



**WORKING GROUP OF EXPERTS ON THE FAO AQUACULTURE
QUESTIONNAIRE, FISHSTAT AQ**

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**PROPOSED CHANGES TO THE AQUACULTURE QUESTIONNAIRE
FISHSTAT AQ AND POSSIBLE CHANGES IN THE SCOPE FOR
MONITORING AQUACULTURE PRODUCTION AND DEVELOPMENT¹**

SUMMARY

This paper was presented by FAO at the SEAFDEC/FAO Ad Hoc Expert Consultation on Variables and Terminology for Aquaculture Monitoring in Asia, 13-16 September 1999, and is reproduced and reformatted here for the information of the WG. Responses of the Consultation to suggestions put forward by FAO regarding modifications to FISHSTAT AQ and its instruction sheet are paraphrased from the report of the Consultation² and presented in italics in the relevant sections of the document.

1. The production, development and role of aquaculture in contributing to national food security and socio-economic development have steadily increased since the 1970s. The Fisheries Department of the FAO recognised the growing importance of aquaculture to total fisheries production and national food security strategies and began collating, analysing trends and disseminating aquaculture production data on volume and tonnage in 1984. In keeping with their mandatory obligations, Member countries provide these data on aquaculture output to FAO on a questionnaire, FISHSTAT AQ. This questionnaire is sent annually to national fisheries statistical offices and appropriate national institutions in all Member and Non-member countries. The questionnaire and its instruction sheet are intended to (a) promote standardised usage of variables to facilitate international comparability of data and (b) improve monitoring and analysis of trends in aquaculture development.

¹ *In*: SEAFDEC. 2000. The SEAFDEC/FAO Ad Hoc Expert Consultation on Variables and Terminology for Aquaculture Monitoring in Asia. Volume II: Proceedings of the Consultation. Bangkok, Thailand.

² SEAFDEC. 2000. The SEAFDEC/FAO Ad Hoc Consultation on Variables and Terminology for Aquaculture Monitoring in Asia. Volume I. Report of the Consultation. Bangkok, Thailand. 36p.

2. The aquaculture questionnaire, FISHSTAT *AQ* could be one tool in promoting better data acquisition for facilitating national and international comparability of aquaculture development. One key challenge will be to identify and develop internationally harmonised variables that can be practically collected and reported on such a questionnaire on a regular basis. For such an attempt to be of value, however, internationally harmonised variables and their definitions must be rapidly and effectively disseminated at national level and be clearly understood at the enumerator level where the primary data are collected.

3. Of central importance is the definition of aquaculture, which enables fishery activities to be categorised in a standardised manner. To optimise data quality, the questionnaire and the instruction notes for its completion need to be clearly understood by the respondents and the format and layout should facilitate rapid transfer of data from national files to FISHSTAT *AQ*. To contribute to this process this paper discusses and proposes modifications to the:

- current aquaculture questionnaire, FISHSTAT *AQ*, and
- instruction sheets accompanying FISHSTAT *AQ*

to make them more user friendly. These and any other proposed modifications should promote discussion on the scope of information that countries may need to collect to effectively and objectively monitor the sector and relate to their national objectives for monitoring the sector.

PROPOSED MODIFICATIONS TO FISHSTAT AQ

4. The scope of the data collected by FAO may need to be revisited in view of the increasing demand for information for objective decision-making for developing and managing *aquaculture* and on preserving the aquatic environment. At FAO the opportunity to modify and develop a more appropriate questionnaire for aquaculture arises from the total separation of aquaculture and capture fisheries databases. It is envisaged that this is likely to be an evolving process following consensus building between member countries and FAO needs. The practicality and quality of data that is currently reported and those additional variables that may be useful for a more holistic approach in monitoring the sector may need to be carefully evaluated by countries.

Current Structure of FISHSTAT AQ

5. At present the three page questionnaire requests the following average national information:

- Structural information on the number and area or volume of rearing facilities such as ponds, cages, pens etc. used for culturing finfish, molluscs and crustaceans in fresh, brackish and sea water environments,
- Tonnage (tonnes) and value (Price/kg in local currency) of finfish, mollusc, crustaceans, and seaweed, and

- Seed produced in hatcheries or nurseries for release “to controlled environment” and “to the wild”.

Modified Structure

6. Suggested changes to the FISHSTAT AQ questionnaire are described below.

Production method (editor's addition)

7. The method of culture is reorganised to group raceways with tanks. Enclosures and barrages as categories are removed but can be reported under “others” should they be used exclusively for aquaculture purposes. Seaweed has been changed to submerged aquatic plants to reflect both micro as well as macro algae and include all submerged plants.

Structural statistics (editor's addition)

8. The current version of the questionnaire requests average national volume data for cages, raceways, silos etc. Given the huge variation in size of such rearing facilities on farms, practical difficulties and potential inaccuracies by farmers estimating volume, the quality of such data is unlikely to be high. It may be more feasible and appropriate, however, for farmers to report the number of such rearing units and the gross area allocated for such facilities. For example, the area allocated for cage culture may be more readily available and more accurate than the actual accumulative volume or net cage area. Such information may also be available as part of any lease or licensing agreement with regulatory authorities.

Hatchery/Nursery output (editor's addition)

9. The section on hatcheries and nurseries is redesigned to take into account the spectrum of activities to procure seed.

Culture environments

10. At present countries are requested to report final aquaculture output as freshwater culture, brackishwater culture and mariculture. We propose to maintain the three culture environments to maintain current level of resolution of the data. It has been suggested that production should be aggregated as coastal and inland and that production from off-shore activities and coastal ponds and on-shore tanks using brackish or full seawater should be classed as coastal. There are several problems with this approach. Firstly, it assumes that inland waters are synonymous with freshwater. There are huge inland water bodies e.g. great salt lakes, inland seas such as Caspian, Black and Aral seas, and lakes in which the salinity is higher than freshwater and some of these waters can be used for aquaculture. Also, changes in culture methods and practices may also cloud the distinction between inland and coastal. For example, inland shrimp culture using hyper-brine for saline water ponds should be ideally classed as brackishwater culture and not as freshwater culture. Equally important is the definition of how far inland is coastal. For

coastal management purposes, for example distances up to 200 km are regarded as coastal. In the absence of a clear definition of 'coastal' it may prove difficult for countries to categorise production as inland or coastal. Such delineation will also have to take into consideration the actual physical coastal/inland boundaries in countries, as these are unlikely to correspond to political and administrative boundaries. Such a scheme is likely to increase the workload of enumerators and be an added burden to countries.

11. The use of species tolerance or natural habitat may also not be useful as a criterion since the euryhaline nature of some species facilitates their culture outside their natural habitat range. For example, several species of tilapia, which are naturally found in freshwater, can and are successfully cultured in seawater. Similarly, the marine prawn *Penaeus semisulcatus* is being cultured several hundred kilometres inland using the saline waters of the Caspian Sea.

12. It is practical, relatively easy and cost effective, to measure the salinity of water using the refractive index or density of the water. This is the most widely used method in aquaculture for estimating the salinity of water and is usually expressed as parts per thousand (ppt.) of sodium chloride. It is therefore proposed that culture environment be classified on the basis of its salinity and not geographic location or habit of the cultured species.

Conclusions/recommendations of the Consultation

13. *It was suggested that complexities in the definition of terms be avoided to simplify data collection. Use of the term 'Brackishwater' adds complexity to the definition of environment and will constrain harmonization. It was suggested that environments be classified as inland, coastal and marine. Where opportunity does not exist, aquaculture may be classified into inland and marine, or inland and coastal. Guidelines should be made on the disaggregation of coastal or marine data into coastal and marine data.*

Fishing area

13. A new column is proposed for the questionnaire on sheet 2 for the fishing area as defined by FAO. In most cases countries will have one fishing area for reporting aquaculture output. In cases where a country is transected by more than one major fishing area, production should be allocated to the respective areas. These data are required by FAO to compile total marine production (Capture and culture) by fishing areas and necessitates such countries to allocate aquaculture production from brackish environments into their respective fishing areas.

Seed supply

14. The current questionnaire requests hatchery/nursery output for aquacultural, stocking and restocking purposes. The acquisition of such data may need to be re-evaluated in view of changing priorities for monitoring aquaculture. The collection of appropriate seed data may facilitate the monitoring of seed production efficiency, on-

growing production efficiencies and the development of technologies for supply of seed itself.

15. Current reporting of seed supply excludes the reporting of seed collected from the wild for aquaculture purposes. The collection of such information together with seed supply from hatcheries will enable countries to establish the viability of the culture of target species. At present carp, milkfish, groupers, crabs etc. collected from the wild for aquaculture are not monitored by FAO. We therefore propose to change the reporting of hatchery output to “seed supply” to include seed from the wild. Reporting of seed production from culture facilities should be partitioned into those going for aquaculture and those going into the wild for stocking or restocking purposes. Seed cultured for ranching should be included with those destined for the wild.

16. In addition a column for life stage is included. The practicality of providing such information may need to be discussed in greater detail. Several problems are envisaged. Since the seed production sector in many countries is segmented into egg and hatchling production, fry and fingerling production the problem of multiple counting is likely to reduce the quality and value of such information. Such monitoring will also require enumerators to visit hatcheries and collectors and this will add to their workload and costs, and may not be feasible. The collecting and reporting of data on the number of fry/fingerlings purchased by farmers for the year for on-growing, however, will be of greater value for monitoring the performance of the sector. Collection of such data will enable the efficacy of national seed production and supply as well as the efficiency of farm production to be estimated. The latter will allow total loss of production to be estimated for the first time and should facilitate the basis for economic, disease and other losses to be established.

17. We therefore propose changes in the reporting of the production of seed from hatcheries and nurseries to seed supply. We would like countries to consider the feasibility of reporting seed specifically produced for aquaculture and stocking to the wild including releases for ranching purposes. For better identification we suggest the reporting of species by their local, common and scientific names

Value of Collected Information

18. Complementing information on seed output with gross area (preferably net area) of land and water area used for aquaculture, and final species output, should enable the productivity of the sector to be estimated and compared with other food production sectors. Other variables for monitoring aspects such as employment and socio-cultural development may also need to be considered if a more holistic approach for monitoring aquaculture is adopted.

19. The scope of data collected however, will have to take into account the national capacity and commitment of countries to effectively monitor the sector on a **routine** basis. This in turn is likely to be based on the importance of the sector to the national economy. If an internationally harmonised national system for systematically collecting national information on production from aquaculture becomes a reality it will also

provide a much-needed mechanism for the verification of national data. To achieve this goal, countries will need to evaluate, improve or develop a good aquaculture frame or listing on which to base their monitoring strategy. The guidelines on the collection of structural aquaculture statistics could be used as one working document from which to develop a more holistic but practical approach.

20. To optimise the probability of success, intimate collaboration between and within national and international institutions involved in aquaculture development and monitoring will be crucial. Given the costs, segmented and fragmented nature of aquaculture perhaps the most important of all is that countries should primarily benefit from any initiative to improve the monitoring of the sector. Therefore if the needs and concerns of countries are not carefully evaluated, monitoring programmes are unlikely to be sustainable.

INSTRUCTION SHEET

21. To improve the procedure for completing FISHSTAT *AQ* we propose to modify the instruction sheet (Appendix 1) to consider the following:

Definition of Aquaculture (Item No. 1)

22. Nationally and internationally harmonised procedures for defining fishery activities, as aquaculture is central to monitoring aquaculture production and development. To contribute to this process the FAO, whilst recognising that several definitions exist, formulated a definition following extensive discussions within the FAO Fisheries Department, and the Co-ordinating Working Party on Atlantic Fisheries. This definition currently used on the instruction sheet states that:

“Aquaculture is the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated. For statistical purposes, aquatic organisms which are harvested by an individual or corporate body which has owned them throughout their rearing period contribute to aquaculture while aquatic organisms which are exploitable by the public as a common property resource, with or without appropriate licences, are the harvest of fisheries.”

23. Although this definition is widely accepted by international fishery bodies, e.g. Eurostat – Statistical Office of the European Union, ICES - International Council for the Exploration of the Sea, SEAFDEC - Southeast Asian Fisheries Development Commission, etc. it has some shortcomings. Whilst the above definition delineates most categories of aquaculture from capture fisheries, changing practices in capture fisheries has caused notable practical difficulties in classifying some types of activities as aquaculture. Therefore to contribute to the acquisition of better data, the above definition is currently being refined and the following definition is proposed for inclusion in the instruction sheet as Item No 1:

“Aquaculture is the farming of aquatic organisms including, finfish, aquatic molluscs, crustaceans and [plants] [macroalgae], crocodiles, alligators, amphibians where farming refers to their rearing [up to their juvenile and/or] [or during the entire] [or for all or most of their life] adult phase under captive conditions. Aquaculture also encompasses individual, corporate or state ownership of the organism being reared and harvested in contrast to capture fisheries in which aquatic organisms are exploited as a common property source, irrespective of whether harvest is undertaken with or without exploitation rights”

24. To assist in the implementation of this definition specific guidelines on the categorisation of fisheries activities are given in Appendix 2.

Conclusions/recommendations of the Consultation

25. *The need to revise the FAO definition of aquaculture was recognized in order to respond to changes in the sector. The definition should include the three concepts in the original definition, namely, the organisms and their farming environment, aquaculture practice, and the ownership of the organism. In establishing the revised definition, clear rules should be identified to separate aquaculture from capture fisheries. The 'refined' definition and the table differentiating various aquaculture and capture fisheries practices proposed by FAO were widely accepted. In this regard, it was recommended to disseminate the revised definition to the countries.*

Aquaculture production (Item No. 2)

26. For international comparability it is important for countries to harmonise the definition of aquaculture production. For monitoring purposes it should be regarded as the final production for consumption or other purposes including aquatic plants.

Culture of aquatic species by environments (Item No. 3, 4 and 5)

27. To assist in deciding to which culture environment the final output should be attributed, freshwater, brackish and marine culture are defined. The basis for this separation is salinity and not geographic location or species preference. Whilst it is acknowledged that several technical methods and standards are available for measuring salinity, the most practical and widely used method of refractive index of water and density, expressed as 'parts per thousand', i.e. ppt, is proposed.

Method of culture (Item No. 6)

28. The type of rearing facility and their numbers (units) provides useful information on the direction of aquaculture development. In this instruction the method of culture refers to the rearing facility, e.g. ponds, cages etc. being used. The most commonly used facilities are described. Specific reference to barrages and enclosures are removed but

they are described in the instruction sheet for inclusion under the ‘others’ section, if applicable. These types of rearing facilities are not widely used but could be used as sheltered sites in which culture-based capture fisheries may be practised and/or be used to site cages and pens. In the latter case output would need to be reported under cages and pens and not enclosures.

Total area (Item No. 7)

29. Ideally two types of land and water area should be reported, net and gross areas. Net area represents the national aggregation of actual area of land or water utilised for the rearing facilities. For ponds it should include pond banks. Although such information can be used for developing workable indication of efficiency of production methods, it may not be practical to collect on a regular national basis. It may be feasible, however, to record the size of the site, i.e. the **gross area** and then estimate a proportional area actually used for culture.

Seed supply (Item No. 8 & 9)

30. The life stage/size at which seed are recorded needs to be harmonised. In view of the high probability of multiple counting, the number and size of seed purchased or transferred by the farmer for on-growing to final sale is proposed.

Price at first sale/farm gate (Item No. 10)

31. FAO uses such information to estimate the value, in US dollars, of aquaculture production. In cases where countries do not report unit species value it is estimated by FAO. This is unsatisfactory and can result in significant distortions of the sector. It is therefore important that enumerators record the average gate prices of the species being cultured. If only wholesale prices are available, gate prices could be estimated by taking into account the average profit mark up for species. In cases where commodity data such as shrimp tails are available live weights should be estimated for reporting production.

Fishing area (Item No. 11)

32. We propose to provide the country with their fishing area and request countries to demarcate production along the lines of the fishing area. In cases more than one fishing area transects a country a map providing guidelines will be provided with the questionnaire.

ACTION BY THE CONSULTATION (editor’s addition)

33. We invite participants to review the above proposals and invite their comments on the problems and concerns in responding to FAO’s aquaculture Questionnaire. We also invite participants to discuss if and how the scope of the national information collected by countries can be improved, and the role FAO can play in assisting them in this process.

We welcome the views of the experts on the proposed changes and on recommendation on how the questionnaire can be modified to better facilitate the monitoring of production from aquaculture in their countries.

APPENDIX 1

INSTRUCTIONS FOR THE COMPLETION OF FISHSTAT AQ

1. For international harmonisation and standardisation of data collection and analysis, FAO requests your country to identify production as aquaculture using to the following definition:

Aquaculture is the farming of aquatic organisms including, finfish, aquatic molluscs, crustaceans and {plants} [macroalgae], crocodiles, alligators, amphibians where farming refers to their rearing up to their juvenile and/or [or during the entire] [or for all or most of their life] adult phase under captive conditions. Aquaculture also encompasses individual, corporate or state ownership of the organism being reared and harvested in contrast to capture fisheries in which aquatic organisms are exploited as a common property resource, irrespective of whether harvest is undertaken with or without exploitation rights”

The definition encompasses three components:

- ◆ the cultured organism,
- ◆ the practice, and
- ◆ ownership of product during the entire phase of production

All three components *must* be fulfilled for an activity to be classified as aquaculture.

To assist in the implementation of this definition specific guidelines on the categorisation of fisheries activities are given in Appendix 2 (this paper).

2. By **Aquaculture production** is meant output from aquaculture activities, which are designated for final consumption or other purposes. This includes aquatic organisms as defined in (1) above. Do not include output from hatcheries and nurseries, which will continue to be reared. These outputs should be entered in the section devoted to “seed supply”
3. By **freshwater culture** is understood the cultivation of aquatic organisms in water in which the salinity does not exceed 0.5ppt; earlier stages of the life cycle of these species may be spent in brackish or marine waters.
4. By **brackishwater culture** is understood the cultivation of aquatic organisms in water in which the salinity is usually characterised by regular fluctuations between fresh water and full strength seawater. Enclosed coastal and inland water bodies in which the salinity is greater than freshwater are also regarded as brackish; earlier stages of the life cycle of these species may be spent in fresh or marine waters. If these conditions do not exist please record production under either “freshwater culture” or “mariculture”.

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5. By **mariculture** is understood the cultivation of aquatic organisms in marine water. The earlier stages of the life cycle of these aquatic organisms may be spent in brackishwater or freshwater
6. By **method of culture** is meant the type of rearing facilities or structures such as ponds, cages, pens etc. used for aquacultural production. By unit is meant the actual number of ponds, pens, cages, etc., Please record the national total number of each type of unit used in your country.
- i) By **pond** is meant an artificial unit capable of holding and interchanging water in which at least one, but usually all, surfaces are constructed from soil. Ponds can be constructed above or below ground level.
 - ii) By **tank** is meant: artificial units constructed above or below ground level capable of holding and interchanging water. Tanks are structures of varying sizes (e.g. round, “D” ended, rectangular, square). Tanks can be made of various materials such as bricks, cement, concrete, fiberglass, plastic, timber, asbestos, metal etc.
 - iii) By **raceway** is meant tank structure in which the length is several times the width (i.e. long narrow tanks)
 - iv) By **cage** is meant a structure usually constructed and supported by a floating framework made of metal, plastic, bamboo or wood enclosed by net, mesh or any porous material allowing natural water interchange. These structures may be floating, suspended, or fixed to the substrate but still permitting water interchange from below.
 - v) By **pen** is meant a water surface artificially enclosed from the substrate to above the water surface on all sides by mesh, bamboo, timber or any porous material to facilitate exchange of water
 - vi) By **others** is meant additional facilities such as:

Barrage is meant semi-permanent or seasonal enclosures formed by impervious man-made barriers and appropriate natural features.

Enclosure is meant natural or artificial water areas in which all but one of the sides is enclosed by ashoreline poles or porous material to facilitate water exchange usually screens the open side if such enclosures are used to site cages and pens please record the production under cages or pens. If such facilities are used for capture fishery purposes do not record output on this questionnaire.
- 7 By **total area** is meant the total gross area of land or open water surface area in hectares allocated to the various rearing facilities in your country.

- 8 By **seed** is generally meant eggs, spawn, offspring or progeny, which are used for on-growing in aquaculture or capture fishery purposes. Here it is also meant to include wild seed, which may be collected for aquaculture purposes. The number and life stage of the seed that is collected for reporting should be that stage and numbers that are purchased/or stocked by the farmer for on-growing for final consumption or other purposes
- 9 By **Hatchery/nursery** is meant facilities used for the production of seed for aquaculture, capture or rehabilitation purposes. These facilities may be indoors or outdoors.
- 10 By **stocking to the wild** is meant intended release of hatchery reared seed for stocking or restocking artificial or natural water bodies for capture fisheries purposes.
- 11 Please note **quantities** should be given to the nearest metric tons (e.g. 100.6 tonnes should be recorded as 101 tonnes except for ICES Member States which should report in units of 0.1 tonne e.g. 80.58 tonnes should be recorded as 80.6 tonnes.) In cases where processed weights of products are used e.g. shrimp tails, appropriate conversion factors should be applied to report live weight quantity for species.
- 11 **Price/Kg.** Please give national average price at first sale i.e. farm gate price in national currency. If wholesale prices are used they should be adjusted for average mark up for the species.
- 12 For **fishing area** pertaining to your country please consult chart-showing boundaries of each FAO fishing area. Where more than one FAO fishing area adjoins a reporting country data should be split into each fishing area and designated in this column.
- 13 Please indicate in your reporting any national exceptions to the concepts listed above

APPENDIX 2

CLASSIFICATION PROPOSED FOR VARIOUS AQUACULTURE AND CAPTURE FISHERIES PRACTICES (MODIFIED FROM CWP 1992)

| PRODUCTION FROM/OF: | DESIGNATION | | |
|---|-------------|-------------------|-------------|
| | AQUACULTURE | CAPTURE FISHERIES | |
| | | Enhanced | Traditional |
| Hatcheries | * | | |
| Managed grow-out sites for organisms reared from fry, spat & juveniles | | | |
| - Ponds | * | | |
| - Tanks | * | | |
| - Raceways | * | | |
| - Cages | * | | |
| - Pens | * | | |
| - Barrages | * | | |
| - Integrated vallicoltura production | * | | |
| - Private, tidal ponds (tambaks) | * | | |
| - Poles, ropes and net bags for molluscs | * | | |
| Stocked lakes, dams, reservoirs and rivers: | | | |
| - With additional enhancement (predator control, engineering and/or fertilisation etc.) | | * | |
| - other modification | | * | |
| - no other intervention " exploitation with or without rights " | | * | |
| Unstocked lakes, dams, reservoirs and rivers: | | | |
| - with enhancement (fertilization and/or predator control habitat modification), "exploitation with or without rights " | | * | |
| Rice-fish culture: | | | |
| - from stocked rice-paddy | * | | |
| - from unstocked rice-paddy | | | * |
| Brush parks: | | | |
| - managed over time and with other enhancement | | * | |
| - harvested on an install and harvest basis | | | * |
| "Fish" aggregating devices | | | * |

| | | | |
|--|---|---|---|
| Holding facilities for live captured organisms of marketable size held for a few months (e.g. tuna, lobsters, crabs) | | | * |
| Ranching | | * | |
| Artificial reefs with or without exploitation rights | | * | |
| Aquatic plants: | | | |
| - <i>from planted or suspended facilities</i> | * | | |
| - <i>from natural seaweed beds</i> | | | * |
| Privately owned recreational riverine fisheries | | | * |
| Open access waters with or without exploitation rights | | | * |