guidebook for developing aquaculture co-management systems*. Your collective wisdom and contributions have significantly enriched this process.

Distinguished experts and participants,

It is with great satisfaction that we acknowledge the substantial progress made during this workshop. We have taken important steps towards realizing our shared vision of harnessing the potential of co-management in aquaculture for sustainable development. The Guidebook and deliverables developed during this workshop will undoubtedly contribute to the achievement of the SDGs and FAO's Blue Transformation in the aquaculture sector.

We must emphasize that the ecosystem approach to aquaculture is of paramount importance, underlining our commitment to holistic and sustainable practices, but we must also recognize that our journey is far from complete. Converting the ideas and knowledge we have discussed into the Guidebook is a

significant task. We will need to continue collaborating, stay committed, and persist. We are confident that, with your support, we can achieve this and make a real impact in the aquaculture sector.

In closing, I want to express my deep gratitude for the privilege of hosting such a distinguished group of experts and participants. Also, much thanks must go to the Government of the Philippines for hosting this workshop. Your collective efforts will have a lasting impact on the future of aquaculture co-management. I'm excited about our ongoing partnership and the impressive accomplishments ahead.

Thank you all for your unwavering dedication and attention.

This document represents the final report of FAO Expert Workshop on the Development of the Aquaculture Co-management Guidebook held in Manila, the Philippines from 9 to 11 October 2023. The objectives of the workshop were to: enhance understanding of aquaculture co-management; identify key aquaculture co-management best practices, models, and case studies; and undertake a thorough review and validation of the background document entitled *Guidebook for developing aquaculture co-management systems*.

ISBN 978-92-5-138699-6 ISSN 2070-6987



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CD0328EN/1/04.24