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Tradeoffs in Fisheries -Sustainability and Development

R. Narayanakumar
Head
Socio Economic Evaluation and Technology Transfer Division
Central Marine Fisheries Research Institute, Cochin-682 018
Email:ramani65@gmail.com

Fishery resources are renewable natural resources but not in-exhaustible. The threat of extinction or over-exploitation due to indiscriminate fishing practice is being witnessed at different countries. One of the important aim of the fisheries management is to develop programme for sustainable fishing. The concept of sustainable fishing focuses on maintaining inter and intra-generational equity in the parlance of resource economics.

Sustainability

Generally sustain refers to keep up continuously without any interruption or disturbance. "Sustainability refers to the simple principle of taking from the earth only what it can provide indefinitely, thus leaving future generations no less than we have access to ourselves."

Sustainability is viewed differently from the point of view of ecology, economics and sociology.

- From the ecology point of view, it is the ability of ecosystems to maintain its structure and function and to remain resilient in order to continue to give and support life.
- From economic angle, the sustainability refers to the ability of the market to optimally allocate scarce resources, to send proper price signals and to provide mechanisms for investment and to maintain a healthy labour market.
- For a sociologist, it refers to the ability of individuals and communities to remain in good health physically, mentally, emotionally and spiritually and ensure equity among and between generations.

Sustainable development

> "Sustainable development is a requirement to our generation to manage the resource base such that the average quality of life we ensure ourselves can be potentially be shared by all future generations ".(Asheim, 1991)

The definition sustainable development given by the World Commission on Environment and Development (1987) is taken as the guide line for the sustainable development now. "**Sustainable development is that Development that meets the need of the present generation without compromising the ability of future generations to**

meet their own needs" This definition of sustainable development is widely accepted and commonly used world-wide.

Since the definition of sustainable development in 1987 by the Brutland Commission report followed by extensive discussion, **there dimensions of sustainable development** have emerged.

1. **Economic dimension**: An economically sustainable system must be able t produce goods and services on a continuing basis, to maintain manegable levels of government and external debt, and to avoid extreme sectoral imbalances, which damage agricultural or industrial production
2. **Environmental Dimension:** An environmentally sustainable system must maintain a strong and stable resource base, avoiding over exploitation of renewable resource systems or environmental sink functions and depleting non-renewable resources only to the extent that the investment is made in adequate substitute. This includes maintenance of biodiversity, atmospheric stability and other ecosystem functions not ordinarily grouped as economic resources.
3. **Social dimension:** A socially sustainable system must achieve distributional equity, adequate provision of social services including health and education, gender equity and political accountability and participation.

Sustainability rules

The resource economics, environmental and ecological economics have described possible approaches for sustainability in various literature. There are a few sustainability rules for achieving sustainable development. They include (a)Hartwick-Solow approach; (b) Non-declining natural stock approaches, (c) safe minimum standards approach and (d) Daly's operational principles. The most popular model that is being quoted for sustainable development is Common and Perrings (1992) model. In this model, a pair of constraints that are sufficient for ecological and economic sustainability are incorporated. These constraints are endogenous and the objective function is dependent on discounted social welfare. (Hanley et al, 1997)

Sustainable Fisheries Yield

Fisheries are classified under renewable natural resources. However such resources are also liable to become extinct if the rate of harvest or exploitation is higher than the rate of regeneration or reproduction. Here the size of the stock (population) depends on the biological, economic and social considerations.

The sustainable yield in fishing commonly referred to as "Maximum Sustainable Yield (MSY) is a biological phenomenon. MSY means that level of fish catch or yield that can be harvested from a given system in perpetuity without affecting the stock of the system (or the sea). In other words, a catch level is said to be sustainable whenever it equals the growth rate of the population since it can be maintained for ever. As long as the population size remains constant, the growth rate will remain constant as well.

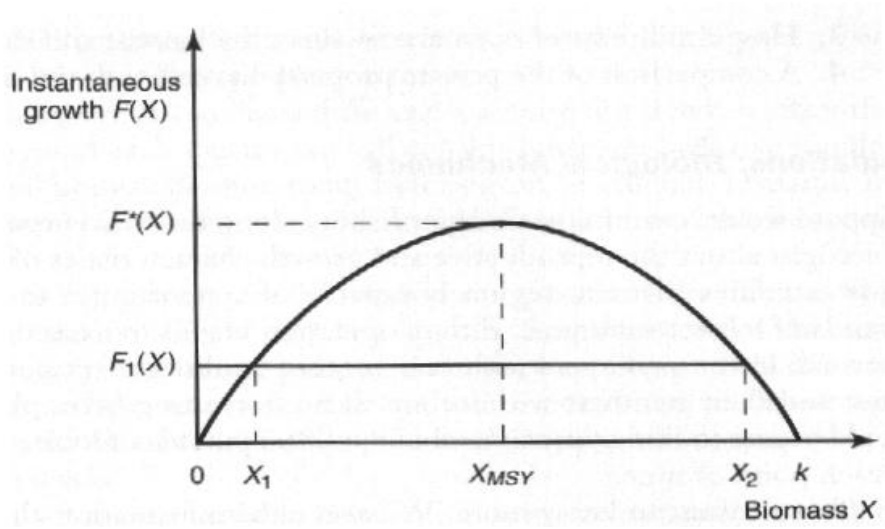

Figure 20.1 Sustainable Yield Curve

Source John A. Dixon, Fisheries and Aquatic Resources World Bank Institute

There is an additional concept called Maximum Economic Yield (MEY) which includes the monetary terms of the effort and returns.

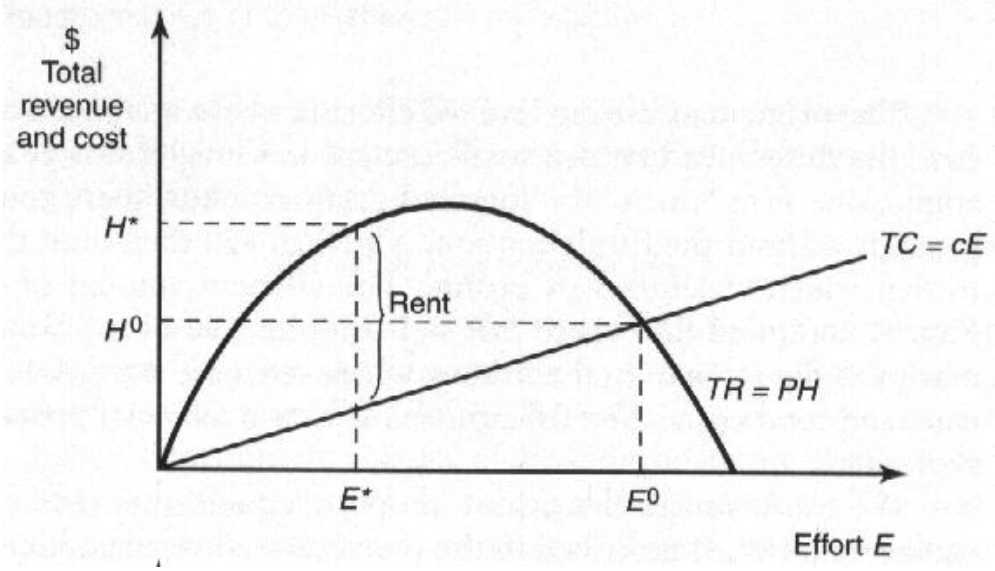

Figure 20.2 Maximum Economic Yield

When the relationship between effort and money are measured, it was observed that when stock is low, effort must be high.

- Total revenue (*TR*) = Price (*P*) × Catch (*H*)
- TC = Unit cost (*c*) × Effort
- Rent = TR – TC

The rent is maximized at the point E*. Here

- *MEY* is left of *MSY*
  - Optimal harvest (*H**) is less than the *MSY* harvest
  - But rent is larger than at *MSY*

The marginal analysis can show that the MEY occurs at the point where MC =MR. It is observed that for marginal unit of effort, marginal rent is = 0 and average rent >1.

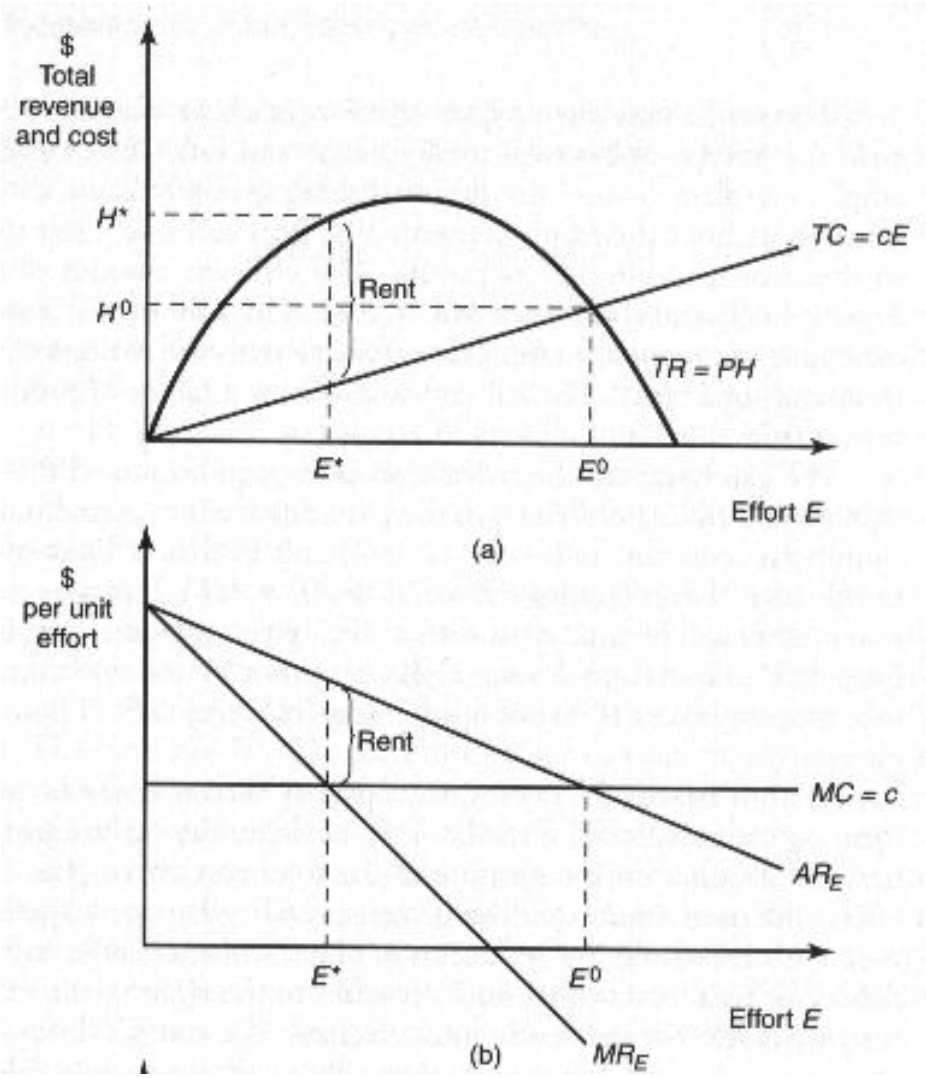

Figure 20.3 Cost and Earnings for Efforts

Dixon concludes that the "Goal of traditional fisheries management: achieve *MSY.* However the economists aim for MEY in contrast to MSY. AT MEY, compared to MSY, the fish catch is lower, fishing profit is higher, fishing effort is lower and the fish stock is higher. Thus the author concludes that MEY is where more fish is conserved. (Dixon, 2005)

The trade off

All fishery management plans aims to bring sustainable fishing to protect the stock from indiscriminate harvest. All the development programmes are also aimed at such sustainable fisheries management.

But there are certain issues that have cropped up in the due course. Initially our fishing is carried out on subsistence fishing since we did not have advanced fishing crafts to harvest the resources of our seas. Gradually when the mechanized fishing was introduced, the catch rates and the harvest increased. This has helped the fish catch to increase from 0.5 million tones in 1950 to 3,83 million tones in 2011 with fluctuating harvest over the years.

Initially our fishing fleet comprised only traditional crafts with limited mobility. This prevented the fishers to venture into far off seas, where the resources were abundant then. But the fishing fleet gradually increased over the years from about 90,424 in 1961-62 to the present level of 1,94,490 crafts. The mechanized crafts were introduced first and after 1980, the motorized crafts entered into the fishing fleet. At present there are about 50,618 non-mechanized crafts and 71,313 motorized and 72,559 mechanized crafts in the fishery (CMFRI, 2010).

The share of the non-mechanized landings in the total marine fish landings decreased from 24 per cent in 1985 to 2.45 per cent in 2011, while that of the mechanized crafts increased from 66 per cent to 78 per cent during the same period. The share of the motorized crafts also increased from 9 per cent to 19 per cent between 1985 and 2011. These statistics indicate that the non-mechanized crafts are almost nearing the stage of marginalization and being phased out of the fishery. But is the proportions of fishers who are depending on such traditional fishery have also shifted to other sectors? The answer is not a comprehensive yes. The incidences of marginalization of such traditional fishers are taking place in isolation. This point has to be looked into. The seafood export has also increased multi-fold during the last six decades to reach the level of about Rs.16,000 crores presently, which acts as as incentive to invest and expand the fishery infrastructure both on-shore and off-shore. How far the benefits of such developments have reached the gross root level fishers, who are also involved in fishery and fishery related activities. What is the impact on the harvest of the resources? Whether the resources have been over exploited or become extinct? Such questions needs a comprehensive evaluation of the sector in total.

This topic has raised some questions that normally arises when development takes place. But fisheries sector is very unique in the sense, we are managing a resource where we do not see the total stock unlike in other natural resource like land and forest. Hence our estimation needs more precise methods to arrive at any conclusion for translating into policy framework. The trade off between sustainability and development in fisheries, thus have to be arrived at after a comprehensive evaluation of the sector in total and arriving at an optimum path way. This is no doubt, a huge task but definitely achievable with all our concerted efforts.

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