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WorldFish CENTER

FOOD SECURITY AND POVERTY ALLEVIATION THROUGH IMPROVED VALUATION AND GOVERNANCE OF RIVER FISHERIES IN AFRICA

Technical Guidelines for Economic Valuation of Inland Small-Scale Fisheries in Developing Countries

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Fish for All

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1 Introduction

1.1 Aims and Scope of the Guidelines

These "Technical Guidelines for Economic Valuation of Inland Small-scale Fisheries in Developing Countries" are one of the outputs of the project on "Food security and poverty alleviation through improved valuation and governance of river fisheries in Africa". The guidelines draw upon research results and experience gained during the course of the project. The project was coordinated and implemented by the WorldFish Center and was carried out in cooperation with the National Agricultural Research Institutes (NARs) from the participating countries: the Nigeria Institute for Freshwater Fisheries Research, the Departments of Fishery of Niger, Malawi and Zambia, and the Cameroonian Ministère de l'Elevage, des Pêches et de l'Industrie Animale; and three advanced research institutes (ARIs): the Leibniz University of Hannover in Germany, the Institute for Sustainable Development and Aquatic Resources in UK, and the University of Cape Town in South Africa.

The rationale for these guidelines is the pressing need for data and information on the value of fisheries, particularly their contribution to the livelihoods of rural households (Béné 2006). Currently, there is an acute lack of relevant research and data about the socio-economic value of small scale fisheries to fish-dependent households and communities. As a result, communities depending on small-scale fisheries are often marginalized or ignored in national and regional development policies due to a relative dearth of information about the conditions of poverty, the specific elements contributing to it, and the factors governing vulnerability to poverty. Up to now, very few studies on fisheries have been conducted at household level, the majority mainly focusing on macroeconomic and market analyses. Organizations (e.g. FAO, DFID, WorldFish Center) have therefore repeatedly called for the generation of adequate information on and assessment of the extent, nature, causes and dynamics of poverty in fishery-dependent communities (Macfadyen and Corcoran 2002, FAO 2005, 2006, Béné 2009).

Several issues have to be addressed in order to assure reliable and adequate results when conducting valuation of fisheries worldwide. Methodological improvements need to be adapted to the conditions of institutions in fisheries and should be harmonized to the degree possible. Of particular concern is the clarity and practicability of the methods. Achievements in desk-based methodological development and their adaptation to fisheries, as well as the approach to survey design and methodology have to be accurately documented and made available to national and international research community and policy makers.

The Technical Guidelines presented here constitute a "handbook" on the economic valuation of small-scale fisheries in developing countries. Applying the tools and techniques described in these guidelines can help to make the contribution of small scale fisheries to the well-being (for e.g. risk mitigation, poverty reduction and food-security) of households clearer.

The targeted audience for this document includes national and international research organizations, universities, practitioners and non-governmental organizations engaged in research and intervention related to small-scale inland fisheries. The guidelines may also

be useful for experts dealing with broader development issues in natural resources management, poverty reduction, food and nutrition security, policy and governance issues.

The core of the document is a methodological toolkit for economic valuation of small scale fisheries. This includes an overview of techniques of valuation of natural resources, as well as practical issues in design and implementation of household surveys for economic analysis, including sampling issues, questionnaire design and interview methodology. A basic introduction to the analysis of quantitative household data is also given at hand, so that the user may benefit from the experiences and lessons drawn during the course of the project.

1.2 The Project Framework

The goal of the project within which these guidelines were developed was to sustain and improve the livelihoods of the rural poor who depend on fisheries for their employment, income and food security along the rivers of the Lake Chad and Zambezi river basins, and at the same time strengthening the capacity of national and regional decision-makers to develop and implement improved governance and policy mechanisms that sustain river fisheries and enhance their contribution to poverty alleviation and national food security (WorldFish Center 2004).

The project started in January 2006 and was sub-divided into three phases. The first phase focuses on policy and governance in small scale fisheries. It looked at how the existing policy and governance arrangements in small scale fisheries can be improved to strengthen the contribution of small scale fisheries to household livelihoods. In the second phase, the contribution of small scale fisheries to the wellbeing of households and communities were assessed. The phase was implemented in two locations in the Chad Basin: the Hadejia-Nguru Wetlands in North-East Nigeria and the Yaéres floodplain along the Logone river in North Cameroon; and two in the Zambezi Basin: the Kafue floodplain in central Zambia and the Lower Shire floodplain along the Shire river in South Malawi. In the course of implementing this phase, methodologies of collecting and assessing poverty and vulnerability of households have been adapted to small scale fishing communities.

This approach was intended to lead to the development of an adapted portfolio of methodologies for inland fisheries valuation, presented in these Technical Guidelines, which will specifically account for the contextual and institutional constraints of developing countries fisheries: strong interaction and interdependence between fishery and other rural activities, incomplete markets of the activities (high degree of subsistence), and lack of institutional capacities for a large number of NARS of the African continent.

Phase three of the project was about scaling up and dissemination of the methodologies that have been developed. These Guidelines are therefore an output of the third phase of the project.

1.3 Structure of the Guidelines

The document is organized as follows. Chapter two presents the state of the art in evaluation techniques. It is divided in two sections. At first, the general principles of economic valuation are reviewed. In the second section, important conceptual issues in economic welfare indicators, such as income, consumption and assets, are introduced. This section also includes a brief

description of vulnerability assessment. In chapter three data collection techniques and sampling procedures are presented. This includes country-specific examples. Chapter four presents data management issues. The guidelines are concluded with a summary in chapter five.

2 Methods of Valuation

To better understand the methods used in economic valuation of fisheries resources, it is useful to begin by presenting what economists mean when they talk of 'economic value'. Economic value is a measure of what the maximum amount of resources an individual is willing to forgo in order to obtain some good and/or services (Lipton, et al., 1995). This definition of economic value is derived from the fact that resources are limited but the demands for those resources may be unlimited. As such, individuals and societies make trade-offs on which commodities (goods, services, or state of the world) they should spend their few resources on and they reveal their valuation of the commodity by their willingness-to-pay (WTP). The money an individual pays for a commodity is the market price. The market price is not always equal to the economic value of the commodity. An individual buys a commodity when his/her willingness-to-pay for the commodity (i.e. the value the individual places on the commodity) is equal or greater than the market price. This difference between market price and economic value of a commodity is illustrated in Figure 1 below.

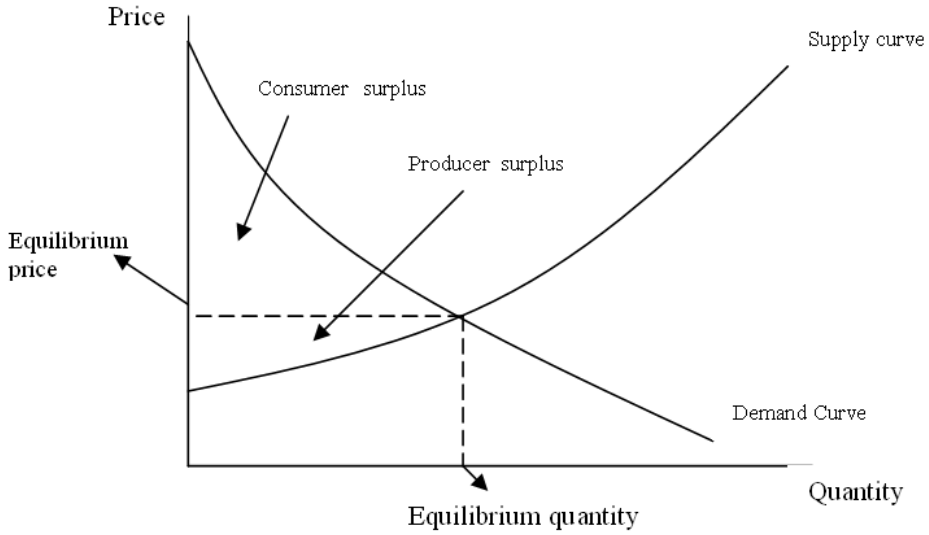

Figure 1: Illustration of consumer and producer surplus

The demand curve maps out the consumers' willingness-to-pay at different quantities and the market price (or equilibrium price) is equal to the point where the demand curve intersects with the supply curve. When consumers value a commodity more than its market price, they will buy the commodity. On the other hand, if the market price of a commodity is greater than the consumer valuation, the consumers will not buy. The excess of what consumers are willing to pay over what they actually pay for the total quantity of a good purchased is called consumer surplus and this reflects the good's value to the consumers in

terms of net WTP. Consumer surplus is presented by the area below a good's demand curve and above the equilibrium price line.

2.1 General principles

Valuation of fisheries resources is a sub-component of environmental and natural resource valuation. In general, this involves the quantification of the benefits of the resource. Economic valuation studies in fisheries can be categorized into conventional economic valuation techniques and socioeconomic and livelihood analysis (Neiland and Béné 2003).

Conventional economic approaches involve measuring the monetary value a society/community attaches to a natural resource. These values are classified into use and non-use values. When both use and non-use values of the resource are considered in a valuation, the valuation exercise is said to capture the total economic value (TEV). Estimating the total economic value of a natural resource poses a challenge because of the benefits of the natural resource that are not traded in the market and do not have a market price. Figure 2 below gives an illustration of the concept of total economic value.

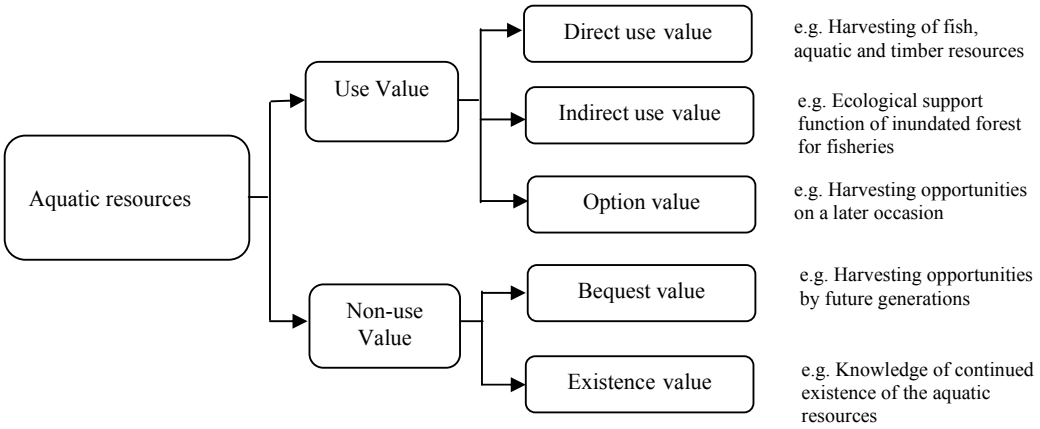

Figure 2: Components of the Total Economic Value (TEV) of an aquatic resource, such as a river system and its adjacent wetlands (Redrawn from Béné and Neiland 2003)

Direct use values relate to direct utilisation of the resource such as harvesting of fish. These are relatively straightforward to measure, and usually involve market value of production gains (Bann, 2002). In small scale fisheries, this involves the valuation of total fish catch at market prices. Indirect use values relate to indirect utilisation of the resource which is comprised of the environmental and ecological functions and benefits provided by the coastal marine system. Option values on the other hand are values perceived by the people in terms of their ability to use the resource at present and in the future, including use options that may go beyond small scale fisheries (Kronen, 2007).

Non-use values on the other hand comprise of the continuous existence of the coastal fisheries system and its value for future generations. This might include the value associated with the desire to maintain a river fishery intact for future generations (bequest value) or simply the satisfaction of knowing that a particular aquatic habitat has been preserved in perpetuity (existence value) (Béné and Neiland, 2003).

The methods that are used to measure these values are broadly categorised to market based approaches, revealed preference approaches and stated preference approaches (OECD, 2002; Bann, 2002).

2.1.1 Market based approaches

Market based approaches involve the observation and use of market prices to value the resource. These are grouped into (1) observed market value approach; (2) productivity approach; and (3) cost based approach.

The observed market approaches are applied where the market prices of the resource exist and the prices are combined with quantity of the resource to estimate the value. In fisheries valuation, this involves multiplying fish catch with market price of the fish to find the value of the catch. This is a straight forward way of valuating fisheries resources and provides relatively cheap and quick estimates of value. This method may however undervalue the resource if the market price is less than the consumer willingness to pay.

The market-based approach has been used in a number of valuation studies. Yet there are still some unanswered questions. One of the questions is: which price should we use? Should it be the price the fisher receives for his catch, or should it be the final price the consumer pays? Use of the fisher's price shows the income fishers obtain from fishing. On the other hand, the consumer's price includes the utility addition activities such as place, time, and utilities of the fish processing form. The choice of the price depends therefore on the type of policy that initially drives the value exercise.

One of the major disadvantages of this method is that it uses market values that do not necessarily reflect non-use values. The approach may also require large data to correctly estimate the resource value (see below).

The second approach under market-based approaches is the production function approach. A production function relates output of a commodity to different levels of inputs or factors of production (land, labour, capital, raw materials). More formally the production function of a single output may be given by:

$$Y = f(X, Z) \qquad (1)$$

where Y is the output, X is a set of factors of production and Z is the input of un-priced environmental resource. It is assumed that output Y that has a market price can be measured. If prices of inputs are not expected to change when supply of environmental resource (Z) changes, then the economic value of the change ΔZ in the supply of Z is the value of the production change ΔY associated with the change in Z at constant inputs of the other factors (X) (Pearce and Moran, 1994). This method, which can be data intensive, ignores non-use values. Additionally, a more complex view of the market structure may be needed if the environmental changes have sizeable impact on the market. The application to fisheries valuation is limited because fish is not used as an input in a production system.

Finally, cost-based valuation techniques assess the costs of different measures that would ensure maintenance of the benefits provided by the environmental goods or services being valued. Cost based approaches include opportunity cost-based approaches, and approaches

that measure environmental values by examining the costs of reproducing the original level of benefits (e.g. replacement, restoration, and relocation cost methods). This is a practically difficult approach and is usually considered as the second best valuation techniques.

2.1.2 Revealed preference approaches

Revealed preference approaches include a set of conventional economic valuation approaches that do not require observation of market prices. They are sometimes known as the indirect techniques. These methods make use of observable behaviours of individuals to deduce how much an individual values something even if the commodity is not traded in the market. The methods are designed to estimate demand curves and consumer surplus. These approaches are favoured by many economists and policy makers because the values are revealed in real rather than hypothetical markets as we will see below with stated preference approaches. A disadvantage of these approaches though is that they are unable to account for non-use values and they require a lot of data. Examples of revealed preference methods include travel cost models of recreation, random utility models, hedonic models, and averting behaviour models. The travel cost method is presented succinctly below as it is easily understood.

The travel cost method (TCM) can be used to estimate recreational values of the fisheries and other natural resources. The cost of travelling to the site where the resource is located (which includes time and travel expenses) is used to proxy the value of the site to the individual. The idea is that if the individual spent a given amount of money to travel to a site, then the travel cost should reflect the lower bound of the value of the resource for the individual. By observing the characteristics of individuals visiting the site, it is possible to estimate the derived demand for the site. That is for any given price of the site, the derived demand relationship will determine the number of visits consumers will "purchase" at a price. The TCM is applicable when the study site is accessible for at least part of the time and people spend a significant time, or incur other costs to travel to the site (Bann, 2002). Figure 3 below is the illustration of the travel cost demand curve.

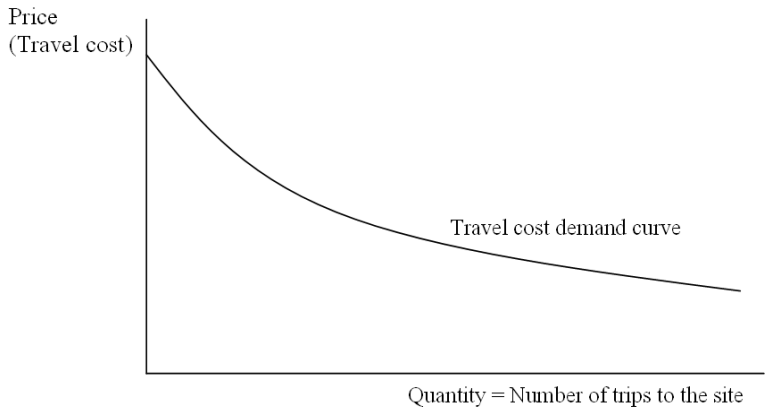

Figure 3: Travel cost demand curve

To derive this curve, one has to conduct a survey of individuals who visit the site. The cost of travelling to the site can then be plotted against the number of trips made to derive the

travel cost demand curve. The consumer surplus which measures the value of the resource to the society can then be derived from the demand curve. The application of the TCM in small scale fisheries in developing countries is limited because many times individuals do not go to the small fisheries just for site seeing.

2.1.3 Stated preference

Under stated preference methods people are directly asked to state their values, rather than these values being inferred from actual choices, as in the "revealed preference" methods. The contingent valuation method (CVM) is an example of the stated preference technique that is commonly used to estimate economic values for all kinds of ecosystem and environmental services. The method allows valuation of a wider variety of non-market goods and services than is possible with any other non-market valuation technique. It is used for both 'use' and 'non-use' values, and it is the most widely used method for estimating non-use values. The method involves directly asking people in a survey, how much they would be willing to pay (WTP) for specific environmental goods and services. In some cases, people are asked for the amount of compensation they would be willing to accept (WTA) to give up specific environmental goods and services. It is called "contingent" valuation, because people are asked to state their willingness to pay, contingent on a specific hypothetical scenario and description of the environmental service. In small scale fisheries, individuals for example can be asked how much they are willing to pay to maintain a certain status of the fisheries. An alternative can be a case when a dam is about to be constructed upstream which is expected to affect the small scale fisheries. Before the river is dammed, the population that is deriving their livelihood from the fisheries can be asked how much they are willing to accept (WTA) to be paid for them to allow the productivity of the fishery to be affected by the dam. The individuals are given full information of the changes that are expected. The money they are willing to accept shows how much they value the fishery.

2.2 Household welfare analysis

2.2.1 The household approach

The type of information collected for the evaluation of fisheries can be categorized in two basic approaches: (1) the market (or sector) approach, and (2) the household approach. The market approach can be summarized as a "value chain" approach, where the different steps in the value adding process are analyzed from producer (fisher) to the final consumer. This involves a detailed analysis of all the steps in-between, such as processing, trade etc. Previous studies on SSF have mostly focused on the analysis of the sub-sector, i.e. applying the market approach. While this approach is particularly attractive for value chain analyses, it has a number of weaknesses if it comes to the valuation of non-market benefits of SSF. Market analyses are unsuitable for the assessment of welfare among a given population, since only a fraction of total welfare is considered. Hence, the relative importance of a sub-sector can only be shown in aggregated market values but not at the household level. As it has been argued before, such figures systematically ignore the benefits that accrue outside the market economy such as nutritional security, stability within the rural environment, or the value of SSF in providing protection against external economic variations, thus reducing risk and vulnerability to poverty. In addition, market approaches ignore the interrelationships between different activities. Comparing the market

value of SSF with other sectors often implies a conflictive relationship. However, different activities performed by the household with the goal of income generation and risk mitigation suggest rather a complementary relationship between fisheries and crop production, for example.

In contrast to the market approach, the household approach has a different objective. It is particularly practical for the analysis of social welfare in general. Data on all economic aspects of a household allow the assessment of household well-being by use of different welfare indicators, e.g. consumption, income or assets, and hence a detailed analysis of different activities and their interrelation. As such, the household approach concentrates on all the activities that are performed by a household for income generation. In a simple framework four basic types of inputs can be assumed as factors of production: land, labour, capital, and knowledge (Figure 4). Each household undergoes a decision-making process that results in the allocation of production factors to different activities or processes, such as crops, fishing, livestock and off-farm enterprises. In making decisions on how to allocate their inputs in producing one or more products, households have to make decisions that involve using their knowledge to come as close as possible to fulfilling the goals for which they are striving. These goals may vary from household to household (e.g. maximizing their income, producing enough food to feed the family, etc.). Livelihood strategies are comprised of the range and combination of activities and choices that people undertake in order to achieve their livelihood goals. The resulting combination (portfolio) of products they are producing with their inputs depends on the production system they have adopted.

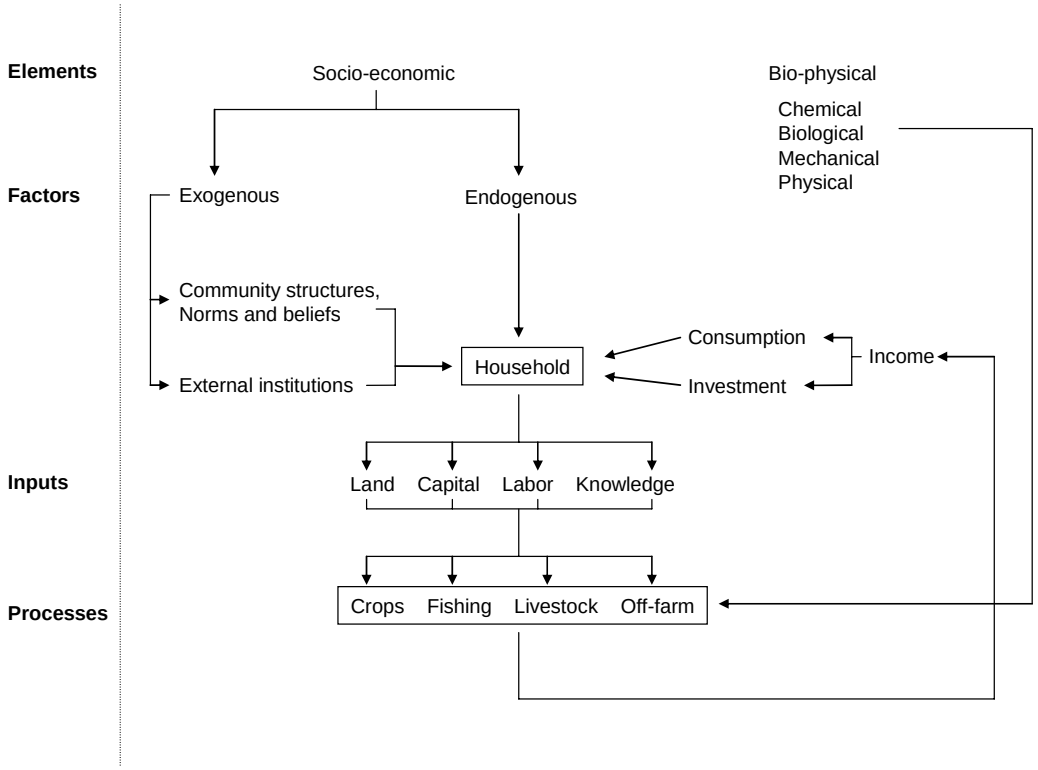

Figure 4: Schematic presentation of the household system (Source: adapted from Norman et al., 1995)

Hence, there is a clear difference between the two approaches. While the market approach focuses on one economic activity from producer to consumer, the household approach combines all different activities (not just fishing) – no matter where the household finds himself on the value chain. Very often households are producers, processors, traders and consumers at the same time.

The decision making on the production portfolio has to be understood as a dynamic process in which people combine activities to meet their various needs at different times and on different geographical or economical levels. Their direct dependence on asset status and transforming structures and processes becomes clear through the position they occupy within the framework. A changing asset status may strengthen or hinder other strategies depending on the policies and institutions at work. For example, imagine a household with 10 members. They have now to decide what to do during the cropping season. For illustration purposes we assume two activities, rice production and fishing. The household has a limited labor supply, and limited capital, and these input factors have to be allocated between the activities. The different combinations of the two activities are depicted on the production possibilities curve, which is a result of the input allocation (Figure 5). The input-output relationship illustrates that no activity should be regarded alone, because all activities are interrelated and interdependent. If a household chooses a specialization strategy, e.g. only rice production, it has its reasons. If somebody pursues a diversification strategy, doing many activities at the same time, he or she also has its reasons. A household model can explain these decisions assuming rational behavior.

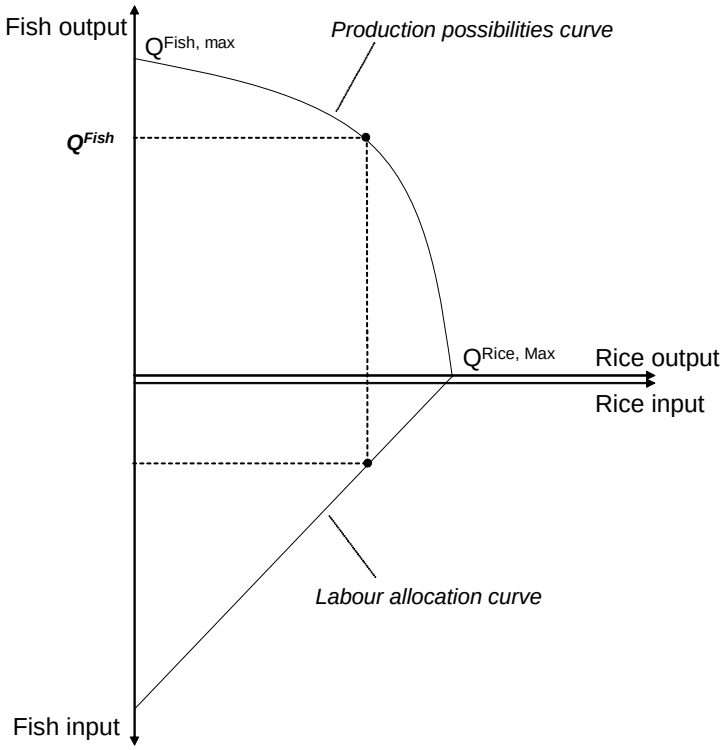

Figure 5: Input-output relationship in a rural production system

In order to demonstrate the strength of the household approach, an illustrative example of two households is presented. Both are real households who live in the Logone floodplain in

Cameroon. Household 1 is from the village of Galazi, which is located at the Lorome Mazra River, a tributary of the Logone River. The second household lives in Kalang, a village at the border of the Maga Lake. To assure comparability, the two households have almost the same demographic structure. The household heads are of similar age, each has one wife and a grown-up but unmarried son.

Looking at fishing income only (Figure 6), we could conclude that the second household is better off. It has the opportunity to fish 9 months in the year and has a much higher income from fishing than the first household.

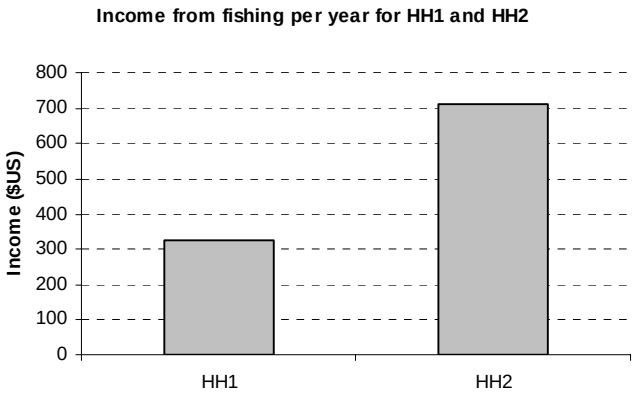

Figure 6: Two household illustrative example: Income from fishing

However, this picture is misleading. Looking at income from other activities (Figure 7) it becomes obvious that household 1 is in reality much better off. This is the strength of the household approach: It shows the relative importance of one activity, e.g. fishing, within the total activity and income portfolio of a household.

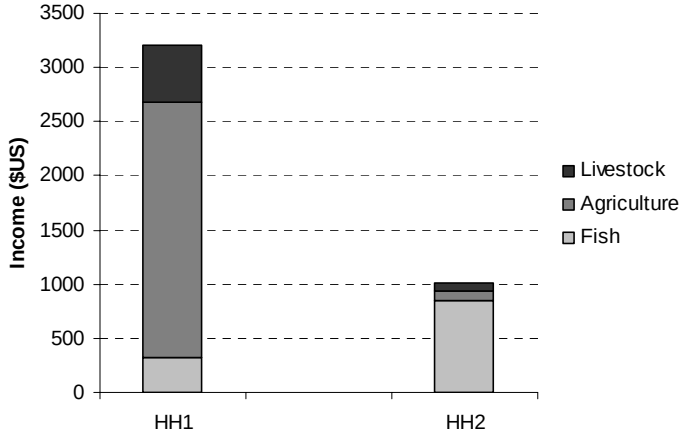

Figure 7: Two household illustrative example: Total household income

Box 1 summarizes the advantages and disadvantages of the market and household approaches.

Box 1. Comparing Market and Household approaches

Market approach
Advantages:
- yields information of the value adding process from producer to consumer
  → Value chain analysis possible
- yields a value for a certain "market" in a region, e.g. the fish market
- allows the identification of weaknesses in the system, e.g. access to markets (input and output), prices, regulations, property rights etc.

Disadvantages:
- fails to assess the welfare of the target group, i.e. single households or communities
- ignores the interrelationships between different activities, e.g. fishing, farming, livestock
- does not show the relative importance of a certain activity for the local economy

Household approach
Advantages:
- suitable to assess household economics by use of different welfare indicators, e.g. consumption, income, assets
- allows a detailed analysis of different activities and their interrelation
- allows optimization solutions (portfolio optimization)
- allows the assessment of economic value (not just the market price)

Disadvantages:
- requires a large amount of primary household data
- fails to incorporate all value adding processes, because they are limited to the household/farm level

We can conclude that the household approach is more appropriate to assess the economic value of fishing. Using the market approach it is possible to derive the "market value" which has its advantages for value chain analyses. However, the market value of fisheries does not sufficiently show the economic value of this sector. We shall see below that the household approach goes beyond that market value and captures the manifold contributions of fisheries to the local economy (e.g. food security, poverty reduction or risk mitigation).

2.2.2 Welfare indicators

Welfare indicators are measures used to estimate the level of household or individual wellbeing. Household wellbeing can be measured by different variables such as consumption expenditure, income, food security, education, assets, health, etc. Some of the most commonly used measures are presented and discussed here.

1. Consumption
Consumption expenditure is usually categorized as food consumption and non-food consumption.

Food consumption - food consumption is comprised of both food that is produced by the household (crops, livestock products, fish, and other natural resources), and food that is purchased at the market. Valuing food purchased from the market is straight forward because the information about the quantities that were purchased and the prices can be easily obtained. The product of the two provides a value of total expenditure on those items.

To value the food consumed from home production (auto consumption), one needs to obtain information about quantities that were consumed and the market prices. In valuing auto consumed commodities it is assumed that the household would have bought the commodity from the market if it did not produce it on its own. One of the challenges of valuing auto consumption is to choose the price of the commodity. Many of the commodities have different prices along the value chain (the route it takes from the producer to the final consumer). Use of local market price is more realistic even if the commodities are not always sold to final consumers in the local market.

Non-Food Consumption - non-food consumption constitutes items such as expenditures on education, clothing, housing, health care, water, electricity, body care, etc.

2. Household Income

All the inflows (monetary and non-monetary) that are obtained from all activities in a livelihood/production system are referred to as total household income. In a typical farm household in the floodplains, this will be comprised of income from agriculture, livestock sales (including livestock products such as milk and eggs), fishing, other natural resources, remittances, and off-farm activities.

Gross revenue (Gross income) – this is total monetary value of an output without considering costs. For crops this is the monetary value of total yield (auto consumed or sold). For fish, this is the monetary value of total catch (auto consumed or sold) while for livestock this is equal to the revenue obtained from livestock and livestock products plus the value of livestock and livestock products auto consumed. Note that a cow in the grazing field is not an income unless it is sold while crops in the storage may be considered as an income.

Production costs – the expenses incurred in production processes are referred to as production costs. Total production costs are the sum of total fixed costs and total variable costs.

Fixed costs - the costs that do not vary with the level of production e.g. rent for a piece of land or a dugout canoe. When a household rents a fixed piece of land, say one hectare, or one dugout canoe, the cost of rent will not increase or decrease with respect to the level of crop production or fish catch.

Variable costs - the costs that vary depending on the level of production e.g. cost of labour. If the usage of labour is increased, output is also expected to increase.

Opportunity costs – these are defined as the costs of any course of action as compared to alternatives. These are referred to as forgone benefits and they reflect the real cost of a resource.

Net revenue (net income) - this is computed when the production costs are subtracted from the gross revenue. The net revenue shows the profitability of an enterprise (activity). This is illustrated in Figure 8.

Both gross income and net income can be used to assess the welfare of a household. Net income is a better measure because it shows the amount of income that is available to the household.

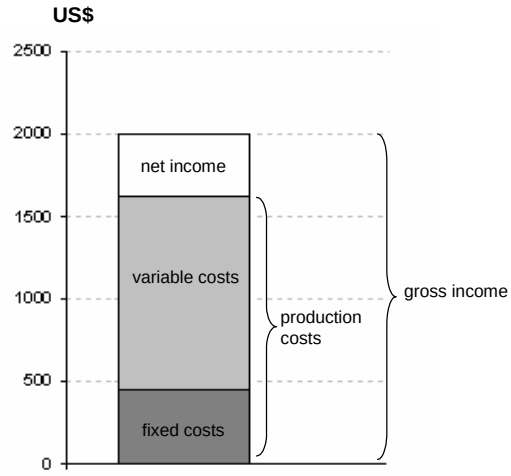

Figure 8: Illustrative calculation of net income

3. Assets

Broadly, an asset can be defined as a tangible or intangible holding that can be converted to cash and/or used for production. In most rural settings tangible assets matter most and these can be categorized as productive assets and consumptive assets.

Productive assets – assets that are used for productive purposes such as land, fishing gear, ploughs, irrigation engines, etc.

Non-productive assets – assets not used for production such as furniture, housing facilities, etc

Livestock – livestock is also a form of an asset that is used for consumption and production

The ownership of these assets can also be used to assess household welfare. Assets can be measured in different ways. One possibility is to count them (e.g. number of cattle owned by the household, which is often used as an explanatory variable in econometric estimations). Another possibility of measuring assets is to find the monetary value of the asset by taking the market price (sale price). In the cases where it is difficult to quantify/monetize the asset, a way of accounting for the asset holdings of a household is to simply categorize households as having or not having a certain asset.

2.2.3 Static analysis

Livelihood outcomes are the achievements of livelihood strategies. They help us to understand the 'output' of the current configuration of factors within the livelihood framework. They demonstrate what motivates households to act as they do and what their priorities are. They might give an idea of how people are likely to respond to new opportunities and which performance indicators should be used to assess support activities.

Livelihood outcomes can also be called welfare measures. Total expenditure on consumption or total income over some period are the mostly used welfare measures but other indicators such as food security, life expectancy, infant mortality, and literacy are also used in some studies. The use of either income or consumption expenditure has raised debates mainly in developing countries where measurement of both indicators is

problematic. Presently, consumption expenditure is a more preferred welfare measure than income mainly because it is much difficult to measure income than consumption expenditure. In terms of practicalities, at least three factors make household income more difficult to measure than household consumption expenditures. These difficulties are likely to impair the accuracy of the income data gathered and are especially apparent in developing and transition countries.

First, survey questions on income typically require a longer reference period than is needed for questions on expenditures because income estimates for periods less than a year will be affected by seasonal variation, especially for agricultural households. While there may be seasonal and other short-term temporal patterns in consumption expenditures, they will normally be less marked if households have access to consumption-smoothing devices such as savings, credit, storage, and exchange networks. Longer reference periods needed for measuring income introduce greater problems of recall error. Second, household income is harder to construct for self-employed households and those working in the informal sector because of the difficulty in separating out business costs and revenue. Frequently, arbitrary assumptions are needed to measure the income streams from assets such as agricultural and livestock, and there can be difficulties in valuing the receipt of in-kind payments and self-produced items. These problems are less severe, although not absent, when household consumption is measured. Moreover, in developing and transition economies, the sources of household income are more diverse than the categories of household consumption so it is harder to design and implement questions for all of these sources. Third, questions about consumption are usually viewed as less sensitive than questions about income (although alcohol, tobacco and narcotics, and sexual services are usually viewed as sensitive and so expenditure on these is unlikely to be reliably measured), especially if respondents are concerned that the information will be used for tax collecting purposes or where illegal or barely legal activities provide a substantial portion of household income (Gibson, 2005).

Although household income is a less favoured welfare measure in poverty assessments, it should be said that income provides a different dimension of the contribution of fisheries to household livelihood. Comparisons of incomes from different livelihood strategies to total income would show the contribution of the livelihood strategy more directly than comparing household consumption of households that have different livelihood strategies. There are a lot of decisions and processes that are just implied if consumption is used as a welfare measure. Apart from own consumption of fish catch, it is very difficult or impossible to trace consumption of other goods and services to incomes from fishing. That is why looking at income from fishing itself is a more direct way of looking at the contribution of this activity to household livelihood outcomes.

After understanding the different measures that are used to assess welfare, there is need to know how we can use these to assess the value of small scale fisheries. Household income will be used for illustrations.

Different ways can be used to conduct a simple static welfare analysis. In the following example some possible approaches to data analysis are presented.

1. Assessing the contribution of income from fishing to total household income. This shows how important fishing is to the household economy. For example, Figure 9

shows that for the groups of households considered, fishing contributes 20% on average to total income.

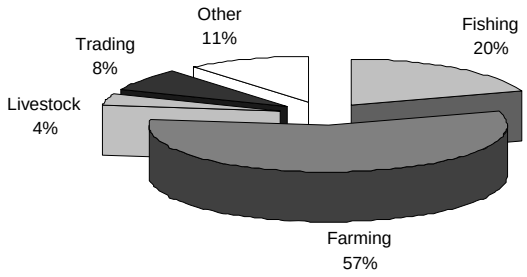

Figure 9: Pie-chart of household income, by income source

2. Fishing income can further be divided into the different fishery-related activities, such as fishing, fish trade, fish processing, boat construction etc (Figure 10). This helps identifying the type of fishing activity that is more important to the households.

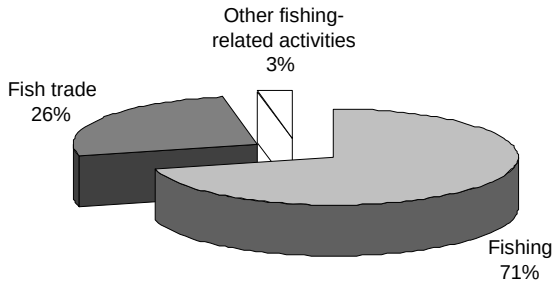

Figure 10: Pie-chart of income from different fishing-related activities

3. In order to disaggregate households depending on their major livelihood activities it is possible to compare total household income for fishing and non-fishing households. This method begins by dividing households into fishing and non-fishing groups and then computing mean incomes for the two groups. This method is less direct but it may capture the outcomes of some of the contributions that are difficult to assess directly. Figure 11 shows the income from different activities for two groups of households. This offers some insights into the production system of fishers as compared to other livelihood groups.

4. Comparing contribution of fishing households to externally defined welfare groups. This may involve the use of a welfare benchmark that defines better off and worse off households. In terms of the assets for instance, comparisons can be made between households that have a given asset such as a plough and others that do not have it.

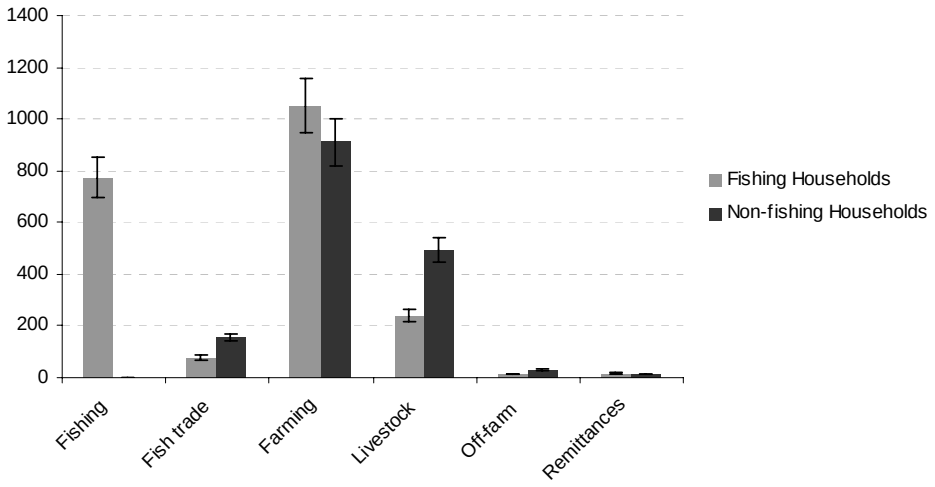

Figure 11: Bar-chart of income from different sources, by fishing and non-fishing households

5. In terms of income and consumption, percentile analysis or poverty line can be used. In a percentile analysis, the households are ranked with respect to the welfare measure from the household with the lowest value to the household with the highest value. The households are then grouped into equal sizes which are known as quantiles. The researcher can decide on the number of groups depending on the size of the sample. In using this approach, it is possible to assess the income for different intensities of fishing.

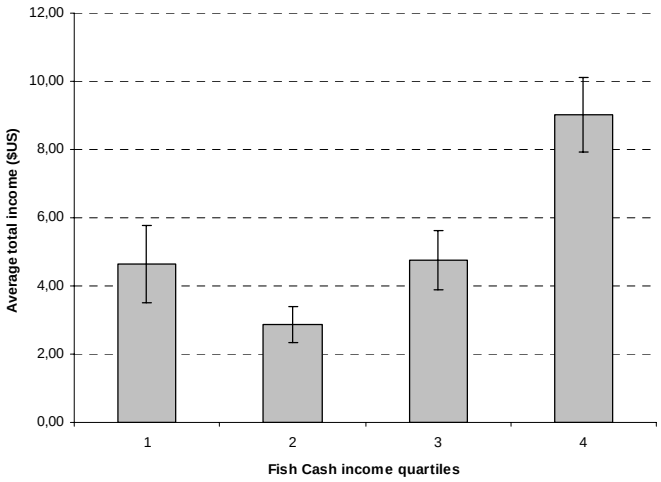

Figure 12: Total household income by quantiles of fish income

In Figure 12, households were classified in quartiles, i.e. each percentile contains 25% of the sampled households. The variable for categorization is "cash income from fishing", where 1 is the lowest and 4 highest quartile. If the households in the highest quantile obtain the highest income, then there should be something with fishing that makes most of the households belong to that group.

6. Poverty analysis applies a poverty line, which is a threshold below families or individuals who are considered to be lacking the resources to meet the basic needs. Families or individuals whose income or consumption is below the poverty line are said to be poor while those that have their incomes or consumption above the poverty line are said to be non-poor. Finding the proportion of the poor and non-poor for the different groups (fishing versus non-fishing) is therefore another option for assessing the value of small scale fisheries (Figure 13).

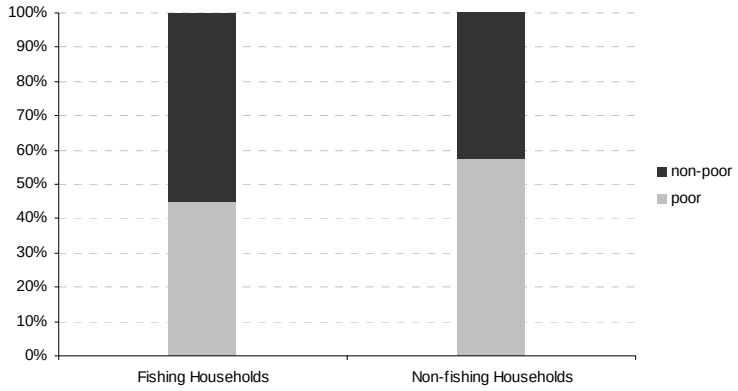

Figure 13: Share of poor and non-poor households among fishing and non-fishing households

2.2.4 Dynamic analysis

Welfare measures are subject to fluctuations over time. Increasingly in the literature, the necessity to account for this fluctuating nature is recognised (Christiaensen and Subbarao 2004), suggesting the need for a dynamic welfare analysis. These dynamic welfare analyses consider the changes in household or individual welfare over time. For example, if a given household was surveyed in two years say, 2007 and 2008, the points on the vertical dotted lines in Figure 14 would represent the household specific welfare levels for these two years.

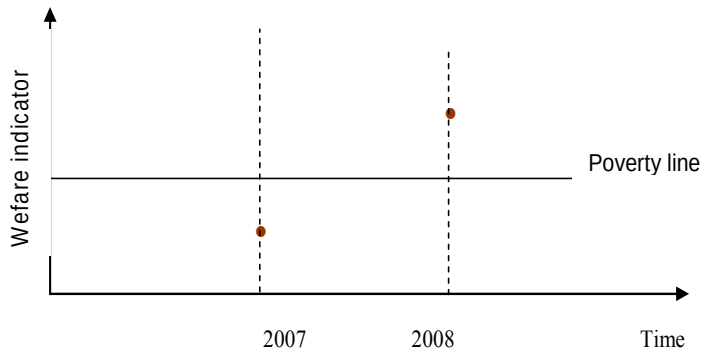

Figure 14: Illustration of variation in household welfare levels at different times

When this household was surveyed in 2007, it was categorized as poor, while in 2008 it was categorized as non-poor. The question is: which information should be trusted, 2007

or 2008? The answer is: both. Observing the household over a long period of time to understand changes in its welfare position is the best way to capture these dynamics.

This dynamic consideration leads to important distinctions between transient and chronic poverty. Transiently poor households or individuals are households that are temporarily poor due essentially to stochastic events. In opposition, the chronically poor are households who are observed to be permanently under the poverty line. Figure 15 assists in showing these important distinctions in dynamic poverty.

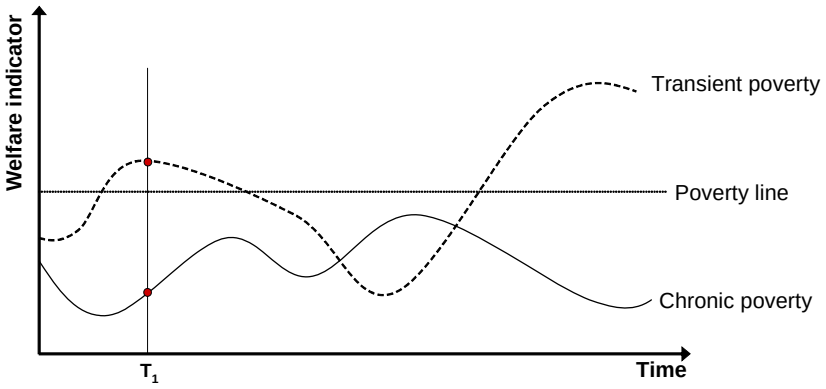

Figure 15: Illustration of dynamic poverty concepts

Households that are chronically poor do not have the capacity to get out of poverty and require policies that favor asset accumulation to help them getting out of their poverty trap. On the other hand, transiently poor households need to be protected from negative income shocks through safety nets and similar interventions to reduce the effects of risks and shocks.

Both short term fluctuations and longer term fluctuations (e.g. over life cycle) can be important for household or individual. Long term changes in welfare are mostly due to asset accumulation or de-accumulation, while short term changes are mainly due to shocks and seasonal changes. Inter-temporal variations in welfare mean that different levels of welfare can be observed for a given household. Short term variations are huge in communities where income sources are very sensitive to seasonal changes and this can have serious implications on the characterization and profiling of households in welfare groups. For example, if we consider in a farming-fishing community, a household that is involved more in farming is expected to be better off during harvesting period while a household that depends more on fishing is expected to be better off during peak fishing period. If a single cross section survey is conducted, the results will not give a true picture of welfare profile of the households in the area. If the surveys are conducted at different times of the year the researcher will manage to classify the households at least in that year but this does not say anything about long term changes in welfare which is also important in understanding welfare dynamics. Assessment of livelihood outcomes should therefore be conducted at different times of the year to capture short term variations and it should also be done for a number of years to understand the long term fluctuations. This however may constitute a major challenge in terms of survey as some of these fishers may live in very remote areas or may even be migratory.

The concept of dynamic welfare measurement accounts for uncertainty about future level of welfare. In the presence of risk and uncertainty, it is possible to differentiate between the observed welfare status and the expected welfare status. The expected welfare status is dependent on household resource endowment while the observed welfare status depends on both household resource endowments and stochastic events. A simple illustration using the two-household example from the previous section can assist in elaborating this concept (Figure 16).

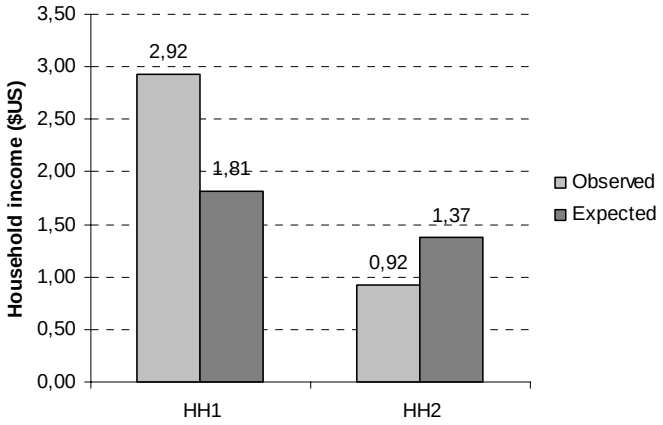

Figure 16: Illustration of difference between observed and expected poverty

For household 1, the expected income is greater than the observed income, which suggests that household 1 may have experienced positive income shocks (such as, e.g., very good rains) and this helped the household have an income greater than what it was expected (based on its assets endowment). Household 2 on the other hand has an expected income higher than the observed one. This may be the result of a negative shock that reduces its actual income below the expected one.

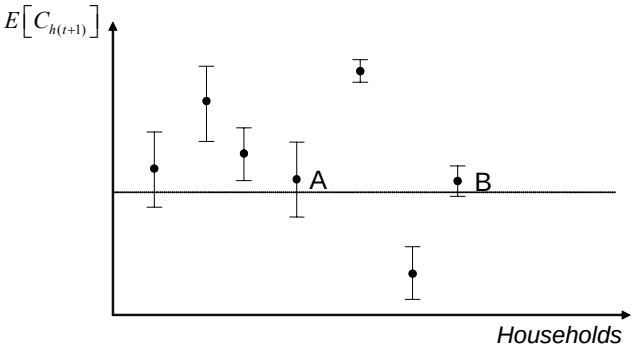

Figure 17: Illustration of vulnerability concept (Source Hoddinott and Quisumbing 2003)

This difference between expected and observed incomes shows another important dimension of dynamic poverty analysis, namely vulnerability to poverty. In economic

literature vulnerability to poverty is defined as the probability that at a given time in the future, an individual will fall to a level of welfare below some norm or benchmark. The risk of falling below poverty line is computed by considering the expected income level and its variance. Figure 17 is a simple illustration of the concept of economic vulnerability.

In this figure the vertical axis represents the expected levels of consumption at some point in the future, t+1; the horizontal axis represents households with different expected levels of consumption. Households differ in their exposure to shocks and their ability to cope with these shocks. The expected (mean) levels of consumption are denoted by the filled circles along the vertical lines. The variability of consumption around these mean levels is shown by the vertical rule that passes through these circles. In the above illustration, household A is more vulnerable than household B (although the two households have the same expected consumption level in period t+1) as its consumption variability is greater than that of household B. Indeed, some individual or even groups of households may be more sensitive to shocks than others (for example, they may live in localities more prone to natural disasters or their livelihoods depend on commodities with especially volatile prices) or have less ability to manage these shocks; such groups are characterized by consumption with greater variance (see Hoddinott and Quisumbing, 2003).

The predicted probabilities of falling into poverty can be calculated as a function of the mean and the variance of consumption. An example of probabilities to be poor for households 1 and 2 is presented in Figure 18:

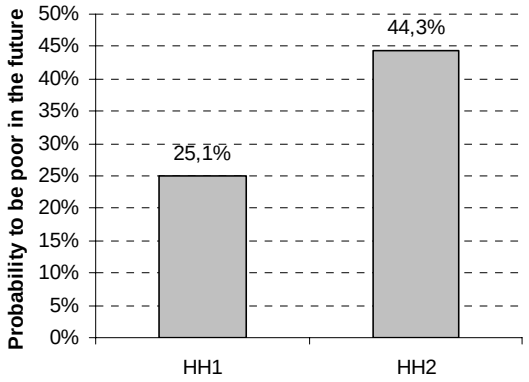

Figure 18: An example showing vulnerability levels of two households

Analyzing vulnerability of individuals and households does not only involve the estimation of the probability of becoming poor in the future but also the identification of factors that are responsible for increasing or reducing this probability. Additionally, the analysis looks at what households do when they are faced with negative income shocks to cope with the impact. The value of fishing can therefore be either in reducing the probability of falling into poverty or in providing coping means to households when the households are faced with shocks. For example, the probabilities of falling into poverty can be computed for households with different livelihood strategies. An example is presented in Figure 19.

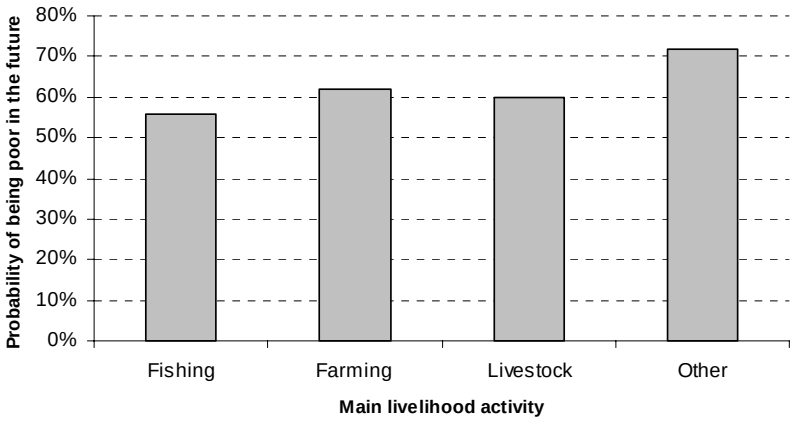

Figure 19: Assessing the role of livelihood strategies to household vulnerability

The econometric procedures used to estimate these probability values are beyond the scope of these guidelines and they will not be discussed. For an overview of different methodological approaches to vulnerability estimation see Hoddinott and Quisumbing (2003). For researchers that do not have adequate econometrics knowledge, assessing the contribution of small scale fisheries may involve assessing the relationship between fishing and vulnerability. For example, a researcher can use variations in incomes to infer to household vulnerability and relate it to different livelihood activities. Other variables such as asset level and accumulation, land holding size, and household demographic characteristics can also be used to infer about the vulnerability level. In the presence of household observations over a long time, researcher can compute the expected income and variance directly from the observations. These can be used to compute probability measures.

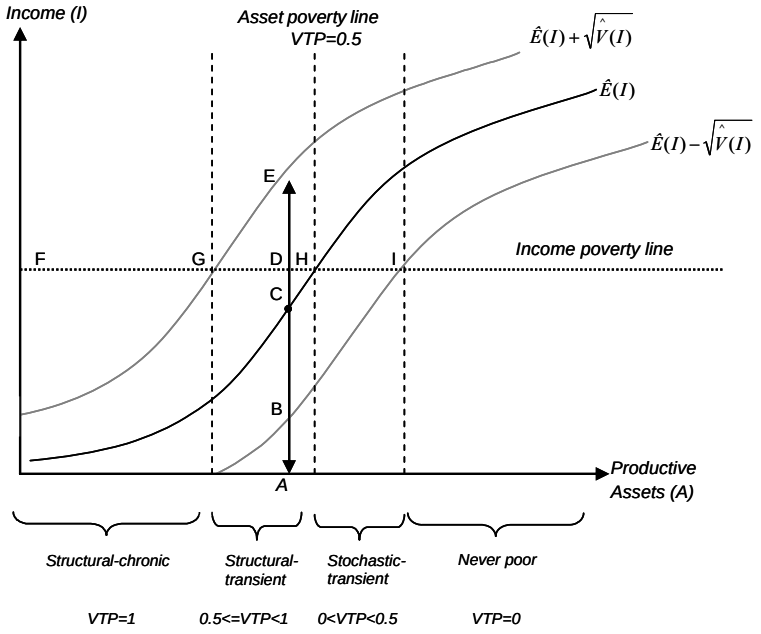

Figure 20: Illustration of an asset-based vulnerability measure

An asset based approach to vulnerability can yield insights into the nature of poverty, i.e. whether poverty is chronic, structural-transient or stochastic transient. The theoretical framework for such analysis is presented in Figure 20. The figure shows that if a household has assets equal to *A* and its structural income equals *C* which is less than the income poverty line, it implies that this household is expected to be poor. However, due to risks and shocks, the household's income is expected to be varying between *E* and *B* which means that the household can still experience some episodes of non-poverty (as *E* is above the income poverty line) due to positive shocks such as good weather or increased fishing opportunities, although on average the household is expected to be poor. Since there are some prospects of non-poverty for this household, its vulnerability level is less than one but greater than zero because it is expected to be poor.

When the highest possible income is below the income poverty line, households are said to be 100% vulnerable, i.e. they are categorized as structural-chronically poor even in the presence of good luck such as favourable weather conditions. Households with productive assets between point *F* and *G* belong to this category. When the lowest possible income is above the poverty line, those households are non-vulnerable, i.e. they are expected to be always non-poor even in the presence of bad luck such as for example a severe drought or flood. Households to the right of point *I* belong to this category. Households whose assets lie between *G* and *I*, i.e. when the lowest and highest income prospects are equal to the income poverty line, are vulnerable, i.e. they can be expected to move in and out of poverty (transient poverty) but for different reasons. If their level of vulnerability *VTP* is above 50% and below 100% ($0.5 \leq VTP < 1$), they are expected to be structural-transient poor (i.e. between *G* and *H*). They are defined as structural-transient poor because the transient poverty they (are likely to) experience is due to insufficient asset levels. Households who are not expected to be poor (i.e. between *H* and *I*) but because of negative shocks end up below the income poverty line some time in the future are called stochastic-transient poor. These households are also vulnerable but their level of vulnerability is below 50%. Hence, the different poverty groups are defined as:

a) Structural-chronic poor, if $VTP = 1$
b) Structural-transient poor, if $0.5 \leq VTP < 1$
c) Stochastic-transient poor if $0 < VTP < 0.5$
d) Never poor, if $VTP = 0$

Table 1 shows how this approach can be used to elicit the value of fisheries in terms of poverty and vulnerability reduction. For example the data shows that poverty and vulnerability indicators are improving across the board with increasing dependence on fishing.

For the non-fishing households, low expected income levels and high variation of income result in more pronounced poverty, particularly structural poverty. Adding up the structural-chronically poor and the structural-transiently poor, over 77 percent of non-fishing households are asset-poor. Households with fishing as a secondary income source also have a high share of chronically poor. However, 25 percent of this livelihood group are estimated to be non-poor, i.e. adverse stochastic events are not supposed to push these households below the poverty line. Finally, fishing-oriented households rank lowest in the poverty distribution. About 46 percent are estimated to be non-poor or at worst,

stochastically poor. Such results may provide a strong argument for the value of SSF, concerning their function as a risk-mitigating and hence vulnerability reducing activity.

Table 1: Poverty and vulnerability among households with different dependence of fishing

	Non-fishing		Fishing as primary income source		Fishing as primary income source	
	Mean	*Std. Dev.*	Mean	*Std. Dev.*	Mean	*Std. Dev.*
Expected income per capita [USD PPP]	342.46	*291.64*	467.49	*309.66*	467.49	*309.66*
Expected poverty head count ratio	0.77	*0.43*	0.54	*0.50*	0.54	*0.50*
Average vulnerability level [%]	0.75	*0.34*	0.57	*0.43*	0.57	*0.43*
Structural-chronic poverty [%]	0.48	*0.50*	0.35	*0.48*	0.35	*0.48*
Transient poverty [%]	0.44	*0.50*	0.43	*0.50*	0.43	*0.50*
Structural-transient (VTP>0.5) [%]	0.29	*0.46*	0.19	*0.40*	0.19	*0.40*
Stochastic-transient (VTP<0.5) [%]	0.15	*0.36*	0.24	*0.43*	0.24	*0.43*
Never poor [%]	0.08	*0.27*	0.22	*0.42*	0.22	*0.42*

3 Survey research methodology

One of the essential conditions for the assessment of socio economic contribution of small scale fisheries is the generation of reliable, consistent (unbiased), representative, and accurate data. This section gives an overview of methods in social and economic empirical studies with special emphasis to social research in fisheries communities. Generally, five stages can be distinguished in the process of development and completion of a survey (adapted from Czaja and Blair 1996):

1. Preliminary planning
2. Field trip
3. Survey design
4. Questionnaire design, pre-testing and enumerator training
5. Survey implementation

At any of these stages, the researcher needs to make sure that he/she is not getting away from the research objectives and that he/she collect appropriate data. Since data collection is costly (both in terms of money and time), it becomes very important for researchers to make sure that they plan and implement their survey effectively and collect the relevant data.

3.1 Preliminary planning

Preliminary planning needs to cover a wide range of aspects of the survey from the establishment of the need to collect data to the time the data is ready for use. The plan should provide answers to questions such as: Who or what is the population of interest? Which geographic area should the survey represent? Is a sampling frame from which to select a random sample available? If not, it has to be reflected on the procedure to generate a sampling frame that would suit the research objectives.

Another issue that should be considered is the kind of analysis that is going to be performed with the data from the survey. The methodological and model requirements may crucially determine the questionnaire design. In designing a first draft of the questionnaire, decisions have to be made on the type of information that has to be elicited from respondents and how to go about it. For example, would open-ended or rather close-ended questions fit better? What variables are important for the analysis in mind, and what type of information on demography, income, expenditures, ecological conditions etc. is needed? Based on these considerations, an outline of the questionnaire and type of information needed can be produced at this stage.

Two other important factors in the preliminary design stage are the budget and time that is available for conducting the survey. Money and time determine the size of the study area, which may have logistical implications such as: number of enumerators that have to be hired, the modes of transport, the length of the questionnaire and the sample size (depending on the geographic distribution of the sample).

3.2 Field trip

Having settled the issues discussed above, usually a field trip is an indispensable element in the survey preparation. The main objective of the field trip is to ascertain that the preliminary plans that have been made above are in line with the situation on the ground. In other words, a field trip is still part of the planning exercise but researchers at this stage want to make sure that they understand the reality on the ground. Even when the researchers come from the same region in which the survey will be conducted, an exploratory trip to the study area with keen interest on the variables of interest is necessary. The researchers have to get a personal impression of the situation. Each study area has its peculiarities concerning ecological, cultural, human resource and other conditions, which have to be considered before the implementation of the survey. In particular in the case of fishing communities (or other similar communities living in remote rural areas), certain villages may be inaccessible during some periods in the year due to bad road conditions (Box 2). The cultural norms and values may also be a significant factor to consider when designing questions or the interview procedure and a clear understanding of these can be obtained during the field trip.

Box 2. Experiences from the field trip in Cameroon:

Due to the annual flood cycle, access to the villages in the Logone Floodplain is very restricted during several successive weeks in the year, from mid December to end of February. During that period no access is possible, neither by vehicle, nor by pirogue. Hence, the placing of the survey periods need to be adapted to these conditions. For example, although it would have been more reasonable to conduct a follow-up survey at the end of the production cycle in January, thus better capturing agricultural production and fishing harvests, this procedure proved to be unfeasible. From mid December to end of February access to the sampled villages was absolutely impossible. The research team decided for a compromise, collecting data in November /December, even if this falls in the midst of the harvesting season. The missed data on yields and income was then recollected during the second follow-up.

The issue of the sampling frame can also be clarified at this moment. A sampling frame is whatever is being used to identify the elements in each sampling unit. The choice of a

sample always requires an exhaustive list of all the elements of the population, e.g. village or household lists. Such lists and records will always contain mistakes, especially in developing countries, where such information is very scarce, but they are the only means of finding the sample elements so that the population can be surveyed. Particularly for rural areas, such information very often does not exist. However, some other studies may have been performed in the same area by other organizations or institutions. While contacting them from the home office might often be difficult if not impossible, this kind of information may easily be elicited on the ground.

3.3 Survey design

3.3.1 General considerations

Maybe the most important step in planning a survey with regard to quality of data is the survey design. While in industrial countries other survey approaches such as mail or telephone surveys might be an option, the only reasonable method of data collection in developing countries is the face-to-face interview, also referred to as personal interview survey. This is the most expensive method due to the travel costs involved, and the amount of time needed to collect the data. It is estimated that only about 25-40% of the total time is spent for actually interviewing the sampled population. The rest of the time is consumed by travel, editing of responses and other tasks (Czaja and Blair 1996). However, despite the greater costs involved, this method also implies many advantages. For example, response rates are usually very high as it is easier to get the respondent's cooperation in a face to face interview. Also, the response bias is normally low due to a better control of the response situation. Another important advantage is related to the questionnaire itself. The questionnaire can be more complex, and the interview can take more time, because it is administered by a trained enumerator and allows a more relaxed atmosphere. Nevertheless, as a result of the high costs and time implicated in personal interview surveys, the sampling (i.e. sample size and geographical distribution) s often principally determined by the budget and logistical constraints.

A sample is defined as a set of elements (these would refer to households in a household survey) selected in some way from a population. Usually, the researchers are interested not just in the characteristics of a sample, but in those of the whole population from which the sample has been drawn. A *representative* sample is therefore imperative, in order to be able to draw conclusions for a larger population (region wide or nationwide) and to extrapolate the research findings. The aim of sampling is to save time and effort, at the same time obtaining consistent and unbiased estimates of the population status in terms of whatever is being researched (Stapsford and Jupp 1998).

The first step in sampling is to define the population of interest. This may seem obvious, but it is where survey design can all too easily be defective. With regard to the research objectives, the population of interest might be different. The important point to note is the restricted meaning of the term population in statistics. A population could be all children in a specified age, all urban households in a specified region, all rural households engaged in aquaculture production, etc. For the purposes of sampling, populations can be thought of as consisting of sampling units, which represent elements of research interest that do not overlap and at the same time exhaust the entire population. In most studies, sampling involves multistage selection of sampling units. In multistage sampling, usually sampling units are ordered hierarchically, moving from one level to the next. Thus, the primary

sampling units are often geographical or administrative districts/provinces. Subdividing the primary sampling units then leads to the next sampling level etc. The final sampling units in economic or social studies are usually households or individuals.

The selection of the sample, finally, is a decision that can be based on a number of methods. The objective is to obtain estimates of population parameters, and some methods do this more accurately than others depending on the nature of the parameters to be estimated. The choice of the method will be a question of balancing accuracy against cost and feasibility. Two main categories can be distinguished: probabilistic sampling (simple random sampling, stratified random sampling and cluster sampling) and non-probabilistic, or purposive, sampling (quota sampling) (Stapsford and Jupp 1998). Probability samples have a considerable advantage over all other forms of sampling, which is the accurate estimate of the sampling error. Probability sampling procedures are therefore most widely used, because they assure that each element in the sampling frame has a known (and equal in the case of simple random sampling) chance of selection set by the sampling procedure.

Box 3. Sampling procedure in Nigeria

Sampling process in the Hadejia-Nguru wetland aimed at identifying a sample of fishing and non-fishing households that were to be compared in terms of poverty, vulnerability and food security. To better understand the role of fishing, it was necessary to have the non-fishing sub-sample of households from the same ecological zones so that we should hold ecological conditions constant during the analysis. However, it was difficult to define fishing and non-fishing households before the survey.
A multi-stage sampling strategy was adopted. At first a list of 121 villages from the study area was compiled (sample frame). The list of the villages in the sampling frame was compiled by consolidating lists from state departments of fisheries and wildlife and conservation. From this list, 11 sample villages were selected randomly. The villages were randomly selected because there are no clear stratification factors in the area.
After identifying sample villages a list of all households in the sampled villages was generated to create the sampling frame for individual households. A sample of 300 households was then drawn randomly from this frame. Number of households selected in each village was based on the size of the village proportion to the total number of households in the sampled villages.

One problem with simple random sampling is that the sample size may need to be large enough to ensure that all subgroups (or strata) in the population are adequately represented. If some characteristics of the population of interest are identifiable at the time of sampling, there is the possibility of structuring the sampling process. In this case a stratified random sampling is applied, where the elements of a population are divided into non-overlapping groups. Random samples are then drawn from each of these strata. If the proportion of the sample from each stratum is the same as the population, then this procedure is called proportionate stratified random sampling, and the total sample will match the population. Usually, samples of populations of geographic areas are stratified by some regional variable. Lists of employees typically are stratified by occupational classification of some sort. Stratification is a desirable feature of a sample design, since it increases the precision of estimates of variables to which the stratification variables are related without hurting the precision of other sample estimates.

When there is no adequate sampling frame of the whole population, multistage sampling provides a useful approach. The basic approach is to divide the total target area into exhaustive, mutually exclusive sub areas. After drawing a random sample of sub areas a list is then made of housing units or other lower sampling units and a random sample is

then drawn. Usually, proportional (or weighted) sampling is applied, where a fixed share of final sampling units is selected, i.e. the sample size is proportionate to the population in each primary sampling unit. For example, the number of households selected per village must be proportionate to the total number of households in the village. Hence, in a larger village, more households will be selected than in a very small village (see Box 4 and Box 5)

Box 4. Sampling procedure in Cameroon

A stratified multistage random sampling procedure was used in Cameroon. Given the need to survey a representative sample of households in the study area with different production conditions (such as access to fish resources), the sampling design envisioned a stratification of the study site into different zones. It was assumed that under different ecological and production conditions the role of fisheries in terms of income generation is different. This procedure allowed capturing the whole continuum of fishing intensity (from wholly specialized fishermen to purely agriculture/livestock rearing oriented households). Hence, based on the criterion of access to fish resources, three zones were identified in the Logone floodplain: the Lake Maga area (zone 1), the Logone and its tributaries (zone 2), and the arid, only short-term flooded area (zone 3).
In a second step, a complete list of villages in the study area (N=88) was compiled, based on information from different sources. These villages served as the primary sampling unit. For statistical reasons a total sample size of 300 households was assumed to be reasonable, which represents about 7% of the population in the study area (estimated at ca. 20,000 inhabitants). Several discussions with experts resulted in the decision to choose 14 villages and then randomly select about 50 percent of households per village (the average village size in the floodplain is about 45 households, but ranges from 15 to 100 households). The villages were selected by weighted random sampling, proportional to the total number of villages per zone (zone 1: 9 villages; zone 2: 59 villages; zone 3: 20 villages), which led to the choice of two villages in zone 1, nine villages in zone 2 and three villages in zone 3.
All selected villages were visited before commencing the HH level survey with the aim to conduct focus group discussions (FGDs) with the village (or quartier) leaders. The objective of the FGDs was primarily to create a sampling frame, i.e. complete household lists for every selected village had to be compiled, since no such information existed. In the last step, the household lists were then used for a weighted random sampling of the 300 sample households.

Box 5. Sampling procedure in Malawi and Zambia

Household was the sampling unit for the survey. It was defined as a group of individuals continuously living in one house and eating from one pot under the overall leadership of the household head. Lists of households in each village within the floodplains with potential access to the fishery were obtained from agriculture and fisheries offices which were later verified and updated during key informant interviews and focus group discussions. All the villages along and far away from the river channels but within the floodplains formed the sampling frames. This was necessary to ensure adequate spatial spread of the households. In order to maintain a statistically robust sampling strategy, random sampling was used to draw the survey households in the villages across the floodplains. Households were sampled every month from February 2007 to December 2008 in Lower Shire Floodplain and from June 2007 to July 2008 in Kafue Floodplain, covering one complete farming and fishing season. For each month, new households were randomly drawn and interviewed. About 70 households were randomly sampled every month for twenty three months in Lower Shire Floodplain and fourteen months in Kafue Floodplain, resulting in 2034 independent households in Lower Shire Floodplain and 980 independent households in Kafue Floodplain.

3.3.2 Survey design for collecting longitudinal and repeated cross-sectional data

Some of the questions that need to be considered when designing longitudinal and repeated cross-sectional surveys include duration of the study, number of survey rounds, and period of the year when the survey rounds are implemented. Both longitudinal surveys and

repeated cross section surveys involve more than one survey round but they have some slight differences. Longitudinal surveys are the ones where the same study units (households or individuals in our case) are interviewed in each survey round. In contrast, in repeated cross section surveys different study units are sampled each time. Duration of the study refers to the time from the first survey of the study to the last survey of the study. On the other hand, number of survey rounds refers to the number of times a questionnaire will be administered to the respondent. The final consideration on period of the year is mainly to consider seasonality of the livelihood activities and occurrence of some shocks such as floods in fishing communities.

Shocks are by nature unanticipated, and it is pure coincidence that a survey will be able to capture information on shocks (particularly if it is a one time shock). This means that one cannot make a survey unnecessarily long to wait for a shock because the shock you are anticipating may not occur. An alternative approach was taken by Dercon and Krishnan (2000) and others where households were asked to state the shocks they have experienced in the past, say, 20 years. These can be used with the current observations to conduct vulnerability assessments.

Box 6. Sample Attrition in Nigeria

Although 300 households were sampled in the HN wetland, the final sample size for the first survey was 282 due to different reasons. One of the major problems was that many under aged individuals were included in the list of household heads. This was probably done with the anticipation that the project will bring some form of direct assistance to the villages and this was to increase the level of assistance they may obtain from the project. In order not to disturb much the sampling probabilities, it was decided not to replace these households from the village because it was thought this would over represent the villages where this problem occurred. We assumed that the distribution of the under-aged in the sample was the same across the villages as simple random sampling technique were used to obtain sample households from each of the sampled villages. Other households were 'lost' due to migration or the death of the household head. In case of death of the household head, it was considered as a lost case because most of the times, the wife (wives) remarries within a short time such that there is discontinuity in the household. Sometimes the wives leave the household to stay with relatives.

Even after the first survey, the study still experienced sample attrition in subsequent survey rounds. After the first survey, the main causes of attrition were refusal to be re-interviewed and missed identity of the household. Missed or mixed identity refers to cases that were interviewed up to the last survey but their identity did not match that of the case that was interviewed in the first survey. After it was suspected that some case identities have been missed or mixed in the course of the study, we decided to collect information about household demographic information again in the last survey to reconcile household identities. These were compared with the information that was collected in the first survey and cases whose demographic information did not match the ones from the baseline survey were dropped from the sample. These cases were dropped from the follow up surveys only since the information obtained from the baseline survey from households with this identity will still be used for static analysis.

In the case of fishing communities, intra-year survey rounds are important because fishing and farming, both of which are important livelihood activities, are seasonal. The question of how frequent these rounds should be is not an easy one and may heavily depend on resources and contexts.

Monthly surveys may be ideal because the respondents are given a short period to recall and this can result in the reduction in measurement error. But this has a high const in terms of resources. Respondents are also likely to experience survey fatigue and this may result in high levels of sample attrition i.e. loss of sampled households. One attempt to overcome sample attrition is to randomly sample independent households for each monthly survey, also known as repeated cross-sectional surveys (see Box 6). However, the data sets

collected using this approach may not be efficient for assessing long-term dynamics of poverty within the household unless strong assumptions about the homogeneity of the stochastic causes of poverty dynamics are made.

3.4 Questionnaire design, pre-testing and enumerator training

Parallel to the sampling, the development of the questionnaire should be completed at the final survey design and planning stage. A questionnaire is a set of questions that have been formulated to collect information from study units such as individuals, households, communities, etc. A lot of scientific methodological work has been done in the past decades by cognitive psychologists and survey methodologists on questionnaire design, particularly on the question-response process and the different biases that may be introduced by a wrong conceptualization of the questionnaire and the interview procedure. Most of the aspects are however well beyond the scope of these guidelines. Some issues shall nevertheless be introduced and discussed here, since it may be of use to research work in developing countries to consider some methods and peculiarities of questionnaire design.

A prerequisite to designing a good questionnaire is deciding what is to be measured. This is mainly to be derived from the project's objectives and the methodology to be applied in data analysis. This implies the clarification of questions such as: (1) which variables are designed to be dependent variables, (2) which are needed as independent variables in order to understand distributions and patterns of association, and (3) which variables may be deemed as control or intervening variables to explain patterns observed and to check out competing hypotheses (Fowler 1988). This is very important since sometimes questionnaires give the impression that their authors tried to think of every conceivable question that might be asked with respect to the general topic of concern, resulting in very long questionnaires with many questions irrelevant to the analysis intended and sometimes valid for only small proportions of the sample. The result is annoyance and frustration on the part of many responders (Frey 2001). A focus on really required information may hence not only reduce the length of the questionnaire, but also improve data quality.

While the specific contents of questions (behaviour, beliefs, attitudes or attributes), the wording of questions (negative or positive wording, direct or indirect questions, personal or impersonal wording, etc.), as well as the type of question (i.e. open or closed format, scaling of answers, ranking formats etc.) may differ significantly depending on the research question, some general guidelines can be given concerning the questionnaire layout (de Vaus 1990).

1. In order not to waste time reading irrelevant questions, contingency questions should be used where appropriate. Contingency questions are the ones that help to filter respondents to some specific questions. For example: "Do you go fishing?" Individuals that would answer "No" to this question will not be required to answer the fishing related questions.
2. To provide flow, use general instructions, section and question introductions, and "go to" instructions.
3. Attention should be also paid to the order of questions. A good questionnaire is one in which there is a good logical flow to questions.
    a. Start with easy and interesting questions

b. Go from concrete to abstract questions

c. Group questions into sections

d. Make use of filter questions

4. Since data is usually analyzed by statistical software packages (e.g. EXCEL, SPSS, SAS, STATA), it is useful to prepare for this by already allocating codes to the responses in the questionnaire. This pre-coding not only saves time during the interviews, but also simplifies the data entry and cleaning process. In the codes, you should always give room for other responses which you may not have considered when developing the questionnaire. This does not apply to cases that are already closed such as gender of an individual is either male or female but occupation of an individual may be something you did not think of.

Every questionnaire should be pre-tested no matter how skilled the researcher is. Once the final questionnaires are printed and data collection has begun, changes are expensive and very difficult to make. For instance already completed interviews should be eliminated from the analysis if question wording has been changed. A pre-test could however generate very useful feedback on individual questionnaire items, such as the structure and wording of the questions, but also on the interview procedure, and other issues involved in the survey. Although, the questionnaire can already be tested informally in earlier stages on family, friends or other students, this stage implies a formal test with real respondents in the survey area. A pre-test usually involves a number of interviews, determined by things as the number of subgroups of interest, or testing the aptitude of the questionnaire to different settings (e.g. in different strata). Usually this results in a need to revise the questionnaire and survey procedures.

A common way to implement a pre-test when doing surveys is to combine it with a training workshop for enumerators (Box 7). Since the interview in itself poses by far the most serious problem in face-to-face surveys, particular attention should therefore be paid to the choice and training of enumerators. Each study is particular in that it investigates different aspects of the social, economic or ecological settings in the study area. Hence, even if the enumerators recruited for the interviews are skilled and possess year-long experience in doing surveys, a training workshop is in most cases an essential part of survey preparation. Interviewers have two primary roles in the collection of survey data: (1) to ensure the cooperation of selected respondents, and to motivate them to honestly provide the needed information, and (2) to ensure an objective interview, i.e. asking questions in a standardized way and that answers meet the question objectives. It is always a good idea to give interviewers a sense of the project's objectives, and also some familiarity with sampling procedures, coding, and the kinds of analyses and reports that result from the surveys. Such information may be helpful to interviewers in answering respondent questions and may play a positive role in motivating the interviewers and helping them to understand the job. This information can well be provided in the first phase of the training workshop, then moving to the discussion of the questionnaire and other issues, such as:

- procedures for contacting respondents and introducing the study
- conventions used in the design of the questionnaire with respect to structure, wording and skip instructions, so that interviewers can ask the questions in a consistent and standardized way
- procedures for recording answers

- rules and guidelines for handling the interpersonal aspects of the interview in an unbiased way

The knowledge acquired during the workshop can then be tested during the pre-test. The researcher has the possibility to supervise and observe the enumerators' behaviour and give further instructions and advise before the start of the survey, where data has to be recorded in an unbiased way.

Box 7. Enumerator choice in Cameroon

The lack of sufficiently educated interviewer personnel in the Far-North Province in Cameroon presented a serious constraint. For this study, a team of five MINEPIA staff, who work as government officials in the survey area, was recruited as enumerators. While respondents can have reservations to provide information to government officers, the more important factor was that the survey team represented the two ethnic groups of the study area. Also, enumerators spoke the languages of the local population to be surveyed, they were familiar with the local peculiarities, and used to the conditions in the field. In addition, respondents' willingness to provide information was actually encouraged in expectations of a follow-up governmental support.

3.5 Survey implementation and its challenges

Once all the planning has been made, all the research tools have been finalised, it is time for the research team to implement the survey. Implementation of a survey involves administering the questionnaires to the respondents. Prior to the interview, the objectives of the research should be clearly explained to the respondents to make sure that they do not distort the information. It is good not to promise any form of assistance when implementing the survey. It is also good for researchers to pay particular attention to the cultural settings and beliefs during the interviews because a breach of cultural norms during an interview can distort the whole survey. It may also be useful to have a schedule and inform the villages before one starts the interviews. This has an advantage of increasing the level of cooperation by the villagers. The research team should avoid going to the village the days important activities such as market days and praying days are occurring. It is always difficult for the respondents to cooperate when they feel that the researchers are denying them a chance of attending to some of these activities and this may jeopardize the quality of the data.

While implementing the survey, the supervisor should be checking the completed questionnaires straightforward so that the mistakes that are being made are corrected while the team is still at the location where the questionnaires have been administered. Although enumerators have been involved in rigorous training, most of the times they have some sections of the questionnaire which they have not fully understood. This can be noted by the way they are filling the questionnaire. Depending on the level of mistakes, the whole questionnaire or some sections of the question should be re-administered.

One of the major challenges in implementing a survey is non-cooperation or refusal of the respondents to be interviewed. Of course it still remains a paradox because while some of the individuals who are in the sample are not willing to be interviewed, other individuals who are not part of the sample mostly ask the question why they were not included in the sample. Other challenges emerge from the time the sampling frame was drawn. Villagers may not have full knowledge of all the inhabitants in the village such that the sampling

frame may include households that are no longer living in the village. This may involve re-sampling to replace lost cases or the lost cases may not be replaced.

Data Management

3.6 General data handling issues

Data management involves data cleaning, data entry, and data analysis. Data cleaning involves checking all the questionnaires and taking care of all inconsistencies with the aim of maintaining the quality of the data. According to Muñoz (2005) the questionnaire data need to be subjected to five kinds of checks: range checks, checks against reference data, skip checks, consistency checks and typographic checks. The nature of these checks and the way they can be implemented under the various operational set-ups are here reviewed. Range checks are intended to ensure that every variable in the survey contains only data within a limited domain of valid values. Categorical variables can have only one of the values predefined for them on the questionnaire (for example, gender can be coded only as 1 for males or 2 for females); chronological variables should contain valid dates, and numerical variables should lie within prescribed minimum and maximum values (such as 0 to 95 years for age.).

Skip checks refers to whether the skip patterns have been followed appropriately. For example, a simple check verifies that questions to be asked only of schoolchildren are not recorded for a child who answered no to an initial question on school enrolment. Another example would be to find that an individual who indicated that he/is not involved in fishing has income from fishing. It may be possible that this income belongs to a different activity. Consistency checks ensure that answer from one question is consistent with answer from another question. A simple check occurs when both values are from the same statistical unit, for example, the date of birth and age of a given individual. More complicated consistency checks involve comparing information from two or more different units of observation. An example is to find that an 8 year old child is in secondary school. There is no natural limit imposed on the number of consistency checks that can exist.

A typical typographical error consists in the transposition of digits (like entering 14 rather than 41) in a numerical input. Such a mistake for age might be caught by consistency checks with marital status or family relations. For example, the questionnaire of a married or widowed adult age 41 whose age is mistakenly entered as 14 will show up with an error flag in the check on age against marital status. However, the same error in the monthly expenditure on meat may easily pass undetected, since either $14 or $41 could be valid amounts.

Data cleaning exercise begins in the field and continues to the time when the data is analysed or when the report is being written. It does not matter at which stage the data is checked but when a strange figure seem to appear, the researcher is supposed to check if a collect figure was corrected and if it was entered correctly in the computer program that is being used for analysis.

Presently, there are many computer programs that can be used to analyse data. Data entry begins with the creation of the data entry template (database) which should be a form of the questionnaire in the computer program. The design and formatting of the template

should be in a form so that figures from the questionnaire should just be punched into the program. Any statistical program such as stata, SPSS, excel, access can be used to enter data depending on the knowledge of the researcher of the statistical program.

3.7 Computing welfare measures

Finally, it becomes important for the researcher to compute the welfare indicators (income, consumption expenditure, and others) before relating them to different household characteristics. This is a relatively challenging task for the research because theoretical definitions of welfare measures need to be matched with practical methods.

Box 8. Estimating annual household income in Nigeria

Estimating annual household income from a single cross section survey has always been very difficult. In most cases, recalls are used and these are done on different periods such as a day, a week, a month and a year with different income sources. In Nigeria, the respondents were given the freedom to state the frequency of the flow of income from a given source. Unfortunately, this approach led to some measurement errors. The estimated values were suspected to be overestimated mainly on activities the respondents indicated that they obtain money from on daily basis such as fishing and hawking/petty trading. Some assumptions had to be made to obtain more reasonable estimates of these values. For fishing, it was assumed that the fishing pattern shown by the individual/household in the year (during the follow up surveys) reflect a perennial fishing pattern of the individual/household (i.e. whether seasonal or not) and this was used to judge whether daily meant everyday throughout the year or everyday within certain seasons. It was therefore arbitrarily assumed that in a week, there are three days when an individual can not go for fishing. Even within the fishing period, an individual will be faced with some situations that will not allow him/her to do the activity everyday. While accepting the fact that in peak fishing periods individuals fish everyday, individuals may even go fishing for only one day or not fish at all in off fishing periods. This was thought to be an appropriate way of dealing with the overstatement of fishing frequencies. Prices were corrected manually by replacing prices that were suspected to be too high with observed prices reported by a given household during the follow up surveys. The assumption here was that the fisher is using the same measuring container (basket or basin) for pricing, in which case downward movements in prices were not expected. This meant that high prices reported during the baseline survey were mainly due to measurement error. A similar process was also followed to estimate incomes from hawking and petty trading.

Total income from farming was computed by multiplying the total crop output with the average price of a crop in a given village. Average village prices were used to take care of outliers and also spatial variations of output prices. Total household income from livestock was defined as the sum of the monetary value of livestock and livestock products consumed by the household and the revenue from livestock and livestock product sales. Own consumption of livestock and livestock products was considered as an income since valuing total value of crops also implicitly considers on value of crops consumed as an income.

Total household income virtually refers to the sum of monetary income, income in kind (including production of the household enterprise and government services), and the value imputed to services derived from endowments and assets such as durables, housing and time owned by the household (Grootaert, 2005). Practically, estimation of household income involves estimation of income from different economic activities for a period which is covered by the survey (Box 8). These estimates are then summed up to have an estimate of total income. Incomes from different sources are not estimated using exactly the same procedure. For example, estimating income from crops involves multiplying total output with the market prices. Since different households may sell the crop to different buyers, different prices may be reported by the farmers. Use of an average income is therefore recommended to standardize the value of the output. The uses of average prices also help to eliminate outliers. The average prices of the crop can still be computed at village level and not study area level to make sure that we do not overlook/eliminate the spatial differences in prices. Although the entire crop yield is valued to determine income

from crops, income from livestock is computed by estimating total revenue from livestock and livestock product sales plus the value of livestock and livestock products own consumed. Own consumption is defined as income because it is assumed that they would have sold this output and then use the money to by it. Estimating income from fishing involves determining the monetary value of the fish catch.

On the other hand, consumption expenditures estimation typically aggregates expenditure on all goods and services consumed, valued at appropriate prices, and including consumption from own production. Total household consumption expenditure is practically defined as the sum of out of pocket expenditures on consumption goods and services and the value of crops, fish and livestock consumed from own production. Valuation of own consumption of produced commodities should be done by multiplying quantity of the good consumed with the mean village level price.

When either of the two indicators is computed, considerations about differences in household size and composition should be made to make the indicators comparable and meaningful. An equal amount of income for households with different sizes and composition imply different levels of living standards. The household with more members has a lower level of living standard because many people are assumed to share the same 'cake'. Individuals of different sex and age also require different levels of consumption to meet the minimum required levels. Adult equivalent scales have been derived in many countries to take care of this and these are based on daily recommended calorie intake. However, the simple way of handling this is just to divide the total household income or consumption expenditure with household size to determine per capita levels.

4 Summary

The need to determine the value of small scale fisheries in developing countries have been raised in many sections of fisheries literature. One of the reasons for the lack of valuation studies in developing countries is the lack of capacity in many fisheries departments to value the contribution of small scale fisheries to the livelihoods of rural households. This handbook has been developed to guide fisheries personnel in assessing the contribution of small scale fisheries to household livelihood. The document reviews succinctly the conventional economic valuation techniques and also shows how poverty and vulnerability assessment can generate additional useful information about the value of SSF to rural households.

In determining the value of small scale fisheries, there is a need to recognise the difference between the market price of fish and its value. The value fish or a fishery captures the amount of money an individual is willing to pay for a commodity while a market price is the amount of money an individual is supposed to pay in the market for the commodity. In cases where some of the attributes of the commodity can not be traded on the market such as in small scale fisheries, market price presents an undervaluation of the commodity.

Most of the conventional economic valuation techniques used in environmental and natural resource economics can also be applied to small scale fisheries. These are broadly categorised into market based approaches, revealed preference approaches and stated preferences approaches. However, these valuation techniques do not show the potential of small scale fisheries in poverty reduction. That is why the findings from such valuation

studies have not been very useful in positioning small scale fisheries in poverty reduction strategies.

The more appropriate technique of valuing the contribution of small scale fisheries to household welfare and assessing its potential in reducing poverty and vulnerability is what is being referred to as the household welfare analysis in this document. This type of approach involves the assessment of the impacts that small scale fisheries have on different welfare indicators such as income, assets, consumption expenditure, food security, health, etc.

The measures in the household welfare analysis can be assessed either at a point in time (static assessment) or through changes over time (dynamic assessment). In implementing a static analysis, different methods can be used to show the contribution of small scale fisheries. Some of these include assessing the contribution of fishing to total household income, or comparing the welfare status of fishing and non-fishing households. Fishing households can also be compared to externally defined welfare groups such as the poor and non-poor groups or percentiles.

The dynamic assessment draws on the empirical observation that household welfare level changes over time. Dynamic assessment of welfare includes important distinctions in poverty 'structure' such as chronic and transient poverty. These can further be categorised into structural-chronic, structural-transient and stochastic-transient. These poverty groups can then be related to fishing identity of a household. The dynamic assessment of welfare is also related to the concept of vulnerability which measures the probability that a household will be poor at some time in the future. This presents some important insights for policy makers.

The collection of such data relies on a rigorous scientific method that includes several stages: preliminary planning, field trip, survey design, questionnaire design, pre-testing, and enumerator training, and finally survey implementation. The exact way these stages are implemented needs to be context-specific but also follows general rules which are common to any scientific research, in order to ensure the reliability, consistency, representativeness and accuracy of the data.

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Glossary of Economic Terms

Poverty:	the state of living with income below a socially defined poverty line
Vulnerability:	the ex ante risk that an individual or household will fall into poverty line in the future
Consumer surplus:	the difference between the price that a consumer pays and the price that he/she is willing to pay
Producer surplus:	the difference between the amount that a producer receives from the sale of a good and the lowest amount that producer is willing to accept for that good
Equilibrium price:	the price of a good or service at which the demand curve crosses the supply curve
Equilibrium quantity:	the quantity of a good or service the consumers buy and producers sell at the equilibrium price
Demand curve:	a curve that shows the quantity of goods and services consumers are willing to buy at different prices
Supply curve:	a curve that shows the quantity of goods and services suppliers are willing to supply at different prices
Economic value:	a measure of what the maximum amount of money an individual is willing to forgo in order to obtain some good or service
Total economic value:	economic value of a good or service that considers both use and non use values
Production function:	a mapping from quantities of inputs to quantities of an output as generated by a production process.
Social protection:	a form of support by public, private and/or not-for profit organisation to individuals, households or communities in their efforts to prevent, manage or overcome vulnerability and poverty
Social insurance:	regular premiums to secure entitlements to financial assistance in the occurrence of specified risks
Social assistance:	transfers, in cash or kind to the poor to address poverty and vulnerability
Welfare:	economic assistance to individuals, households or communities to improve their well-being
Fall-back:	last resort activity adopted after a loss of main livelihood strategy
Risk spreading:	cushion against risks that can cause temporary (or permanent) shortfalls from a preferred welfare level
Livelihoods system:	combination of activities with the aim to satisfy the household's needs
Poverty alleviation:	policies aiming at a reduction of existing poverty
Poverty prevention:	policies aiming at preventing future poverty