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Economics, fisheries and responsible fisheries management

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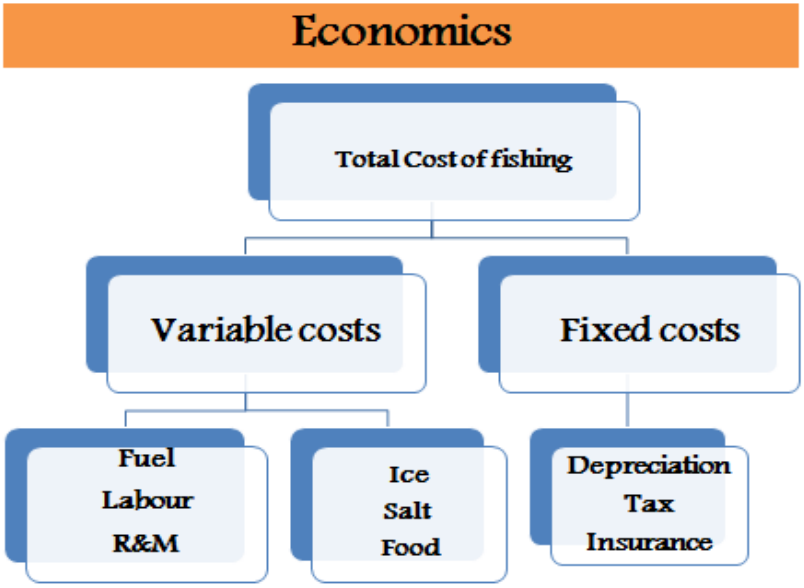
Introduction

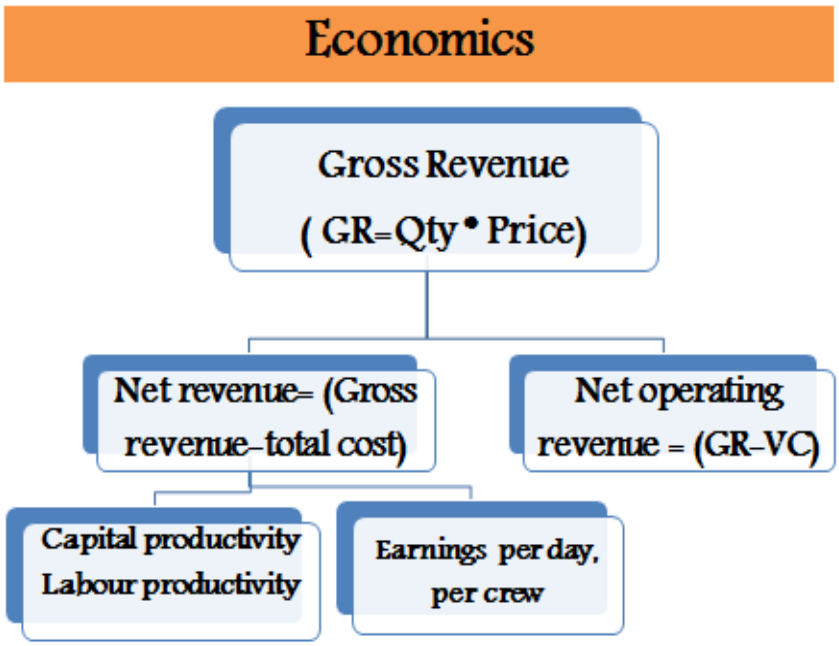
Economics is the basis for life. Every one of us is a practicing economist in himself/herself in life. The principle of economics, when applied to fields like agriculture, animal husbandry, fisheries, poultry and other enterprises becomes more valuable. Initially fisheries did not consider economics as a component. But later in course of time, the fishery biologists realized that economics is a vital component of fisheries management. In this lecture we will see the concepts of economics, fisheries and responsible management separately and finally link them for a better understanding.

Economics: A few basic concepts

Wants are unlimited but the means to satisfy them are limited. This is the basis of scarcity definition of Economics. In the wider sense, the resources at our disposal to meet our requirements are limited. We have to allocate the resources among the competing alternatives, for which the economic theory helps us. Optimization of resource use to obtain maximum profit is one of the aims for applying economic principle in entrepreneurship.

In fisheries also, the economic principles are allocated for formulating fisheries management measures. In fisheries, the point of optimum harvest occurs where the average revenue cost cuts the average revenue curve, contrary to the other fields, where the optimum occurs where marginal cost cuts the marginal revenue curve.





Fishery resources

Fishery resources are renewable natural resource but are not inexhaustible 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. Fisheries come under Common Property Resource (CPR), due to which a comprehensive management measure could not be exercised. "In an open access regime like fishery, negative externalities are many, which implies that uncontrolled fishery will bound to end up in what is called tragedy of commons.' (Grafton *et.al,* 2006)

Sustainable Fisheries Yield

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.

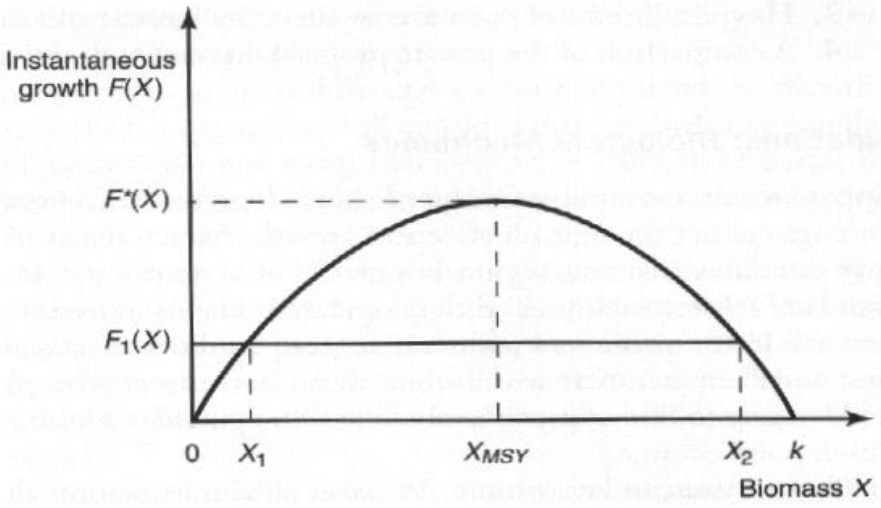


Figure: Sustainable Yield Curve

Economics of fisheries management

Economics play a vital role in fisheries management. In the earlier stages, fisheries management focused on controlling the effort to maintain the fish stocks. The common assumption is that if the control measures are strictly implemented, the further increase in effort is prevented and thus a sustainable harvest can be expected. But by 1970 it was found that such measures fail to control the fishing effort and capacity as the fishers substituted from regulated to unregulated inputs (Wilen, 1979) and further remedies suggested also failed to prevent the increase in fishing effort (Townsend, 1990).

"An economic perspective of fisheries management is that marine resources should not only be managed sustainably but also in a way that they contribute to and provide net

benefits for the nation as a whole. Indeed the economists argue that sustainable and economically profitable fishery is complimentary. A level of harvest that maximizes the sustainable returns from fishing is often at a stock size that is greater than that which would maximize the overall yield from a fishery. Moreover, if there are other costs associated with fishing like habitat damage or environment loss etc., the economic optimum level of harvest that accounts for these costs would be even less, and the desirable fish stock even larger. In other words, a fishery that is economically optimum in the long run is also likely to be an ecologically sustainable fishery". (Grafton, et al., 2006)

Maximum Economic Yield (MEY) is realized at that level of effort in which the sustainable net return from the fishery is maximum. The difference between the total revenue (TR) and the total cost (TC) is maximum. This difference is also referred to as **resource rent.**

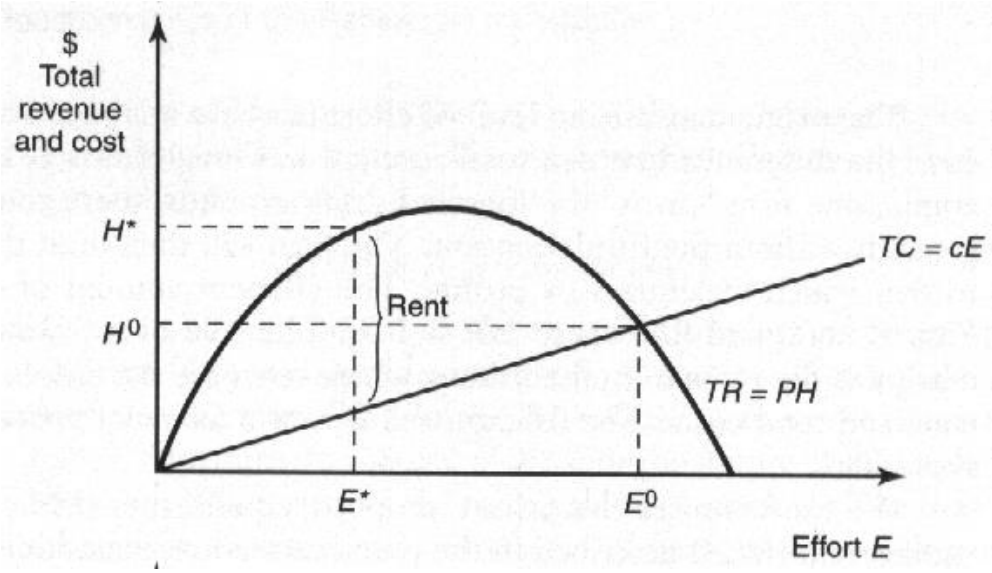


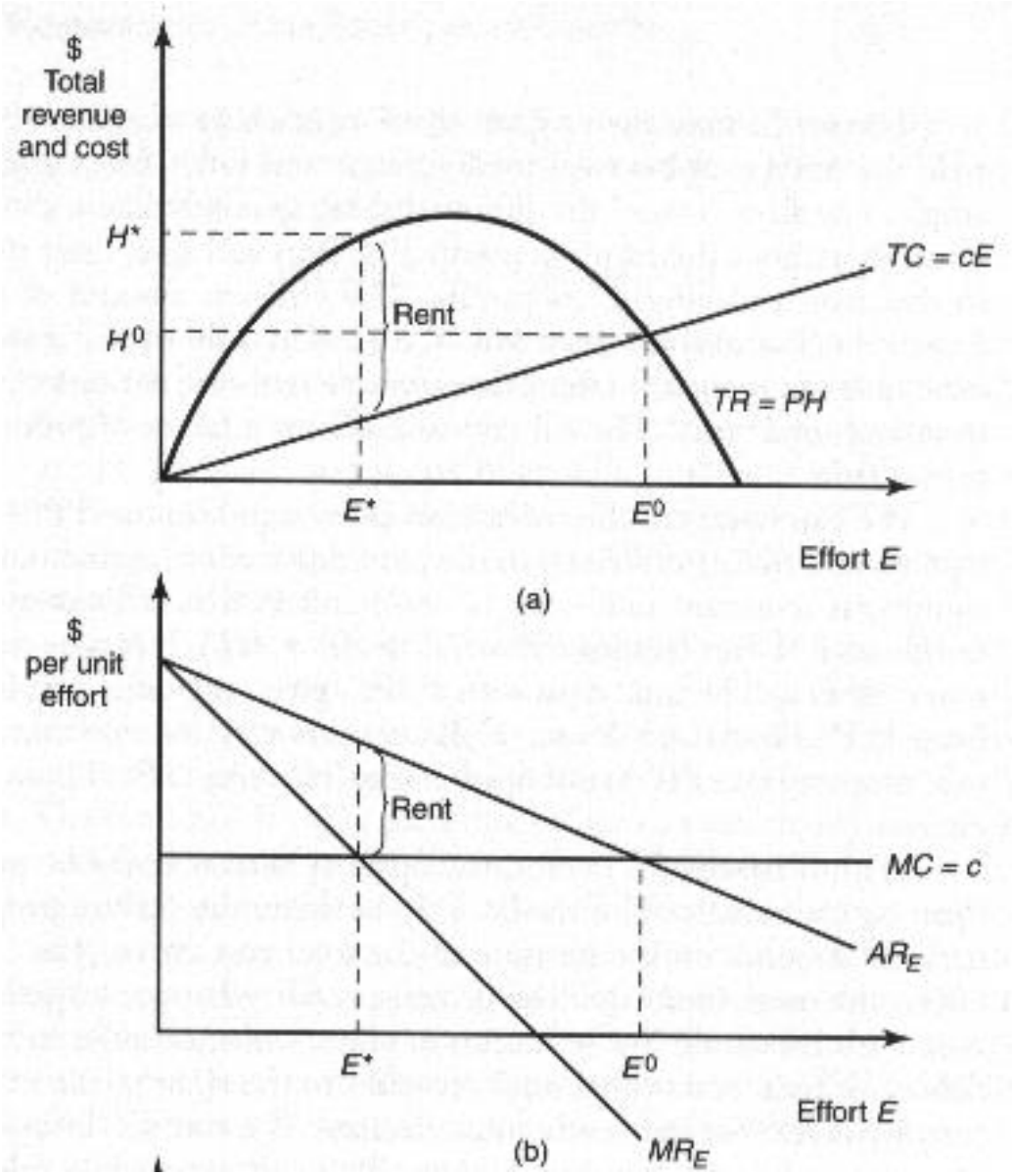
Figure Maximum Economic Yield

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

The resource 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.



The point **E* is that effort level at which the MEY occurs**. At this point of effort only the **difference between the total revenue from fishing and total cost of fishing is the maximum.** This difference is also referred to **as resource rent.**

"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 MEY is where more fish is conserved.(Dixon, 2005 and Grafton et.al., 2006)

MEY is affected by the changes in price of fish and the costs of fishing. When the price of fish increases, the total revenue curve shifts upward at all effort levels, leaving the intercepts unchanged and the point of MEY moves closer to MSY but never beyond MSY so long as the cost of fishing increases with effort. On the other hand, if the cost of fishing increases, the total cost curve moves upward to the left, thus the new point of MEY is to the left of the previous MEY. This will lower the optimal fishing effort (E*) because with a more costly harvest, it pays more to have larger stocks from which to catch. In total, a fall in fish price or an increase in cost of fishing will lead to lower harvest with a less fishing effort and a larger stock size in order to maximize the economic profits (Grafton et.al., 2006)

Fishery regulation

Fisheries are open access resource or common property resource where every one has , equal right to fish. In such cases there is no monitoring of the level of harvest by the individual fishing sector. This leads to faster harvest of the stock and leave less resources for the future or even for the same generation. In such circumstances there is a need to regulate the fisheries to ensure optimal harvest of the resources.

The problem in fisheries sector is that because of the intrinsic characteristic of the open access nature of the fishery, implementation of any regulation measures becomes a difficult task. A few of the regulatory measures that has been formulated is described below.

Traditional Management-Total allowable catch (TAC)

The traditional management methods concentrated on the controlling of annual catch. The traditional management agency determines the total allowable annual catch (TAC). The cumulative years' catch is tracked and the fishery closed once the TAC is reached. Also the length of the fishing seasons can also be determined in advance, based on an estimate of the fleet's capture efficiency. With the correct estimate and reporting of catches, the TAC will provide an efficient management tool.

However the method has economic side effects. This include heavy competion from the vessel operators to take their share of TAC before the stipulated closing date. Hence they increase their vessel capacity and it has its own implications. In case of pacific halibut fisheries, the fishing season lasted for three days only in early 1990's. This also forced the fishermen to venture into the sea before the closure irrespective of the weather conditions, putting their life into risk.

Individual Transferable quotas (ITQs)

In this method, each fisher is allotted a specified annual quota, which may be caught as and when deisired by the fishermen. Quota units can be purchased or sold. The fishery management authority decides the total quotas.

In this method, economic rents are preserved and distributed among the quota owners. This eliminates competition among fishers. This has been successfully tested in Pacific halibut fishery in 1993 and US fishery in 1996. This also has a few disadvantages.

Taxes

The taxes imposed on the landed catches are another alternative method for regulation of fisheries. In this method, the net price received for the catch is reduced due to taxes. The taxes reduce the incentive for overfishing. If properly formulated and implemented a tax could help to achieve the desired effect in the regulation of fish. All the resource rents will be retained by the government in the form of tax revenues.

Responsible Fisheries Management

Objective

To ensure long term sustainability of living marine resources so that these can be harvested by generations to come thus making a substantial contribution to world food security and employment opportunities (Article 8 of Code of Conduct) (FAO, 1996)

Definitions

- **Fishing vessel** –vessel for commercial exploitation of living marine fishery resources, including mother ships and any other vessel directly engaged in such fishing operations
- **Fisher**- an individual taking part in fisheries from a fishing vessel, platform (whether fixed or floating) or from the shore
- **Owner**-an individual or entity holding shares in fishing vessel or fishing licence
- **Manager**-an individual or an entity acting on behalf of the owner for the operations of the fishing vessel or fishing operations
- **Charterer** –an individual or entity that leases a vessel for a fixed period of time or for a voyage
- **Fisheries Protection vessel** A vessel not engaged in commercial fishing and deployed by a State for monitoring, control and surveillance and law enforcement and is clearly identifiable being a government service
- **Transhipment**-the act of transferring the catch form one vessel to either another fishing vesel or to a vessel solely for the carriage of cargo

Application

The guidelines may be applied by the States on a *voluntary basis to*

1. All fishing operations on all oceans, seas and inland waters

2. Fishers, owners, managers masters of harbours of fishing vessels and competent authorities for the purpose of fisheries management and maritime transport

3. All fishing vessels engaged in transhipment of fishes

Conclusion

The economic performance of the fishing methods or vessels is the basis of any management measaure. Unless the economic performance is in favour of the fishermen, he will not be interested to continue the business. The excess fishing capacity existing now is an indication of poor economic performance of the fishing methods.

It is time, we find out a middle point between biological and economic optimum involving all stakeholders so that practically implementable management measures can be formulated. We can even revisit the traditionally community based management practices followed sometimes back and scrutinize them for modification to the present needs and incorporate them into our present day management regimes.

The involvement of the stakeholders in the formulation of the fisheries management measures is very much essential for it successful implementation. Besides, a strong and committed will is required to enforce the formulated management measures for successful adoption of the responsible fisheries management measures by the stakeholders.

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