



Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

Lecture 3

Production Functions: Meaning and Types



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

The production function

The production function portrays an input-output relationship. It describes the rate at which resources are transformed into products. There are numerous input-output relationships in agriculture because the rates at which the inputs are transformed into outputs will vary among soil types, animals, technologies, rainfall amount and so forth. Definition: Production function is a technical and mathematical relationship describing the manner and extent to which a particular product depends upon the quantities of inputs or services of inputs, used at a given level of technology and in a given period of time



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

It shows the quantity of output that can be produced using different levels of inputs. A production function can be expressed in different ways: in written form, enumerating and describing the inputs that have a bearing on the output; by listing inputs and the resulting outputs numerically in a table; depicting in the form of a graph or a diagram; and in the form of an algebraic equation. Symbolically, a production function can be written as

$Y=f(X_1, X_2, X_3, \dots, X_n)$ where Y is output, $X_1, X_2, X_3, \dots, X_n$ are inputs. It, however, does not tell which inputs are fixed and which are the variable ones.

Since in production, fixed inputs play an important role, these are expressed as: $Y=f(X_1, X_2 / X_3, \dots, X_n)$ where Y is output, X_1, X_2 are variable inputs and X_3, \dots, X_n are fixed inputs.



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

Types of Production Functions

Linear Production Function: Also known as first degree polynomial. It's algebraic form is given by $y = a_0 + bx$ where a_0 is the intercept and b is the slope of the function. It is not commonly used in research because it violates the basic assumptions of characteristic functional analysis.



Centurion
UNIVERSITY
*Shaping Lives...
Empowering Communities...*

Quadratic PF: Also known as second degree polynomial. This type of PF allows both declining & negative marginal productivity thus embracing the second and third stage of production simultaneously. $y = b_0 + b_1 x + b_2 x^2$ where b_0 , b_1 , & b_2 , are the parameters. Such PFs are quite common in $0 \leq x < \infty$ fertilizer response studies.



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

Cobb-Douglas PF:

It is also known as power production function. It is most widely used PF. It accounts for only our stage of production at a time & cannot represent constant, increasing or decreasing marginal productivity simultaneously. $Y = b_0 x^{b_1}$ where b_0 is efficiency parameters & b_1 is elasticity of production