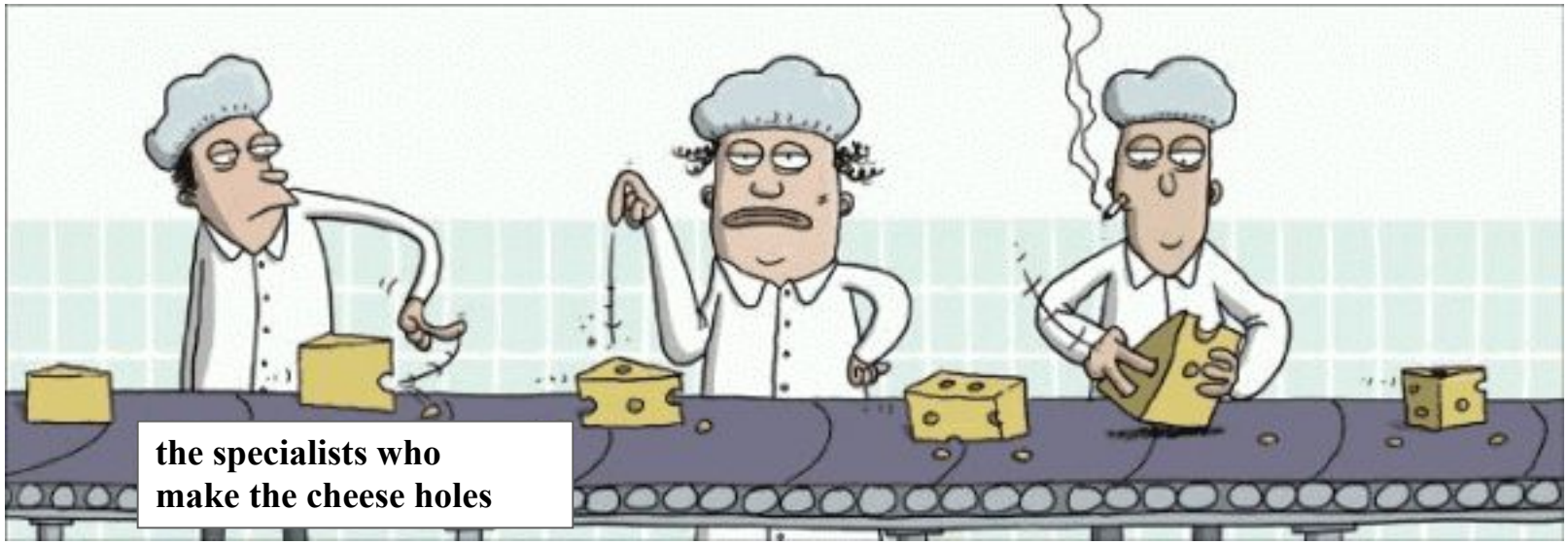
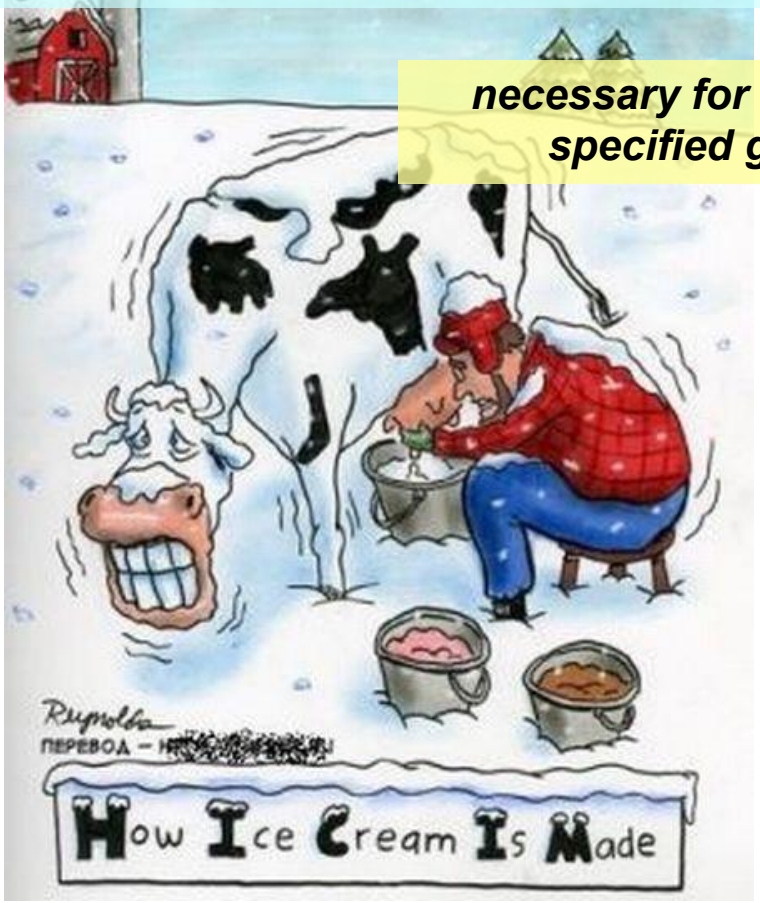
Analysis of production



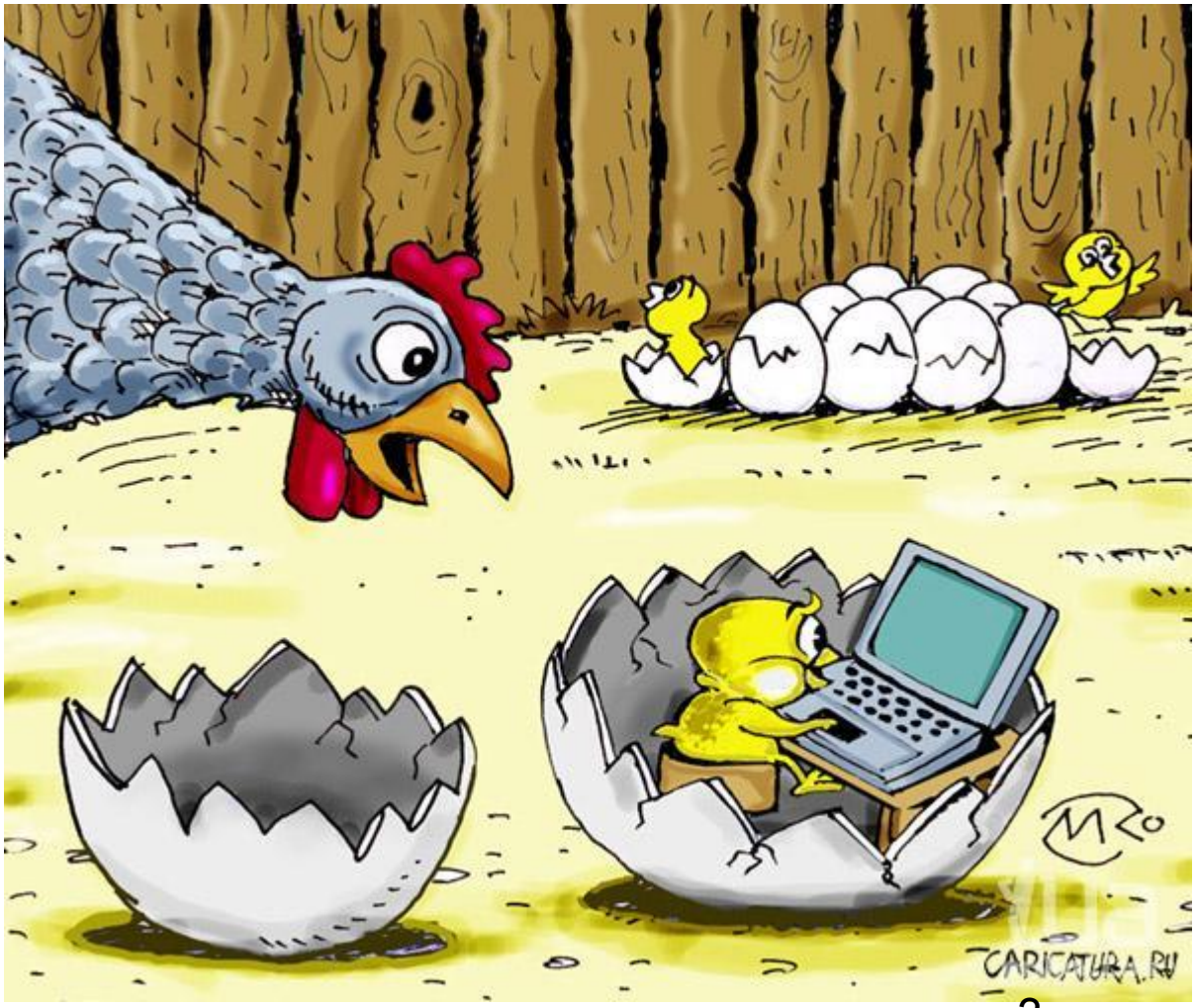
Once the need for this type of goods or services is established,

the next step in production management should be determination of the most profitable way to use the resources of this company,

necessary for the production of the specified goods or services



To make the best decisions it is necessary to introduce the concept of "production function"



Production function - interdependence **"input-output"** between one or more input factors of production and produced goods or services

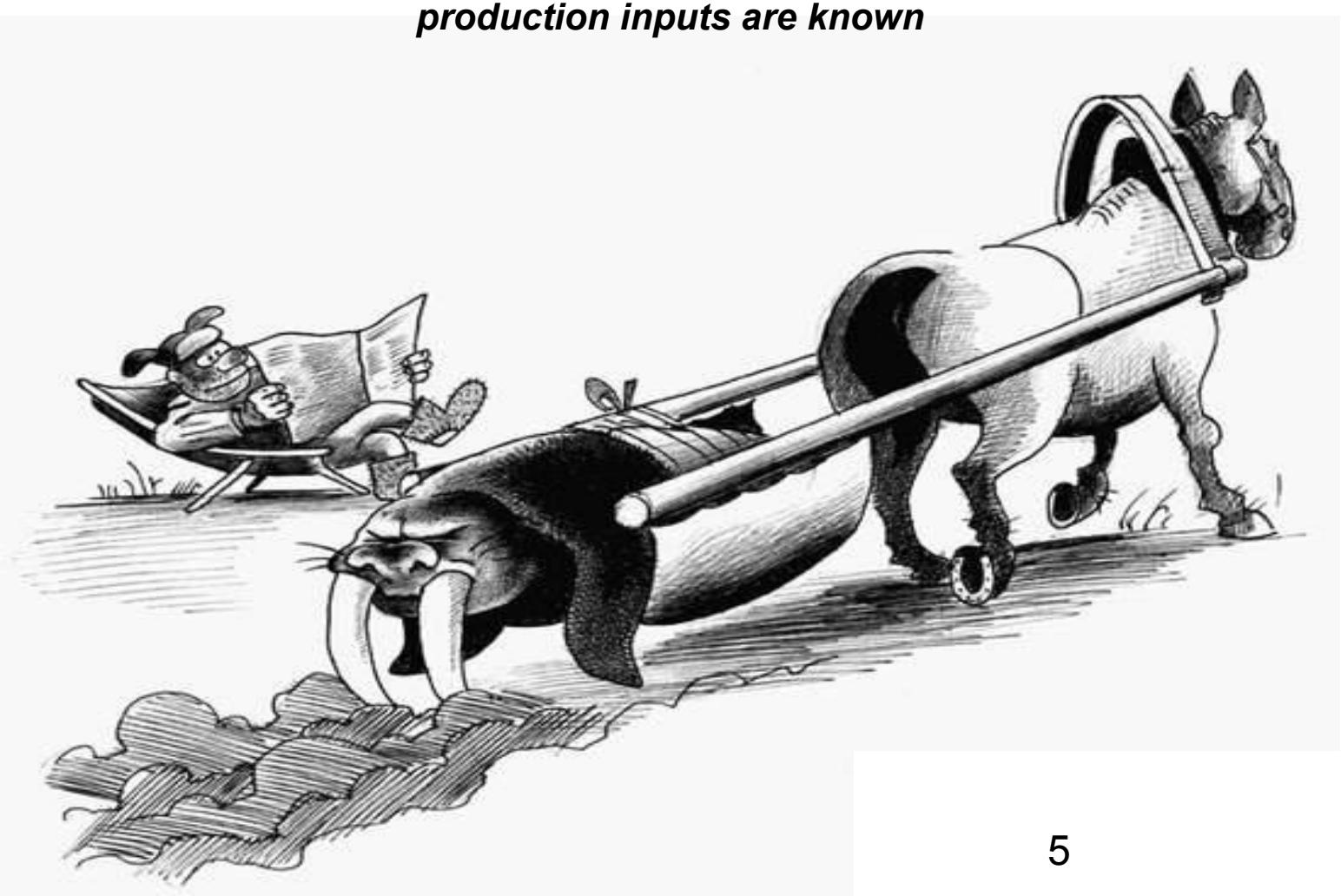
Determination of the most **efficient combination of inputs**, providing a given level of output

Determination of the **maximum achievable level** of output given the level and structure of inputs

The production function is the base for ***cost analysis***

The production function is the base for cost analysis

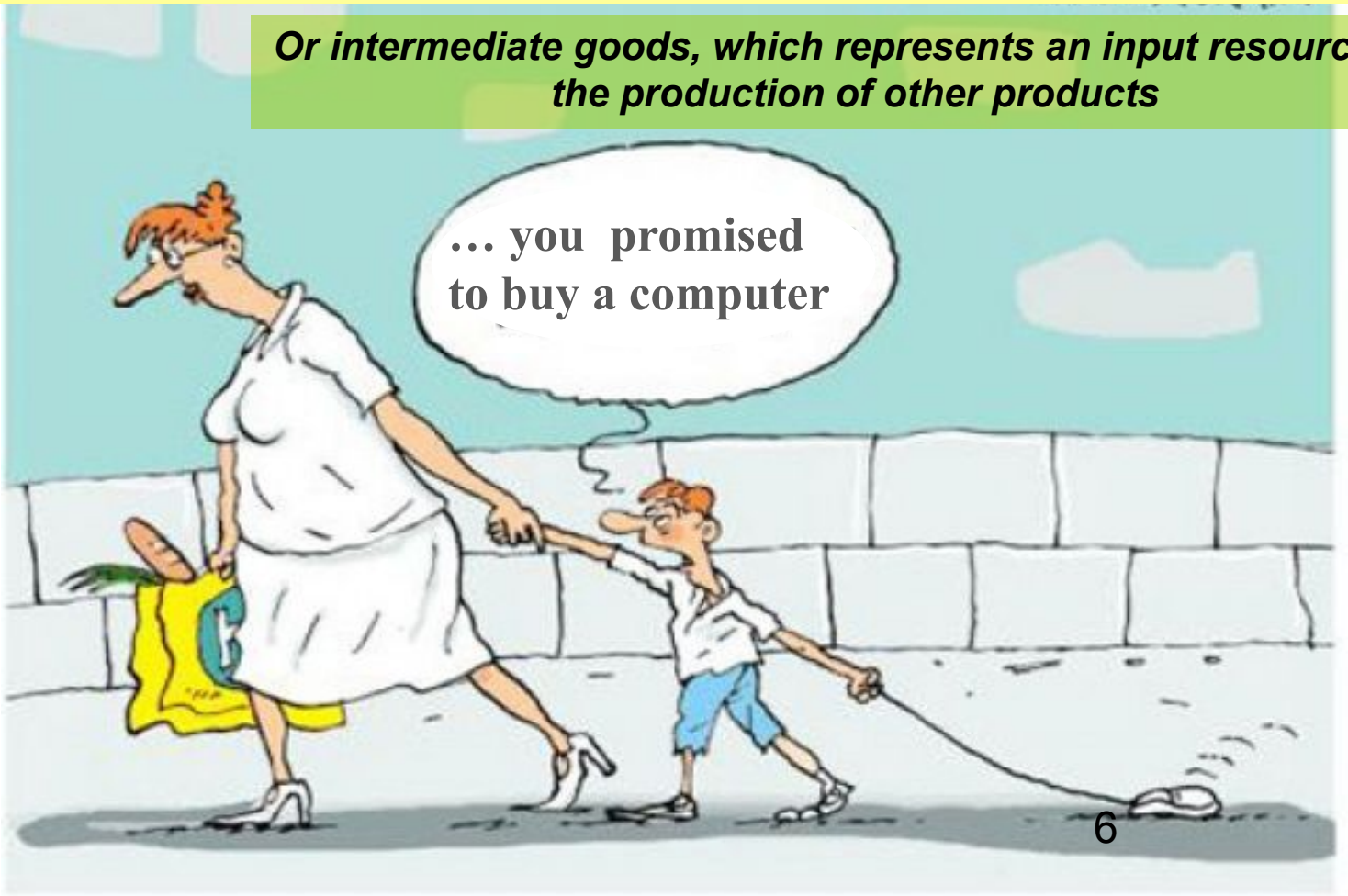
Defining the production function of a certain company, you can define the cost function, provided that the market prices of production inputs are known



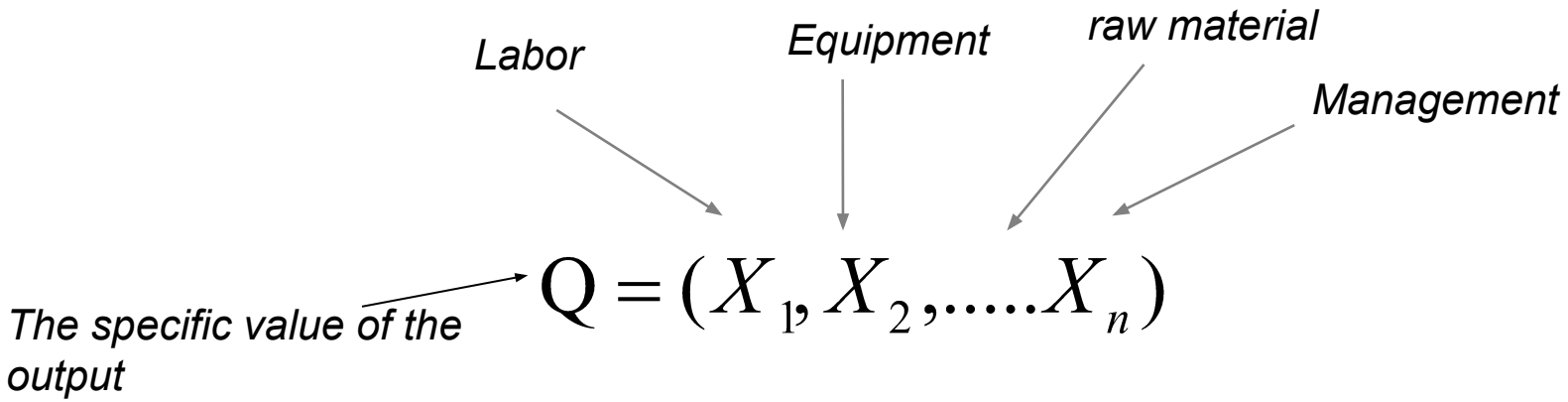
<u>Production</u> is the process of transformation of inputs such as labor, materials, equipment into finished products after a certain period

Finished products can be consumer commodities ready for sale to the ultimate consumer

Or intermediate goods, which represents an input resource for the production of other products



By analogy with the demand function, the production function can be represented in the form of a table, graphically or analytically:



All inputs can be grouped into
two main factors of production: capital, C and labor, L:

$$Q = f(C, L)$$

It is important to bear in mind that

The production function corresponds to the given *level of technology*

If this level of technology is changing due to the increase in quality of labor, materials, equipment, processing, and management,

the production function is changing accordingly

394. Мосин А.
Развивайте свиноводство! 1955

At any given moment the production inputs can be divided into two categories:

2 categories of production factors:

Fixed factors of production

Are in most cases capital resources

Land, buildings, equipment

The quantity cannot be changed during the considered period of time

2 categories of production factors:

Fixed factors of production

and the concept of "short period" should be interpreted as a period during which some part of the input factors of production remains constant

Are in most cases capital resources

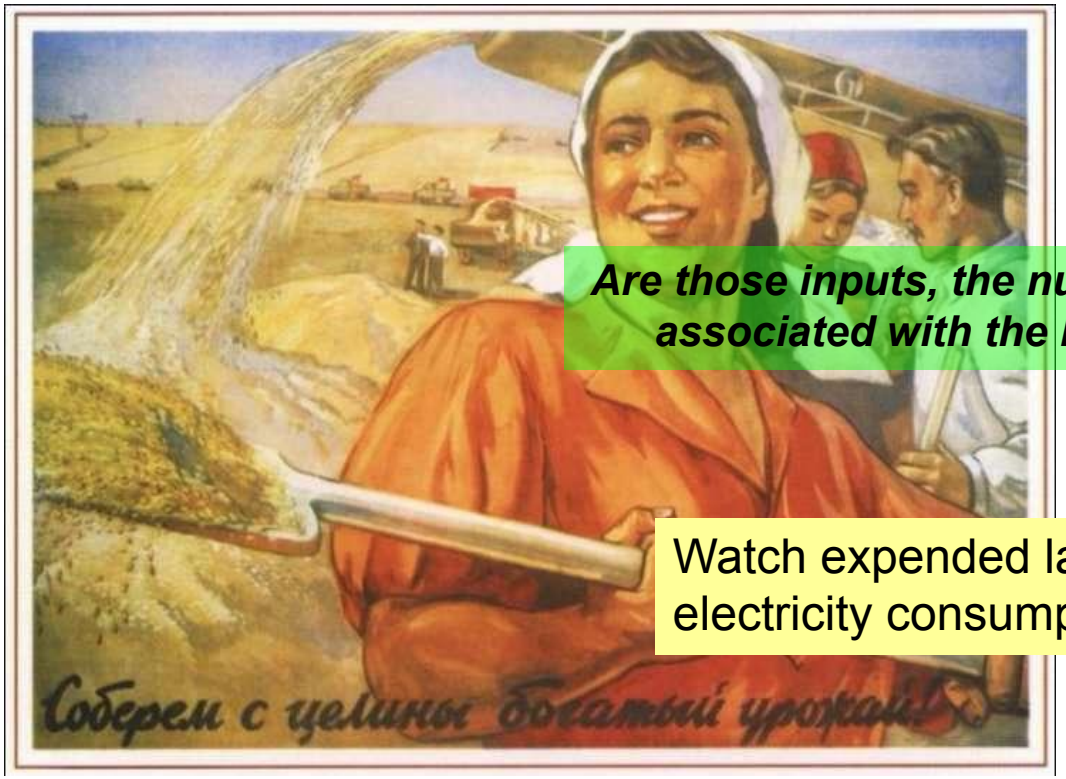
Land, buildings, equipment

The quantity cannot be changed during the considered period of time

2 categories of production factors:

Fixed factors of production

Variable factors of production

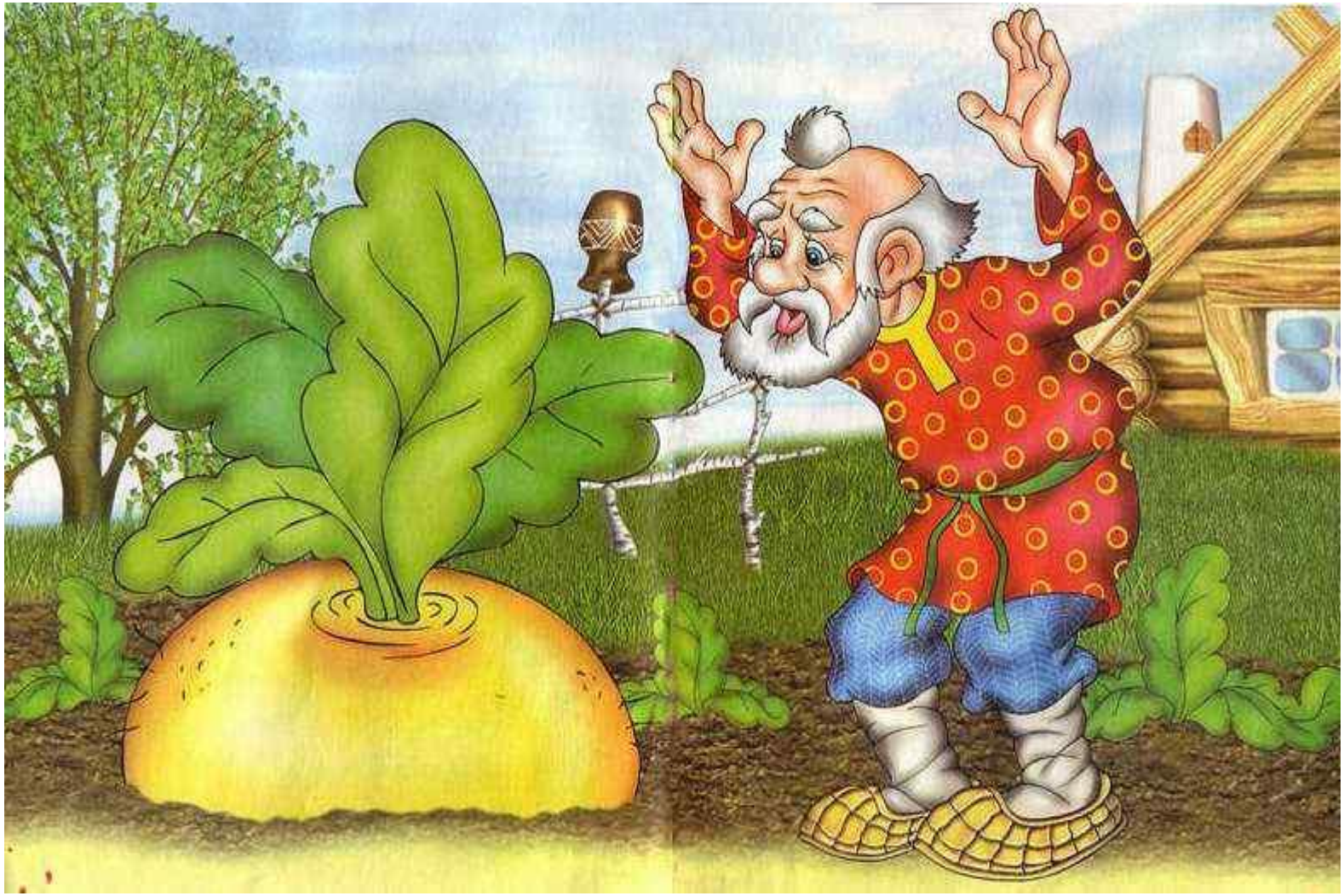


Are those inputs, the number of which is associated with the level of output

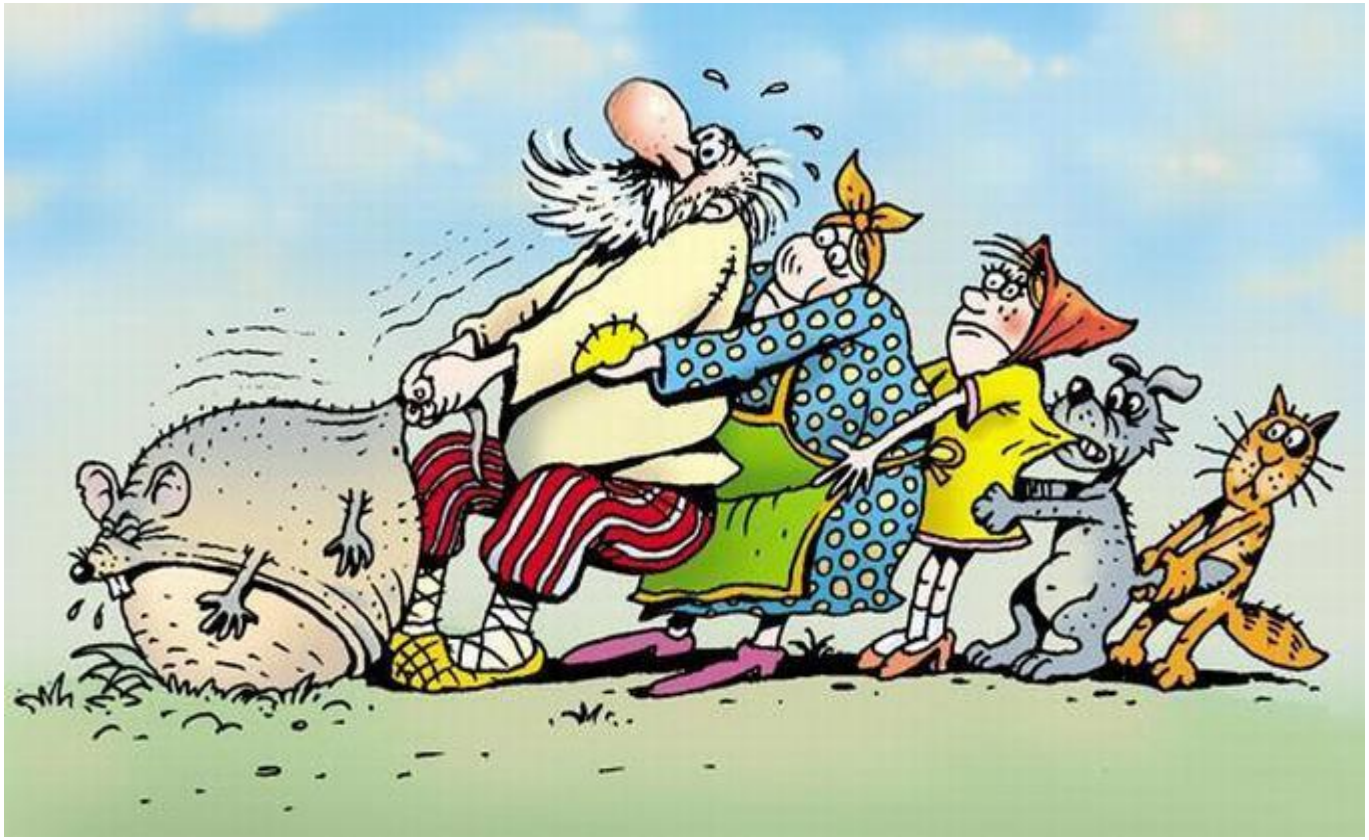
Watch expended labor, electricity consumption

The efficiency of production depends on the balance that is achieved between fixed and variable factors of production

Lack of manpower, or direct labor (variable factor of production) will lead to insufficient use of equipment (fixed factor of production).



And only if you can balance the constant and variable factors of production, the firm will achieve maximum production efficiency



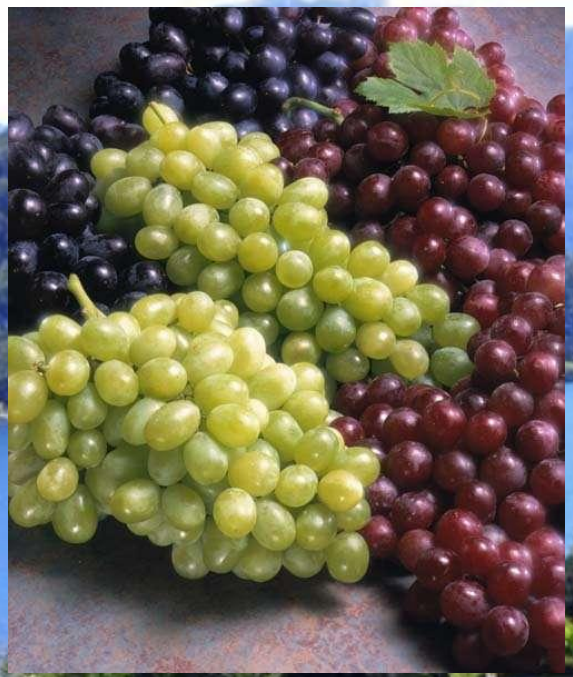
The behavior of the production function with one variable input factor of production providing all other inputs are constant

To understand the mechanism of changes in the level of production it is useful to assess the impact of one input changing while preserving all other inputs unchanged

Mathematically this functional dependence can be represented by the following equation:

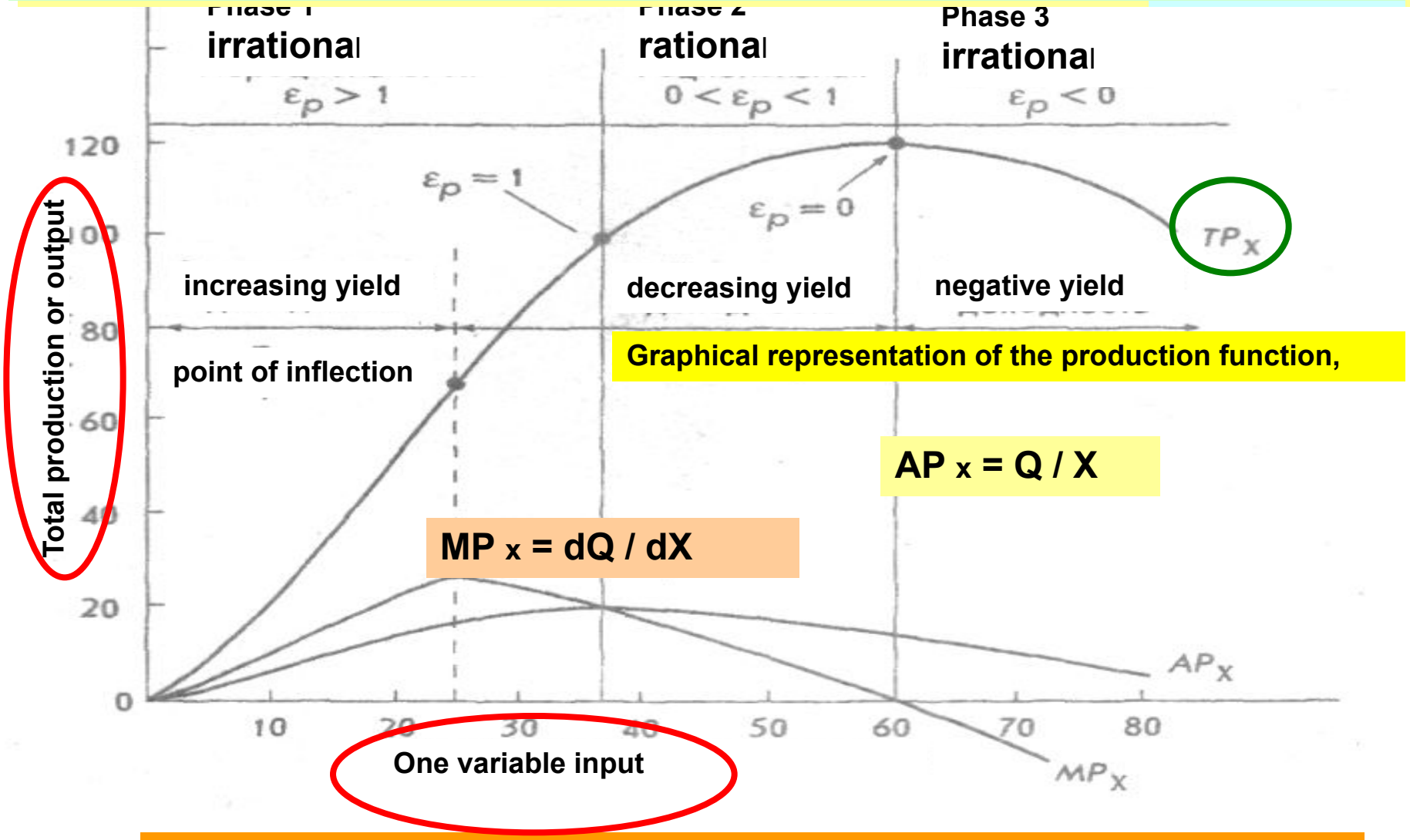
$$Q = f(X_1 \mid X_2, X_3, \ldots, X_n)$$

Later the grapes from each plot will be weighed separately



(1) the number of bags of fertilizer X	(2) Total production (pounds) Q	(3) Average production (pounds/bag) $AP_x = Q/X$	(4) Marginal product (pounds) $MP_x = \Delta Q/\Delta X$
0	850	–	
			85
10	1700	170	
			180
20	3500	175	
			340
30	6900	230	
			310
40	10 000	250	
			150
50	11 500	230	
			110
60	12 600	210	
			−105
70	11 550	165	
			−115
80	10 400	130	

The point of decreasing yield- X = 25; On the curve of the total production it is reflected in the inflection point (feature from concave upward moves in a concave down)



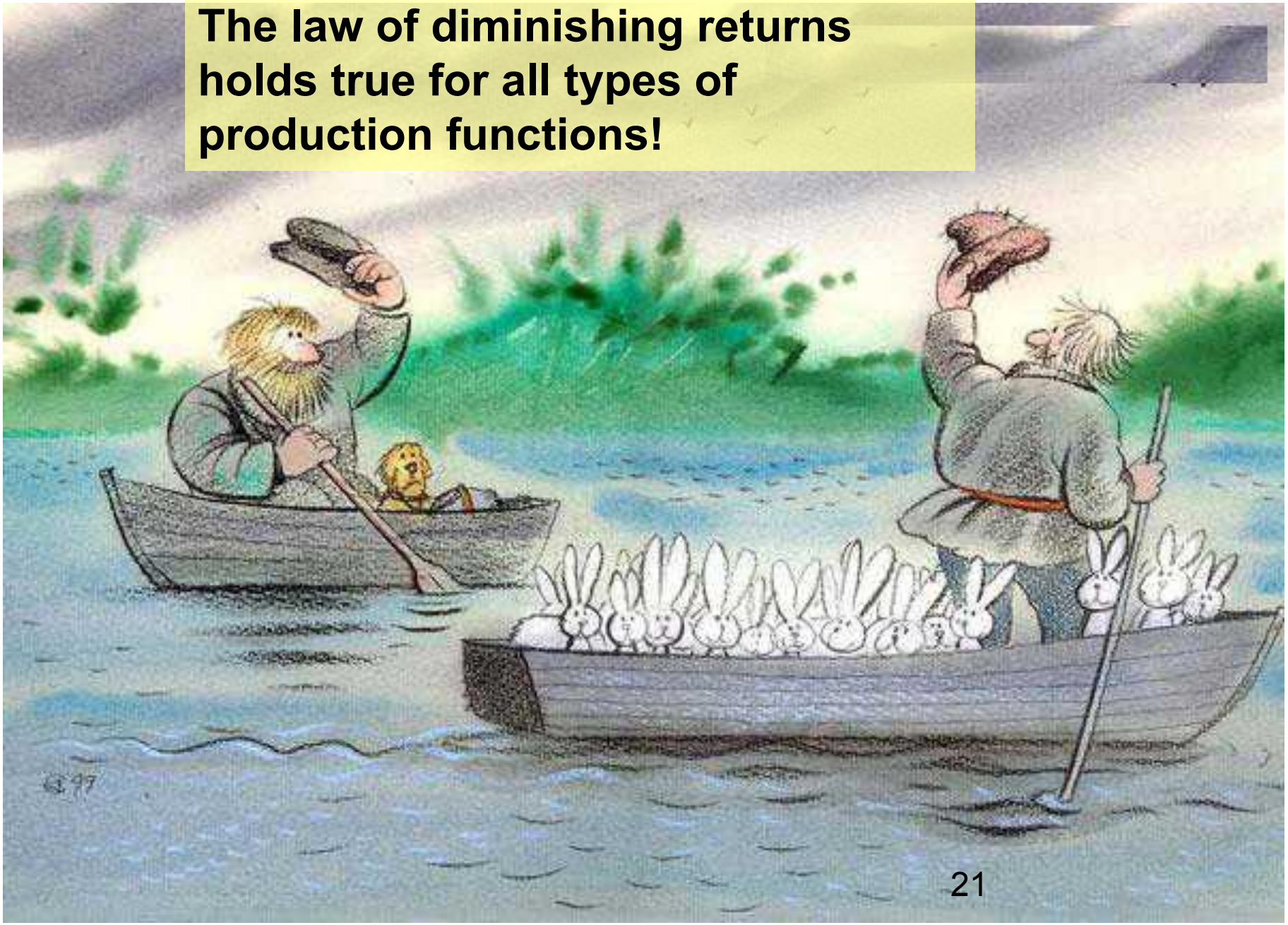
Graphical representation of the production function,

$AP_x = Q / X$

$MP_x = dQ / dX$

What conclusions can be drawn based on the analysis of these curves?

The law of diminishing returns holds true for all types of production functions!



Responding to this event point corresponds to the maximum production efficiency

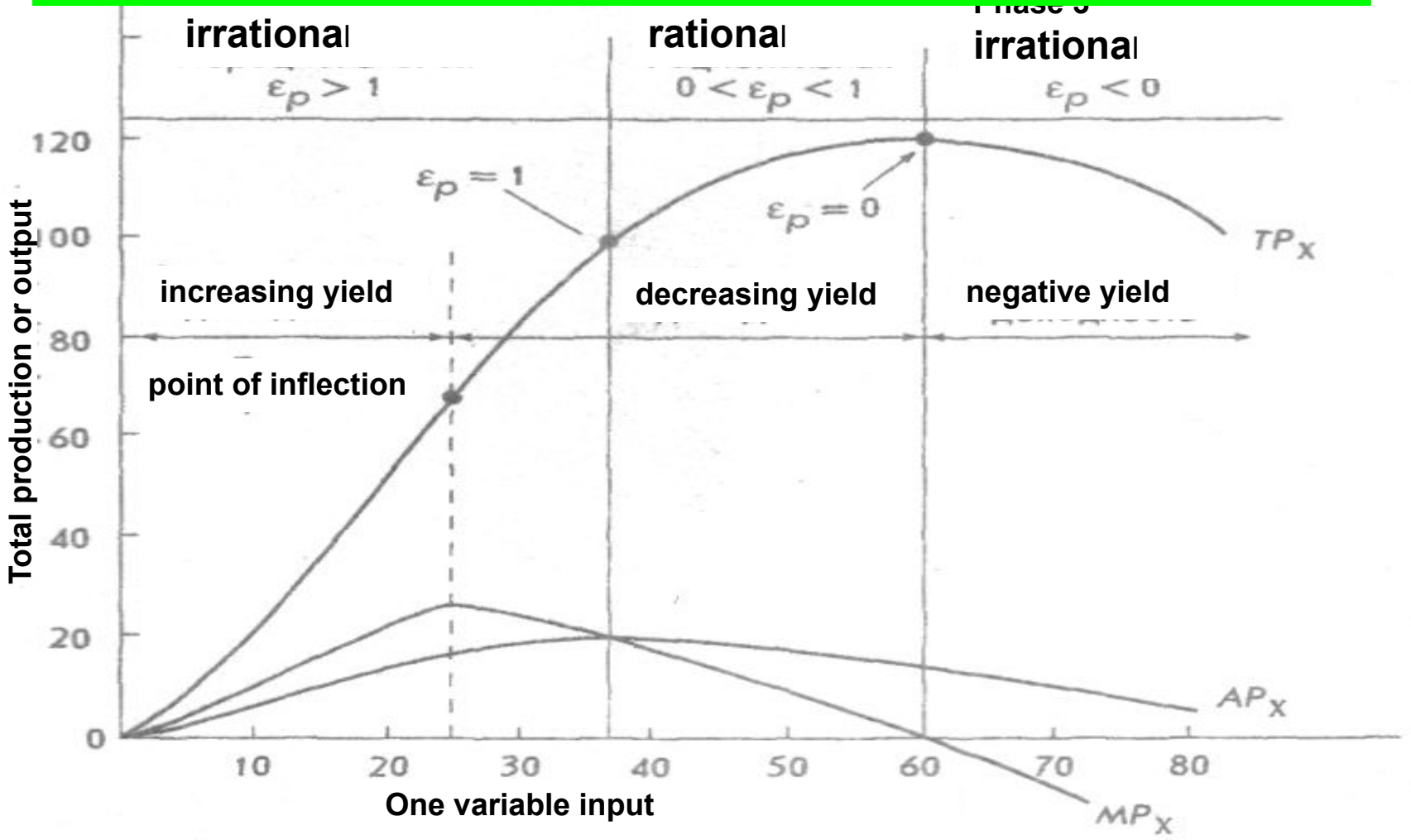
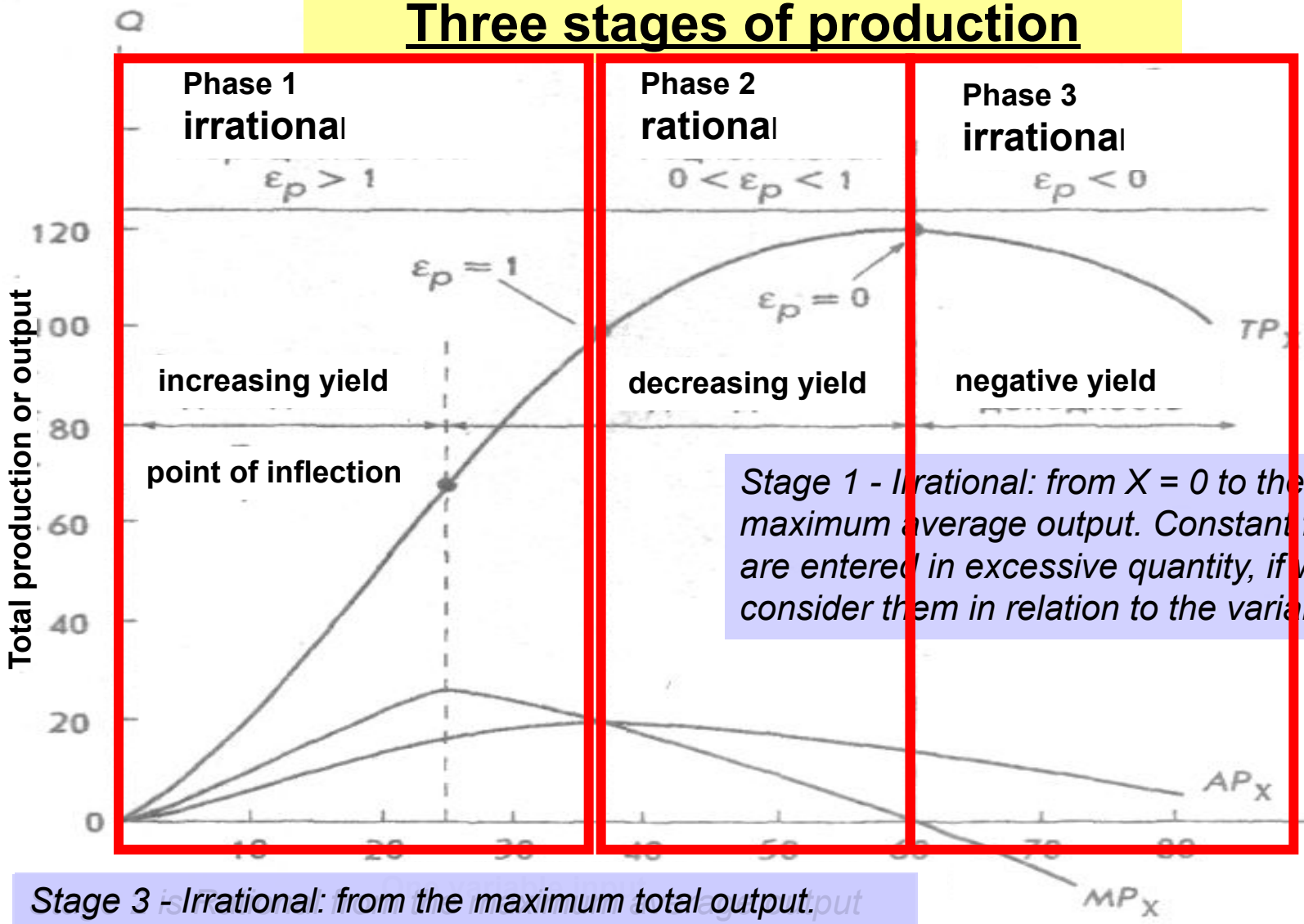


Рис. 10.1. Соотношения производственной функции

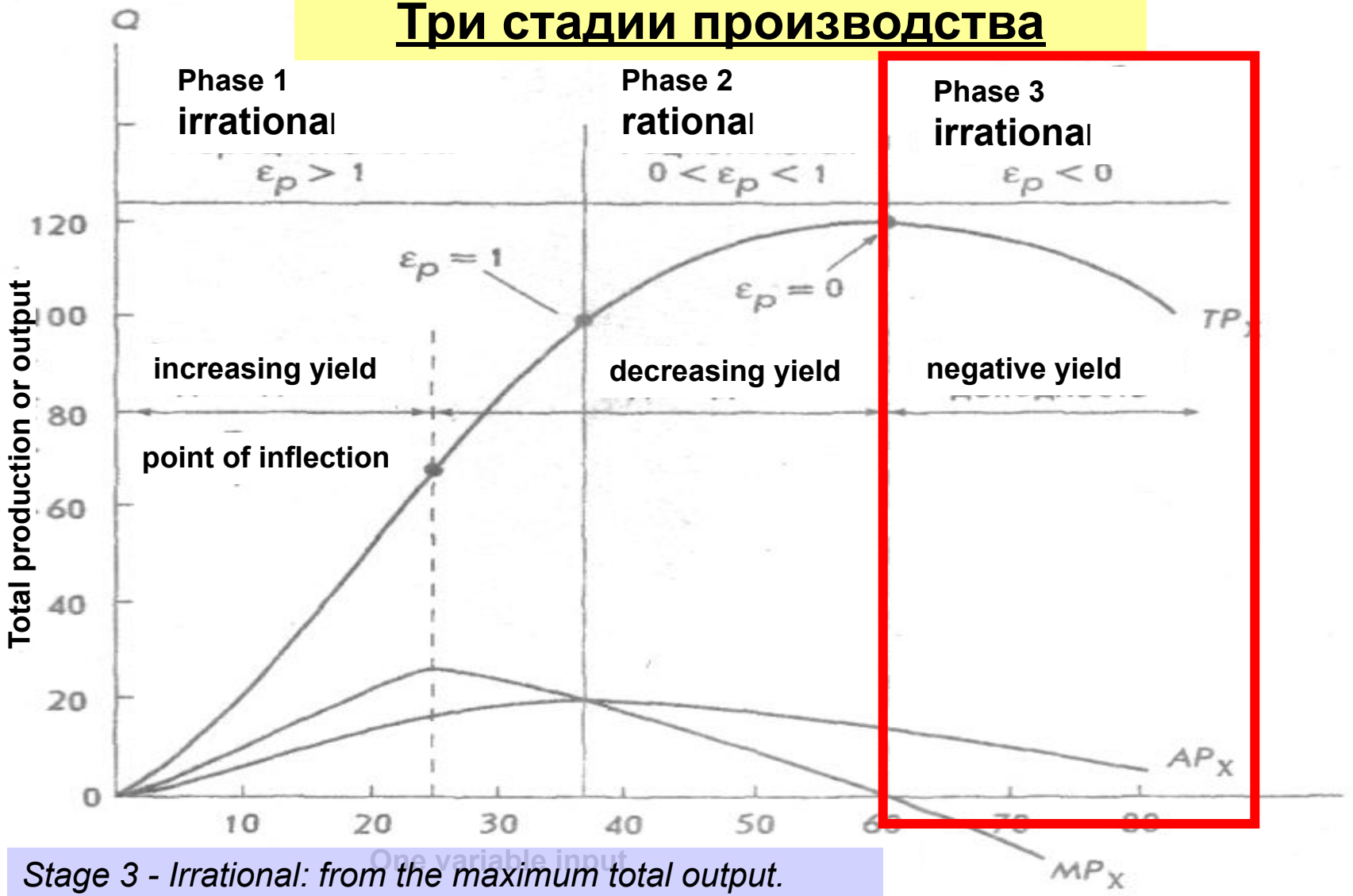
Three stages of production



Stage 1 - Irrational: from X = 0 to the maximum average output. Constant factors are entered in excessive quantity, if we consider them in relation to the variable factor

Stage 3 - Irrational: from the maximum total output. Variable factor is introduced into the production process in excess

Три стадии производства



Stage 3 - Irrational: from the maximum total output. Variable factor is introduced into the production process in excess

From the graph you can clearly get an idea about what "elasticity of production" means

The elasticity of production

is the ratio of the relative change in total output to slight relative change in a variable input factor of production

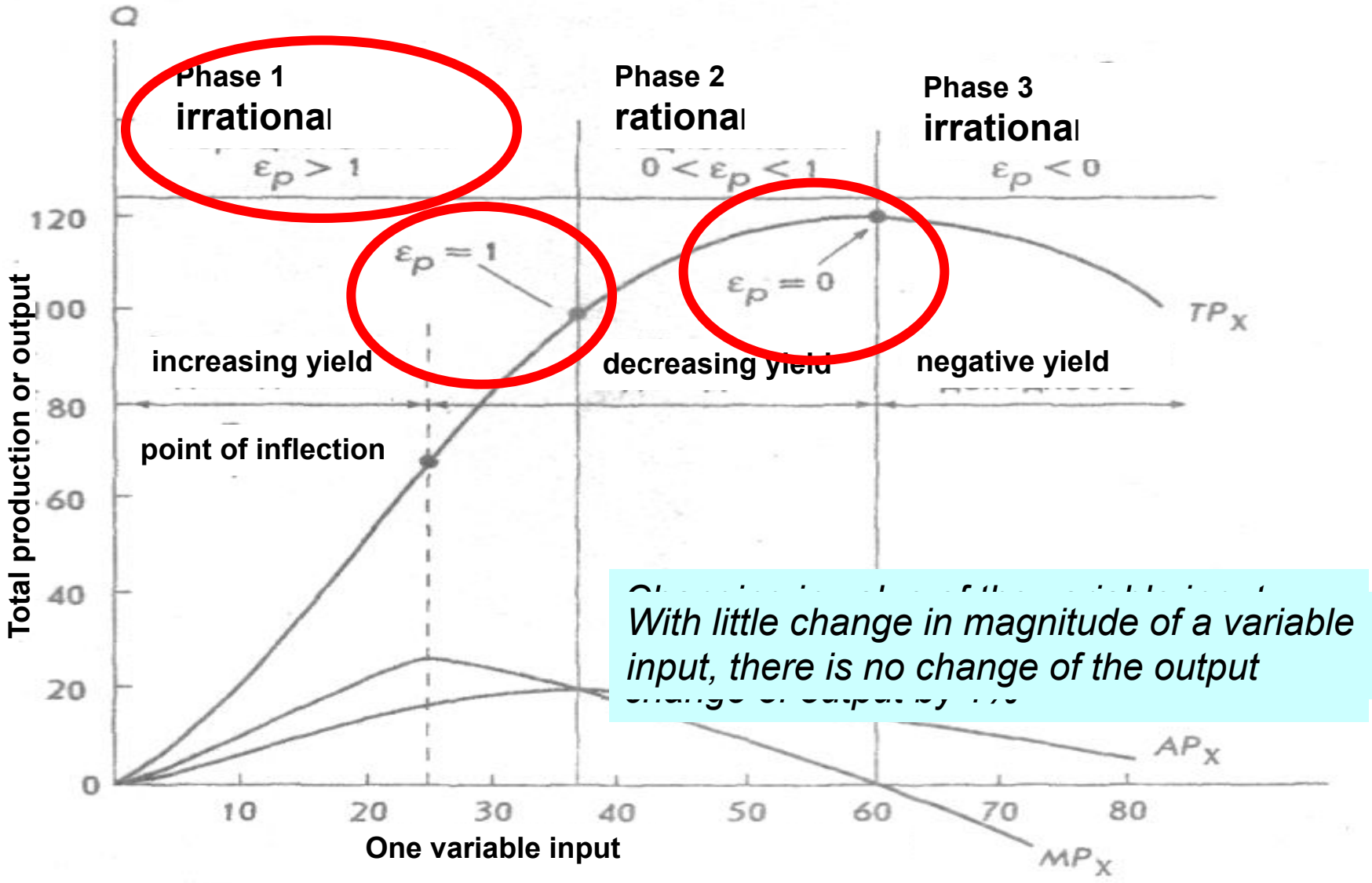
$$\varepsilon_p = \frac{\Delta Q / Q}{\Delta X / X} = \frac{\Delta Q}{\Delta X} \cdot \frac{X}{Q} = \frac{\Delta Q / \Delta X}{Q / X}$$

= MP

=AP

$$\varepsilon_p = \frac{MP}{AP}$$

The elasticity of production is the ratio of the marginal product and average product



With little change in magnitude of a variable input, there is no change of the output

Рис. 10.1. Соотношения производственной функции