UNIT 1:THEORY OF PRODUCTION

Production

In common Parlance, Activity of making something Material.
→ Tangible Goods

→ **In Economics:** Production is any Economic activity which converts inputs into outputs which are capable of Satisfying human wants.

→ Whether it is making of material goods or providing services, it is included in the production. Eg :- Teaching, CA services, etc.

James Bates & J.R Parkinson :-
Production is the organised activity of transforming resources (Inputs) into finished products (Output) in the form of goods/services & the objective of production is to satisfy the demand of such transformed resources.

→ According to fundamental law of science:
→ "Man cannot create matter"

→ Production- Does not mean creation of matter.
→ Humans can add only utility to things which already exist in nature.

"Production can also be defined as creation or addition of utility"

→ **There are various types of utility:**

a] **Form Utility:** Changing the form of natural resources.
Eg:- Changing the form of log of wood into chair/table.

b] **Place Utility:** Changing the place of the resources from a place where they are of little or no use, to another place where they are of greater use.
Eg:- Extraction of Coal & Supplying to Markets.

c] **Time Utility:** Making available material at times when they are normally not available.
Eg:- Canning of seasonal fruits is undertaken to make them available during off season.

d] **People/personal Utility:** Making use of Personal skills in the form of Services.
Eg:- Transport Workers

Eg:- Woolen Clothes

Wool → Form Utility ---→ Woolen Clothes

Place Utility --------→ Transport to Market

Time Utility --------→ Retained until sold to customers

In the whole process, Services of various groups of people are utilised. ↓ People Utility

Factors of Production

→ Inputs; Goods/Services which are required in the production process.

Factors

Land | Labour | Capital | Entrepreneur

1] Land:

→ Does not mean **Soil or earth's Surface,** but it refers **to all the gifts of nature.**

Characterstics of Land:-

1] Free gift of nature: a] No human effort is required for making Land available for Production.

b] **No Supply price since no payment has been made** to mother nature.

2] Supply of Land is Fixed: a] **Strictly Limited in Quantity.**

b] No change in demand can affect amount of land in existence.

Economy POV	Firm's POV
Supply of Land is **Perfectly InElastic**	Supply of Land is **Relatively Elastic**

3] Land is permanent & has indestructible power:

According to **Ricardo,** Land has certain industructible powers & these properties of Land cannot be destroyed.

4] Land is a passive factor: Unless human effort is exercised on Land, it does not produce anything on its own.

5] Land is Immobile: Land cannot be shifted physically from one place to another.

6] Land has Multiple uses: Can be used for various purposes.

7] Land is heterogeneous: They differ in fertility & other characterstics.

2] Labour:

→ Human efforts

a) Any mental or physical efforts directed to produce goods & services.

b) Various types of human efforts which require the use of **Physical exertion, Intellect & Skill.**

c) Anything done out of love & affection is not labour in economic sense.

→ Services of housewife/husband are not treated as Labour.

→ While the sevices of househelp/maid treated as Labour.

Characterstics of Labour:-

1] Human Effort:

Labour is connected with human efforts. Certain psychological consideration like fair treatment, work environment, etc are essentials for Labourer, which is not the case with other factors.

2] Labour is Perishable: which Can't be Stored

Day's Labour lost cannot be completely recovered by extra work on any other day.

3] Labour is an active factor:

Without active participation of Labour, Land & Capital may not produce anything.

4] Labour is inseparable from Labourer:

A Labourer is the source of his/her own labour.

5] Labour power differ from Labourer to Labourer:

Labour is hetrogeneous.

Labour power depends on Labourer inherent & acquired qualities, work environment & incentive to work.

6] All Labour may not be productive:

i.e. all efforts are not sure to produces goods/services.

7] Labourer has poor bargaining power:

Since labour can't be stored, the labourer is compelled to work at the wages offered by employers.

8] Labour is Mobile:

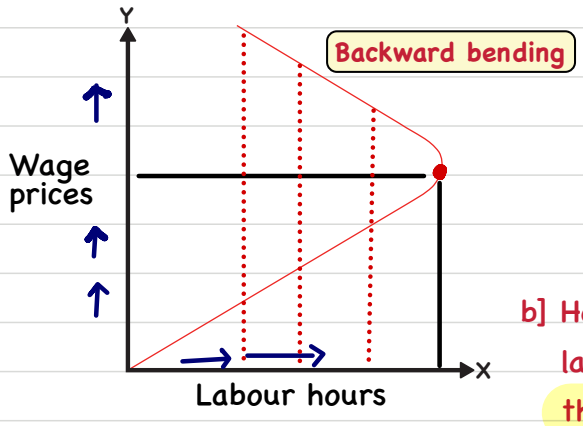
Labourer can move from one place/job to another.

9] There is no rapid adjustment of supply of Labour to the demand of it:

The total supply of Labour cannot be increased or decreased instantly.

10] Choice between hours of Labours & hours of Leisure:

This feature gives rise to a Backward Bending Shape to the Supply curve of Labour.



a] Supply of Labour & wage rate is directly related

↓

It implies as the wage rate increases, Labourer increases supply of Labour.

b] However, beyond desired level of income, labourer prefers to have more of rest & leisure than earning money.

3] Capital:

→ Investment

Wealth ------→ Total value of an asset an individual posseses at a given point of time. ------→ Stock concept

Capital

- → Part of wealth.
- → Assets used for production.
- → Used for production of wealth

Production ------→ Income ↑
Wealth ↑

↓

Stock concept which generates a periodical income which is a flow concept.

Factors

- Primary or original factors of production → Land, Labour
- Man-made factors of production → Capital
  Eg :- Machines

Types of Capital:-

1] Fixed Capital: a) Exists in Durable Shape.
b) Renders services over a period of time.
Eg:- Machine.

2] Circulating Capital: Single use, not available over a period of time.
Eg:- Raw Material, Fuel, etc.

3] Real Capital: Physical Assets. Tangible
Fixed ⟷ Circulating

4] Human Capital: a) Human skills & ability.
b) Good deal of investment goes into creations of these abilities in human.

5] Tangible & Intangible Capital: a) Tangible: Physical existence,
Eg:- Machines.
b) Intangible: No physical existence,
Eg:- Goodwill, Patent.

6] Individual Capital: Personal property owned by an individual.
Eg:- Camera, Machines.

7] Social Capital: What belongs to Society as a Whole.
Eg:- Roads.

Capital Formation:- *

→ Increase in the stock of real capital in the country.

Stages of Capital formation:
Savings
→ Mobilisation of Savings
Investment
→ Capital Formation

1] Savings:

Foundation of Capital depends on
↓
Ability to save
↓
Income of an Individual
↓
Income ↑
- Propensity to consume ↓
- Propensity to save ↑

True not only for individual but for economy as a whole as well.

→ Not only the ability to save, Willingness to save is also important.

Willingness depends on
- Concern about future
- Social setup in which he/she lives.

→ **Government's Role:** Allow tax deductions on income saved. Enforce compulsory savings on employed people by making insurance & PF compulsory.

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2] Mobilisation of Savings: Saved money should enter into circulation & facilitate the process of Capital formation.

Pre-conditions of Mobilisation of Savings
- Wide-spread network of Banking ✓
- Availability of financial products ✓

→ **Government's Role:**

Generating Savings through various incentives → Channelising the Savings towards the priority needs of the community.

Leads to Socially beneficial type of Capital Formation.

3] Investment: Real Savings gets converted into real Capital Assets.

---→ Economy should have entrepreneurial class, who is ready to take risk & invest these savings.

Important points:

1] In order to accumulate Capital goods, some current consumption has to be sacrificed.

2] If society consumes all & saves nothing, future productivity will fall.

3] High rate of Capital Formation will enhance:
- Productive Capacity.
- Accelerate economic growth & opportunities of employment.

4] Entrepreneur:

→ Mobilises the factors - Land, Labour, & Capital.
→ Combined factors in the right proportion.
→ Initiate the process of production.
→ Bears the Risk.

---→ He/she has also been called organizer, the manager, Risk taker.
---→ But, in these days of specialisation, separation of ownership & Management is common.

Manager ----> Decision making of Routine & Non-Routine types.

Entrepreneurs ----> Initiate production work & bear the risk.

Functions

- Initiate business enterprise & resource co-ordination
- Risk bearing or uncertainity
- Innovation

1] Initiate Business Enterprise & resources co-ordination:

First & foremost function

- Senses business opportunities
- Conceives project ideas
- Decides on scale of operation

---> Obtaining factors of production

Land Labour Capital

---> Right proportion & co-ordination among them

---> Payment

---> Surplus after paying all factors of production belongs to Entrepreneur, as reward for efforts & risk-taking.

2] Risk-bearing or uncertainity:

Most Important function

---> Ultimate Responsibility for success & Survival lies with Entrepreneurs.

Risk

Financial Risk

What is Planned & anticipated may not come true.

- Demand, cost structure, fashion & taste, government policies may change.

Technological Risk

Inventions & improvements in technology/techniques of productions.

Making existing technique obsolete.

Frank Knight: "Profit is the reward for bearing Uncertainity"

Foreseeable Risk

---> These can be insured

Eg :-Theft, fire, etc.

Uncertainity

---> These cannot be insured

Eg :-Emergence of competition, etc. Change in taste of consumer, etc.

--> While nearly all the functions of entrepreneur can be delegated, Risk bearing cannot be delegated to anyone.

3] Innovation:

--> According to **Schumpeter**, the true function is to introduce Innovation.

Innovation may lead to
- Greater efficiency
- Competitiveness
- Greater profit

--> Innovation may yeild profits for a **Short time.**

Copy

Successful innovation will be imitated by others & when it is widely adopted, profits tend to disappear.

--> Entrepreneurs promote economic growth of the country by introducing new innovations & contributing to technological progress.

Production Function

Relationship between input & output.

Independent Dependent

- Scarce resources
- Factors of production

Inputs

Technological
[using the available technology]

$Q = \int [\text{Inputs / factors}]$

Output

Eg :- $Q = 5L + 2K$

Three main assumption of production function:

1] Relationship between input & output exists for a **specific period of time.**
- Q is not a measure of accumulated output over time.

2] There is a given **'state of the art'** in the production technology.
- No change
- Most efficient

3] Output resulting from utilisation of inputs is at **maximum level.**
- No wastage / No ineffecincy

Samuelson

According to ~~Samueleon~~, Production can be defined as:

---> Max amount of output that can be produced with given quantity of input under given state of technical knowledge.

Constant

Also, Min. quantity of inputs required to produce ~~knowledge~~ given quantity of output.

Short Run v/s Long Run

For the purpose of analysis, various inputs are reduced to 2 in Production functions.

Labour Capital

---> Distinction is not related to any particular measurement of time.

	Short Run	Long Run
	Production period	Planning horizon
Meaning	If atleast one of the inputs used remains unchanged during that period. ---> Capital is fixed	All factors are Variable. ---> No factor is fixed
Production function	Max amount of output that can be produced by set of inputs, assuming atleast one input fixed.	Max amount of output that can be produced by set of inputs, assuming all factors variable.
Law	Law of variable proportions.	Law of returns to scale.

Law of Variable Proportions
or
Law of Returns to a variable input
or
Law of Diminishing Returns
---> Short Run

Meaning of certain terms:

1] Total Product [TP]: Total output (Output) resulting from the efforts of all the factors of productions combined together at any time.

2] Marginal Product [MP]: Addition to the TP by an additional unit of input. (Additional)

1] $MP_N = TP_N - TP_{N-1}$

$MP_3 = TP_3 - TP_2$

$= 330 - 220$

$= 110$

2] $MP = \frac{\triangle TP}{\triangle \text{Variable factor}} = \frac{180}{3} = 60$

Labour	TP	MP	AP
1	50	50	50
2	120	70 [$TP_2 - TP_1$]	60
5	300	60 $\frac{\Delta TP}{\Delta L} = \frac{180}{3} = 60$	60

(+3, 180)

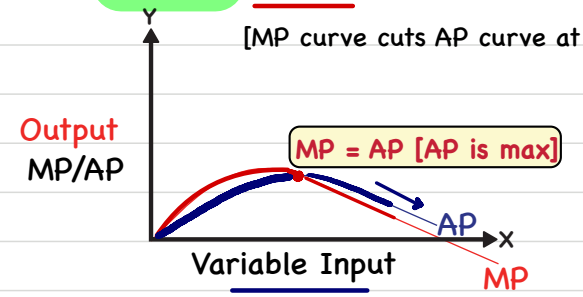
3] Average Product [AP]: TP per unit of variable factor.

$$AP = \frac{TP}{\text{No. of Variable factors}}$$

→ Relationship between AP & MP:

1] When MP > AP, AP rises as a result of ~~increase~~ increase in variable input.
2] When MP = AP, AP maximum.
3] When AP > MP, AP falls.

[MP curve cuts AP curve at its Max, from above]



Quantity of labour	Total Product [TP]	Average Product [AP]	Marginal Product [MP]
(1)	(2)	(3)	(4)
1	100	100.0	100
2	210	105.0 Avg↑	110 MP↑
3	330	110.0 Avg↑	120 MP↑
4	440	110.0	110 MP↓
5	520	104.0 Avg↓	80 MP↓
6	600	100.0	80
7	670	95.7	70
8	720	92.0	50
~~8~~ 9	750	83.3	30
10	750 Max	75.0	0
11	740	67.3	-10

VK

Marg > Avg. Avg↑ Marg < Avg. AP↓

Average 50 > 45 Avg↓ (Marg.) 100 Avg↑ (Marg.)

Law of Variable proportions:

Describes the relationship between Input & Output in the Short Run.

Assumptions:

1] No change in technology. ✓

2] Some inputs must be fixed. ✓

3] Law does not apply to those cases where factors must be used in fixed proportions to produce output.

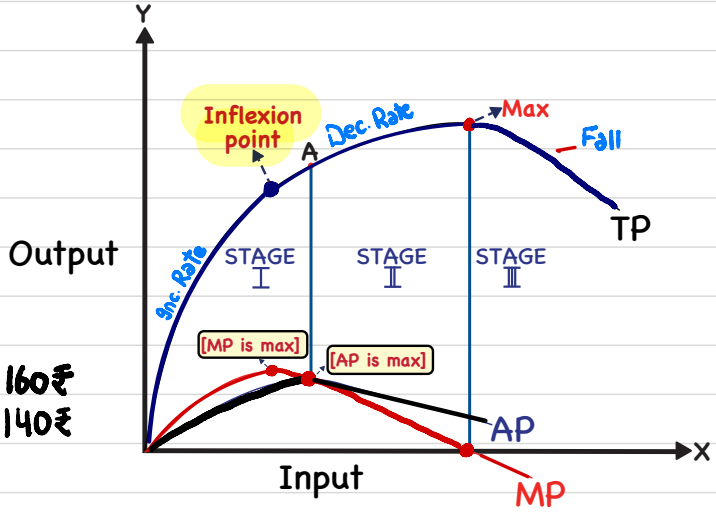
1 Machine → (To ↑ Output) → 1 Machine
1 Labourer → 1 Labourer
Qty

4] We consider only physical inputs & outputs & not economic profitability in ✗ monetary terms.

$\frac{\Delta TP}{\Delta L}$

Quantity of labour	Total Product [TP]	Average Product [AP]	Marginal Product [MP]
(1)	(2)	(3)	(4)
1	100	100.0	100
2	210	105.0	110
3	330	110.0	120
4	440	110.0	110
5	520	104.0	80
6	600	100.0	80
7	670	95.7	70
8	720	92.0	50
8	750	83.3	30
10	750	75.0	0
11	740	67.3	-10

Inc. Rate (TP) · Dec Rate (TP) · Fall · AP<MP · AP>MP · Inc. (MP) · Dec. (MP) · +ive · Negative



Cost: ₹100
80 qty: SP = MR = ₹2 = 160₹
70 qty = 140₹

→ **Law is divided into 3 stages:**

Stage 1: Stage of ~~Incresing~~ Increasing Returns

Upto Inflexion

- TP is increasing at increasing Rate
- MP also rises & is max at inflextion point
- AP also increases

From inflexion to A

- TP is increasing at diminishing Rate
- MP falls but is still greater than AP MP > AP
- AP keeps on rising & reaches its max point
  - → MP = AP ✓

---→ The **Stage I ends where AP reaches its Max point.** MP = AP

---→ **Explanation:**

a) Quantity of fixed factor is abundant, relative to quantity of variable factor.

b) Efficiency of **fixed factor increases** as ~~addtitional~~ additional units of variable factor are added to them.

c) As more units of variable factors are employed, efficiency of **variable factor also increases.**
   - → Specialisation ✓

Stage 2: Stage of Diminishing Returns

a) TP is increasing at diminishing Return, -Reaches its max point. → MP = 0 ✓

b) Both MP & AP are falling, but positive. AP > MP

c) MP is zero & at this point, Second stage ends.

---→ **Explanation:**

a) Fixed factor becomes **inadequate** (कमी हो गई) relative to the quantity of variable factor.

b) Imperfect Substitutability of one factor for another.

c) AP & MP decreases because fixed factor is worked too hard & Labour is not a perfect substitute for fixed factor.

Stage 3: Stage of Negative Returns

a) TP declines

b) MP is negative & AP is falling.

Explanation:

a) Quantity of variable factor becomes too excessive relative to the fixed factor so that they get in each other ways, with the result that TP falls.

b) In such a situation, reduction in the units of variable factor will increase the Total Output.

Stage of Operations:

In which Stage a rational producer will seek to produce ?

Stage 1
Not in stage 1
Fixed factors won't be fully utilised

Stage 3
Not in stage 3
MP is negative

Stage 2
Yes
At which point in Stage 2 ? (Labour Cost)
- Depends upon price of factors
- Principle of Marginalism
  MR = MC
  Marginal Revenue = Marginal Cost

Economic absurdity
or
Economic Non-sense

Returns to Scale:

Long Run, Planning period

All factors of production are increased or decreased together in the same proportion.

Eg :- 2 Labour + 1 Machine
4 Labour + 2 Machine (100%)

Eg :- Inputs increased by 100%

	Machines	Labour	Output
	2	2	= 20
	4	~~20~~ 4	?

Constant Return to Scale
Inputs ↑ 100%
Outputs ↑ 100%
- Output change in the same proportion

Linear Homogeneous production function
Q = f(L,k)
Q = f(2L,2k)
Q = 2 × f(L,k)
2Q = 2 × f(L,k)
Let constant no. - h
hQ = h × f(L,k)

Increasing Return to Scale
Inputs ↑ 100%
Outputs > 100%
- Output increase in greater proportion
- Economies of Scale
- Specialisation & division of Labour

Decreasing Returns to Scale
Inputs ↑ 100%
Outputs < 100%
- Output changes in smaller proportion
- Difficulty in Management
- Lack of co-ordination

$Q = f(L,K)$
$2Q = 2f(L,K)$
$hQ = hf(L,K)$

COBB- Douglas Production function:

C.W cobb, Poul H. Douglas → Long Run

USA - Studied American Mfg. industries

--> This production function applies not to an individual firm but to the whole Manufacturing industry.

Originally, $Q = K. L^{a}. C^{1-a}$

0.3, 0.7 | 0.4, 0.6 | Input 120t | a, 1-a, 1

Output | Labour | Capital | Constant no. → Factor productivity

a = Labour elasticity
→ how much output changes in response to change in Labour.

1 - a = Capital elasticity

Eg :-

	a	1-a
	0.7	0.3
Inputs ↑ 50%		
Change in output	35% [50 × 0.7]	15% [50 × 0.3]

Total ↑ in Output = 50%

--> Cobb & douglas assumed that returns to scale is Constant.

Revised → Now,

$Q = K. L^{a}. C^{b}$

a + b = Total input elasticity

a+b = 1.4, Inc. Return. (0.6, 0.8)

Eg :- a = 0.8, b = 0.7] 1.5 = Inputs ↑ 100%, Outputs ↑ 150%

If,
- a + b > 1, Increasing Returns to Scale
- a + b = 1, Constant Returns to Scale
- a + b < 1, Decreasing Returns to Scale

*

--> Conclusion drawn from this Statistical Study
→ Labour contributed 3/4 & capital 1/4 of increase in Manufacturing Production

Production Optimisation

Goal of a producer ---> **Minimize cost**

What combination of factors to use for given output ?

Iso-quant **Iso-cost**

→ **1] Iso-quants:** ---> All those combinations of Inputs which are capable of producing same level of Output.

- Equal Quantity/ Product
  - Very similar to IC curve
- Producer is indifferent as to which combination to choose.

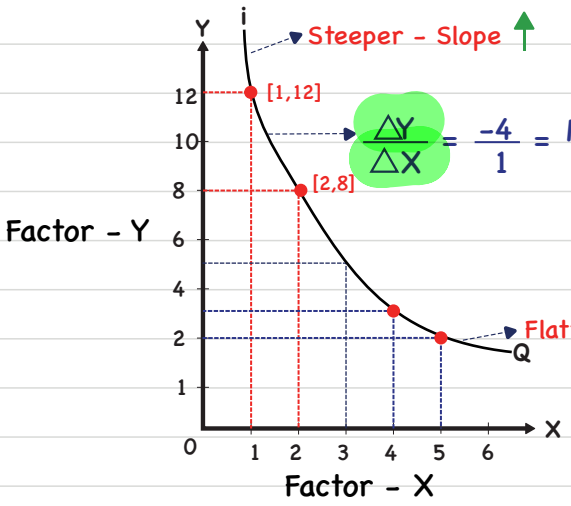
Iso-quant = **Equal product curve** = **Production indifference curve** = **Iso product curve**

Schedule: Labour Capital Marginal Rate of Techical Substitution

Factor Combination	Factor X	Factor Y	MRTS
A	1	12	Slope of Isoquant
B	2	08	4
C	3	05	3
D	4	03	2
E	5	02	1

MP↓

Isoquont



$\frac{\Delta Y}{\Delta X} = \frac{-4}{1}$ = MRTS

Absolute Slope of isoquont

only numeric value

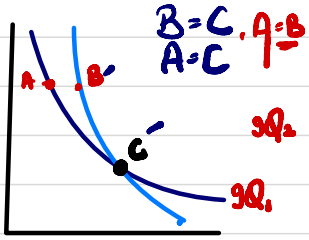
$= \frac{1}{1} = 1$

---> MRTS [Absolute slope value of Isoquants]

$\frac{\text{Factor Y}}{\text{Factor X}}$, is decreasing

Convex to the origin

Properties of Isoquant



1] Negative Slope - Downward sloping curve
- Inverse relationship between X& Y

2] Convex to the origin - MRTS is decreasing

3] Non - Intersecting

4] Higher IQ- Higher level of output

Difference between Indifference curve & Isoquant curve:
In IC, it is not possible to quantify the level of satisfaction but, the level of production is easily Quantified in Isoquant.

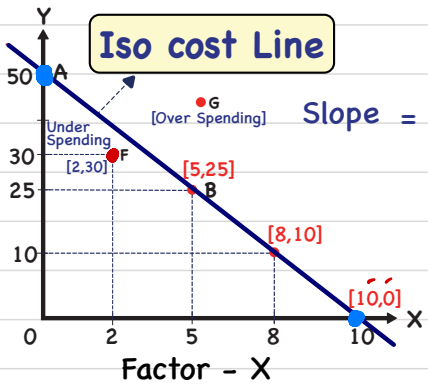
2] Iso-Cost: Or Equal cost Line Or Budget Line

Various combinations of 2 inputs which producer can buy with the given budget.

Eg :- Budget ₹1000 $\frac{P_X}{P_Y} = \frac{100}{20} = 5$

	X[₹100]	Y[₹20]
A	10	0
B	0	50
C	5	25
D	8	10
E	2	40

Factor -Y: $\frac{25}{5} = 5$; $\frac{\Delta Y}{\Delta X} = \frac{30}{6} = 5$



Slope = $\frac{\Delta Y}{\Delta X} = \frac{25}{5} = 5$

$\frac{P_X}{P_Y} = \frac{100}{20} = 5$

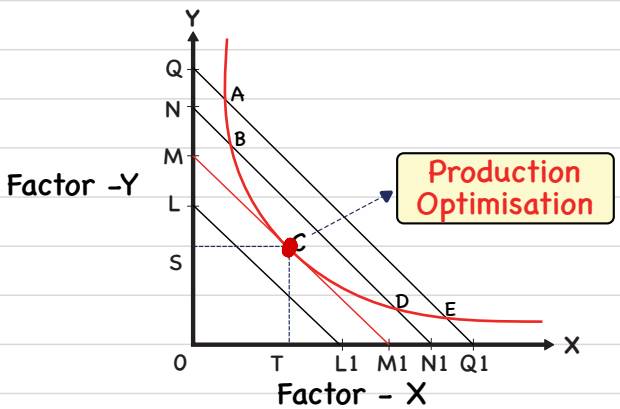
Price of Factor X / Price of Factor Y

$P_XQ_X + P_YQ_Y = B$

Optimisation:

1] Minimize the cost of producing given level of output.
2] Maximize output for a given cost.

Eg :- Output level is given - 1000 units
- Which factor combination to choose ?



Same level of Output at A,B,C,D & E
- Least cost combination
- Iso cost line is tangent to the isoquont curve.
- Point C