



**GLOBAL STRATEGY TO IMPROVE AGRICULTURAL AND  
RURAL STATISTICS**

**TRAINING COURSE TO ENHANCE FISHERY AND  
AQUACULTURE STATISTICS  
(Training material user guide)**

<b>Title of training</b>	Training course to enhance fishery and aquaculture statistics
<b>Duration</b>	4–5 days
<b>Training type</b>	Face-to-face

## 1. Background

Small-scale fishery (SSF) and aquaculture are crucial to the nutritional and economic sustenance of fishing households and communities. The collection of statistics from SSF and aquaculture is emphasized by the Blue Growth Initiative of the Food and Agriculture Organization of the United Nations (FAO), the Sustainable Development Goals (SDGs) and international agreements such as the UN Fish Stock Agreement, Code of Conduct for Responsible Fisheries, etc., so that the sustainable harvesting of aquatic resources can be achieved while meeting food security and economic welfare objectives.

Emphasis is placed on the development of strong national statistical systems, capable of generating data on sea and inland water fish biological stocks and diversity, cultivated stocks and harvested quantities, and socio-economic data on households and fishing communities. These data, pertaining to the practice of SSF (or artisanal fishing) and aquaculture, are necessary to pursue the policy objectives of sustainable harvesting of aquatic resources, food security and economic sustenance.

However, the capacities of the national statistical systems of many countries continue to lag behind, due to insufficient human and financial resources as well as a lack of cost-effective data collection systems that produce quality data capable of supporting objectives that optimize the conservation of aquatic resources, food security and economic growth.

The Food and Agriculture Organization of the United Nations (FAO) has published guidelines on developing and implementing sample-based fishery surveys to produce the total catch (output) of capture fisheries through landing and effort surveys. As for statistical work to produce socio-economic information on fishing households and communities, the Global Strategy to Improve Agricultural and Rural Statistics (GSARS), hosted by FAO and also known as the Global Strategy (GS), developed guidelines on collecting socio-economic data on fishing households and communities by enhancing questionnaires within the population and agricultural census framework, to capture detailed household and community SSF and aquaculture information. This expands the pool of data that can be obtained to support the socio-economic assessment of fishing households and communities. FAO and GSARS have produced the following guidelines that are relevant to the production of statistics on the fishery sector:

- *Sample-based fishery surveys: A technical handbook* (<http://www.fao.org/3/a-y2790e.pdf>)
- *Guidelines to Enhance Small-Scale Fisheries and Aquaculture Statistics through a Household Approach* (in English; <http://gsars.org/en/guidelines-to-enhance-small-scale-fisheries-and-aquaculture-statistics-through-a-household-approach/>)
- *International Training Course in Fisheries Statistics and Data Collection* (<http://www.fao.org/3/a-i3639e.pdf>)
- *Master Sampling Frame for SSF and Aquaculture Statistics* (forthcoming)
- Brochure on producing quality cost-efficient sustainable SSF and aquaculture statistics by GSARS (forthcoming)

Based on the above guidelines and technical handbooks, GSARS has prepared training materials to be used in workshops and classroom environments. This GSARS initiative aims to build technical capacity within countries' national statistical systems to produce the advocated minimum set of core agricultural data in the crop, livestock and fishery sectors. The training material (in English and French) is accessible free of charge on the GSARS website.

This user guide describes the intended training objectives, content and target audience of the training in the collection of SSF and aquaculture statistics. It also provides recommendations on aspects of the organization of training, such as a sample training duration timetable (see appendix).

## **2. Objectives of the training**

### **General objectives**

The overall objective of the training in the collection of SSF and aquaculture statistics is to strengthen the technical capacity of statistical producers (statistical offices and other institutions involved in the production of fishery statistics) to set up and operate systems to collect and compile SSF and aquaculture statistics in a cost-effective manner. The intended statistics or indicators cover output-related indicators, as well as socio-economic information on fishing households and communities necessary to support the broader policy objectives of sustainable harvesting of aquatic resources, food security and economic sustenance. The objective of the training can be reached by:

- Improving the understanding of concepts and indicators related to SSF and aquaculture activities, and their importance
- Improving the understanding of existing and new approaches or methods for producing data on the fishery sector that are relevant to broader policy objectives and are capable of supporting economic growth, food security and conservation of aquatic resources. In particular:
  - The estimation of the total catch of marine and inland capture fishery using landing and effort surveys
  - The production of socio-economic data on fishing households and communities, including output-related data through a household approach based on the population and agricultural census framework
- Training statisticians on survey designs to implement sample-based data collection systems for SSF and aquaculture statistics:
  - Survey designs for estimating the total catch of SSF through landing and effort surveys
  - Survey designs for collecting household and community data on SSF and aquaculture through a household survey approach
- Exposing statisticians to the technologies available for cost-effective and quality data collection and compilation

## Expected outcomes

At the end of this training, participants will be able to:

- Define the concepts and list the indicators related to SSF and aquaculture, and appreciate their importance to facilitating policy objectives of conservation, nutrition and economic sustenance;
- Understand and apply appropriate survey designs to collect and compile indicators for SSF and aquaculture;
- List the various technologies available to assist data producers in setting up and operating cost-effective and quality data collection and compilation;
- Sustain the technical capacity gained through continuous self-learning, using the GSARS knowledge resources available online and peer-to-peer knowledge transfer.

## 3. Course content

The training topics covered by the training material are the following:

**Module 1:** SSF and aquaculture concepts and indicators for supporting sustainability, food security and economic sustenance objectives

1. Definition of Small-Scale Fishery (SSF) and aquaculture
2. Why SSF and aquaculture statistics (including map of SSF distribution worldwide and statistics on output, consumption, employment)
  - SDGs (food security, sustainability, economy)
  - National data needs
  - Regional data needs
3. Indicators for SSF and aquaculture
  - a. Biological indicators
  - b. Fishing operations indicators
  - c. Economic indicators
  - d. Community indicators
4. Criteria for selecting indicators to collect
5. International classifications for fisheries statistics
  - Boat gear classifications
  - Fish species classifications, etc.

**Module 2:** A quick refresher on biostatistics and estimators

- **General statistics**
  - ✓ 1.1 Why a refresher on biostatistics
  - ✓ 1.2 Statistical terms: *population versus sample*
  - ✓ 1.3 Statistics/Estimates (*mean, variance, standard deviation*)
  - ✓ 1.4 Reliability, precision and accuracy of estimates (*confidence intervals, relative error, bias*)

✓ 1.5 Analysis of SSF and aquaculture data

**Module 3:** Data collection methods and strategies

1. Data sources and collection methods
2. Data sampling strategies
3. Setting up a stratified sampling scheme for routine SSF data collection

**Module 4:** Approaches to producing routine statistics or indicators of the total catch of marine and inland fishery production

1. Survey designs for estimating total catch
  - Survey design for single operational unit métiers
  - Survey design for several operational unit métiers
  - Handling use of multiple gears by boats or vessels
2. Effort survey designs
  - Frame surveys
  - Active Days Surveys
  - Boat Activity Surveys
3. Landing survey designs for estimating total catch and Catch Per Unit of Effort (CPUE)

**Module 5:** Obtaining SSF and aquaculture statistics through a household approach

1. Building a frame of SSF and aquaculture households through population or agriculture censuses
  - Screening questionnaires to identify SSF and aquaculture households during the census
2. Survey designs for collecting household and community data for SSF and aquaculture through the household approach

**Module 6:** Technology to support data collection and compilation

1. Computer-Assisted Personal Interview (CAPI) for reduced data collection costs and improved data quality
  - CAPI versus PAPI
  - CAPI software – a quick introduction to ODK and Survey Solutions
2. Open ArtFish for compiling indicators for total catch from effort and landing surveys

**Module 7:** Exercises with case studies for compiling SSF statistics. Hands-on exercises in small groups, with examples of data sets

## **4. Course design and delivery**

### **Delivery mode**

The training material has been designed to support a four- to five-day training, depending on the target audience's needs and prevailing circumstances.

The course should envisage a combination of:

- Lectures on specific technical topics
- Hands-on exercises in small groups

To enhance understanding, it is important to ensure interaction between the trainer and trainees, and among the trainees themselves. For this reason, questions, interventions and peer-to-peer discussions are encouraged and expected to be part of the training. Furthermore, trainees are to be reminded that they are expected to master this topic through continuous learning, using the online training material and guidelines available on the FAO and GSARS websites. See especially:

<http://gsars.org/en/tag/fisheries/>

<http://gsars.org/en/category/publications/trainingmaterial/>

<http://www.fao.org/3/a-y2790e.pdf>

<http://www.fao.org/3/a-i3639e.pdf>

Detailed country examples are not given in the training material. The trainers should source case studies from practical country field experiences and include them as part of the training discussion on the various aspects of SSF and aquaculture data collection.

### **Number of trainers and requirements**

A trainer with experience in general fishery data collection and statistical dissemination, requisite mastery of the topic, and conceptual and practical fieldwork experience, is the ideal figure to deliver this training.

### **Number of trainees**

The number of trainees should be sufficiently large (15 to 25 participants) to ensure interaction among trainees and the trainer and to reach most stakeholders requiring the training. In addition, it depends on the context of the training, both in terms of the countries covered (at regional workshops) or country needs. The number also varies according to whether the training is delivered in a seminar or workshop or classroom setting.

## **5. Course material**

The training material consists of six modules, including presentations and a series of exercises. A seventh module includes a compilation of hands-on exercises. The presentations contain exhaustive information and the trainer can decide to adjust the number of slides according to the needs of the target audience. The supporting material to be reviewed by the participants prior to and after the training is composed of documents available online:

- *Sample-based fishery surveys: A technical handbook*, <http://www.fao.org/3/a-y2790e.pdf>
- *Guidelines to Enhance Small-Scale Fisheries and Aquaculture Statistics through a Household Approach* (in English), <http://gsars.org/en/guidelines-to-enhance-small-scale-fisheries-and-aquaculture-statistics-through-a-household-approach/>
- *Master Sampling Frame for SSF and Aquaculture Statistics* (forthcoming)
- *International Training Course in Fisheries Statistics and Data Collection*, <http://www.fao.org/3/a-i3639e.pdf>
- Brochure on producing cost-effective SSF and aquaculture statistics (forthcoming)

## 6. Target audience

The course is designed to bring together the persons within national statistical systems who are responsible for producing SSF and aquaculture statistics. The training should therefore be open to decision-makers in agriculture or fishery ministries and national statistical offices (NSOs), survey managers, trainers of field staff, data analysts, researchers, teaching staff and students at training centres of statistics and agriculture or fisheries.

At the end of the training, participants should be given an evaluation sheet, where they will be able to provide their feedback on the course and identify the areas where further training could be provided.

## 7. Relationship with other GS research and training activities

The GS has ongoing research work on building MSFs for fishery statistics that provides guidelines for building and maintaining a cost-effective, stable and reliable sampling frame for fishery data collection. In this regard, the GS will publish guidelines and training material to support instructors in delivering an adequate statistical capacity development.

## 8. References

**De Graaf, G.J., Nunoo, F., Ofori Danson, P., Wiafe, G., Lamptey, E. & Bannerman, P.** 2015. *International training course in fisheries statistics and data collection*. FAO Fisheries and Aquaculture Circular No. 1091. Rome, FAO.

**Global Strategy to Improve Agricultural and Rural Statistics.** 2017. *Guidelines to Enhance Small-Scale Fisheries and Aquaculture Statistics through a Household Approach*. FAO: Rome

**Stamatopoulos, C.** 2002. *Sample-based fishery surveys: A technical handbook*. FAO Fisheries Technical Paper 425. Available at: <http://www.fao.org/3/a-y2790e.pdf>.

**United Nations General Assembly.** *Agreement for the implementation of the provisions of the United Nations convention on the law of the sea of 10 December 1982 relating to the conservation and management of straddling fish stocks and highly migratory fish stocks*, A/Conf. 164/37 (8 September 1995). Available at

[http://www.un.org/depts/los/convention\\_agreements/texts/fish\\_stocks\\_agreement/CONF164\\_37.htm](http://www.un.org/depts/los/convention_agreements/texts/fish_stocks_agreement/CONF164_37.htm).

**Food and Agriculture Organization of the United Nations (FAO).** *Code of Conduct for Responsible Fisheries.* Available at <http://www.fao.org/docrep/005/v9878e/v9878e00.htm>.

**FAO.** *Blue Growth Initiative.* Available at [www.fao.org/policy-support/policy-themes/blue-growth/en](http://www.fao.org/policy-support/policy-themes/blue-growth/en).



**Appendix 1.** An example of agenda for a regional/country training workshop.

<b>Day 1</b>	
08:00 – 09:00	<b>Registration</b>
09:00 – 10:15	<b>Opening session/photo session</b> <ul style="list-style-type: none"> <li>• Welcome remarks</li> <li>• Introductions [participants, resource persons and support team]</li> </ul> Group photo
10:15 – 10:30	<b>Break</b>
10:30 – 10:45	<b>Introduction: Training objectives, design and expected outcomes</b> <u>Introductory presentation</u>
10.45-12.00	<b>Module 1: General introduction</b> SSF and aquaculture concepts and indicators for supporting food security scientific and policy advice <ol style="list-style-type: none"> <li>1. Introduction to Small-Scale Fishery (SSF) and aquaculture sectors</li> <li>2. Importance of SSF and aquaculture (global distribution of SSF production, consumption, employment)</li> <li>3. Indicators for SSF and aquaculture               <ol style="list-style-type: none"> <li>a. Biological indicators</li> <li>b. Fishing operations indicators</li> </ol> </li> </ol> <u>60 minutes presentation; 15 minutes discussion</u>
12:00 – 14:00	<b>Lunch</b>
14:00 – 15:00	<b>Module 1: General introduction</b> <ol style="list-style-type: none"> <li>3. Indicators for SSF and aquaculture (continued)               <ol style="list-style-type: none"> <li>c. Economic indicators</li> <li>d. Community indicators</li> <li>e. Criteria for selecting indicators</li> </ol> </li> <li>4. CWP International Standards and Classifications</li> </ol> <u>50 minutes presentation; 10 minutes discussion</u>
15:00 – 15:15	Break
15:15 – 17:00	<b>Exercise:</b> Explore international classifications used in the fisheries and aquaculture statistics (Classifications of species, gears, vessels, etc.)

<b>Day 2</b>	
09:15 – 10:15	<p><b>Module 2:</b> Refresher on biostatistics</p> <ul style="list-style-type: none"> <li>• <b>General statistics</b> <ul style="list-style-type: none"> <li>✓ 1.1 Why refresher on biostatistics</li> <li>✓ 1.2 Statistical terms: <i>population versus sample</i></li> <li>✓ 1.3 Statistics/estimates (<i>mean, variance, standard deviation</i>)</li> </ul> </li> </ul> <p><u>45 minutes presentation; 15 minutes discussion</u></p>
10:15 – 10:45	<b>Break</b>
10:45 – 12:00	<p><b>Module 2:</b> (continued)</p> <ul style="list-style-type: none"> <li>• <b>General statistics</b> <ul style="list-style-type: none"> <li>✓ 1.4 Reliability, precision and accuracy of estimates (<i>confidence limits, relative error, bias</i>)</li> <li>✓ 1.5 Statistics for data analysis in SSF and aquaculture</li> </ul> </li> </ul> <p><u>1 hr presentation; 15 minutes discussion</u></p>
12:00 – 14:00	<b>Lunch</b>
14:00 – 15:00	<p><b>Module 2:</b> (continued)</p> <ul style="list-style-type: none"> <li>• <b>General statistics</b> <ul style="list-style-type: none"> <li>✓ 1.1 Why refresher on biostatistics</li> <li>✓ 1.2 Statistical terms: <i>population versus Sample</i></li> <li>✓ 1.3 Statistics/estimates (<i>mean, variance, std. deviation</i>)</li> <li>✓ 1.4 Reliability, precision and accuracy of estimates (<i>confidence limits, relative error, bias</i>)</li> <li>✓ 1.5 Statistics for data analysis in SSF and aquaculture</li> </ul> </li> </ul> <p><u>50 minutes presentation; 10 minutes discussion</u></p>
15:00 – 15:15	<b>Break</b>
14:45 – 17:00	<p><b>Exercise:</b></p> <p>Statistics used in the context of data analysis in SSF and aquaculture. Using Excel, calculate the mean, standard deviation and relative error based on data sets provided, such as “Lake Chad”</p>

<b>Day 3</b>	
09:15 – 10:15	<p><b>Module 3:</b> Data collection methods and strategies</p> <p><b>Data collection methods</b></p> <ul style="list-style-type: none"> <li>- Frame/census surveys</li> <li>- Sampling surveys</li> <li>- Master Sampling Frames (MSFs)</li> <li>- Other data collection methods</li> </ul> <p><b>Data sampling strategies</b></p> <p><b>Setting up a stratified sampling scheme for SSF routine data collection</b></p> <p><u>45 minutes presentation; 15 minutes discussion</u></p>
10:15 – 10:45	<b>Break</b>
10:45 – 12:00	<p><b>Module 4:</b> Producing SSF statistics</p> <p><b>Sampling design</b>  <b>Sample-based surveys for estimating Catch Per Unit of Effort (CPUE)</b>  <b>Handling use of multiple gears by vessels</b></p> <p><u>1 hr presentation; 15 minutes discussion</u></p>
12:00 – 14:00	<b>Lunch</b>
14:00 – 15:00	<p><b>Module 4:</b> Producing SSF statistics (continued)</p> <p><b>Sampling design</b>  <b>Sample-based surveys for estimating Catch Per Unit of Effort (CPUE)</b>  <b>Handling use of multiple gears by vessels</b></p> <p><u>45 hr presentation; 15 minutes discussion</u></p>
15:00 – 15:15	<b>Break</b>
15:15 – 15:17:00	<p><b>Exercise:</b>  Compute using Excel: CPUE, effort and total catch using a case study data set</p> <p>Open discussion – break out groups to discuss for instance:</p> <ul style="list-style-type: none"> <li>- MSF implementation (case study: Burkina Faso)</li> <li>- Methodology and results of the SSF frame survey conducted in countries of the West African Economic and Monetary Union (UEMOA)</li> </ul>

Day 4	
09:15 – 10:15	<p><b>Module 5:</b> Obtaining SSF and aquaculture statistics through a household approach</p> <ul style="list-style-type: none"> <li>- Building frame of SSF and aquaculture households through population census/agriculture census</li> <li>- Screening questionnaires to identify SSF and aquaculture households during census</li> </ul> <p><u>45 minutes presentation; 15 minutes discussion</u></p>
10:15 – 10:45	<b>Break</b>
10:45 – 12:00	<p><b>Module 5:</b> Obtaining SSF and aquaculture statistics through a household approach (continued)</p> <p>Setting up sample survey for household surveys</p> <p><u>1 hr presentation; 15 minutes discussion</u></p>
12:00 – 14:00	<b>Lunch</b>
14:00 – 15:00	<p><b>Module 6:</b> Tools to support data collection, compilation and analysis</p> <ul style="list-style-type: none"> <li>• Computer-Assisted Personal Interview for reduced data collection costs and improved data quality <ul style="list-style-type: none"> <li>– CAPI versus PAPI</li> <li>– CAPI software – a quick introduction to ODK and Survey Solutions (SuSo)</li> </ul> </li> <li>• Open ArtFish for estimation of total landings</li> </ul> <p><u>50 minutes presentation; 10 minutes discussion</u></p>
15:00 – 15:15	Break
15:20 – 17:00	<p><b>Exercise:</b></p> <p>Explore the CAPI software – Survey Solutions.</p> <ul style="list-style-type: none"> <li>• <a href="http://www.gsars.org/e-learning/index.html">http://www.gsars.org/e-learning/index.html</a></li> </ul> <p>Explore the generic software Open ArtFish</p> <ul style="list-style-type: none"> <li>• <a href="http://www.fao.org/fishery/topic/16081/en">http://www.fao.org/fishery/topic/16081/en</a></li> </ul>

<b>Day 5 - Optional</b>	
09:15 – 10:15	<p><b>Module 7:</b> Case studies of SSF statistics (exercises)</p> <ul style="list-style-type: none"> <li>- Basic data screening: identifying outliers</li> <li>- Computing means, standard deviation, relative error</li> </ul> <p><u>45 minutes presentation; 15 minutes discussion</u></p>
10:15 – 10:45	<b>Break</b>
10:45 – 12:00	<p><b>Module 7:</b> Case studies on SSF statistics (exercises)</p> <ul style="list-style-type: none"> <li>- Computing effort, CPUE and total catch</li> <li>- Comparing CPUE and ANOVA</li> </ul> <p><u>1 hr presentation</u></p>
12:00 – 14:00	<b>Lunch</b>
14:00 – 15:00	<b>Module 7:</b> Case studies of SSF statistics (exercises) (continued)
15:00 – 15:15	<b>Break</b>
15:15 – 16:00	<p><b>Closing evaluation and remarks</b></p> <p><u>50 minutes</u></p>