

**Econ 325: Environmental and Natural Resource Economics**  
**Fall 2007**

**Problem Set 4: Solutions**

Due in class: Thursday November 8, 2007

Instructions: Answer all 4 questions. Please show your work, and be sure to label all graphs accordingly.

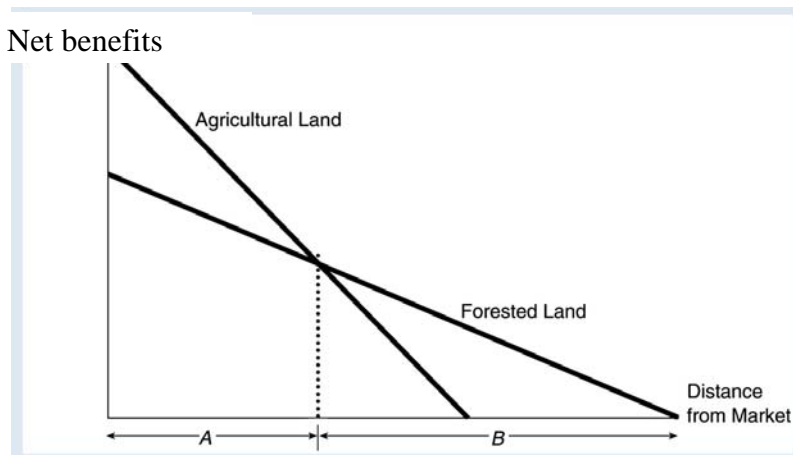
1. According to the biological decision rule, when should a forested be harvested? Will this maximize economic efficiency? Explain.

Biological decision rule: harvest when MAI is maximized

Economic decision rule: harvest when PV of net benefits is maximized

Biological decision rule will only maximize economic efficiency if it happens to maximize the PV of net benefits. The maximum annual increment being maximized does not imply that net benefits will be largest.

2. With the aid of a graph, explain efficient conversion of forest land into agricultural land. Under what circumstances might this conversion be efficient?

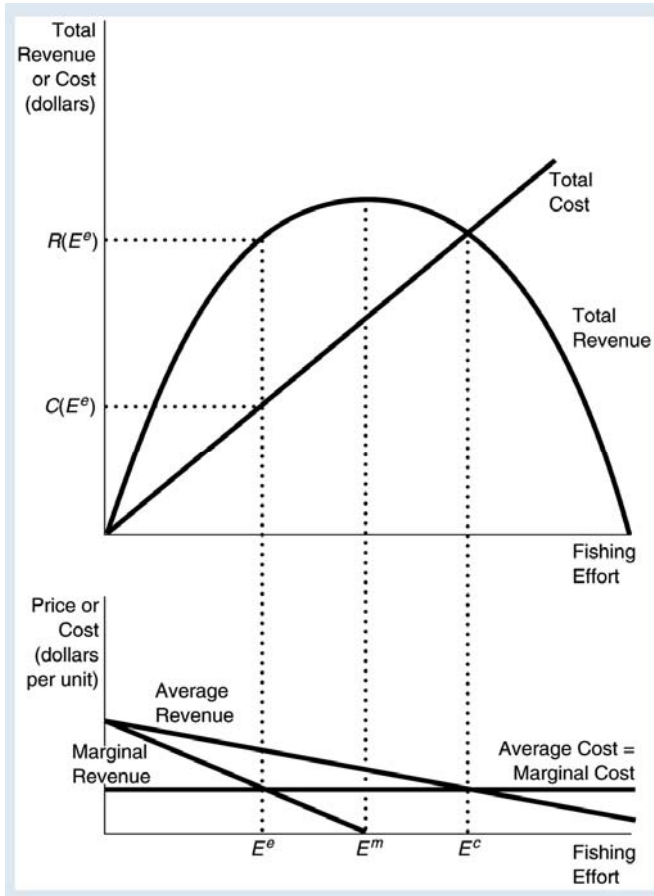


- allocate closest land to agriculture (A)
- other land to forest (B)
- efficient conversion occurs when these net benefit functions change
- agriculture net benefits may change if
  - i. population increases (need more food)
  - ii. new technology lower costs
- forests net benefits may change if
  - i. demand for forest products changes

3. With the aid of a graph, explain whether economic rent will be earned in the fishery? Why or why not?

Economic rent originates from the productivity of the fish stock, where more fish implies greater catch with less effort (cost).

The optimal effort, that effort which maximizes economic rent, occurs at  $E_0$ .



In an open-access fishery, when economic rent is earned in the fishery, entrance by new firms occurs until economic rent falls to zero, effort level of  $E_c$ .

The entrance of firms in response to economic rent and the resulting increase in effort to  $E_c$  results in  $AR = MC$  rather than the optimal effort level of  $E_0$  where  $MR = MC$ .

4. Australian lobstermen fear a collapse of the lobster industry from over-harvesting. They are comparing various policy options for regulation. Use the following information to analyze their choice.

Suppose it costs \$30 for each lobster trap set. Lobsters sell for \$15. If  $X$  traps are set, the harvest rate of lobsters,  $L$ , as a function of the number of traps, is given by:

$$L = 45X - X^2.$$

- a. With no restrictions on the number of traps, and open access to the waters, how many traps will be set? How many lobsters will be harvested? How much profit will be realized from lobstering?

$$\begin{aligned} X &= 43 \text{ traps} \\ L &= 86 \text{ lobsters} \\ \text{Profit} &= 0 \end{aligned}$$

- b. Suppose lobstermen could limit the number of traps permitted. How many traps should be permitted, if Australia wanted to maximize overall profits from lobstering? How many lobsters would be harvested? What would total profits be from lobstering?

$$\begin{aligned} X &= 21.5 \text{ traps} \\ L &= 505.25 \text{ lobsters} \\ \text{Profit} &= \$6933.75 \end{aligned}$$