

Small-scale fisheries: Overview, importance, vulnerabilities and management

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The objective of this study is to develop an understanding of the concept related to small-scale fisheries (SSF) and to highlight its role in various dimensions. SSF contributes about 50% in the global fish catch and supplies food for local, national, and global markets. SSF also plays a major role in social and economic benefits to communities including poverty alleviation, nutrition, food security, livelihoods and supporting their local cultures. Nevertheless, communities that depend on SSF are at risk. The plausible reasons for these hazards include climate change, habitat loss, and overfishing, which not only contribute to the declining health of the oceans but also threaten this sector itself. Mostly, SSF lacks scientific information to access resources, which results in sustainable management failure of this sector.

[Keywords: Small-scale fisheries; Socio-economic development; Vulnerabilities; Poverty alleviation; Management]

Introduction

Since very early in human history, fishing has been a major source of food, employment, and economic benefits. However, there have been tremendous changes over the last five decades, especially, due to fisheries development with more stress on production. There is a remarkable increase in production because of industrialization and introduction of modern technologies, but Small-scale-fisheries (SSF) also play a major role in increasing fisheries production¹.

Unfortunately, there is no harmony and real practice in existing literature to define SSF precisely². Hence, it is very important to define SSF accurately because it is a relative term and encircles many fishery types. SSF is an important contributor to food security, poverty

scale and intensity operated by both of these fisheries sectors is a determining factor of their interactions and conflicts¹¹. The effect of both, large and SSF, on the ecosystem, also changes, depending on gears used and overall fishing effort¹². Hence, both LSF and SSF can lead to overfishing and degradation of the ecosystem¹³. Table 1 represents the categories and characteristics of SSF and LSF.

Present study is a part of this ongoing process in an attempt to improve our general knowledge about SSF. In addition, it describes the contribution of SSF in the improvement of socio-economic development, environmental development, supporting culture, food security, and poverty alleviation. Moreover, it also discusses the vulnerabilities and managerial steps to resolve them through an overview of the literature recently published on these questions globally.

Overview

The recent attempt to define SSF is considered impossible because it acts as small scale in one case and large scale in another¹⁶⁻¹⁸. In the past, SSF often presented as a type of fishery with low production and low yield rate¹⁹⁻²¹. Current literature, however, questions this thought and discusses various aspects.

causing livelihoods for millions of people throughout the world, especially in developing countries. Despite, the fisheries managers give more importance to commercial fisheries than SSF³. This ignorance is due to the lack of deep insight perception about the unique and essential nature of SSF. Moreover, this happening is also due to lack of policies and their implementation. Nevertheless, the socio-economic and cultural importance of SSF has been accepted nationally and internationally over the last three decades³⁻¹⁰.

Large-scale fisheries (LSF) and SSF often go hand in hand in different parts of the world. The relative

Table 1 — Categories and characteristics of SSF and LSF^{7, 13-15}

Characteristics	Small-scale		Large-scale
	Subsistence	Other small-scale	
Size of fishing craft/ vessel and engine	None or small (< 12 m), with low-power engine or non-motorized	Small (< 24 m) usually with low-power engine (< 375 kW)	Large (≥ 24 m) with high power engine (≥ 375 kW)
Type of craft/ vessel	Undecked wooden boat, such as a canoe or dinghy	Decked or undecked vessel of wood, fiberglass, aluminium or steel	Steel-hull vessel, trawler, factory vessel
Fishing unit	Individuals, or family or community groups	Small groups, some specialization and division of labour; importance of household and community	Smaller and larger groups; specialization and division of labour
Ownership	Craft/gear owner operated	Usually owned and operated by senior operator; some absentee ownership	Concentration of ownership, often by non-operators; cooperative ownership
Time commitment	Mostly part-time/ occasional	Full-time or part-time	Usually full-time
Fishing grounds	On or adjacent to shore; inland or marine	Inshore/coastal; inland or marine	All marine areas
Disposal of catch	Primarily household consumption but some local barter and sale	Sales to local, national and international markets; household consumption	Primarily sale to organized markets
Utilization of catch	Fresh or traditionally processed for human consumption	Fresh or processed – generally traditionally – for human consumption	Mostly processed; large share for reduction for non-food products
Knowledge and technology	Premium on skills and local knowledge; manual gear	High skills and knowledge needs; manual and mechanized gear; some electronic equipment	Skills and experience important but supported by technology; mechanized gear; automation and electronic equipment
Integration into economy	Informal, not integrated	Partially integrated	Formal, fully integrated

For instance, West African pirogue fisheries (a type of SSF) played a distinctive role in the steady increase of production, revenue generation, trade in domestic markets and exports to the North Africa over the last two decades²².

In December 2003, Advisory Committee on Fisheries Research (ACFR) of Food and Agriculture Organization (FAO) suggested a better idea about SSF through a detailed paragraph. According to this explanation, SSF not only provides fish and fishery products to regional and national markets but also for subsistence consumption. Consequently, SSF is not homogenous nationally and internationally and the consideration to this sector will increase when new strategies and policies will plan to enhance its role in poverty alleviation and food security⁹. However, FAO's description comprehensively cover the socio-economic aspects of SSF, but fails to describe the technological dimensions¹.

This concept was revised later on. From, the technological point of view, marine artisanal SSF are characterized by a non-mechanized fishing vessel with low-horsepower engines, use of submissive fishing practices, the labour-intensive operation of fishing gear and the lack of navigational devices and

electronic fish-finding²³. Another way to define SSF is based on many characteristics that are as follows: (1) a wide range of directorial elevations, (2) simple technology, (3) labor intensive methods and (4) relatively low capital inputs^{9,24}. In the past, some researchers have estimated the global catch through SSF, boat size is a key factor in defining the SSF under the information provided by various countries included in the database. Table 2 highlights the several criteria were given by different countries to characterize SSF on the common basis.

Recently, SSF is a family-based enterprises, private or self-owned property, regardless the farm-size, species reared and volume produced²⁵.

Importance

In developing countries, SSF contributes in the growth of domestic economies, which in turn not only provides employment but also food to small-scale fishing communities^{3-4,10,18,26-29}. So, in this article various aspects of SSF are discussed such as socio-economic development, environmental conservation, cultural support, food security and poverty alleviation. SSF is explained in terms of synergies because overall input of SSF is greater than total contributions.

Table 2 — Summary of definitions of SSF¹⁴

Key features	Common Definition (range)
Boat size	between 5-7 m; less than 10, 12 or 15 m (2 to 24 m)
Boat GRT	less than 10 GRT (3 to 50 GRT)
Size of engine	less than 60 HP; between 40-75 HP (15 to 400 HP)
Boat type	canoe, dinghy, non-motorized boat, wooden boat, boat with no deck, traditional boat
Gear type	coastal gathering, fishing on foot, beach seine, small ring net, hand line, dive, traps
Distance from shore	between 5-9 km; within 13 km; up to 22 km
Water depth	less than 10, 50 or 100m depth
Nature of activity	subsistence, ethnic group, traditional, local, artisanal
Number of crew	2-3; 5-6
Travel time	2-3 hours from landing sites

Moreover, as aforementioned, SSF is comparatively more significant and profitable than large-scale industrial fisheries in terms of social, economic, cultural and environmental contribution. Thus, its role in national economic growth is enormous, however, unfortunately, very little information is available which highlight the contribution of this fisheries sub-sector. It is very easy to evaluate the total contribution of SSF because they make up the massive contributions to overall fishing activity. These national contributions of SSF can be evaluated through many ways which can be seen in later sections.

Fisheries directly contribute 0.5-2.5% to GDP worldwide, which shows that this sector is not a major contributor to the global economy but in some countries, its contribution reaches up to 7%¹. For example, the contribution of fisheries to Mauritanian agricultural GDP and overall total national GDP was 48.71% and 12.47%, respectively, in 2004. Similarly, there was a huge share of the fisheries sector in Vietnam's agricultural GDP (49.95%) and total GDP (10.14%) in 2007³⁰. It can be concluded on the basis of these examples that if contribution in GDP is the accurate macroeconomic indicator in order to judge country's economy, then SSF deserves more consideration than is has in the history.

Trade of fisheries products has continuously increased during the period 1976-2014 with a growth rate of 8.0% y^{-1} in nominal and 4.6% y^{-1} in real terms. The exports of fisheries products reached \$148 billion in 2014 with the share of 77% from developing countries in the top 10 exporters. The fisheries products net exports from developing countries have shown an ongoing increasing trend in recent decades. The export values have increased from \$16 billion (1994) to \$42 billion (2014). These export values were considerably higher than the values of other

agricultural commodities such as rice, coffee, and tea³¹. From macroeconomic viewpoint, the developing countries play a key role in the growth of fisheries products trade around the globe. It is estimated that 95% of fishermen in developing countries were employed in SSF and contributed 50% in the total global fish catch³². Thus, fishermen, associated with SSF, certainly have to get advantage from this sector.

In most of the countries in the world, tax revenues from both the large and SSF are not collected and spend within fisheries sector rather they are deposited into national treasuries. However, some countries keep a significant amount of user fees for fisheries-specific expenditure, such as research or monitoring control and inspection activities¹. For instance, Alaska seafood industry pays over \$250 million y^{-1} in taxes and fees. In order to reduce community dependence on state funds about \$52.4 million fishery business and taxes were directly deposited by or circulated to 65 communities and boroughs in 2013³³. Sometimes, the macroeconomic effects due to taxation on license fees and fisheries access play a vital role to local government revenue, government budgets and also foreign currency generation. These revenues significantly contribute towards macroeconomic growth as the most successful mean of large-scale poverty reduction through SSF³⁰.

In 2014, it was estimated that nearly 56.6 million people were employed in the primary sector of capture fisheries and aquaculture. Out of this total, the percentage of full-time and part-time engaged fishers was 36% and 23% correspondingly, while the rest were either occasional fishers or of unspecified status³². Hence, SSF plays a vital role in the social development of engaged communities in terms of providing employment and generating income because the 90% of all persons employed in capture fisheries are engaged in this sub-sector.

In many parts of the world especially in developing countries, SSF resources are one of the major contributors to income and survival among fishing communities^{1, 36}. The coastal fishing communities primarily depend on fisheries sector for their cash income but recent studies reveal that this happening cannot be applied everywhere. For example, in Mozambique and Tanzania, the percentage of fisheries to cash income out of total cash income was 44% and 55%, respectively³⁷. Moreover, the seafood sector in Canada produced about 37,225 direct jobs and 25,200 in related activities and also contributed in generating approximately \$2.2 million household income³⁸. Consequently, the basic services and needs as food purchases, clothing, fishery inputs, health, and education, are gained by this cash income.

The protective role of SSF in increasing livelihoods is described for the full-time, seasonally or occasionally engaged coastal communities in developing countries which was examined globally in the past. The wage-based people, usually, men in coastal areas that join the artisanal or semi-industrial vessels due to lack of opportunities in other domestic activities are considered as full-time professional fishermen^{22,39}. Although, some share of their incomes may be rewarded in kind but their incomes usually depend on a share-contract profit system and mainly depend upon this full-time activity. These concerned fishermen not only the inhabitant of the coastal rural area but also urban areas in Africa and Asia¹.

Broad and multi-activity livelihood strategy are the main concern for some people to join fisheries related activities as part-time or as seasonal fishermen⁴⁰⁻⁴². Part-time fishermen are expert young men who use highly sophisticated and very effective fishing gears and techniques. They are actually one of the major contributors to technical modernization in SSF with the use of innovative fishing techniques or gears by technological transfer from other areas¹.

Occasional fishermen include non-leading members of the household who mainly use economic and simple fishing gears. During the flood, 70-80% of the households participated in fishing activities in floodplain areas of the Indian⁴³⁻⁴⁴ and also in the West African subcontinent⁴⁵⁻⁴⁶.

Under institutional, economic and climatic uncertainty, it is necessary to realize the coexistence of need of environmental conservations with short-term achievements⁴⁷. In recent years, it is usually accepted that fisher folk generally and small-scale

fisher folk particularly responsible for resource degradation, habitat destruction, and overfishing. So, fishermen associated with SSF collaborated with NGO's, working for environment, and started to work for the protection of aquatic resources and livelihoods^{1,47}. However, many researcher and practitioner considered that SSF is more eco-friendly than large-scale fisheries. This concept is further accepted by this general idea that formal and informal SSF community-based management approaches are more effective in developing countries which increases believe of stakeholders to lessen the threat of overexploitation of the resources¹.

Fish is a major source of high-quality protein and essential micronutrients⁴⁸. Marine fish also supply a broad range of vitamins and minerals, including phosphorus, magnesium, selenium and iodine⁴⁹. Moreover, surveys conducted in Bangladesh revealed that small fish supply vitamin A, calcium, iron, and zinc in a large extent to the diets of the rural poor than big fish. In addition to this, fish also provides fatty acids that are essential for the development of the brain and body³⁴. In East Asia and Africa, 400 million people depend upon fish for their more than 50% of the animal protein intake⁷. However, SSF sector provides high-quality protein for more than 1 billion people all over the world and particularly in developing countries where the supply of animal protein is not plentiful or costly^{1,48}. Nevertheless, the contribution of SSF to national self-sufficiency is ignored and very little research is carried out for this purpose. Consequently, it seems that the significant role of fish in general and the role of SSF to national food security, in particular, is under-estimated.

The Development Action Committee's (DAC) guidelines on poverty reduction proposed the broadly accepted definition of poverty. According to these guidelines, poverty encompasses different dimensions of deprivation that relate to human capabilities including food consumption and security, health, education, rights, security, dignity and decent work. This centralization in defining poverty is the result from a huge development in the ways poverty has been perceived, understood and measured⁵⁰⁻⁵³.

In developing countries, the income of around 1.3 billion people is only \$ 1 or less than per capita per day which is insufficient to buy chief food commodity and clothing stuffs⁵⁴. The progress and discussion in the international development community have also been reflected in fisheries sector to a certain extent.

Poverty does not stop fishing. However, all Fishing communities in general and SS-fishing communities, in particular, are affected by multidimensional nature of poverty³⁴. Poverty is explained here in terms of two categories viz., income and non-income according to an outline figured out by the World Bank and the UK's Department for International Development (DFID, Fig. 1)⁵⁴⁻⁵⁵.

Poverty Alleviation

It is the need of the time to remember concepts of poverty alleviation, prevention and reduction separately, otherwise, it is likely to lead to confusion, undesirable outcomes and wrong policies. Poverty alleviation is used as a comprehensive concept surrounding both poverty reduction and poverty prevention (Table 3)³⁴.

The concept of poverty reduction based on this fact that the living standards of people improve with the passage of time due to their investment or involvement in economic activities. Thus, poverty reduction in SSF refers to lift the people out of poverty by the agencies where wealth is generated and capital is accumulated through their investments³⁴. In contrast, poverty prevention reveals the contribution of an economic activity in serving people to retain a minimum standard of living and which prevents them from falling deeper into poverty³⁴. Table 4 describes all the different dimensions of poverty alleviation in relation to SSF, including the specific issues and vulnerability.

Vulnerabilities

The vulnerability is often described as a collective effect of risks which people may be faced, the sensitivity of their livelihoods to those risks and their aptitude (or lack of) to adapt to, deal with or recover the impacts of external shocks^{57,58}. In fisheries, the sensitivity of fisher-folk to risks is connected with their cash dependence and fishery resources. Their adaptive capacity may depend on their ability to

adjust to or avoid risks⁵⁹. Vulnerability along with poverty and marginalization is the main dimension in often deprivation of fishing communities (Fig. 2)⁵⁹⁻⁶⁰. According to FAO, almost 75% of fish stock worldwide are reduced due to overfishing. Overcapacity or changing uses of fish catch is the basic reason of overfishing by industrial and SSF.

Increasing competition for few resources lead to declining fish stock, which has a shock on vulnerability and by this mean requiring SS-fishers to fish additional offshore or spend longer at sea.

Fishermen potentially faced greater variability and extremes in drought, rainfall, and flood due to the impact of global warming which led to an increase in climatic fluctuations. Moreover, the overall rise in temperature has various impacts on the vulnerability in different regions. For example, reduced rainfall level, which led to declining lake level, river flow, and flood plain areas severely, affect the countries with significant inland fisheries.

Fishing communities are in the midst of the most severely affected by the HIV/AIDS epidemic in many parts of the world, especially the Eastern and the Southern Africa. In Uganda, for instance, the Uganda Participatory Poverty Process recognized HIV/AIDS as the main reason of poverty. The common reasons for this state are thought to lie in the demographics, the mobility, the cash-oriented economy and the high-risk life style of fishermen, together with the lack of access to HIV prevention measures and AIDS mitigation therapies⁶¹⁻⁶².

SSF is frequently at a point of geographical, political, social and economic exclusion. Levels of marginalization becoming ever greater in many countries because political and economic developments of a country basis are not uniformly distributed which lead to the growing gap between the rich and poor.

Externalities in other sectors are being absorbed by the fisheries sector because people start fisheries activities as the last option. Thus, this situation lead to the conflict among anglers, fish workers, and other

Table 3 — The two dimensions of poverty alleviation³⁴

Poverty Reduction (Lifts people out of poverty)	Poverty Prevention (Prevents people from falling deep into poverty)
Through Capital accumulation Wealth generation	Through Safety-net mechanism Welfare function
Leading to Economic growth Capital generation	Leading to Poverty impact mitigation Reduction of vulnerability

Table 4 — The different dimensions of poverty alleviation in relation to small-scale fisheries, including the specific issue of vulnerability¹

Level	Poverty reduction: Fishery contributes to lift people out of poverty		Poverty alleviation		Fishery as a source of vulnerability
	Contribution	Mechanism	Contribution	Mechanism	
Individual/ Intra- household	Livelihood support to other household members, particularly dependents	Fishing income spent on children's' education, and building other household assets (e.g. farm inputs, investment in small enterprises for other household members to run)	Household subsistence	Fishing income contributes to household budget - expenditure on food, clothing and healthcare	Strongly gendered roles and frequent absence of (migrant) male fishers may limit intra-household income distribution. Moreover, Absence from home and fishing lifestyle may increase vulnerability of partners to HIV infection
Household level/ sector	Generation of wealth	Effective capture of fishery rent (capital accumulation) High level of commercialization Access to effective market mechanisms Fish as cash crop for investment and diversification	Safety-net function (transient poverty) Activity of last resort for the poorest (chronic poverty)	Reduce vulnerability and mitigates poverty effects Food security through direct contribution (subsistence) but also fish as immediate cash-crop for safety-net	High occupational risk Risks of losing physical assets
Local level	Engine for rural development	Increased demand for goods and services Rise in wages and employment opportunities (income and employment multipliers)	Social-redistributive system (welfare)	Alternative sources of income, food and/or employment.	Unpredictability of the natural resource availability Natural disaster risk Conflicts
National level	Economic growth	Trickle up to government through taxes and foreign exchange earnings (regional or international trade)	Re-distributive	Government expenditure from fisheries-related tax and foreign exchange earnings on poverty alleviation measures	High susceptibility to macro-economic fluctuations

coastal users, which result in the rising pressure on land and coastal resource use.

Management

Stakeholders should participate in defining co-management objectives. However, we should make sure that trade-offs between achieving impartiality, competence and sustainability are clearly recognized, understood and examined by all stakeholders. These objectives should also be well-matched with national fisheries policy to ensure that national interests triumph over local elites personal interests in poverty eradication and resource conservation. This is the way to achieve predicts goals.

An essential part of pro-poor development in SSF can be done at the post-harvest sector level i.e.,

processing and trading activities. The instant steps from local public and private investments are required to sustain small-scale marketing initiatives in this domain. Such radical initiatives would result in to improve food and nutritional security. At the same time, these initiatives would result in the rural development and women's economic empowerment. The cross-sectional management would be done at various levels of management.

If cross-sectoral management initiatives are to be flourishing then the basic affairs of official action to develop policies, authority structures, supportive legislation and enforcement of rights must be forwarded. Policies and legislation need to make obvious jurisdiction and control, provide authenticity to possessions rights and decision-making planning,

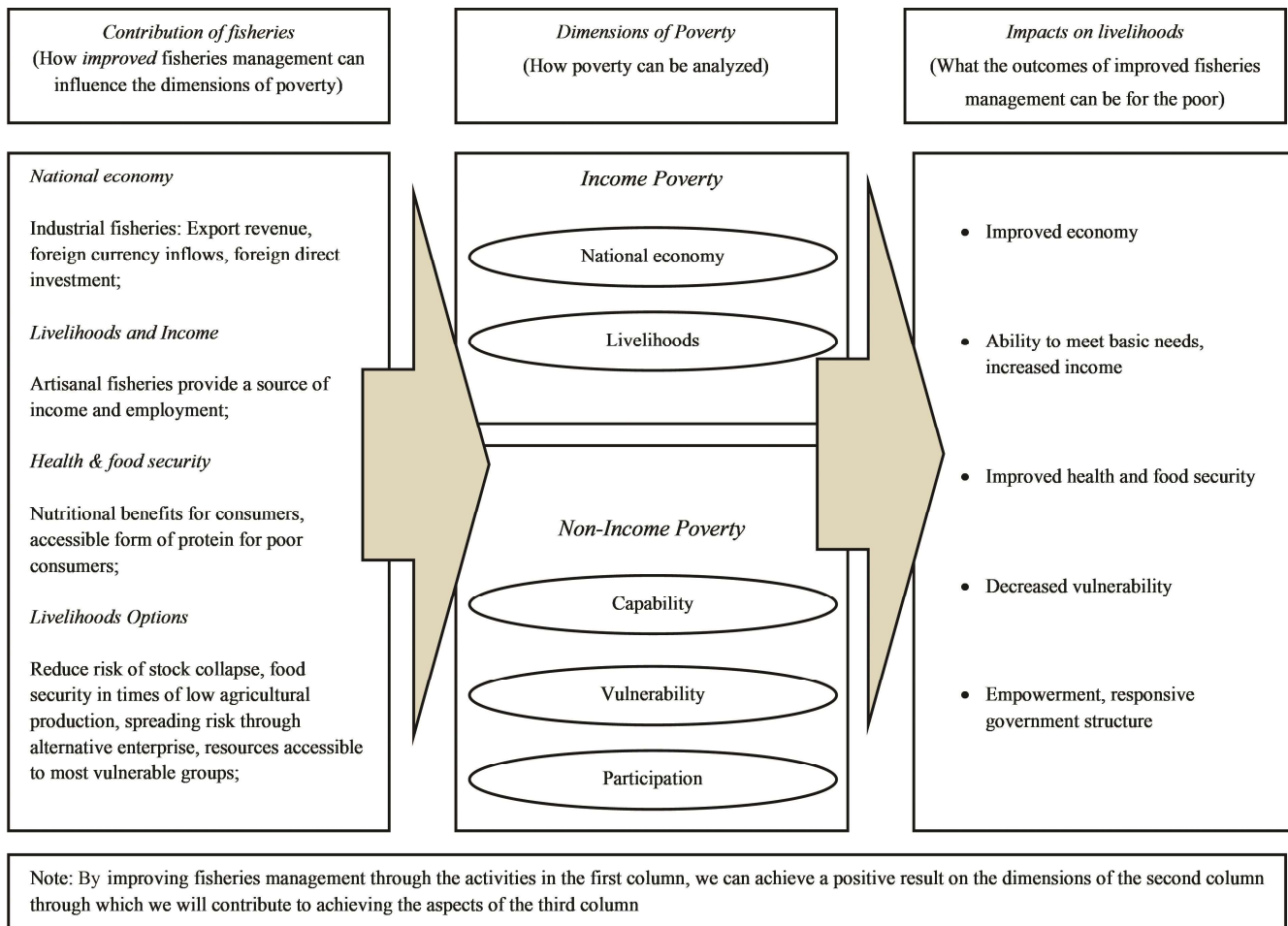


Fig. 1 — The dimensions of the poverty and the contribution of improved fisheries management to poverty reduction⁵⁶ (adapted from World Bank and DFID)

identify and make clear local responsibility and authority, sustain local enforcement and accountability mechanisms, and provide fisher groups or organizations the legal right to manage and make planning linked to their needs.

The co-management method requires adopting a gender-balanced perception and must accept the position of women both within the community and within the sector. Women should be given the chance to develop themselves and energetically contribute in the co-management process.

Appropriate Information, Research and Communication Systems

At least five major areas of improvement can be recognized in this regard. Firstly, assimilation of local knowledge and participatory research in the co-management of SSF is required. Secondly, improvement of information systems that is low on data supplies should be improved.

Thirdly, acceptance of information systems that permit assessment and monitoring of poverty/vulnerability in fishing communities should be encouraged. Fourthly, there is a need of amplification of assessment methodologies that let a better understanding and certification of the true involvement of SSF in the livelihoods of fishing communities. The last but not the least fifthly, emphasis on information systems on the pro-poor impact of decentralization reforms^{7,63} should be done.

Conclusion

The study points out that although some significant results can be identified which confirm the significance of SSF but it is not quite simple to assess global contributions of SSF. Main limiting factor behind this fact is the lack of data that counters the researchers from being able to assess in an exact and reliable way the true importance of SSF. Finally, the study recommends that there is need to focus attempts

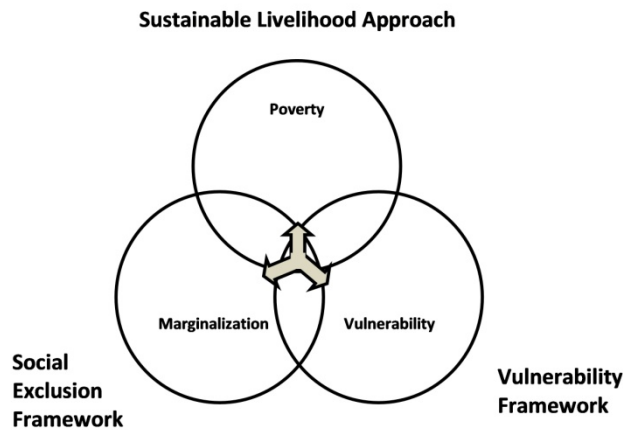


Fig. 2 — Poverty, vulnerability and marginalization as the three main dimensions in fishing communities' general deprivations⁶⁰

on promoting the responsiveness of sector stakeholders including fisheries institutions, research institutions, planning institutions, government fisheries and international agencies to examine the issues and find their suitable solution.

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