Ecological Economics 124 (2016) 69–75

Contents lists available at ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon

Methodological and Ideological Options

Economic viability and small-scale fisheries — A review

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ARTICLE INFO

Article history:
Received 25 April 2015
Received in revised form 30 January 2016
Accepted 31 January 2016
Available online 27 February 2016

Keywords:
Small-scale fisheries
Economic viability
Vulnerability
Coastal communities
Financial viability

ABSTRACT

Globally, over 90% of all fishing vessels and about 22 million fishers are considered small-scale. Despite their high numbers, small-scale fisheries are often understudied. They are usually economically and politically marginalized, and therefore vulnerable to large-scale threats (e.g., globalized markets). To support this sector and contribute to its sustainability, we argue that it is fundamental to understand how economically viable small-scale fisheries are. Hence, the main objective of this article is to critically review and describe the current discourse on the economic viability of small-scale fisheries. We find that currently, economic viability is mainly equated with financial viability, where profitability is the goal. In consideration of socio-economic aspects, the maintenance of nonnegative net benefits to society is often not considered in current notions of economic viability. While these shortcomings have been acknowledged in some of the existing literature, our review shows that they have not yet been addressed comprehensively. We therefore conclude that it is necessary to develop or expand current methods to better take into account social aspects when assessing the economic viability of small-scale fisheries. This would help find solutions to make these fisheries less vulnerable and better equipped to face large-scale processes of change.

1. Introduction

Marine fisheries play a crucial economic, social and cultural role globally; they support human well-being through employment in fishing, processing, and retail services (Dyck and Sumaila, 2010; FAO, 2014; Pontecorvo et al., 1980), as well as food security (Srinivasan et al., 2010). However, global fisheries are known to be underperforming, mainly due to overfishing, harmful subsidies and over-capacity (e.g., Sumaila et al., 2012). Small-scale fisheries (SSF) constitute a substantial component of global fisheries, however, they are found to be understudied as well as politically and economically marginalized (Allison and Ellis, 2001; Chuenpagdee, 2012; Pauly, 1997). We argue that understanding how to make SSF more economically viable is very relevant as it will bring attention and understanding to the existing problems encountered by these fisheries. Here, we ask the question: how can economic viability analysis of SSF facilitate a resource management approach that comprehensively takes into account the ecosystem, and social, economic and institutional attributes of SSF. The current article, therefore, critically reviews the usefulness of current economic viability analyses of SSF. The goal is to examine how economic viability is currently defined and what approaches have been applied to analyze it in relation to SSF. Further objectives of this study are to (i) identify gaps in the assessments presented herein; and (ii) present recommendations on what could be done to possibly improve the way economic viability of SSF has been defined and applied in the past. We suggest that this can help to improve policies for managing small scale fisheries.

According to the Food and Agriculture Organization of the United Nations (FAO), over 90% of the 4.36 million fishing vessels active in the world can be classified as small-scale (FAO, 2014). Teh and Sumaila (2013) also estimated that SSF support up to 22 million fishers, who make up about 44% of all fishers in the primary production sector. An additional 100 million people are involved in the post-harvest sector of SSF (Béné et al., 2007). Furthermore, Béné et al. (2010) estimated the value of the labor-buffer function of the world's SSF to be US$ 61 billion annually. This amount supports the livelihoods of many fishers in fishing communities with few employment opportunities. SSF, therefore, perform a very important function as an employer of last resort, which if not regulated can in turn result in fish stock depletion (Sumaila et al., 2012).

Small-scale fisheries, which here include artisanal and subsistence, are often perceived to be fisheries using low technology or less advanced gears. Another characteristic of SSF identified in the literature is that their products are mostly for household consumption and/or sold in local markets within the fishing community (Chuenpagdee et al., 2006; FAO et al., 2008; Guyader et al., 2013). However, many SSF today are able to employ more advanced gear that can move further away from the ports, and increasingly, they have access to a broader range of markets due to the availability of storage and transport facilities at lower costs (Pomeroy and Andrew, 2011). Furthermore, characteristics dividing a region's fishery into large- or small-scale are often relative, i.e., small-scale in one region might be considered large-scale in

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http://dx.doi.org/10.1016/j.ecolecon.2016.01.018
0921-8009/

another (Berkes et al., 2001; FAO et al., 2008; FAO, 2003; Smith, 1979). However, despite the fact that the definition of SSF is contextual, there is much common ground found in what constitute these fisheries. For example, SSF are often tied to their local communities, reflecting their traditions and values (FAO et al., 2008; Pomeroy and Andrew, 2011). Additionally, SSF face the same or at least very similar problems and threats: low economic performance; inability for SSF fishing communities to retain most of the benefits from their fisheries; relatively high incidence of poverty and pressure from globalization and global challenges such as climate change (Chuenpagdee et al., 2006; Harper et al., 2013; Lam et al., 2012; Zeller et al., 2006). In addition to these challenges, poor governance (Sumaila, 2012), ineffective management and the under-representation of local stakeholders in decision making processes have contributed to the marginalization of SSF (Allison and Ellis, 2001; Béné, 2003; Béné et al., 2009; Béné and Friend, 2011; Chuenpagdee, 2012; Pauly, 1997). Therefore, for the purposes of this study, we focus on the common characteristics of SSF and on how they have been categorized for each study we reviewed.

The main reason for critically reviewing the intersection of SSF and economic viability is that SSF research clearly needs more attention, especially, in regard to the social dimension. Analyzing economic viability by applying the viability theory (a mathematical method based on viability kernel developed in Aubin, 1991) has been the dominant approach to date for the study of how economically viable small scale fisheries are. Contributions that have applied this approach to consider social, ecosystem, economic and institutional dimensions in their study of SSF include Cissé et al. (2015) and Hardy et al. (2013).

2. Economic Viability

2.1. Defining Economic Viability

According to the Webster 2nd edition 20th century Dictionary, viability is: “The state or quality of being viable (i.e. able to live) and the state of being able to survive under conditions of wide geographical distribution, as species of animals and plants”. This definition is also used to describe the viability of artificial systems, entities and ideas, which have to maintain themselves in the long term to survive. The viability theory studies dynamical systems that capture viability and uses algorithms to describe and model them. The future of these complex and diverse systems is uncertain due to many variables and frequent changes that cannot be easily determined. It is necessary to understand how the dynamic system and the constraints it faces function to be able to restore its viability when problems arise (Aubin et al., 2011). Viability kernel analysis (Krawczyk et al., 2013), has been adapted for use in modeling the dynamics of renewable resource systems under scenarios of uncertainty (Baumgärtner and Quaas, 2009; Béné et al., 2001; Béné and Doyen, 2000; Doyen et al., 2013).

Variables that describe biological and/or social systems can evolve in many different ways which can be deterministic or stochastic; they, however, have the purpose to always adapt to their environment (Aubin et al., 2007). For example, any economic system has to adapt to scarcity constraints and it needs to find a balance between supply and demand to be able to function (Aubin et al., 2007, 2011). According to Aubin et al. (2011), the environment is described by different types of variables and that some of those variables must obey specific constraints that can never be violated. Constraints are restrictions that are applied to a given system, they can, for example, be economical, biological or social. The strength of the viability theory therefore is that it involves interdisciplinary investigations, meaning it spans across fields, which have traditionally developed in isolation (Aubin et al., 2011).

To fully comprehend the term ‘economic viability’, the economic part of it also needs to be clearly understood. The term ‘economic viability’ has been used in many different contexts in the literature without being explicitly defined (Adeogun et al., 2009; Barclay and Cartwright, 2007; Ehui and Spencer, 1993; Lery et al., 1999; Yazdani and Gonzalez, 2007). Here, we combine the concept of economics with viability and focus on how an economic entity (e.g. a small scale fishing enterprise) can survive in the long term. To be able to understand economic viability, therefore, the system's variables and constraints need to be identified (Aubin, 1991; Baumgärtner and Quaas, 2009; Doyen et al., 2012). Constraints in this case could be, for example, that the system's net benefits to society need to be nonnegative.

In the following paragraph, we provide a selected review of how economic viability is described in the context of natural resource exploitation and more specifically fisheries (Table 1).

Lery et al. (1999) and Adeogun et al. (2009) analyzed and compared economic viability of fisheries in the sense of pure financial performance based on financial indicators, which typically include net cash flow divided by the sum of total earnings and returns on investment (net cash flow/investment). These indicators are then used to compare the economic viability of different fisheries or a threshold can be set, which has to be exceeded for the fishery to be considered economically viable (Adeogun et al., 2009; Lery et al., 1999). Economic performance, another term often used, measures how well the economic entity is doing currently, as opposed to evaluating it over time. It is argued that economic viability, on the other hand, should not only address the momentary economic performance of an economic entity but also consider its future performance (Tisdell, 1996). Tisdell therefore points out that the most important step in assessing viability is the consideration of time, as an economic entity needs to be profitable not only today but also in the future. Therefore, cost benefit analysis is often seen as a good tool to determine how economically viable an entity is as it incorporates the time aspect into the assessment of net benefits (Tisdell, 1996). When assessing natural resource exploitation, e.g., by fisheries, it is essential to also consider an intergenerational equity perspective, meaning we should account for the ability of future generations to also be able to benefit from the use of these resources in the future (Doyen and Martinet, 2012; Ekeland et al., 2015; Sumaila and Walters, 2005).

Baumgärtner and Quaas (2009) argue that a dynamic system, such as a fishery, is viable when its different components and functions remain stable, an indication that they will exist with sufficiently high probability into the future. The authors also specify that viability should be a normative criterion for any ecological–economic system. Furthermore, economic viability must provide the basis of strong sustainability under conditions of uncertainty, which means maintaining natural capital stocks and ecosystem services separately. In most models, a level of certainty of the system's future is assumed in order to simulate fluctuations and outcomes. However, using viability kernel analysis makes it possible to endogenously model the system's uncertainties (Baumgärtner and Quaas, 2009; Béné et al., 2001; Doyen et al., 2013).

2.2. Economic Viability of Fisheries

Fisheries are prone to uncertainty because environmental, institutional, economic and social changes cannot easily be foreseen or determined (Charles, 1998; De Lara and Martinet, 2009; Fulton et al., 2011; Lane and Stephenson, 1998; Teh and Sumaila, 2013). To determine whether a fishery is economically viable, uncertainties need to be dealt with in the most realistic way possible. Only by handling the uncertainties in a model appropriately, can we find out how the fishery system will perform in the future.

Béné et al. (2001), Doyen and Péreau (2012) and Gourguet et al. (2013), adjust the classical dynamic fishery model, which focuses on sustainable fisheries and rent maximization by using a viability theory framework (see Section 2.1). The goal of this approach is to assess the system's dynamics and its constraints. Controls can then be determined to ensure that the necessary constraints are not violated. Béné et al. (2001) state that economic viability is reached when the bio-economic system is found in good health. The authors attempted to find instantaneous and simultaneous criteria that would help ensure