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COORDINATING WORKING PARTY ON FISHERY STATISTICS

Intersessional Meetings of Aquaculture and Fisheries Subject Groups Joint Session

Tenth Meeting of the Aquaculture Subject Group (AS)
Thirty-One meeting of the Fisheries Subject Group (FS)

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Progress report of the CWP activities of the Aquaculture Subject Group

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Executive Summary

This document provides the progress report of the work carried out by the ad-hoc Task Group on Aquaculture2 during the intersessional period since CWP 27th session in June 2022 and the Intersessional Meeting of the Aquaculture and Fishery Subject Groups of the CWP (London 28-30 June 2023). The workplan follows the decisions taken including the finalization of the Aquaculture Section of the CWP Handbook, and the process to include the CWP online site for a wide diffusion. In addition, the Task Group on Aquaculture has commenced the reference coding for classification of the farming systems which is presented in this report.

CWP members are kindly invited to provide feedback on the work carried out including the next steps and additional activities to be undertaken in the next intersession period.

1. Background

In 2008 the Coordinating Working Party on Fishery Statistics (CWP) agreed to expand its initial mandate to analyze in more detail the needs of the aquaculture sector, and a specialized group on aquaculture (CWP Aquaculture Subject Group: CWP-AS) was established by CWP-23 in 2010. CWP-AS has made good progress in developing standard questionnaires, revising the International Standard Statistical Classification for Aquatic Animals and Plants (ISSCAAP) and updating the international aquaculture farming systems classification in order to better serve the needs of aquaculture statistics.

The work of TG-Aquaculture is centered on the document drafted by CWP-AS in 2013 and presented at CWP-24. In 2019, CWP-26 set up an ad-hoc task group (TG) to work on the aquaculture section of the Handbook. The TG gave more guidance about the concepts, topics, and structure that had to be considered in the Handbook, such as the classification of farming systems. During the time between sessions in 2019 and 2021, the latest version of the Handbook was changed by updating and improving several sections. At the same time, a first round of global consultation with CWP members and experts was launched to gather advice and feedback during

the preparation of the revised version. As follow-up with the CWP Intersessional Meeting on 2-5 November 2021, the first updated draft of the aquaculture section was presented.

TG-aquaculture completed its work on the final draft of the Aquaculture Section of the CWP Handbook that was submitted and presented at the CWP-27 session (20-24 June 2022) which endorsed it with the request of small amendments. Since 2022 the task group is defined as TG-Aquaculture2.

During the CWP-27 Session it was appointed Mr Houssam Hamza as CWP-AS coordinator and TG aquaculture lead after confirmation of the GFCM's interest in supporting the CWP activities.

The major activity undertaken by the TG-Aquaculture2 during the intersessional period focused on finalizing and refining the Aquaculture Section of the CWP Handbook. Following the adoption of the second draft at CWP-27, the Task Group implemented modifications to clarify that the function of the Handbook serves as a non-binding guidance tool rather than a regulatory document. The third draft also established that the Handbook would be periodically updated to align with the evolving aquaculture sector. Additionally, the section on employment was revised to adopt age group classifications in line with International Labour Organization (ILO) guidelines, harmonizing data collection efforts with international labour standards.

TG-Aquaculture2 continued on the work on development of a coding system for classifying aquaculture farming systems, aimed at standardizing data collection and interpretation. The Task Group proposed a six-digit numerical classification to categorize different farming methods, allowing for hierarchical stratification and future expansions. This system was based on the Adjusted Exhaustive List of Aquaculture Farming Methods, ensuring a structured approach to defining aquaculture production systems. Additionally, the Task Group worked on identifying suitable indicators to monitor aquaculture development, production trends, and sustainability, engaging CWP members in discussions on how to enhance data collection for production and market analysis. The ongoing efforts include making the Handbook accessible online through the CWP website, refining statistical classifications, and continuing discussions on effective indicators for tracking aquaculture sector performance.

During the 2023 Intersessional Meeting of the Aquaculture and Fishery Subject Groups of the CWP (London 28-30 June, 2023) key discussions and decisions focused on enhancing the Aquaculture Section of the CWP Handbook, refining classification frameworks. TG-Aquaculture2 reviewed the progress made since CWP-27, specifically addressing the finalization of the aquaculture section of the Handbook, at the intersession was requested its publication in both print and digital formats, and integration into the CWP website. Participants agreed on the need for a clear and standardized classification system for aquaculture farming systems, leading to the development of a coding system that categorizes different farming methods, ensuring better statistical harmonization and future scalability.

The CWP continued the discussion on the development of suitable indicators for monitoring aquaculture development, including aspects related to sustainability, socioeconomic impacts, and production trends. The Task Group proposed to prepare a work plan for defining common statistical indicators, which would help countries and organizations track aquaculture progress over time. Additionally, revisions to the International Standard Statistical Classification of Aquatic Animals and Plants (ISSCAAP) were discussed to ensure that classifications remain relevant to

evolving aquaculture practices. The meeting concluded with agreements on continuing intersessional work on finalizing the classification of farming systems, refining statistical methodologies, and ensuring that the CWP Handbook remains an up-to-date reference for aquaculture statistics. Furthermore, the TG-Aquaculture worked on expanding the list of Regional Fishery Bodies (RFBs) involved in aquaculture, aiming to strengthen collaboration and broaden cooperation with the CWP TG-Aquaculture.

2. Major activities undertaken

2.1. Finalization of the CWP Handbook on aquaculture statistics (standalone)

The initial task undertaken by the TG-Aquaculture was the review and incorporation of proposed amendments to the final draft of the CWP Handbook on Aquaculture Statistics. These modifications were discussed and adopted during the latest Intersessional Meeting of the Aquaculture and Fishery Subject Groups of the CWP, (London 28-30 June 2023). The revisions focused particularly on refining the coding system and glossary used to classify various aquaculture systems, ensuring consistency and alignment.

Following the adoption of the final draft of the CWP Handbook on Aquaculture Statistics, the next steps included the planning of the online webpage and the finalization of the standalone version of the Handbook, the latter involved appointing an expert editor. The editor was tasked with preparing the document for publication by addressing the structural and editorial aspects of the manuscript. During the intersessional period, the appointed expert worked in close collaboration with TG-Aquaculture2 members to enhance the overall quality of the document. Their joint efforts aimed to unify the terminology and tone throughout the Handbook, making the content more accessible and comprehensible for both technical experts and general users. Particular attention was given to harmonizing hyperlinks, restructuring sections for improved navigation, and adapting all citations and references to conform with the FAO's official referencing style. Importantly, the majority of these revisions were strictly limited to editorial refinements and did not alter the underlying concepts or statistical definitions established by the Aquaculture Handbook. However, during the editorial process, and in conjunction with anticipate updates to selected “General Sections” of the online CWP Handbook, it became evident that related sections of the standalone CWP Handbook on Aquaculture Statistics also required modification. These sections include:

1.4 Interaction between aquaculture and capture fisheries (Table 2)
2.2.1 Identifiers for aquatic animals and plants
2.2.2 Ownership and nationality of production
2.2.3 Identifiers for countries and areas
2.2.6 Currencies and funds
2.2.7 Classifications of aquatic products
2.2.8 Converting product weight to live weight in aquatic production
4.1.2 Employment
7.2 Coordination with agriculture and population censuses

In addition, following the development and adoption of the FAO Guidelines for Sustainable Aquaculture (GSA) by the 36th Session of the FAO Committee on Fisheries in 2024, a dedicated short section on the GSA was added to the CWP Handbook on Aquaculture Statistics. The GSA provide a comprehensive framework for the management and development of sustainable

aquaculture and are intended to support FAO Members and other stakeholders in implementing the FAO Code of Conduct of Responsible Fisheries. The GSA also include specific recommendations related to aquaculture data collection. Furthermore, to comply with FAO's new editorial guidelines, the report must also undergo a light technical review by FAO aquaculture specialists prior to publication. The revised version of the report, showing tracked changes, is presented as Document **CWP-IS/2023/9.a**. After the final review by the FAO aquaculture specialists and CWP parties, the report will be published online by FAO. Selected sections will also be integrated into the updated online CWP Handbook – Aquaculture section, as referenced in Section 2.2 below.

2.2. Handbook availability on the CWP webpages

In order to enhance readability and availability of the main topics regarding aquaculture statistics, separately from the standalone Handbook, a draft structure on the aquaculture section of the online CWP Handbook was developed in the intersessional period to be published, once the standalone report is finalized. The content for the online section of the Aquaculture of the Handbook, based on key sections of the standalone document, was developed with the goal to ensuring consistency and coherence with the capture section of the CWP Handbook.

The structure of the online aquaculture section of the CWP handbook will include key concepts, methodologies, and classification frameworks related to aquaculture statistics. It will present a section on the Introduction to Aquaculture Statistics, which provides the rationale for data collection, referencing international frameworks such as the FAO Code of Conduct for Responsible Fisheries and the GSA. The Terms and Definitions section compiles a glossary to standardize terminologies and ensure consistency in statistical reporting. The General Concepts section links to existing CWP materials, harmonizing methodologies between capture fisheries and aquaculture, and includes essential topics such as monitoring units, aquaculture production systems, ownership structures, and culture environments.The Aquaculture Statistics section aligns with the United Nations System of Environmental-Economic Accounting (SEEA) and details methodologies for tracking production, losses, and economic valuation. Finally, the Tools and Resources section integrates external references, including FAO yearbooks, international standards, and bibliographic sources, making the aquaculture section of the Handbook a comprehensive reference for aquaculture stakeholders.

2.3. Development of coding for the classification of farming systems

During the intersessional period 2022-2023, the TG-Aquaculture proceeded in drafting a proposal to be presented to parties and discussed over the reference coding for classification of the farming systems. The proposal was drafted according to the Adjusted exhaustive list of aquaculture farming methods, a document aiming to detail the Consolidated categorization of aquaculture farming methods adopted as reference for the CWP Handbook for Aquaculture statistics during the CWP-27.

The list was therefore coded according to the twelve presented categories using a six-digit numerical system, with each pair of digits referencing a stratification in the categorization of the farming systems, allowing for a three levels stratification system in order to leave the possibilities for future adding and amendments on the basis of the development of the aquaculture sector.

As part of this forward-looking approach, the coding system was conceived to be continuously evolving, with the possibility of incorporating additional digits in the future to accommodate emerging developments in farming practices. The system will require testing and validation at the country level to ensure its applicability and relevance across diverse national contexts.

In the different categories, also possible ad-hoc further stratification suggestions were given thus permitting better adaptation at a local level of the coding system, in case a six-digit coding would not cover the necessities of implementation. An example is provided afterwards, and the complete coding system is available in Annex 1.

2.4. Proposal of fact sheets on the farming systems

In addition to the coding system, the TG-Aquaculture2 recognized the importance of developing a descriptive manual on different farming systems to ensure a common understanding among partners when discussing aquaculture systems. To this end, the TG-Aquaculture2 proposed two sample fact sheets, which have been submitted to the CWP for review and further decision-making.

The draft fact sheets provide a comprehensive technical overview of cage aquaculture systems and earthen pond culture systems, representing the first two categories selected for description (available in Annex 2). Each fact sheet is organized under key headings to ensure a clear and structured understanding of the systems. The General Description outlines the basic structure, layout, and function of the farming system within an aquaculture context. Features of the System summarizes the key components, materials, and design elements that support its operation, while Technology in Use describes the level of technological advancement, ranging from traditional methods to automated systems. The section on Water Source identifies the type of water used—freshwater, brackish, or marine—and how it is managed within the system. Indication of Use / Species Farmed lists the species typically cultured and explains the system's suitability for various production stages. Measuring Units specifies the standard parameters used to define system size, capacity, and stocking levels, whereas Data Gathering highlights the types of data collected to support system management and environmental monitoring. Geographical Distribution notes where each system is commonly used, based on regional and environmental conditions. Finally, Pros & Cons summarizes the key advantages and limitations of each system in terms of productivity, cost-efficiency, technical complexity, and environmental impact.

These proposed fact sheets on farming systems, developed by TG-Aquaculture2, are intended to serve as a valuable resource for building technical capacity in aquaculture. They offer a practical, up-to-date, knowledge-based tool for stakeholders at various levels by consolidating essential information in a clear and structured format. By supporting a better understanding of farming system design, operation, and management, they aim to assist aquaculture practitioners, extension workers, researchers, and policy-makers alike. Moreover, the fact sheets complement the development of the Proposed coding for the classification of farming systems, as presented at CWP-IS 2023.

Suitable indicators to monitor aquaculture development, production, and performance over time

Recognizing the need to support countries in applying the CWP Aquaculture Handbook, the TG-Aquaculture2, started a process to identify suitable indicators for tracking aquaculture development, production and sustainability. These efforts follow the endorsement of the

Handbook at CWP-27 and reflects the inputs gathered from bilateral consultations with CWP parties. A key challenge noted was how to properly understand and evaluate the several data gathered under the scope of the Handbook. In response, the TG-Aquaculture recommended starting a structured discussion to develop a basic set of statistical indicators able to assist national and regional monitoring efforts. Building on discussions held during the sixteenth session of the Information System for the Promotion of Aquaculture in the Mediterranean (SIPAM) (Monastir, Tunisia, 14-15 May 2025), a subsidiary body of the Scientific Advisory Committee on Aquaculture (CAQ), the GFCM Secretariat proposed a preliminary list of indicators, along with their description, presented in Annex 3. As these indicators were developed within the context of the Mediterranean and the Black Sea, further work may be needed to incorporate additional indicators that address the needs of other regions globally.

2.5. Identifying other Regional Fishery Bodies (RFBs) involved in aquaculture activities

During the intersessional period the TG-Aquaculture2 efforts also included the proposal for the expansion of the Regional Fishery Bodies (RFBs) that could be contacted to become involved in CWP activities and eventually future partners of CWP, targeting those whose work also included the aquaculture sector. These include:

- **APFIC**: Asia-Pacific Fisheries Commission (currently not operationally until 2028)
- **CACFish**: Central Asian and Caucasus Regional Fisheries and Aquaculture Commission
- **LVFO**: Lake Victoria Fisheries Organization
- **RECOFI**: Regional Commission for Fisheries
- **CIFAA**: The Committee for Inland Fisheries and Aquaculture of Africa
- **COREP**: Regional Fisheries Commission for the Gulf of Guinea
- **CRFM**: Caribbean Regional Fisheries Mechanism
- **EIFAAC**: European Inland Fisheries and Aquaculture Advisory Commission
- **LTA**: Lake Tanganyika Authority
- **ANAF**: Aquaculture Network for Africa
- **RAA**: Aquaculture Network for the Americas

Encouraging wider participation of RFBs in TG-Aquaculture activities, the working group aims to enhance regional input and ensure that statistical methodologies and data exchange mechanisms account for the diversity of aquaculture governance and resource contexts across regions. The potential inclusion of additional RFBs in the activities of the Task Group is expected to improve engagement, facilitate data sharing, and strengthen collaboration in reporting processes, while also increasing the relevance and applicability of the group's outputs. To support this effort, a mapping of relevant RFBs and their respective contact points was carried out.

3. Next steps

The TG-Aquaculture2 proposes to continue those activities according to the ToRs adopted, meanwhile specifically the activities to be undertaken in the next intersession period will include the following:

- Contribute to finalizing the final review of the CWP Aquaculture Handbook for its official release;

- Contribute to the revision of CWP webpages to improve content and coverage including the Aquaculture Section of the CWP HandBook;
- Continue developing the farming systems fact sheets;
- Possibly identify targeted case studies to support the implementation of the aquaculture section on the Handbook including;
- Further development and finalization of coding for the classification of farming systems including the sub-categories;
- Continue discussing with the CWP parties on the development of suitable indicators that could be used/applied to monitor aquaculture development over time;
- Continue revising the International Standard Statistical Classification for Aquatic Animals and Plants (ISSCAAP) in order to assess the impact of the revisions including the use of a revised coding system, also taking into account the 2024 revision of the ASFIS list;
- Establish contact with RFBs that are not currently members of the CWP for cooperation.
- Additional activities post CWP-28 could be undertaken in order to provide support to members and practitioners using the Handbook and build on the suggestions stemmed as a result of the bilateral meetings with CWP Parties. These activities will be better defined in the next intersession period.
- CWP members are kindly invited to provide feedback on the work carried out and the proposed next steps and additional activities to be undertaken in the next intersession period.

ANNEX 1

Proposed coding for the classification of farming systems

1. Premise

The classification is organized into the following twelve farming system categories detailed and stratified according to technical and structural characteristics. Each farming system is identified by a two-digit code, from 01 to 12.

01. Earthen ponds
02. Tanks and raceways
03. Man-made and modified water bodies used for aquaculture
04. Lakes, Coastal Lagoons, Reservoirs, Dams
05. Cages
06. Pens and enclosures
07. Recirculation Aquaculture Systems (RAS)
08. Rice field paddies
09. Culture of shelled molluscs (and benthic animals like sea cucumber & sea urchins
10. Culture of marine macroalgae
11. Culture of microalgae (including cyanobacteria, etc.)
12. Other culture methods

For each farming system, the classification includes additional stratification levels at two double digits. At a minimum, the classification should be used at the six-digits, as highlighted in green. This corresponds to the core of the classification. For selected farming system, further stratification (corresponding to a two-digit code each) may also be provided for a tailored approach after the core six-digit code until a maximum of twelve digits. The list of these additional stratifications by the selected farming systems is provided at the end of the core table.

01. Earthen ponds	
01	**Earthen ponds**
0101	Excavated or constructed earthen ponds (usually of regular shape)
	010101 Earthen ponds without lining
	010102 Earthen ponds with lining
0102	Modified or renovated natural ponds (often less regular in shape and larger in size)
	010201 Earthen ponds without lining
	010202 Earthen ponds with lining

02. Tanks and raceways		
02	**Tanks and raceways**	
0201	Tanks	
	020101	openly exposed
	020102	under roof or covering (partially covered)
	020103	in greenhouse (totally covered)
0202	Racewa ys	
	020201	openly exposed
	020202	under roof or covering (partially covered)
	020203	in greenhouse (totally covered)
	020204	traditional stone walled flow-through tanks in mountainous regions

03. Man-made and modified water bodies used for aquaculture		
03	**Man-made and modified water bodies used for aquaculture**	
0301	small reservoirs, dammed water bodies and barrages	
	030101	of permanent impoundment
	030102	of seasonal impoundment
0302	irrigation canals and ditches	
	030201	of permanent impoundment
	030202	of seasonal impoundment
0303	borrow pits and dugouts ex-mining pools	
	030301	of permanent impoundment
	030302	of seasonal impoundment
0304	impounded land depression areas (caused by mining, etc.)	
	030401	of permanent impoundment
	030402	of seasonal impoundment
0305	crop farm ponds and farm reservoirs	
	030501	of permanent impoundment
	030502	of seasonal impoundment
0306	small coastal lagoons or salt marshes modified with water management facilities like	

	water gates	
	030601	of permanent impoundment
	030602	of seasonal impoundment
0307	valliculture and jiwei (gei-wai), etc	
	030701	of permanent impoundment
	030702	of seasonal impoundment

04. Lakes, Coastal Lagoons, Reservoirs, Dams		
04	**Lakes, Coastal Lagoons, Reservoirs, Dams**	
0401	lakes	
	040101	of permanent impoundment
	040102	of seasonal impoundment
0402	oxbow lakes (locally called "boars" in Bangladesh and West Bengal, India)	
	040201	of permanent impoundment
	040202	of seasonal impoundment
0403	wetland (locally called "beel" or "beal" in Bangladesh and India)	
	040301	of permanent impoundment
	040302	of seasonal impoundment
0404	seasonal flood plains	
	040401	of permanent impoundment
	040402	of seasonal impoundment
0405	seasonal lakes (locally called seasonal tanks in Sri Lanka)	
	040501	of permanent impoundment
	040502	of seasonal impoundment
0406	potholes (in Northern America)	
	040601	of permanent impoundment
	040602	of seasonal impoundment

05. Cages	
05	**Cages**

0501	traditional/conventional net cages	
	050101	floating in off-shore sheltered areas
	050102	floating in off-shore exposed areas
	050103	stationary in shallow water
	050104	submersible or bottom-sitting
0502	modern net cages (metal, HPDE, copper alloy etc..)	
	050201	floating in off-shore sheltered areas
	050202	floating in off-shore exposed areas
	050203	stationary in shallow water
	050204	submersible or bottom-sitting
0503	Ultra-modern net cages	
	050301	floating in off-shore sheltered areas
	050302	floating in off-shore exposed areas
	050303	stationary in shallow water
	050304	submersible or bottom-sitting
0509	Other (mobile cages)	

06. Pens and enclosures		
06	**Pens and enclosures**	
0601	Pens	
	060101	traditional net pens supported with poles
	060102	modern net pens with fortified supporting frame
	060109	others
0602	Enclosures	
	060201	enclosures without supporting poles or frame
	060202	enclosures supported with poles or frame
	060209	others

07. Recirculation Aquaculture Systems (RAS)	
07	**Recirculation Aquaculture Systems (RAS)**

0701	RAS system with tailored design and manufactured facilities and equipment	
	070101	single storey large rearing tank installation
	070102	multiple storey small-to-medium rearing tank installation
	070103	stacked multi-storey boxes for individual rearing of aquatic animals (crab condominium)
0702	RAS system using modified recycled structures (out-of-use shipping containers, etc.)	
	070201	single storey large rearing tank installation
	070202	multiple storey small-to-medium rearing tank installation
	070203	stacked multi-storey boxes for individual rearing of aquatic animals (crab condominium)
0703	Aquaponics	
	070301	commercial scale aquaponics system
	070302	small backyard scale aquaponics system
0709	Others	

08. Rice field paddies		
08	**Rice field paddies**	
0801	culture in conventional rice field (paddy)	
	080101	rotational rice-fish culture
	080102	rice-fish co-culture
0802	culture in renovated rice field (paddy) to suit aquaculture	
	080201	rotational rice-fish culture
	080202	rice-fish co-culture
0803	farming integrated with other aquatic plant crops	
	080301	integration with aquatic vegetables
	080302	integration with aquatic herbs, flower, etc.

09. Culture of shelled molluscs (and benthic animals like sea cucumber & sea urchins)	
09	**Culture of shelled molluscs (and benthic animals like sea cucumber & sea urchins)**

0901	on-bottom culture
090101	sea ranching - seeds sowed at seabed
090102	inter-tidal mudflat - seeded sowing (shelled molluscs)
0902	off-bottom culture
090201	longline ropes (suspended vertically in column) with anchors and buoyance
090202	net bags on stationery racks installed in inter-tidal zone or in shallow sea
090203	baskets or trays on stationery racks installed in inter-tidal zone or in shallow sea
090204	rafts (with seeded ropes for culture attached)
090205	poles (of rock, cement, bamboos and other materials)
090206	lantern net cages suspended from floating longline or raft (mostly for scallops)
090207	perforated plastic boxes suspended from floating longline or raft
090208	abalone houses in floating net cages
090209	automated truss-structured abalone culture platform (modern high-tech)
0903	Others:
090301	polyculture with other species in coastal earthen ponds
090302	culture of gastropod molluscs in tanks
090309	others

10. Culture of marine macroalgae	
10	**Culture of marine macroalgae**
100100	longline ropes (suspended horizontally or vertically in the sea) with anchors and buoyance web or net of ropes fixed on stationery racks or poles typically in inter-tidal areas
100200	rafts or floating racks (with seeded ropes for culture attached)
100300	floating baskets (chained with ropes; seaweeds protected from grazing animals)
100400	sleeve shaped long net bags (seaweed seedling held inside)
100500	suspended net trays (mostly for sea grapes)
100600	tanks
100900	Other (e.g. IMTA)

11. Culture of microalgae (including cyanobacteria, etc.)

11	**Culture of microalgae (including cyanobacteria, etc.)**
110100	plastic bags (transparent)
110200	closed photobioreactors systems (tubes or flat panels)
110300	raceways and tanks
110900	Others (e.g. containers)
12. Other culture methods	
12	**Other culture methods**
1201	specified with description for data collection / reporting
120101	close containment culture system (in the sea, lake or reservoirs)
120102	modified from decommissioned cargo ships
120103	purposely designed and constructed fish culture vessels
120200	not specified for data collection / reporting

ADDITIONAL STRATIFICATIONS

01. Earthen ponds	
Lining materials	
01	lined with synthetic material
02	lined with cement and other materials
Water source	
03	rain-fed undrainable earthen ponds
04	irrigated and drainable earthen ponds
0401	irrigated with surface water
0402	irrigated with underground water
0403	irrigated with brackish or sea water
0404	irrigated with underground sea water
040401	Earthen ponds irrigated without heating or cooling
040402	Earthen ponds irrigated with heating or cooling
Species partitioning	
05	earthen pond monoculture
06	earthen pond polyculture

0601	in-pond mixed polyculture
0602	partitioned pond polyculture
060201	pond polyculture with species partitioned by net or fence
060202	pond polyculture with species partitioned with cages or hapas
060203	pond polyculture with species partitioned with baskets or boxes on floating racks
Aeration	
07	earthen ponds without aeration
08	earthen ponds with aeration
0801	aerated with floating aerator, paddle wheel or air-jet
0802	aerated with on-bottom nano-hose aeration
Recirculation	
09	earthen pond with in-pond raceway recirculation system
0901	with in-pond raceway recirculation system built on bottom
0902	with in-pond raceway recirculation system floating above bottom
090201	earthen pond with out-of-pond tank recirculation system
090202	partitioned pond system & split-pond system
Integration with other vegetable crops	
10	earthen pond culture without in-pond integration
11	earthen pond culture with in-pond integration
1101	in-pond integration with aquatic vegetable planted on pond bottom
1102	in-pond integration with floating aquatic plants
1103	in-pond integration with plant crops on floating beds
Effluent treatment	
12	earthen pond culture without effluent treatment for discharge
13	earthen pond culture with effluent treatment for discharge
1301	effluent treated on farm with manufactured facilities and equipment
1302	effluent treated with uses of extra ponds for sedimentation and bio-treatment
130201	effluent treated with on-farm uses of extra ponds for treatment
130202	effluent treated with communal uses of extra ponds for treatment
Covering system	

14	openly exposed earthen ponds
15	greenhouse-covered earthen ponds
1501	earthen ponds covered with greenhouse of permanent manufactured structure
1502	earthen ponds covered with greenhouse of temporary structures
Perimeter use	
16	earthen ponds with steep dykes
17	earthen ponds with exposed area for other related uses
1701	earthen ponds with area for sunbath or feeding of farmed animals (turtles, frogs, etc.)
1702	earthen ponds with area for green folder plantation for feeding farmed animals in ponds
02. Tanks and raceways	
18	Permanent construction
19	Removable/temporary structures
05. Cages	
Materials	
20	metal framed floating net cages (HDPE = high-density polyethylene)
21	metal mesh cages
22	perforated metal sheet cages
23	flexible framed floating net cages
24	HDPE framed floating net cages
25	bamboo/wooden cages
Monitoring	
26	with on-the-spot monitoring, control and management platform
27	without off-the-spot land-based monitoring, control and management
Waste disposal system on land	
28	With waste disposal system on land
29	Without waste disposal system on land
08. Rice field paddies	
Feeding	
30	without artificial feeding
31	with artificial feeding

ANNEX 2

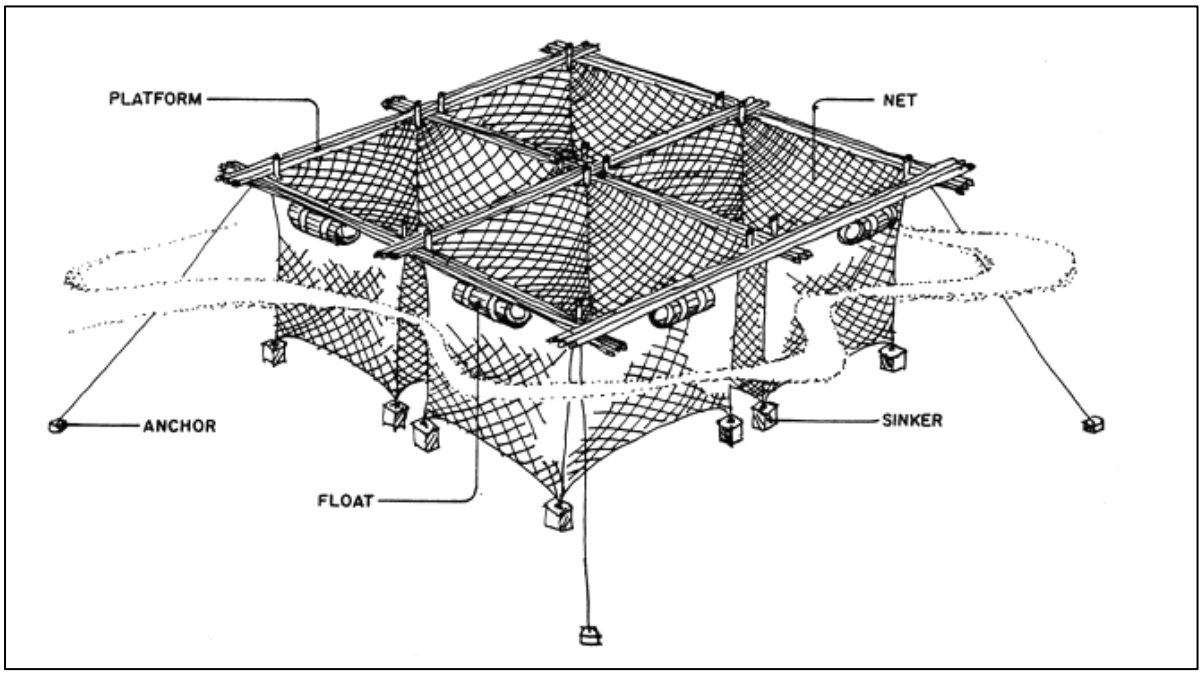
Proposed fact sheets farming systems

DRAFT FACT SHEET: Farming System 05. CAGES

Note: Data and photos should be improved during the editing phase.

Description: Cages refer to open or covered enclosed structures made of net, mesh, or other porous materials that allow natural water exchange. These structures can be floating, suspended, or fixed to the substrate while still permitting free water movement. Cages are supported by frameworks made of metal, plastic, bamboo, or wood, or they are suspended in open water bodies or ponds. They are commonly used for both seed production and grow-out farming.

Features of a cage: Cages are designed to contain aquatic organisms while allowing free water exchange. They may vary in structure, material, and placement depending on the aquaculture system. Some cages are stationary in shallow waters, while others are floating or even submersible. Modern cage systems incorporate advanced materials like high-density polyethylene (HDPE) and copper alloy wire netting for durability and improved performance. Some systems also feature integrated monitoring and management platforms, either on-site or land-based.



(Source: Kungvankij, P., Tiro, L.B. Jr., Pudadera, B.J. Jr., & Potesta I.O. 1985. Training Manual Biology and Culture of Sea Bass (Lates calcarifer). Bangkok, Thailand, Regional Lead Centre in the Philippines Aquaculture Department, Southeast Asian Fisheries Development Center.)

Technology in use: Cages are classified into traditional, modern, and ultra-modern systems based on their materials and technological advancements. Traditional cages are often made of wood or bamboo and are either stationary or floating. Modern cages use metal frames, synthetic netting, or perforated metal sheets and may include waste collection systems for on-land disposal. Ultra-modern cages are engineered with automation, allowing for floating, semi-submersible, or fully submersible configurations.

Water Source: The water source for cage culture varies based on location, species, and environmental conditions. Cages can be installed in freshwater systems such as lakes, reservoirs, rivers, and ponds, where natural water currents provide continuous exchange and oxygenation. In brackish water

environments, cages are placed in estuaries, coastal lagoons, and tidal rivers, benefiting from nutrient-rich waters. Marine cage farming is practiced in protected coastal areas,

fjords, and offshore sites with strong currents to ensure water quality and waste dispersal. Some advanced systems incorporate waste collection devices to mitigate environmental impact. The choice of water source influences species selection, stocking density, and overall farm productivity.

Indication of use/species farmed: Cage culture is widely used for farming various aquatic species, including freshwater, brackish water, and marine species. The suitability of a species for cage farming depends on its adaptability to confined environments, tolerance to water quality fluctuations, and growth potential under controlled conditions. Commonly farmed species include finfish such as trout, tilapia, catfish, and carp in freshwater systems, while brackish water and marine cages often support species like seabass, seabream, groupers, and milkfish. Additionally, high-value species such as salmon and tuna are cultured in offshore cages, where deeper waters provide optimal growing conditions.

Measuring units: Cage size and capacity are measured using key parameters. Dimensions (length, width, depth) in meters determine water volume for fish movement and growth. Stocking density, recorded as fish per cubic meter, is crucial for health and growth. Water depth at the site and current velocity help assess environmental suitability. These measurements are essential for optimizing production efficiency, ensuring ideal rearing conditions, and maintaining a stable and sustainable aquaculture system.

Data gathering: Regular data collection is essential for monitoring the performance and environmental impact of cage culture. Water quality parameters such as temperature, dissolved oxygen, salinity, and pH are routinely measured. Growth performance is tracked by recording weight gain, feed conversion ratio, and survival rates, which help evaluate production efficiency. Stocking and harvesting records provide essential information for planning and optimizing operations. Additionally, waste accumulation and environmental impact assessments are conducted to manage nutrient discharge and mitigate potential ecological risks associated with cage farming in open water bodies.

Geographical distribution: Cage culture is practiced worldwide, particularly in areas with abundant natural water bodies. Common locations include Southeast Asia, the Mediterranean, Scandinavia, North and South America, and Africa. Offshore cage systems are becoming increasingly prevalent in regions with suitable coastal conditions.

Pros & cons: Cage aquaculture offers several advantages, making it a popular choice for fish farming. It allows for the efficient use of existing water bodies, eliminating the need for land-based infrastructure while supporting high production levels. Cages are adaptable to various aquatic environments, from freshwater lakes to offshore marine areas, and enable controlled feeding and monitoring. However, challenges exist, including vulnerability to environmental fluctuations, such as storms and pollution. High stocking densities can lead to disease outbreaks, and waste accumulation poses environmental concerns. Additionally, advanced cage systems, particularly offshore setups, require significant investment and technical expertise.

Modern fish cages in the Black Sea (Türkiye).

Credits: Davide Fezzardi

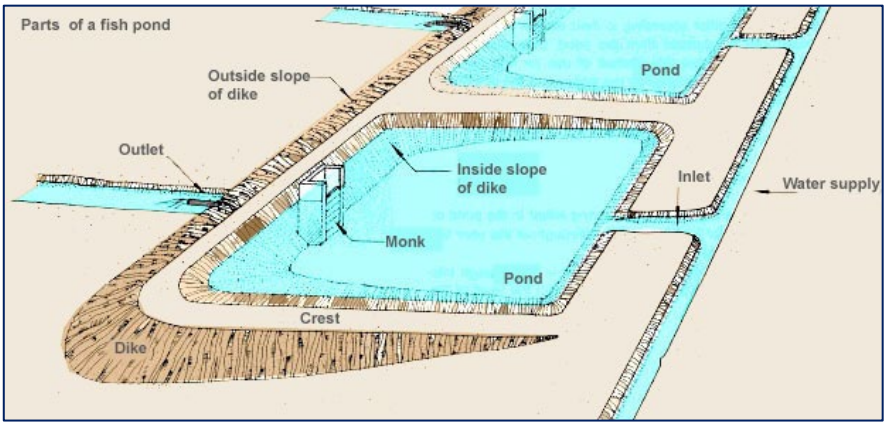
DRAFT FACT SHEET: Farming System 01. EARTHEN PONDS

Note: Data and photos should be improved during the editing phase.

Description: Earthen ponds are natural or artificial structures on land capable of retaining water for the rearing of aquatic species. These ponds typically consist of banks or dykes and can include ditches, floodplain depressions, derelict mining pools, and similar formations. They are often used for aquaculture in stagnant waters with periodic water exchange or flushing. Certain systems may have a high water refreshment rate depending on the species and management practices.

Features of a fish pond: Although there are many kinds of fish ponds, the following are the main features and structures associated with them in general:

- *pond walls or dikes*, which hold in the water;
- *pipes or channels*, which carry water into or away from the ponds;
- *water controls*, which control the level of water, the flow of water through the pond, or both;
- *tracks and roadways along the pond wall, for access to the pond;*
- *harvesting facilities and other equipment* for the management of water and fish.



(Source: Pond construction for freshwater fish culture, FAO Training Series)

Technology in Use: Earthen ponds vary in design and function based on construction, water sources, and species management. They may be excavated, modified from natural ponds, or lined with synthetic materials or cement. Farming systems range from monoculture to polyculture, where species may be separated by nets, fences, or cages. Some ponds integrate aquatic vegetation, either planted on the bottom, floating, or grown on floating beds. Water quality is managed through aeration systems like paddle wheels or nano-hose aeration, while effluent treatment occurs on-farm or in communal ponds using sedimentation and biological filtration. Recirculation systems, such as in-pond raceways, enhance efficiency. Ponds may be exposed to natural conditions or covered with permanent or temporary greenhouses. Some feature steep dykes, sunbathing platforms, or feeding zones. Temperature regulation is achieved through geothermal energy, waste hot water, or deep-sea water, ensuring optimal conditions for farmed species.

Water Source: Earthen pond water sources vary based on location, availability, and culture type. Some rely on rainfall, making them undrainable and dependent on seasonal precipitation. Others are irrigated using surface water from rivers or lakes, underground wells, or brackish and seawater for coastal aquaculture. Advanced systems may incorporate heating or cooling through geothermal heat, power plant waste hot water, or deep-sea water from ocean thermal energy conversion to regulate water temperature.

Indication of Use/Species Farmed: Earthen ponds support a diverse range of aquaculture species, depending on the salinity and water conditions. Freshwater ponds are commonly used for farming species such as tilapia, catfish, and carp. Brackish water ponds, which contain a mix of fresh and seawater, are ideal for species like shrimp and milkfish. Marine earthen ponds, typically found in coastal regions, are suitable for high-value species such as seabass and groupers. Additionally, some earthen

pond systems support the cultivation of amphibians and reptiles, including frogs and turtles, which are farmed for food or conservation purposes.

Measuring Units: To effectively manage earthen pond systems, several key measurements are taken. The surface area of the pond is commonly measured in square meters or hectares, while water depth is recorded in meters to ensure appropriate conditions for the farmed species. Water volume, calculated in cubic meters, helps determine stocking density, which is measured as the number of organisms per square meter or cubic meter. These measurements are crucial for optimizing production and ensuring a balanced ecosystem within the pond.

Data Gathering: Monitoring and data collection play an essential role in the management of earthen ponds. Regular assessment of water quality parameters, including temperature, pH, dissolved oxygen levels, salinity, and ammonia concentration, ensures a healthy environment for aquatic organisms. Growth and survival rates of the farmed species are also recorded, along with stocking and harvesting data, to track production performance. Feed conversion ratios help determine the efficiency of feeding practices, while effluent quality monitoring ensures that wastewater management complies with environmental regulations.

Geographical Distribution: Aquaculture earthen ponds are common in regions with abundant water resources and flat terrain. They are widely used in Southeast Asia (e.g., China, Thailand, Vietnam) for freshwater and brackish water fish farming, as well as in South Asia (India, Bangladesh). In the Mediterranean and Black Sea regions (Turkey, Egypt, Greece), earthen ponds are employed for both freshwater and brackish species. Africa (Nigeria, Egypt, Kenya) and the Americas (USA, Brazil, Mexico) also use earthen ponds for tilapia, catfish, and other species. These systems are distributed globally based on local environmental conditions, land, and water availability.

Pros & Cons: Earthen ponds are a cost-effective aquaculture system requiring minimal infrastructure. They support natural biological filtration and allow for polyculture and integrated farming. Their flexible design adapts to various environmental conditions. However, managing water quality is complex, needing continuous monitoring to prevent oxygen depletion and waste build-up. These ponds are vulnerable to environmental changes, require more land and water than intensive systems, and pose a higher risk of disease due to stagnant conditions. Proper management and biosecurity measures are essential for maintaining productivity and sustainability.

Ponds in integrated agriculture-aquaculture, Bangui, Central African Republic.

Credits: @FAO Aquaculture photo library / A. Coche

ANNEX 3

Key Statistical Indicators to Monitor Aquaculture Development, Sustainability, and Production

Building on the lessons learned and discussions held, the following is a proposal put forward by the TG Aquaculture 2 Secretariat (see also para 2.5).

1. Production and Economic Performance

Indicator	Description	Calculation Method
Total aquaculture production (tonnes/year)	Annual volume of aquaculture production	Sum of all reported aquaculture production segment volumes per year.
Aquaculture production value (USD/year)	Total ex farm value of aquaculture production	Total quantity produced × average ex farm price per species.
Production volume by farming system	Production (tonnes/year) disaggregated by system	Total production per system type (e.g., ponds, cages, RAS, IMTA).
Production volume by species	Production (tonnes/year) disaggregated by species	Sum of production quantities for each farmed species.
Contribution to GDP (%)	Aquaculture sector's share of national GDP	(Aquaculture sector GDP ÷ Total national GDP) × 100.
Trade balance (import vs export, volume and value)	Volume and value of aquaculture exports/imports, disaggregated by species	Export value – Import value; or Export volume – Import volume.

2. Sustainability and Environmental Indicators

Indicator	Description	Calculation Method
Feed Conversion Ratio (FCR)	Average of quantity of feed required per kg of top 3 fed species produced at national level.	• Species 1: Average of total feed used (kg) for species 1÷ Average of total biomass gain (kg) for species 1. • Species 2: Average of total feed used (kg) for species 2÷ Average of total biomass gain (kg) for species 2.

		• Species 3: Average of total feed used (kg) for species 3÷ Average of total biomass gain (kg) for species 3.
% of farms with Environmental Monitoring Programmes (EMP)	Compliance with environmental regulations	(Number of farms with EMP ÷ Total number of farms) × 100.
Extent of integrated/multi-trophic aquaculture	Diversification and ecosystem-based practices	Area under IMTA systems ÷ Total aquaculture area × 100.
Existence of mitigation measures in aquaculture	Quantity of environmental mitigation measures used in aquaculture	Yes/No

3. Social and Institutional Development

Indicator	Description	Calculation Method
Number of aquaculture farmers / enterprises	Disaggregated by gender, age, and region	Survey or census of registered producers.
Employment in aquaculture (FTE)	Jobs created directly and indirectly	Sum of full-time + part-time equivalents.
Participation of women and youth (%)	Gender and age inclusiveness	(Number of women/youth employed ÷ Total workforce) × 100.
Existence of national aquaculture strategies/plans	Presence of strategic guidance	Yes/No or score based on policy evaluation framework.

4. Spatial and Technical Indicators

Indicator	Description	Calculation Method
Ratio of farming area within designated aquaculture zones through spatial planning to the total aquaculture area	Progress in the use of spatial planning as a tool	(Farming area within designated aquaculture zones ÷ total aquaculture area) X 100 (percentage).
% production in areas	Planning effectiveness	(Production from farming area in specific areas allocated to aquaculture ÷ total production) × 100 (percentage).

Farm registration / licensing rate (%)	Formalization of operations	(Number of licensed farms ÷ Total estimated farms) × 100.
Biosecurity or disease control plan coverage (%)	Risk management practices	(Number of farms with biosecurity plans ÷ Total farms) × 100.
Species-specific productivity	Yield per production unit	Production per species ÷ area (ha), volume (m^3) or cycle length.

5. Data Quality and Information Systems

Indicator	Description	Calculation Method
Data reporting coverage rate (%)	Producers reporting to systems	(Reporting producers ÷ Total producers) × 100.
Timeliness of data submission	Delay in months	Date of data availability – Expected submission date (in months).
Number of functional data systems	Infrastructure for data collection	Number of functional operational systems