E-content for M.Com IV Students
Subject- Business Analysis and Forecasting
Topic- **Theory of Production**

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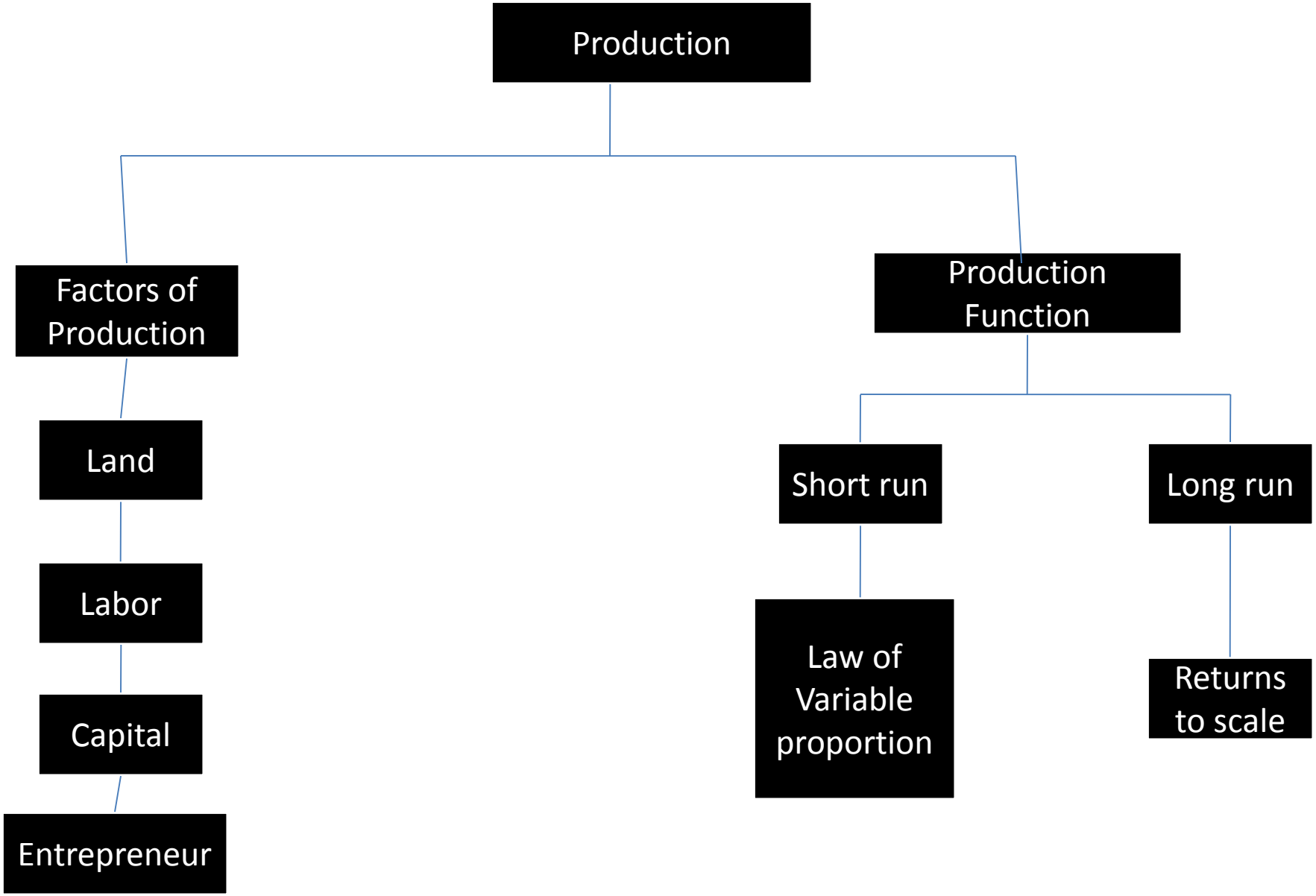
Meaning of Production

- Production is a process of combining various inputs to produce an output for consumption. It is the act of creating output in the form of a commodity or a service which contributes to the utility of individuals.
- According to James Bates and J.R Parkinsion “production is the organised activity of transforming resources into finished products in the form of goods and services ;and the objective of production is to satisfy the demand of such transformed resources”.


Production
Factors of Production
Land
Labor
Capital
Entrepreneur
Production Function
Short run
Long run
Law of Variable proportion
Returns to scale

Factors of Production

- According to Ulmer the “source of services which enter into the process of production are called factors of production”. In simple words factors of production are those things or services are used or applied to produce a good or render a service. These are as follows:

1- Land- Land means all the gifts given by the nature to us. For example, the surface of the earth, the soil, forest, oceans, mountains, climate, etc. Eminent economists Alfred Marshal says that “land means the materials and forces which nature gives freely for man’s aid in land and water, in air and light and heat”. Thus all the natural resources are taken are taken in the category of land.

2- Labour- Labour means mental or physical work exercised by an individual for some monetary reward. In economies, labour includes the services of a factory worker, Chief Executive Officer of a company, an engineer, an accountant, a doctor, a watchman, etc. It should be kept in mind that, in economics mental or physical work exercised by someone for pleasure or happiness without any monetary or benefits is not labour.

3. Capital – All those factors which have been produced by human efforts and which are used further for production activities are termed as capital. It is in this sense that building, plant, machinery, equipments, road, railway tracks, bridges, dams, transport equipment etc, are termed as capital. But modern economists say that human capital is also included in capital. Human capital means the process of addition to knowledge, skills and capacities of all people of a nation.

4- Entrepreneur- It is not enough to say that production is the function of land, labour and capital alone. In fact there must be some other factor which can mobilize these three factors, combine them in right proportion and initiate the process of production and undertakes risk involved in it. This factor is known as entrepreneur. He also regarded as the organizer, the manager or risk taker.

Two Types of Input Factors

- **Fixed input**: Fixed input are those factors the quantity of which remains constant irrespective of the level of output produced by a firm. For example, land, building, tools, machines, superior types of labour, top management etc.
- **Variable inputs**: Variable inputs are those factors the quantity of which varies with variations in the levels of output produced by a firm. For example, raw material, power, fuel, water, transport, labour and communication etc.

Production Function

- Production function is the relationship between physical input and physical output.
- The amount of output that can be produced with given quantities of input during a given period of time for given state of technological logic.
- The output takes the form of volume of goods or services and the inputs are the different factors of production, that is land, labor, capital and entrepreneur.
- A production function may take the form of a schedule, a graph line or a curve, and algebraic equation or a mathematical model.

- The production functions can be expressed as

$$Q=f(K,L,N)$$

Q=Quantity,

f= Functional Relationship

K=Capital

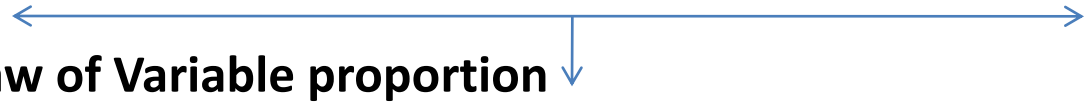
L=Labour

N=Land

Uses of Production Function

- How to obtain maximum output.
- Helps the producers to determine whether employing variable inputs/costs are profitable.
- Highly useful in longrun decisions.
- Least cost combination of inputs and to produce an output.

Law of Production



Law of Variable proportion **Law of Returns**

1-Law of variable proportion:

- **The law of variable proportion is a short term concept.**
- **If one input is variable and all other inputs are fixed the firms production function exhibits the law of variable proportions.**
- **If the number of units of a variable factor is increased, keeping other factors constant, how output changes is the concern of this law.**
- **Suppose land, plant and equipment are the fixed factors and labour the variable factor.**
- **When the number of labors are increased successively to have a larger output, the proportion between fixed and variable factors is altered and the law of variable proportion sets in.**
- **The law states that as the quantity of a variable input is increased by equal doses keeping the quantities of other inputs constant, total product will increase , but after a point at a diminishing rate.**

Assumptions

- **Only one factor is variable while others are held constant.**
- **All units of the variable factor are homogeneous.**
- **There is no change in technology.**
- **It is possible to vary the proportions in which different inputs are combined.**

Stages of Law of Variable Proportion

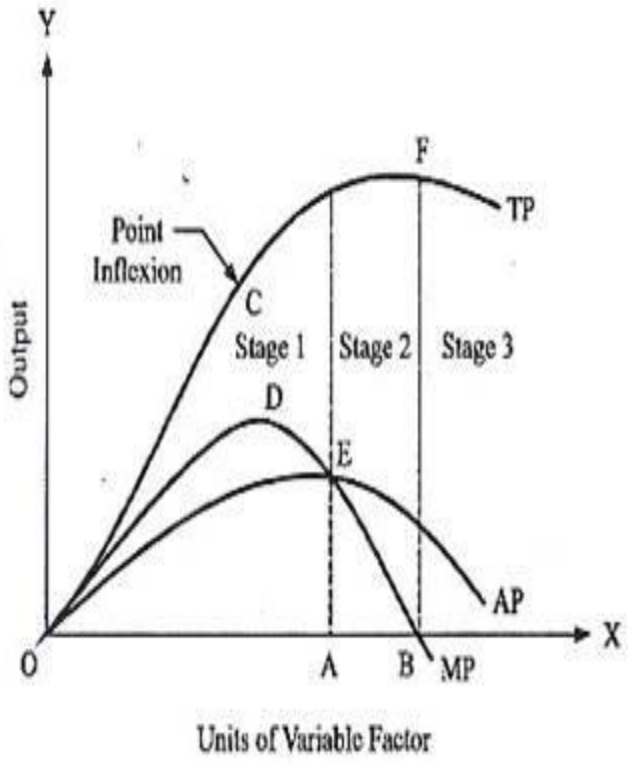


Fig. 8.2: Three Stages of Law of Variable Proportions

Units	Total Product(TP)	Average Product(AP)	Marginal product(MP)	
0	0	0	0	
1	20	20	20	
2	50	25	30	Stage 1
3	90	30	40	Increasing
4	120	30	30	
5	140	28	20	
6	150	25	10	Stage 2 diminishing
7	150	21.4	0	
8	140	20.5	-10	stage 3 Negative

Stage(1) of increasing returns:

- **TP increases at an increasing rate up to point f.**
- **Point f from where TP stops increasing at an increasing rate and starts increasing at a declining rate is known as point of inflexion.**
- **AP also increases and reaches at highest point at the end of the stage.**
- **MP also increases and it becomes equal to AP at the end of the stage.**
- **Variable factors rise throughout this stage. Therefore stage 1 is known as stage of increasing return.**

Stage (2) of diminishing returns:

- **Stage 2 lies between point A and B.**
- **TP continues to rise at a declining rate until it reaches its maximum point B, where the second stage ends.**
- **AP and MP are decreasing but both are positive.**
- **MP becomes zero, when TP is at maximum at the end of the stage**

Stage (3) of negative returns:

- **TP decreases and TP curve slope downwards.**
- **As TP is decreased, MP is negative , AP is decreasing but positive.**

Conclusion stage of operation:

From the above study it is concluded that in stage 1 fixed factors are too much in relation to variable factors. Thus, it will be beneficial for the firm to increase the production.

Likewise in stage 3 variable factors are too much in response to fixed factors as such marginal product of variable factor is negative therefore the firm will never like to produce in stage 3. the firm will always seek to produce in stage 2, where both average and marginal product of variable factors are falling but are positive.

The law of Returns to Scale

- **The law of returns to scale describes the relationship between outputs and scale of inputs in the long run when all the inputs are increased in the same proportion.**
- **In the words of Prof. Roger Miller, "returns to scale refer to the relationship between changes in output and proportionate changes in all factors of production".**
- **To meet a long run change in demand, the firm increases its scale of production by using more space, more machines and labors in the factory.**

Assumptions:

- **All factors(inputs) are variable but enterprise is fixed.**
- **A worker works with given tools and implements.**
- **Technological changes are absent.**
- **There is perfect competition.**
- **The product is measured in quantities.**

Given these assumptions, when all inputs are increased in unchanged proportion and the scale of production is expanded, the effect on output shows three stages: increasing returns to scale, constant returns to scale and diminishing returns to scale.

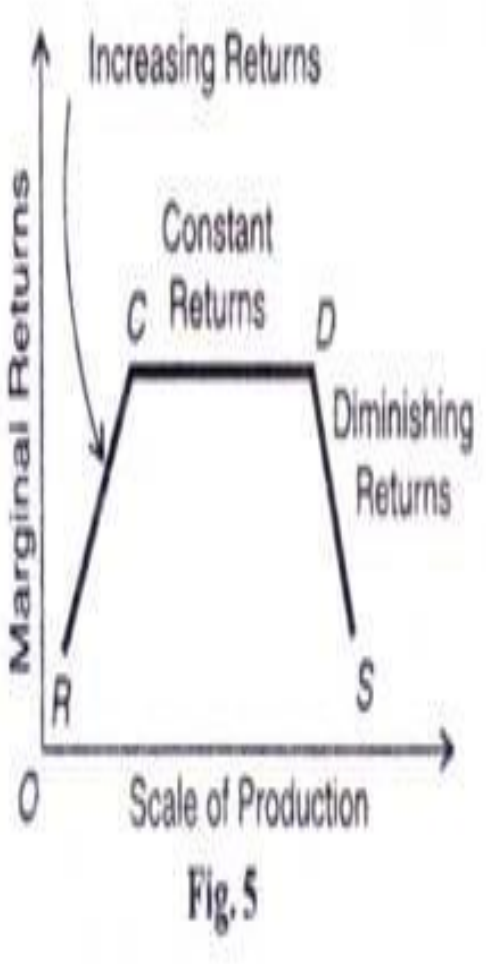


Fig. 5

Unit	Scale of production	Total returns	Marginal returns
1	1 worker+2 acres land	8	8
2	2 workers+4 acres land	17	9
3	3 worker+6 acres land	27	10
4	4 workers+8 acres land	38	11
5	5 workers+10 acres land	49	11
6	6 workers+12 acres land	59	10
7	7 workers+14 acres land	68	9
8	8 workers+16 acres land	76	8

Increasing returns to scale:

- **Returns to scale increase, because the increase in total output is more than proportional to the increase in all inputs.**
- **The table shows that in the beginning with the scale of production of(1 worker+2 acres of land), total output is 8. To increase output when the scale of production is doubled(2 workers+4 acres of land), total returns are more than doubled. They become 17. Now if the scale is trebled(3 workers+9 acres of land), returns become more than three folds, i.e. 27.**
- **It shows increasing returns to scale. In the figure RS is the returns to scale where R to C portion indicates increasing returns.**

Constant returns to scale:

- **Returns to scale become constant as the increase in total output is in exact proportion to the increase in inputs.**
- **If the scale of production is increased further, total returns will increase in such a way that the marginal returns become constant.**
- **In the table, for the 4^{th} and 5^{th} units of the scale of production, marginal returns are 11, i.e. returns to scale are constant.**
- **In the figure, the portion from C to D of the RS curve is horizontal which depicts constant returns to scale.**
- **It means that increments of each input are constant at all levels of output.**

Diminishing returns to scale:

- **Returns to scale diminish because the increase in output is less than proportional to he increase in inputs.**
- **The table shows that when output is increased from the 6^{th} , 7^{th} and 8^{th} units, the total returns increase at a lower rate than before so that the marginal returns start diminishing successively to 10,9 and 8.**
- **In the figure, the portion from D to S of the RS curve shows diminishing returns.**