Sustainability, Livelihood, Production and Effort Supply in a Declining Fishery. The case of Kenya’s Lake Victoria fisheries
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Part Two

The production process in Kenya's Lake Victoria fisheries
Introduction

The management and regulation of fishery resources aims at checking overproduction, conserving the resource stock, maintaining an all-year fishery, and enhancing economic rent by avoiding over-investment in fleet capacity; in a word, ensuring their sustainable exploitation. Such exploitation should, ideally, maintain resource stocks within levels thought to be consistent with ecosystem stability and resilience [Turner 1993]. The fishery or any other resource system should, therefore, be exploited in a way that not only enables it to meet current human needs but also, simultaneously, to support species and biodiversity, and enhance its resilience. The latter will ensure that the resource system is capable of meeting future human needs.

In Chapter 3, we have demonstrated that Kenya's artisanal fisheries of Lake Victoria are not being exploited in such a manner. They are overfished, the ecosystem interfered with, and their sustainability, therefore, seriously threatened. Production technology is, arguably, the most important determinant of how sustainable the exploitation of these fisheries will be. By harvesting immature fish and by destroying fish breeding grounds, bad technology adversely affects the resource's future productivity, thereby compromising the quality and quantity of services that posterity is likely to receive from it. The resource stock will be exhausted in finite time if bad technology harvests fish that have not attained reproduction age. Realisation of the fishery sustainability implications of technology of exploitation could, perhaps, explain why net mesh size and other input restrictions are prevalent forms of fishery regulation.

The role of the fishing vessel in the fishery production function is an excellent indicator of how crucial production technology is to the sustainable exploitation of resources. The way in which a fishing firm responds to economic stimuli, for instance, is determined by the nature of the production process embodied in the fishing vessel [Doll 1988]. Travelling to the fishing grounds, searching for, catching and transporting fish to the ex-vessel market, are the primary functions of the vessel. What this implies is that even if economic incentives are provided for efficient fishing, this will not necessarily yield the desired behavioural change if technology is not adequately flexible. In multispecies fisheries, particularly, whether or not individual species could be targeted is an issue pertinent to management [Campbell and Nicholl 1994]. This, also, is contingent upon production technology. If fishing vessels cannot target individual species successfully, then output mix is technologically determined and the species cannot be managed independently. Reduction of effort in such a fishery, for instance, with the objective of relieving the overexploited species of some pressure will also result in reduced harvests of jointly produced species that may be under-exploited. Gear selectivity is an important determinant of the accuracy with which fishing vessels can target individual species in response to economic incentives such as relative species price.

In fishing technology utilising nets, the major determinant of gear selectivity is the mesh size of the nets. Thus, external diseconomies are not involved in the level of fishing effort only but also in the choice of mesh size [Turvey 1964]. The optimal allocation of the fishery resource will, therefore, require the regulation of both fishing effort and mesh size. Effective

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43 Technology may be defined as the know-how and physical means, that is society's pool of knowledge, of transforming inputs or resources into outputs. In this paper, technology is used to refer not only to this pool of knowledge but also the fishing methods, techniques and gears used in the fish-harvesting sector.
INTRODUCTION TO PART TWO

control on effort, furthermore, cannot be achieved through the limitation of the number of fishermen or vessels only because, as Wilen [1979:855] aptly notes "...the concept of "effort" in most fisheries is excruciatingly nebulous since fishermen are free to choose vessel length, tonnage, engine size, gear type, hull configuration, etc. in an almost limitless way". With flexible production technology, fishermen will simply adjust the unregulated components of effort, effort being multidimensional, in response to the regulations, thereby making them ineffective. Nonetheless, regulations can reduce technical flexibility by limiting key dimensions of effort, thereby increasing the chances of success for input-focused regulatory programs [Wilen 1979].

It is apparent, therefore, that management of fisheries is bound to fail if it ignores the nature and resource implications of production technology. Management that either focuses on the industry level with the objective of managing an aggregate input, fishing effort, and total industry catch, or targets individual species and inputs without due consideration of their technological and cost inter-dependencies, for instance, will fail [Squires 1987]. It is also apparent that the actual form of the technology characterising any fishery has serious implications for its management and regulation [Kirkley 1986; Kirkley and Strand 1988; Squires and Kirkley 1991; Squires 1987]. The relevance of a study of the technology used in the exploitation of Kenya's Lake Victoria fisheries and the determination of the key dimensions of effort incident on them cannot, therefore, be gainsaid. It is an important aspect of the study of the fishery overexploitation problem.

Sound knowledge of the characteristics and impacts of the technology used in the exploitation of these fisheries is, additionally, critical if wanton harvesting of juvenile fish has to be stemmed. Harvesting of juvenile fish, fish that have not had a chance to reproduce, is tantamount to mining capital, a manifestly unsustainable practice. The crucial information of juvenile fish harvest rates is currently lacking and the serious deterioration of these fisheries could be attributed, at least partly, to feeble attempts at management in its absence. While the qualitative effects of inappropriate gears are, perhaps, trite, the same cannot be said about the quantitative aspects of the problem. The quantitative elaboration of any problem is, moreover, not only more illustrative but also attracts more corrective attention.

This part of the thesis is, consequently, devoted to the characterization of the fishing technology used in these Kenyan fisheries (Chapter 4) and the evaluation of the relative resource sustainability implications of the various fishing technologies (Chapter 5). A careful survey and characterisation of the production technology (fishing gears and methods) used on the Kenyan side of Lake Victoria is made, with particular emphasis placed on the relative impact on resource sustainability. The motivation for this is conviction that quantitative elaboration of the inappropriate technology problem will jolt the authorities into taking cogent management measures to ensure sustainable exploitation of these fisheries.

Economists are largely and ultimately more interested in the choices that economic agents (households and firms) make and the motivations that drive these choices. In Chapter 5, therefore, an attempt is also made to understand why fishing units engaged in these fisheries choose exploitation technologies that are manifestly deleterious to the long term welfare of their sole source of livelihood.