PRODUCTION FUNCTION IN ECONOMICS pdf

1: What is the production function in economics? - Market Business News

The production function simply states the quantity of output (q) that a firm can produce as a function of the quantity of inputs to production, or. There can be a number of different inputs to production, i.e. "factors of production," but they are generally designated as either capital or labor.

Contact What is production function? Definition and meaning The production function is a mathematical method of describing the relationship between the quantity of inputs utilized by a company and how much it produces with them output , i. Production is the result of cooperation of 1. Entrepreneurship â€" the four factors of production. Input refers to the factors of production. If, in order to produce one more unit of an item requires a lower quantity of inputs compared to what was needed to make the last unit, the company is said to be enjoying increasing returns to scale, also known as increasing marginal product. If, however, the producer requires more inputs to make the next unit than were required for making the previous one, it is facing diminishing returns to scale, also called diminishing marginal product. Production function is a mathematical method that describes the input-output relationship. Input consists of the four factors of production â€" land, capital, labor and entrepreneurship. How those four factors are combined, and in which proportions, can affect the output total, as well as productivity. According to Encyclopedia Britannica , by definition production function, in economics, equation that expresses the relationship between the quantities of productive factors used and the amount of product obtained. It states the amount of product that can be obtained from every combination of factors, assuming that the most efficient available methods of production are used. The production function of a commercial enterprise generally focuses on the physical things â€" it does not take into account the abstract aspects of products, such as prices. Neoclassical economics focuses on the determination of goods, outputs, and income distributions in the economy through supply and demand Businesses use production function to find out how much output they should get given the market price of a product, and what input combinations they should use to produce something given the price of labor and capital. It is defined for a given set of technical knowledge. It can answer a range of questions that management needs to answer when planning production and prices. It can measure marginal productivity of a specific factor of production â€" how output changes from one extra unit of that factor. Production function reflects how much output we should expect if we have so much of one factor of production, say labor, and so much of another factor, such a capital, and so much of another, etc. It is the indicator of the physical relationship between inputs and output of a producer. A production function may be expressed with this mathematical equation: Every time there is a new development in technology, the production function of that company undergoes a change. This new production function caused by new technology displays either: On some occasions, a new production function slows everything down or undermines efficiency and productivity â€" it takes more inputs to achieve the same output. A short-run production is said to exist when one or more of the four factors of production have not changed from their initial value â€" this is usually land, and sometimes also capital machinery. Long-run production occurs when all the factors of production have changed. Remember that technically-speaking, the difference between the two is not how long or short the periods are, but rather how many factors have changed. In an article published by Economics Discussion , Majoj Kumar wrote:

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2: How to Calculate Production Function?

Production function, in economics, equation that expresses the relationship between the quantities of productive factors (such as labour and capital) used and the amount of product obtained. It states the amount of product that can be obtained from every combination of factors, assuming that the.

See Article History Alternative Title: The theory involves some of the most fundamental principles of economics. These include the relationship between the prices of commodities and the prices or wages or rents of the productive factors used to produce them and also the relationships between the prices of commodities and productive factors, on the one hand, and the quantities of these commodities and productive factors that are produced or used, on the other. The various decisions a business enterprise makes about its productive activities can be classified into three layers of increasing complexity. The first layer includes decisions about methods of producing a given quantity of the output in a plant of given size and equipment. It involves the problem of what is called short-run cost minimization. The second layer, including the determination of the most profitable quantities of products to produce in any given plant, deals with what is called short-run profit maximization. The third layer, concerning the determination of the most profitable size and equipment of plant, relates to what is called long-run profit maximization. Minimization of short-run costs The production function However much of a commodity a business firm produces, it endeavours to produce it as cheaply as possible. This task is best understood in terms of what is called the production function , i. It states the amount of product that can be obtained from each and every combination of factors. Here, y denotes the quantity of output. The firm is presumed to use n variable factors of production; that is, factors like hourly paid production workers and raw materials, the quantities of which can be increased or decreased. In the formula the quantity of the first variable factor is denoted by x1 and so on. The firm is also presumed to use m fixed factors, or factors like fixed machinery, salaried staff, etc. The available quantity of the first fixed factor is indicated in the formal by k1 and so on. The entire formula expresses the amount of output that results when specified quantities of factors are employed. It must be noted that though the quantities of the factors determine the quantity of output, the reverse is not true, and as a general rule there will be many combinations of productive factors that could be used to produce the same output. Finding the cheapest of these is the problem of cost minimization. The cost of production is simply the sum of the costs of all of the various factors. It can be written: The discussion will deal first with variable cost. The principles involved in selecting the cheapest combination of variable factors can be seen in terms of a simple example. Since there are only two variable factors, this production function can be portrayed graphically in a figure known as an isoquant diagram Figure 1. In the graph, goldsmith-hours per month are plotted horizontally and the number of feet of gold wire used per month vertically. Each of the curved lines, called an isoquant, will then represent a certain number of necklace chains produced. The data displayed show that goldsmith-hours plus feet of gold wire can produce necklace chains. But there are other combinations of variable inputs that could also produce necklace chains per month. If the goldsmiths work more carefully and slowly, they can produce chains from feet of wire; but to produce so many chains more goldsmith-hours will be required, perhaps The other two isoquants shown are interpreted similarly. It is obvious that many more isoquants, in principle an infinite number, could also be drawn. This diagram is a graphic display of the relationships expressed in the production function. Substitution of factors The isoquants also illustrate an important economic phenomenon: This means that one variable factor can be substituted for others; as a general rule a more lavish use of one variable factor will permit an unchanged amount of output to be produced with fewer units of some or all of the others. In the example above, labour was literally as good as gold and could be substituted for it. If it were not for factor substitution there would be no room for further decision after y, the number of chains to be produced, had been established. The shape of the isoquants shown, for which there is a good deal of empirical support, is very important. In moving along any one isoquant, the more of one factor that is employed, the less of the other will be needed to maintain the stated output; this is the graphic representation of factor substitutability. But there is a corollary: In the diagram, if feet of gold wire are indicated by x1 and goldsmith-hours by x2,

then the marginal rate of substitution is shown by the steepness the negative of the slope of the isoquant; and it will be seen that it diminishes steadily as x2 increases because it becomes harder and harder to economize on the use of gold simply by taking more care. The remainder of the analysis rests heavily on the assumption that diminishing marginal rates of substitution are characteristic of the production process generally. The cost data and the technological data can now be brought together. The straight line labelled v2, called the v2-isocost line, shows all the combinations of input that can be purchased for a specified variable cost, v2. The other two isocost lines shown are interpreted similarly. The slope of an isocost line is found by dividing p2 by p1 and depends only on the ratio of the prices of the two factors. Isoquant diagram for two factors of production, x1 and x2 see text. Three isocost lines are shown, corresponding to variable costs amounting to v1, v2, and v3. If units are to be produced, expenditure of v1 on variable factors will not suffice since the v1-isocost line never reaches the isoquant for units. An expenditure of v3 is more than sufficient; and v2 is the lowest variable cost for which units can be produced. It may be noted that the cheapest combination for the production of any quantity will be found at the point at which the relevant isoquant is tangent to an isocost line. Thus, since the slope of an isoquant is given by the marginal rate of substitution, any firm trying to produce as cheaply as possible will always purchase or hire factors in quantities such that the marginal rate of substitution will equal the ratio of their prices. The isoquantâ€"isocost diagram or the corresponding solution by the alternative means of the calculus solves the short-run cost minimization problem by determining the least-cost combination of variable factors that can produce a given output in a given plant. The variable cost incurred when the least-cost combination of inputs is used in conjunction with a given outfit of fixed equipment is called the variable cost of that quantity of output and denoted VC y. The total cost incurred, variable plus fixed, is the short-run cost of that output, denoted SRC y. Marginal cost Two other concepts now become important. The average variable cost, written AVC y , is the variable cost per unit of output. The marginal variable cost, or simply marginal cost [MC y] is, roughly, the increase in variable cost incurred when output is increased by one unit; i. Though for theoretical purposes a more precise definition can be obtained by regarding VC y as a continuous function of output, this is not necessary in the present case. The usual behaviour of average and marginal variable costs in response to changes in the level of output from a given fixed plant is shown in Figure 3. In this figure costs in dollars per unit are measured vertically and output in units per year is shown horizontally. The figure is drawn for some particular fixed plant, and it can be seen that average costs are fairly high for very low levels of output relative to the size of the plant, largely because there is not enough work to keep a well-balanced work force fully occupied. People are either idle much of the time or shifting, expensively, from job to job. As output increases from a low level, average costs decline to a low plateau. But as the capacity of the plant is approached, the inefficiencies incident on plant congestion force average costs up quite rapidly. Overtime may be incurred, outmoded equipment and inexperienced hands may be called into use, there may not be time to take machinery off the line for routine maintenance; or minor breakdowns and delays may disrupt schedules seriously because of inadequate slack and reserves. Thus the AVC curve has the flat-bottomed U-shape shown. Maximization of short-run profits The average and marginal cost curves just deduced are the keys to the solution of the second-level problem, the determination of the most profitable level of output to produce in a given plant. The only additional datum needed is the price of the product, say p0. The most profitable amount of output may be found by using these data. If the marginal cost of any given output y is less than the price, sales revenues will increase more than costs if output is increased by one unit or even a few more ; and profits will rise. Contrariwise, if the marginal cost is greater than the price, profits will be increased by cutting back output by at least one unit. This is the second basic finding: Such a conclusion is shown in Figure 3. Marginal cost and price The conclusion that marginal cost tends to equal price is important in that it shows how the quantity of output produced by a firm is influenced by the market price. At any higher market price, the firm will produce the quantity for which marginal cost equals that price. Thus the quantity that the firm will produce in response to any price can be found in Figure 3 by reading the marginal cost curve, and for this reason the marginal cost curve is said to be the short-run supply curve for the firm. The short-run supply curve for a productâ€"that is, the total amount that all the firms producing it will produce in response to any market priceâ€"follows immediately, and is seen to be the

sum of the short-run supply curves or marginal cost curves, except when the price is below the bottoms of the average variable cost curves for some firms of all the firms in the industry. This curve is of fundamental importance for economic analysis, for together with the demand curve for the product it determines the market price of the commodity and the amount that will be produced and purchased. One pitfall must, however, be noted. In the demonstration of the supply curves for the firms, and hence of the industry, it was assumed that factor prices were fixed. Though this is fair enough for a single firm, the fact is that if all firms together attempt to increase their outputs in response to an increase in the price of the product, they are likely to bid up the prices of some or all of the factors of production that they use. In that event the product supply curve as calculated will overstate the increase in output that will be elicited by an increase in price. A more sophisticated type of supply curve, incorporating induced changes in factor prices, is therefore necessary. Such curves are discussed in the standard literature of this subject. Marginal product It is now possible to derive the relationship between product prices and factor prices, which is the basis of the theory of income distribution. To this end, the marginal product of a factor is defined as the amount that output would be increased if one more unit of the factor were employed, all other circumstances remaining the same. Algebraically, it may be expressed as the difference between the product of a given amount of the factor and the product when that factor is increased by an additional unit. The marginal products are closely related to the marginal rates of substitution previously defined. It has already been shown that the marginal rate of substitution also equals the ratio of the prices of the factors, and it therefore follows that the prices or wages of the factors are proportional to their marginal products. This is one of the most significant theoretical findings in economics. To restate it briefly: This is not a question of social equity but merely a consequence of the efforts of businessmen to produce as cheaply as possible. Further, the marginal products of the factors are closely related to marginal costs and, therefore, to product prices. This, also, is a fundamental theorem of income distribution and one of the most significant theorems in economics. Its logic can be perceived directly. If the equality is violated for any factor, the businessman can increase his profits either by hiring units of the factor or by laying them off until the equality is satisfied, and presumably the businessman will do so. The theory of production decisions in the short run, as just outlined, leads to two conclusions of fundamental importance throughout the field of economics about the responses of business firms to the market prices of the commodities they produce and the factors of production they buy or hire: The first explains the supply curves of the commodities produced in an economy. Though the conclusions were deduced within the context of a firm that uses two factors of production, they are clearly applicable in general.

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3: Cobbâ€“Douglas production function - Wikipedia

In economics, a production function relates physical output of a production process to physical inputs or factors of production. It is a mathematical function that relates the maximum amount of output that can be obtained from a given number of inputs - generally capital and labor.

The axes represent the number of physical units used variable input or X and the number of physical units produced output or Y. Production function-- illustrates the relationship between the quantity of variable input and the level of output. The production function could be described as a combination or series of enterprise analyses wherein each point on the production function represents a different enterprise; that is, a different recipe or combination of fixed inputs and variable input. The idea that the production function is a series of enterprises is expanded on in subsequent sections. No business operates with one variable input and one fixed input. Instead, it may be easier to think about fixed and variable inputs as a collection of resources. Any resource or input that cannot be altered during the production period would be considered part of the fixed inputs and inputs that can be varied would be considered variable inputs. In a farm setting during a production season, there may not be enough time to acquire more land, buildings, equipment or labor. These would be fixed inputs. But there may be enough time to borrow more capital with which to buy more fertilizer, seed, pesticides, fuel. These would be the variable inputs. However to simplify illustrating the concept of diminishing marginal productivity, the examples often assume a collection or group of fixed inputs and one variable input. What can we learn by looking at the data or graph? First, as the level of variable input is increased, the level of output: Increases at an increasing rate, then Increases at a decreasing rate, and at some point, decreases. Second, managers should not use so much variable input that the output actually declines. In this example, the manager would not use more than 15 units because the 16th unit does not increase production, and using more than 16 units actually decreases production. The economic concept of marginal physical product can help explain this point. Graph 2 Marginal physical product MPP is the change in the level of output due to a change in the level of variable input; restated, the MPP is the change in TPP for each unit of change in quantity of variable input. Economic theory refers to stage III as the portion of the production function where additional variable input results in decreased output. Managers do not produce in Stage III. Graph 5 Third, there is a minimum level of variable input that the manager should use. If a manager decides to use some of the variable input; is there a minimum quantity of variable input the manager should use? The answer is yes, but why is the answer yes? Consider the example illustrated in the table. Using 1 unit of variable input will result in the production of 1 unit of output. However, using 2 units of variable input will result in the production of 3 units of output. At the first level of production, the variable input, on the average produces just one unit of output. At the second level, each unit of variable input produces 1. Thus increasing the level of input increases that quantity of output for each unit of variable input. Economic theory refers to quantity of output per unit of variable input as the average physical product APP. Graph 3 As long as the APP is increasing, the manager will use more units of the variable input. In this situation, APP increases until the manager is using 11 units of variable input. This is the minimum number of units of variable input the manager will use, if the variable input is used. Economic theory refers to the portion of the production function where the APP is increasing as Stage I. This is the level of variable input where the APP is maximized. Managers will not produce in Stage I because using more variable input will increase the output for each unit of variable input. Average physical product APP -- quantity of output per unit of variable input. How much output is each unit of variable input producing? It is not until the firm reaches stage II declining APP that the answer to the question of whether to use more variable input is unclear.

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4: Production Function Examples

In economics, a production function relates quantities of physical output of a production process to quantities of physical inputs or production function refers as the expression of the technological relation between physical inputs and outputs of the goods.

Estimating this using least squares , he obtained a result for the exponent of labour of 0. Later work in the s prompted them to allow for the exponents on K and L to vary, resulting in estimates that subsequently proved to be very close to improved measure of productivity developed at that time. Douglas remarked "I must admit I was discouraged by this criticism and thought of giving up the effort, but there was something which told me I should hold on. Douglas presented the results of these findings, along with those for other countries, at his address as president of the American Economic Association. Shortly afterwards, Douglas went into politics and was stricken by ill healthâ€"resulting in little further development on his side. However, two decades later, his production function was widely used, being adopted by economists such as Paul Samuelson and Robert Solow. Cobb and Douglas were influenced by statistical evidence that appeared to show that labor and capital shares of total output were constant over time in developed countries; they explained this by statistical fitting least-squares regression of their production function. There is now doubt over whether constancy over time exists. This rationale may be true given the definition of the Capital term. Labor hours and Capital need a better definition. If capital is defined as a building, labor is already included in the development of that building. A building is composed of commodities, labor and risks and general conditions. It was instead developed because it had attractive mathematical characteristics[citation needed], such as diminishing marginal returns to either factor of production and the property that the optimal expenditure shares on any given input of a firm operating a Cobb Douglas technology are constant. Initially, there were no utility foundations for it. In the modern era, economists try to build models up from individual agents acting, rather than imposing a functional form on an entire economy[citation needed]. The Cobbâ€"Douglas production function, if properly defined, can be applied at a micro-economic level, up to a macro- economic level. However, many modern authors[who? Similarly, it is not necessarily the case that a macro Cobbâ€"Douglas applies at the disaggregated level. An early microfoundation of the aggregate Cobbâ€"Douglas technology based on linear activities is derived in Houthakker The purpose of Wikipedia is to present facts, not to train. Please help improve this article either by rewriting the how-to content or by moving it to Wikiversity , Wikibooks or Wikivoyage. May The Cobbâ€"Douglas function is often used as a utility function.

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5: Constant elasticity of substitution - Wikipedia

Here the production function is called the Law of Returns according to the scale of production. As it is difficult to handle more than two variables in graph, we therefore, explain the Law of Returns according to scale of production by assuming only two inputs i.e., capital and labor and study how output responds to their use.

In the long run all factor inputs are variable at the discretion of management. Moysan and Senouci provide an analytical formula for all 2-input, neoclassical production functions. A typical quadratic production function is shown in the following diagram under the assumption of a single variable input or fixed ratios of inputs so they can be treated as a single variable. All points above the production function are unobtainable with current technology, all points below are technically feasible, and all points on the function show the maximum quantity of output obtainable at the specified level of usage of the input. From point A to point C, the firm is experiencing positive but decreasing marginal returns to the variable input. As additional units of the input are employed, output increases but at a decreasing rate. Point B is the point beyond which there are diminishing average returns, as shown by the declining slope of the average physical product curve APP beyond point Y. Point B is just tangent to the steepest ray from the origin hence the average physical product is at a maximum. Beyond point B, mathematical necessity requires that the marginal curve must be below the average curve See production theory basics for further explanation. Stages of production[edit] To simplify the interpretation of a production function, it is common to divide its range into 3 stages. In Stage 1 from the origin to point B the variable input is being used with increasing output per unit, the latter reaching a maximum at point B since the average physical product is at its maximum at that point. Because the output per unit of the variable input is improving throughout stage 1, a price-taking firm will always operate beyond this stage. In Stage 2, output increases at a decreasing rate, and the average and marginal physical product both decline. However, the average product of fixed inputs not shown is still rising, because output is rising while fixed input usage is constant. In this stage, the employment of additional variable inputs increases the output per unit of fixed input but decreases the output per unit of the variable input. In Stage 3, too much variable input is being used relative to the available fixed inputs: The output per unit of both the fixed and the variable input declines throughout this stage. At the boundary between stage 2 and stage 3, the highest possible output is being obtained from the fixed input. Shifting a production function[edit] By definition, in the long run the firm can change its scale of operations by adjusting the level of inputs that are fixed in the short run, thereby shifting the production function upward as plotted against the variable input. If fixed inputs are lumpy, adjustments to the scale of operations may be more significant than what is required to merely balance production capacity with demand. For example, you may only need to increase production by million units per year to keep up with demand, but the production equipment upgrades that are available may involve increasing productive capacity by 2 million units per year. Shifting a production function If a firm is operating at a profit-maximizing level in stage one, it might, in the long run, choose to reduce its scale of operations by selling capital equipment. By reducing the amount of fixed capital inputs, the production function will shift down. The beginning of stage 2 shifts from B1 to B2. The unchanged profit-maximizing output level will now be in stage 2. Homogeneous and homothetic production functions[edit] There are two special classes of production functions that are often analyzed. The production function Q.

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6: What is Production Function - Definition and Explanation - Formula - www.enganchecubano.com

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Meaning, Definitions and Features! Production is the result of co-operation of four factors of production viz. This is evident from the fact that no single commodity can be produced without the help of any one of these four factors of production. Therefore, the producer combines all the four factors of production in a technical proportion. The aim of the producer is to maximize his profit. For this sake, he decides to maximize the production at minimum cost by means of the best combination of factors of production. The producer secures the best combination by applying the principles of equi-marginal returns and substitution. According to the principle of equi-marginal returns, any producer can have maximum production only when the marginal returns of all the factors of production are equal to one another. For instance, when the marginal product of the land is equal to that of labour, capital and organisation, the production becomes maximum. Meaning of Production Function: In simple words, production function refers to the functional relationship between the quantity of a good produced output and factors of production inputs. Watson In this way, production function reflects how much output we can expect if we have so much of labour and so much of capital as well as of labour etc. In other words, we can say that production function is an indicator of the physical relationship between the inputs and output of a firm. The reason behind physical relationship is that money prices do not appear in it. However, here one thing that becomes most important to quote is that like demand function a production function is for a definite period. It shows the flow of inputs resulting into a flow of output during some time. The production function of a firm depends on the state of technology. With every development in technology the production function of the firm undergoes a change. The new production function brought about by developing technology displays same inputs and more output or the same output with lesser inputs. Sometimes a new production function of the firm may be adverse as it takes more inputs to produce the same output. Mathematically, such a basic relationship between inputs and outputs may be expressed as: Hence, the level of output Q , depends on the quantities of different inputs L, C, N available to the firm. In the simplest case, where there are only two inputs, labour L and capital C and one output Q , the production function becomes. As long as the natural laws of technology remain unchanged, the production function remains unchanged. This is a technological relation showing for a given state of technological knowledge how much can be produced with given amounts of inputs. Lipsey Thus, from the above definitions, we can conclude that production function shows for a given state of technological knowledge, the relation between physical quantities of inputs and outputs achieved per period of time. Features of Production Function: Following are the main features of production function: The factors of production or inputs are substitutes of one another which make it possible to vary the total output by changing the quantity of one or a few inputs, while the quantities of all other inputs are held constant. It is the substitutability of the factors of production that gives rise to the laws of variable proportions. The factors of production are also complementary to one another, that is, the two or more inputs are to be used together as nothing will be produced if the quantity of either of the inputs used in the production process is zero. The principles of returns to scale is another manifestation of complementarity of inputs as it reveals that the quantity of all inputs are to be increased simultaneously in order to attain a higher scale of total output. It reveals that the inputs are specific to the production of a particular product. The specificity may not be complete as factors may be used for production of other commodities too. This reveals that in the production process none of the factors can be ignored and in some cases ignorance to even slightest extent is not possible if the factors are perfectly specific. Production involves time; hence, the way the inputs are combined is determined to a large extent by the time period under consideration. The greater the time period, the greater the freedom the producer has to vary the quantities of various inputs used in the production process. In the production function, variation in total output by varying the quantities of all inputs is possible only in the long run whereas the variation in total output by varying the quantity of single input may be possible even in the short run.

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Production Function: Meaning, Definitions and Features! Production is the result of co-operation of four factors of production viz., land, labour, capital and organization. This is evident from the fact that no single commodity can be produced without the help of any one of these four factors of production.

A two variable production function can be expressed as follows: Land and building are excluded because they are constant for aggregate production function. However, in case of individual production function, they are included in capital factor Raw materials are excluded because they represent a constant relationship with the output at all phases of production. For example steel, tires, steering, and engines used for manufacturing cars explains a constant relationship with the number of cars. The algebraic or equation form of production function is most commonly used to analyze production. Let us understand the algebraic form of production function with the help of an example. Suppose a diamond mining organization has used two inputs capital and labor in the production of diamonds. Therefore, its production function can be expressed as under: The production of diamonds would increase with the increase in labor and capital. On the basis of time period required to increase production, an organization decides whether it should increase labor or capital or both. An organization takes into account either long- run production or short-run production for increasing the level of production. In short-run, the supply of capital is inelastic except for individual organization in perfect competition. This implies that capital is constant. In such a case, the organization only increases labor to increase the level of production. On the other hand, in the long- run, the organization can increase labor and capital both for increasing the level of production. Therefore, on the basis of time period, production function can be classified in two types, namely, short-run production function and long-run production function. The short-run production function can be mathematically expressed as follows: The equation of Cobb-Douglas production function is as follows: In such a case, the production function can be expressed as follows: The value of Q can be determined with the help of the following formula:

8: Theory of production | economics | www.enganchecubano.com

We start by explaining the main characteristics of production functions, then show its relationship with returns to scale and, finally, introduce the concept of isoquants. Related videos.

9: Production Function â€" Agricultural Law and Management

The production function relates the quantity of factor inputs used by a business to the amount of output that result. We use three measures of production and productivity: Total product (total output).

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