



- A. Diminishing marginal returns does not allow for a change in production due to technology changes. It assumes that technology is constant.
1. In 1798, Malthus observed that land is fixed and the population was constantly rising. This implied diminishing marginal returns to farming and eventual negative returns. Malthus predicted that famine was inevitable and would wipe out populations of people. When there were less people, each could enjoy more food and the cycle would start all over again as the population increased.
  2. His analysis ignored changes in technology. US farm productivity rose 4.5% per year between 1970 and 2000. Farms were more productive because of technological improvements and a dramatic change in ability to increase yield.
  3. Economics is often called Dismal Science because of mistaken insights such as this one.
- II. Production in the long run is different because it is flexible to changes in both capital and labor. Both can vary and be substituted freely.
- A. Many different combinations of capital and labor can be used to produce the same level of output. For example, to manufacture chairs, the firm can use labor and 17<sup>th</sup> century tools, or can use machines and technology.
- B. **Isoquant curves** show the efficient combinations of labor and capital that can produce a single quantity of output. It links all the bundles of labor and capital that can be used to produce a quantity of output.
1. Isoquants are similar to indifference curves on the consumer side. While an indifference curve links two goods that give the consumer the same level of utility, isoquants link two inputs that give the same level of output.
  2. Just as with indifference curves, there are certain rules for the possible shapes of isoquants.
    - a. Efficient production implies that as you use more of both inputs (move toward the northeast) production must be rising. Therefore, the further the isoquant is from the origin, the greater the level of output.
    - b. Isoquants cannot cross, because this would mean that the same amount of production occurs on both curve, but some points use more of both.
    - c. Isoquants must have a negative slope.
  3. The shape of the isoquant is determined by the substitutability of one input for another.
    - a. If inputs are perfect substitutes, the isoquants will be straight lines. If a machine does exactly the same work as one man, the firm will be indifferent to one machine or one man.
    - b. If inputs are perfect complements, the isoquants will be L-shaped. If you have a lot of extra cereal but no extra boxes, the extra cereal is of no use. You cannot increase output.