AS 3101

ECONOMICS OF FARM PRODUCTION AND MANAGEMENT

COURSE MATERIAL

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Course Material for Economics of Farm Production and Management by,

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Course Content and Intended Learning Outcomes

Course Aims

The purpose of the course is

- to show the application of economic principles to agricultural production and management.
- to analyze the production and management decisions in agricultural sector using economic concepts and tools.

Course capsule

Theory of production and cost; Decision making under risk and uncertainty; Farm management functions and decisions; Farm resource management; Farm planning and budgeting; Farm record keeping; Farm business analysis, Farm investment analysis and Final accounts

Learning Objectives

After successfully completing this course you should be able

to:

- demonstrate an understanding of basic economic principles and their application to agricultural production and management.
- understand the relationship between agricultural production and management in the analysis of resource allocation within the agricultural sector.
- use budgeting, economic analysis, and investment tools for farm production, risk management and decision making.
- understand the economics of farm production and management and the use of economic concepts in the analysis agricultural business.

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LECTURE 01
Farm Management Functions

1.1 Introduction to Farm Management

- **FARM:** A place where farming is done in order to achieve various individuals and social benefits.
- **FARMING:** A process of stimulating plant and animals growth for the production of human needs of foods.
- **MANAGEMENT:** Simply what mangers do? The process of coordinating work activities.

1.2 Why we need to manage farms?

- Farmers have the twin objectives,
    1. maximization of farm profit
    2. Improvement of standard of living of their families.
- The means available to achieve farm objectives, i.e., the factors of production, are scarce in supply.
- Farm profit is influenced by biological, technological, social, economic, political, and institutional factors.
- The resources or factors of production can be put to alternative uses and hence need to decide the optimal allocation.

Management

- This is done by managers.
- Management can be defined as the process of coordinating resources to achieve desired objectives under constraints. It involves decision-making and implementation of those decisions.
- It involves coordinating work activities for others.
- Ends up with **effective** and **efficient** completion of farming activities.

- Effectiveness – Goal attainment ⟶ High attainment
- Efficiency – Resource usage ⟶ low waste

- Effectiveness - Doing the right things for help to reach the goals.

- Efficiency – Means of getting things done.
- Poor management is due to both inefficiency and ineffectiveness, or effectiveness achieved through inefficiency.

➢ **Main functions of management**

-Planning
-Organizing
-Leading
-Controlling

Planning	Organizing	Leading	Controlling
• Define goals • Establish Strategies • Develop sub plans to coordinate activities	• Determine what needs to be done • How it will be done • Who is to do it	• Directing and Monitoring all involved parties • Resolving conflicts	• Monitoring activities to ensure that they are accomplished and planned

- Scarcity of resources and alternative use of resources make the farm decision-making process complex.

Scarcity of Resource

- Relative Scarcity: Land is scare relative to labor
- Temporal Scarcity: Harvesting time labor

Alternative uses of Resources

- Resources can be used in alternative enterprises

Planning

Long Run Planning

- Need to decide on the optimal enterprise mix to increase the efficiency of labor and capital use, whether the business is to be expanded etc.

Short Run Planning

- Specify the timing of input purchase etc.

1.3 Difference between managing a farm and an industry

- Farming depends heavily on biological relationships, weather, soil conditions, etc.
- In industries, the involvement of biological factors are minimal.

1.4 Farm Management

- The process of attempting to achieve farm objectives by using economic principles.
- This involves formulating and implementing budgets for optimal enterprise mix and combining factors of production within a suitable business structure.

1.5 Functions of Farm Management

- Developing ideas and making observations/formulating goals. Starting from goals and diagnosing problems, which limit goal attainment.

  Possible goals: Profit maximization, farm ownership, farm expansion, avoidance of risk, etc.

- Analyzing observations/Compilation of relevant data
- Planning/Decision making

  This is the most important managerial function. The manager has to decide
  What to produce
  How to produce
  How much to produce

- Implementation of the best/action

  Putting the plan to work

  Eg: Planting, maintenance

- Evaluation

  Going back afterward and checking to make sure that all the proceeding steps have been effective and accomplished as planned.

LECTURE 02
Theory of Farm Production and Costs – Part I

2.1 Production Functions

In production function, there are two sides,

- Output side (Y)... Dependent variable
- Input side (X)..... Independent variable

Definition

- ✓ Production function portrays an Input-Output relationship
- ✓ Is the functional approach/ Technical relationship between inputs and outputs

$$Y = f(X_1, X_2, \dots \dots \dots X_n)$$

Is a production function where Y is output and X1.....Xn are different inputs.

E.g Rice Yield= f(Fertilizer, Labour, Land)

Y= 100 + 0.02 Fert + 0.61 Lab + 0.31 Land

- It is a mathematical relationship

Inputs can be → Variable inputs
→ Fixed inputs

2.2 Agriculture Production

- Some inputs are **fixed** and they absorb variable inputs... "Technical Units"

The farmer has no control over to change this input

Eg. Land

- Some inputs are variable

The farmer has the ability or freedom to change

Eg, Labour, Capital, Fertilizer

Uses of Production Functions

- ✓ To find the relationship between crop yields and variable inputs.
- ✓ To find the relationship between the weight gain of an animal and the type of feed used.

Data Sources for the estimation of production functions

- ⦿ Biological Research – Replicated experiments
- ⦿ Farm Records

- In the Economics of farm production, we pay our attention to three relationships namely,
    1. Input-Output (or Factor-Product)relationship
    2. Input-Input (or Factor-Factor) relationship
    3. Output-Output(or Product-Product) relationship

2.3 Factor-Product Relationship

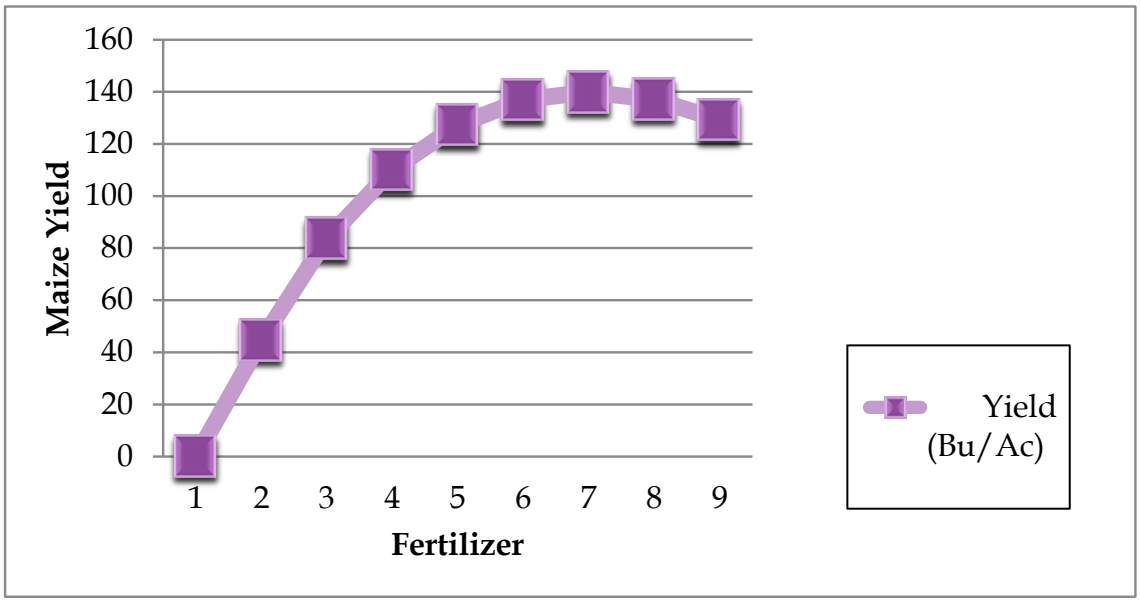
- This explains the relationship that prevails between the output and a variable factor

The data presented in table 1 below represent different levels of Nitrogen and P2O5 applied to maize.

Table 2.1 Response of maize yields to fertilizer application

Fertilizer (1bs/Ac)		Yield (Bu/Ac)
N	P_2O_5	
0	0	0
40	40	44.5
80	80	83.6
120	120	110.1
160	160	127.3
200	200	136.9
240	240	139.9
280	280	137.1
320	320	129.2

Figure 2.1 Response of Maize Yield to Fertilizer Application



- Alternative ways to expressing Production Function
  - ✓ Tabular Representation
  - ✓ Graphical Representation
  - ✓ Algebraic Representation

Production Function

- ✓ Is a planning device
- ✓ It must be looked upon as a future or expected relationship

Production function can be used to plan for the future as long as the production technology is stable.

- In agricultural production, there are an array of factors that are beyond the control of the farmer.

2.4 Important Assumptions in Production Economics

1. Perfect Certainty

   ✓ It is assumed that farmer is aware of the crop yield that he is going to harvest at the end of the season.

2. Level of Technology or the State of Art

   ✓ Farmer has to select the best technology

3. Length of the time period

   ✓ The length of the time period is used to classify resources as fixed and variable.

   I. Very short-run: Period is too short
      All resources are fixed
   II. Short-run: Time period is sufficient to vary one resource while the other resources are fixed.
   III. Long Run: Time period is sufficient to change all resources.

4. Inputs and Outputs are Homogeneous

2.5 Marginal Physical Product(MPP)

- MPP is the change in output resulting from a unit change in the variable input.
- Slope in the production function at any given level of input.

$$\text{MPP} = \frac{Change\ in\ output}{Change\ in\ input} = \frac{\Delta y}{\Delta x}$$

$$= \frac{\Delta y}{\Delta x} = \frac{dy}{dx} \longrightarrow 1st\ derivative$$

2.5.1 Rate of change of MPP

$$= \frac{d^2y}{dx^2} = \frac{d(MPP)}{dx} \longrightarrow 2nd\ \ derivative$$

During the production process, first, MPP > 0

$$\frac{d(MPP)}{dx} > 0$$

Then, MPP > 0

$$\frac{d(MPP)}{dx} < 0$$

Question

- Consider the following production function.

  What is the Marginal Physical Product?

  $$\boldsymbol{y = x^2 - \left(\frac{1}{30}\right)x^3}$$

  $$MPP = \frac{dy}{dx} = 2x - \frac{1}{10}x^2$$

2.6 Average physical product (APP)

- The quantity of total output produced per unit of a variable input, holding all other inputs fixed.
- An average physical product, usually abbreviated APP, is found by dividing the total physical product by the quantity of the variable input.

$$\text{APP} = \frac{Y}{X}$$

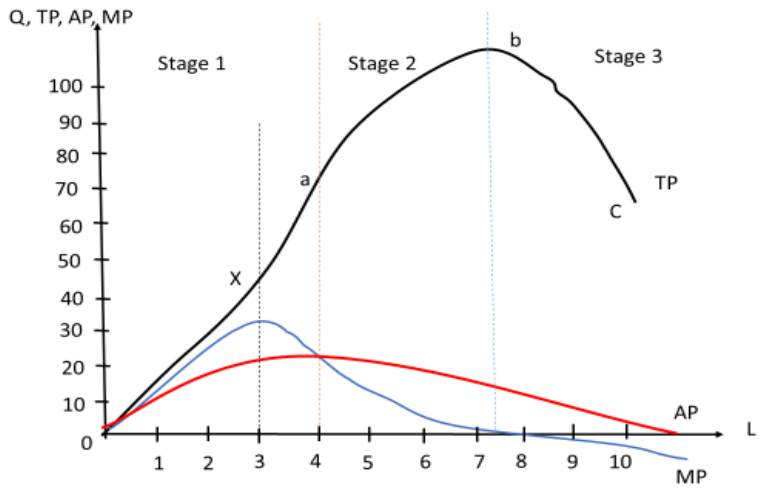
LECTURE 03
Theory of Farm Production and Costs – Part II

3.1 Short run production process

Inputs → One variable input (Labour)
→ One fixed input (Capital)

Capital	Labour (L)	No. Of Output Units (TPP)	Marginal Product MP = ΔTP/Δ L	Average Product AP = TP/L
10	0	0		
10	1	10		
10	2	30		
10	3	60		
10	4	80		
10	5	95		
10	6	108		
10	7	112		
10	8	112		
10	9	108		
10	10	100		

Capital	Labour (L)	No. Of Output Units (TP)	Marginal Product MP=ΔTP/Δ L	Average Product AP = TP/L
10	0	0		0
10	1	10	10	10
10	2	30	20	15
10	3	60	30	20
10	4	80	20	20
10	5	95	15	19
10	6	108	13	18
10	7	112	4	17
10	8	112	0	14
10	9	108	-4	12
10	10	100	-8	10



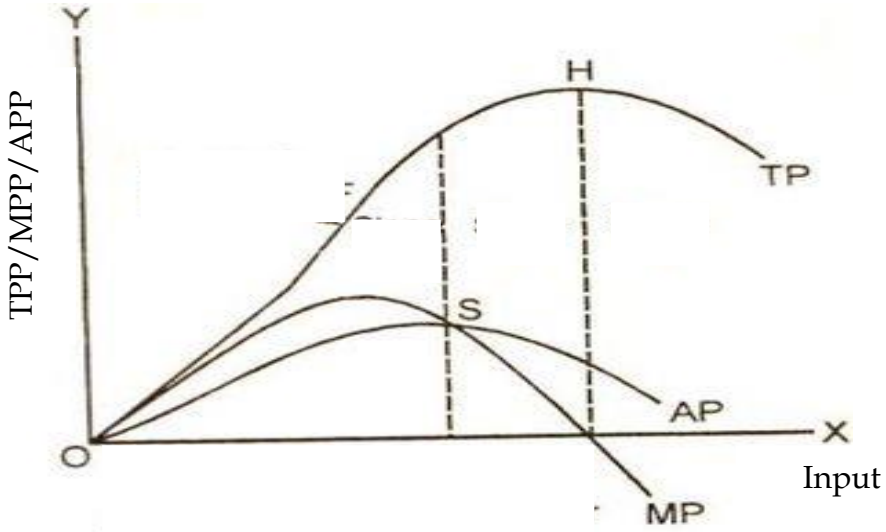
Throughout the production, the slope is positive

$X \uparrow \longrightarrow dY/dX > 0 \qquad d^2Y / dX^2 > 0$

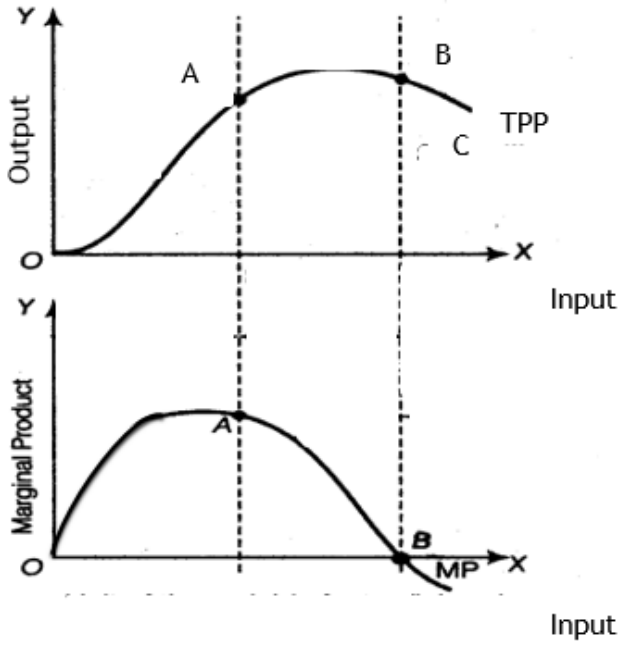
After a certain point ,

$X \uparrow \longrightarrow dY/dX > 0 \qquad d^2Y / dX^2 < 0$

TPP, MPP, and APP



Geometric Relationship between TPP and MPP



- 0 → A → When MPP is increasing, TPP is increasing at an increasing rate.
- A → B → MPP is decreasing but positive, TPP is increasing at a decreasing rate.
- B → C → Output (TPP) declining, MPP (-) ve

Example 1. Given production function

$$Y = 6X$$

i. Find MPP

MPP = 6

$$APP = \frac{Y}{X} = \frac{6X}{X} = 6$$

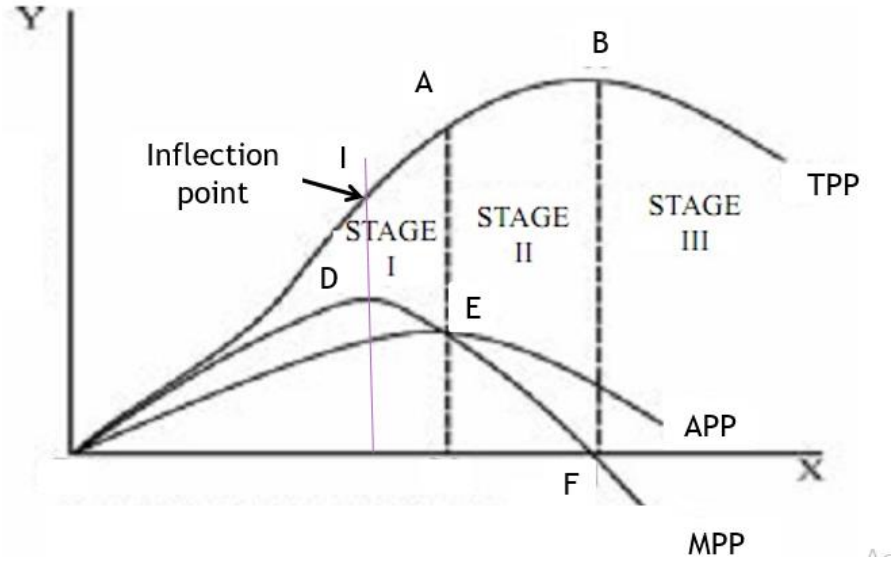
$$Y = 2\sqrt{X}$$

MPP = $X^{-0.5} = \frac{1}{\sqrt{X}}$

APP = $\frac{Y}{X} = 2X^{0.5}/X = \frac{1}{\sqrt{X}}$

APP = $\frac{Y}{X} = 2X^{0.5}/X = 2X^{-0.5}$

3.2 The Law of Diminishing Returns & Three Stages of Production



First angle ↑, then ↓

Therefore, first $\frac{d(MPP)}{dx} > 0$

Then $\frac{d(MPP)}{dx} < 0$

There should be a point where, $\frac{d(MPP)}{dx} = 0$

- This point is called "INFLECTION POINT" (Point I)
- Before inflection point, curve (TPP) is convex to the X.
- After inflection point, concave to X.

MPP

- Increase up to inflection point .
- Decrease after inflection point.
- Maximum MPP is at inflection point.
- After maximum TPP, MPP become (-)ve.

APP

- At the maximum APP → APP = MPP

3 Stages

- Stage I → x = 0, y = 0 to MPP = APP (Point E)
- Stage II → MPP = APP to MPP = 0 or Max TPP
- Stage III → After MPP = 0

Stage I	Stage II	Stage III
•MPP>APP • APP increasing (Increasing efficiency in resource use) • APP reaches a maximum at the end of this stage	•MPP is decreasing MPP<APP and MPP > 0 •APP is at a maximum at the beginning of this stage •Efficiency of the fixed inputs is greater at the beginning	•Occurs where MPP < 0 •Occurs when excess quantities of variable input are combined with the fixed inputs •Total output begins to decrease

- Even if the input is free, it will not use in stage III
- If the product has any value, input used should be continued until stage II is reached. APP of the variable input increases throughout the stage I .
- Production should be continued in stage II and the suitable level of input use depends on the prices of inputs as well as outputs.

- At the maximum TPP → MPP is zero

  Eg: Given production function

$$y = x^2 - \left(\frac{1}{30}\right)x^3$$

- What is the input level at which TPP is maximum **?**

  At maximum TPP → MPP = 0

Therefore,

$$\text{MPP} = \frac{dy}{dx} = 2x - \frac{1}{10}x^2 = 0$$

$$x(2 - 0.1x) = 0$$

$$x = 0 \text{ or } x = 20$$

But , when x = 0

$$\text{TPP} = y = x^2 - \left(\frac{1}{30}\right)x^3$$

$$= 0$$

Therefore X = 0 is not the input level at which the TPP is maximum.

When x = 20

$$\text{TPP} = y = x^2 - \left(\frac{1}{30}\right)x^3$$

$$= (20)^2 - \frac{1}{30}(20)^3$$

$$= 400 - \frac{1}{30}.8000$$

$$= 133.33$$

When x = 133.33, TPP is maximum.
This gives the boundary between stage II and III .

In order to find the input levels at which APP is at a maximum, first derivative of APP function should equal to zero.

$$y = x^2 - \left(\frac{1}{30}\right)x^3$$

Eg: Given production function

What is the input level at which APP is maximum?

$$\text{APP} = \frac{y}{x} = x - \frac{1}{30}x^2$$

APP at its maximum,

$$\frac{d(APP)}{dx} = 0$$

$$1 - \frac{1}{15}x = 0$$

$$x = 15$$

APP reaches a maximum when x = 15

At this point , APP = MPP

3.3 Elasticity of Production and Point of Diminishing Returns

- At the inflection point → MPP is at its maximum
- After that , MPP begins to decline.
- TPP & MPP begin to decline at a point beyond the inflection point .

Question 2

Consider the following production function

$$Y = 6X^2 - 0.4X^3$$

i. Find the value of X that maximizes the output.
ii. Find the value of X that maximizes the MPP
iii. Find the value of X that maximizes the APP

3.4 Elasticity of Production

- Percentage change in output due to one percent change in input level.

$$E_p = \frac{\%\ \text{Change in Output}}{\%\ \text{Change in Input}}$$

$$= \frac{\frac{\Delta y}{y}}{\frac{\Delta x}{x}}$$

$$= \frac{\frac{\Delta y}{\Delta x}}{\frac{y}{x}}$$

$\frac{\Delta y}{\Delta x}$ ← MPP

$\frac{y}{x}$ ← APP

$$= \frac{MPP}{APP}$$

- In stage I, MPP > APP , therefore Ep >1
- In stage II, MPP < APP, therefore Ep <1 but > 0
- In stage III , MPP < 0 , therefore Ep < 0

Eg: Given production function ,

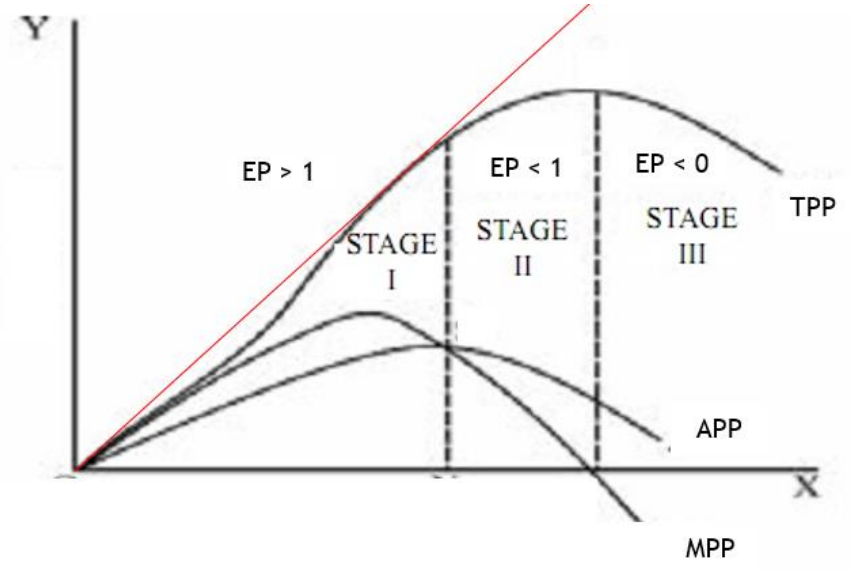
$$y = x^2 - \left(\frac{1}{30}\right)x^3$$

What is Ep?

$$\text{MPP} = 2x - \frac{1}{10}x^2$$

$$\text{APP} = x - \frac{1}{30}x^2$$

$$\text{EP} = \frac{2x - \frac{1}{10}x^2}{x - \frac{1}{30}x^2}$$



- At the point of diminishing returns ,

  APP = MPP

  Ep = 1.0

- This is the lower bound of stage II

  Relevant production interval,

  $0 \leq Ep \leq 1.0$

LECTURE 04
Theory of Farm Production and Costs – Part III

4.1 Partial Derivatives

By holding rest at constant, change one variable at a time.

$$Y = 3X_1^2 + 6X_1X_2 + 5X_2$$

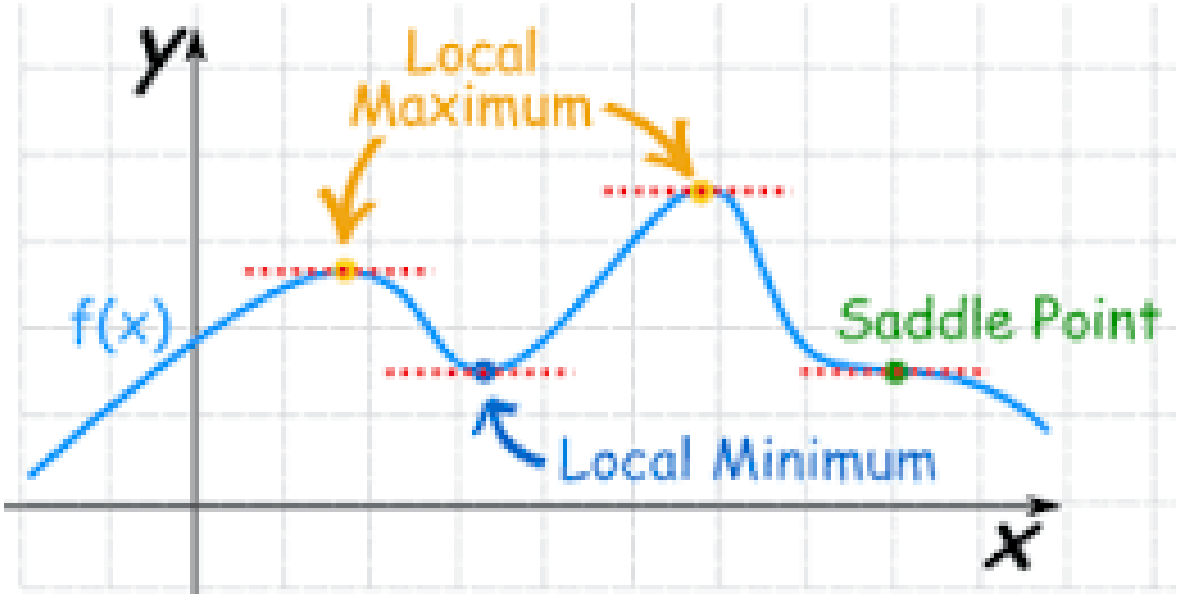
Partial derivative with respect to X_1 → $\frac{\partial Y}{\partial X_1} = 6X_1 + 6X_2$

Partial derivative with respect to X_2 → $\frac{\partial Y}{\partial X_2} = 6X_1 + 5$

With two variables

FOC	$f_1 = 0$	$f_2 = 0$		
SOC	$f_{11} > 0$	$f_{22} > 0$	Min	
$\boldsymbol{SOC}$	$\boldsymbol{f_{11} < 0}$	$\boldsymbol{f_{22} < 0}$	$\boldsymbol{f_{11} \cdot f_{22} > f_{12}^2}$	$\boldsymbol{Max}$

This is the condition should be fulfilled for profit maximization



Question 1

Consider the following profit function

$$Z = X^2 + XY + 2Y^2 + 3$$

Find FOC, SOC with respect to X and Y

Max or Min?

Answer 1

$FOC \longrightarrow$ $f_1 = \frac{\partial Z}{\partial X} = 2X + Y \; set \; 0$

$f_2 = \frac{\partial Z}{\partial Y} = X + 4Y \quad set \; 0$

$2X + Y = 0 \quad -----1$

$X + 4Y = 0 \quad -----2$

$\downarrow$

$X = 0 \quad Y = 0$

$SOC \longrightarrow$ $f_{11} = \frac{\partial^2 Z}{\partial X^2} = 2$

$f_{22} = \frac{\partial^2 Z}{\partial Y^2} = 4$

$f_{12} = \frac{\partial^2 Z}{\partial X \partial Y} = 1$

$f_{11} > 0 \quad f_{22} > 0$

$f_{11}.f_{22} = 8 \quad > \quad f_{12}^2$

$\therefore \; X = 0 \quad Y = 0 \quad \rightarrow \quad Z = 3 \quad Min$

Question 2

The management of ABC Dairy company finds that its annual profit as

$P(X,Y) = -2X^2 - 3Y^2 + 2XY + 100X + 90Y - 3075$ in Rs. 000s.

Where $X = number \; of \; bottles \; of \; fresh \; milk$

$Y = number \; of \; bottles \; of \; powdered \; milk$

How many bottles from each category should the firm produce in order to maximize profits?

LECTURE 05
Cost Functions

5.1 Important Categories of Costs

- Fixed Costs (FC)
- Variable costs (VC)
- Total Costs (TC)

5.1.1 Fixed Costs (FC)

- Costs that are spent and cannot be changed in the period of time under consideration.
- No fixed costs in Long Run (LR)
- Do not change with the level of output
- Include overhead costs
- DIRTI 5 (Depreciation, Interest, Rent, Taxes, Insurance) are included in fixed costs.

5.1.2 Variable Costs (VC)

- Costs that change as output changes
- As output increases, variable cost increases

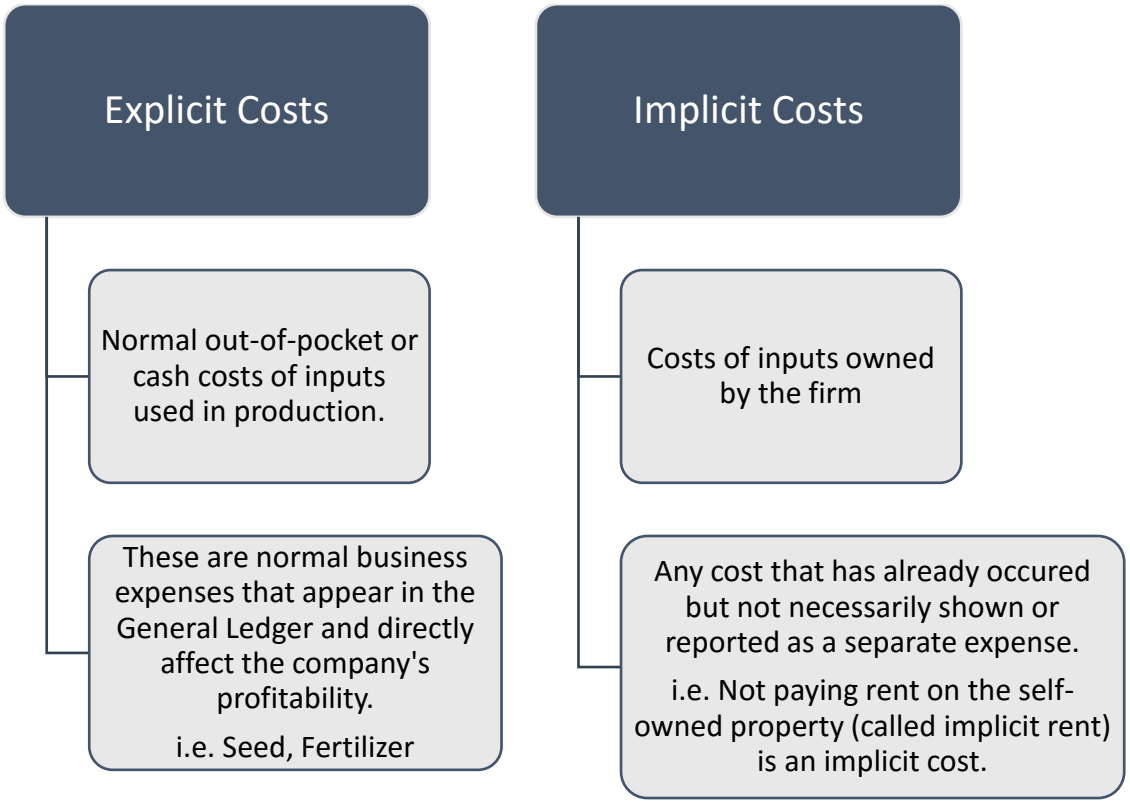
5.1.3 Total Costs (TC)

- Sum of the fixed and variable costs

$$TC = FC + VC$$

5.2 Economic Costs

The payment that a firm must make to acquire inputs and keep them from being used to produce other outputs.



5.3 Average Total Cost, Average Fixed Costs and Average Variable Costs

Average Total Costs : - Total cost per unit of output

where Q = Quantity produced

$$ATC = \frac{TC}{Q}$$

Average Fixed Costs $$AFC = \frac{FC}{Q}$$

Average Variable Costs $$AVC = \frac{VC}{Q}$$

5.4 Marginal Cost (MC)

The most important cost considers when deciding how many units (Quantity) to be produced.

- MC - The increase (or decrease) in total cost from increasing (or decreasing) the level of output by one unit.

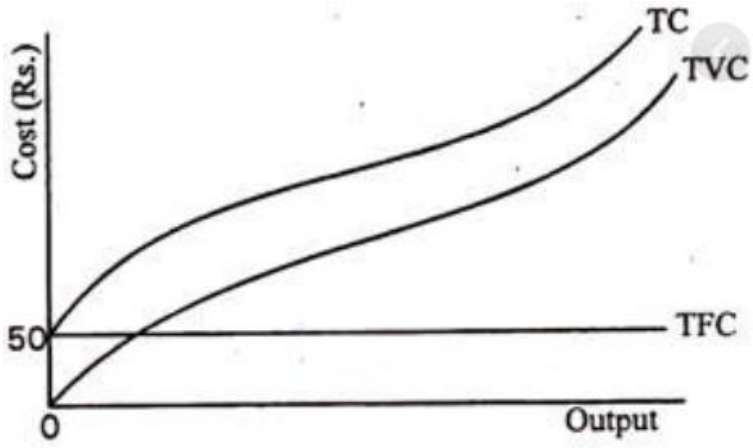
Question 1

O/P	FC $	VC $	TC (FC+VC) $	MC (ΔTC / ΔOUTPUT) $	AFC (FC/OUTPUT) $	AVC (VC/OUTPUT) $
3	50	38				
4	50	50				
9	50	100				
10	50	108				
16	50	150				
17	50	157				
22	50	200				

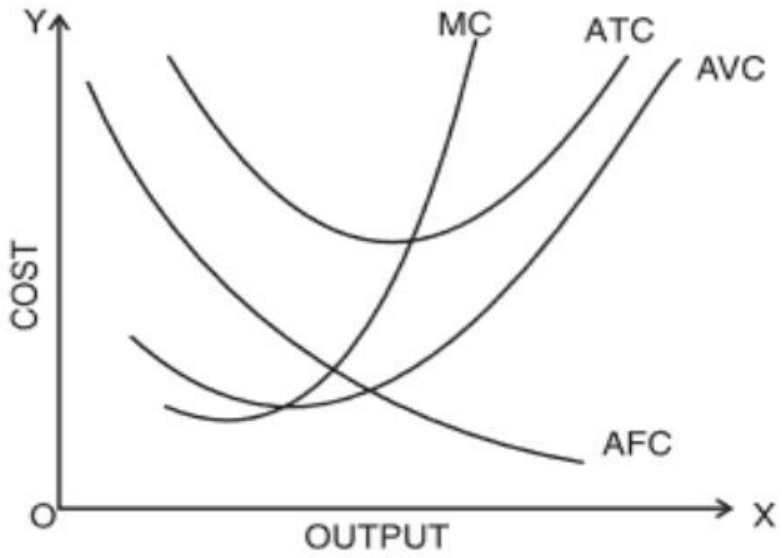
Answer 1

O/P	FC $	VC $	TC (FC+VC) $	MC (ΔTC / ΔOUTPUT) $	AFC (FC/OUTPUT) $	AVC (VC/OUTPUT) $
3	50	38	88		16.67	12.66
4	50	50	100	12	12.50	12.50
9	50	100	150	10	5.56	11.11
10	50	108	158	8	5.00	10.80
16	50	150	200	7	3.13	9.38
17	50	157	207	7	2.94	9.24
22	50	200	250	8.6	2.27	9.09

Shapes of the Cost Curves- SR



SR Average and Marginal Cost Curves



CURVE	SHAPE
1. Total Fixed Cost	Constant ,Doesn't change with the output.
2. Avg. Fixed cost (AFC)	Downward sloping
3. Avg. Variable cost (AVC)	U. Shaped
4. Avg. Total cost (ATC)	U. Shaped
5. MC	U. Shaped . Goes through the minimum points of AVC & ATC

Change with the level of output

$$AVC = \frac{TVC}{Y} = \frac{P_x X}{Y} = P_x \frac{X}{Y}$$ ← 1/APP

$$AVC = \frac{P_x}{APP}$$

$$MC = \frac{\Delta TC}{\Delta Y} = \frac{\Delta TVC}{\Delta Y} = \frac{P_x(\Delta X)}{\Delta Y} = P_x \frac{\Delta X}{\Delta Y}$$ ← 1/MPP

$$MC = \frac{P_x}{MPP}$$

- Production Analysis ⟷ Cost Analysis
- Laws governing costs are the same laws governing productivity

- When MPP ↓ ⟶ MC ↑

  APP ↓ ⟶ AVC ↑

  - Therefore, productivity falls is equivalent to that cost rises.

In short run,

Output can only be raised by increasing variable input

↓

More and more variable input add to fixed input

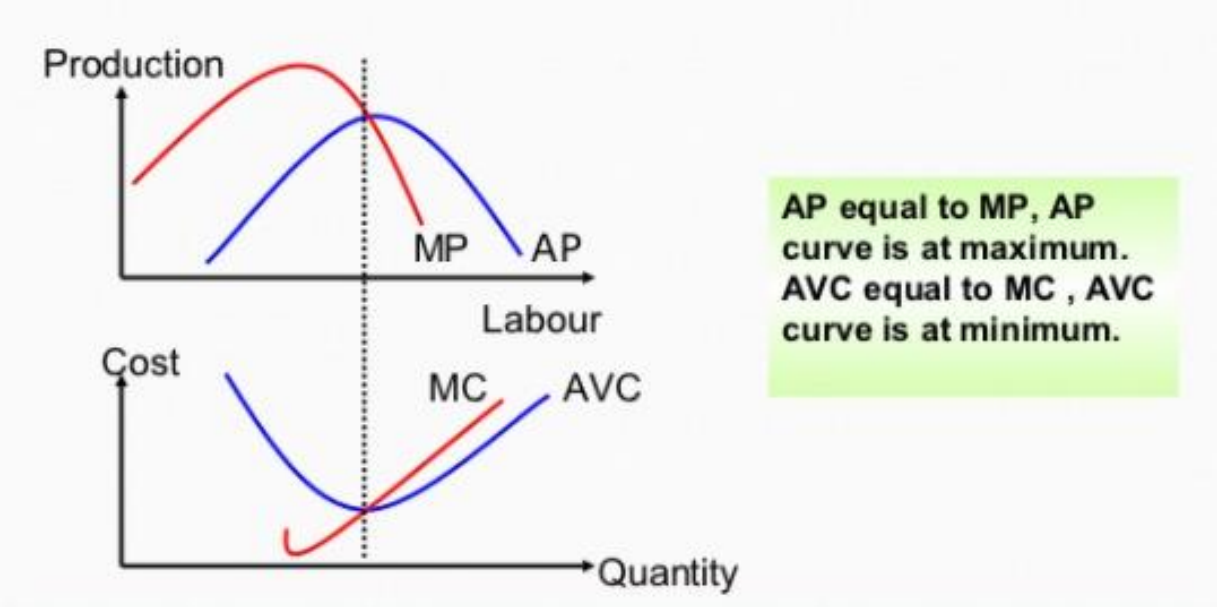
↓

Law of Diminishing marginal returns

↓

MPP & APP fall

The Relationship between Productivity and Cost

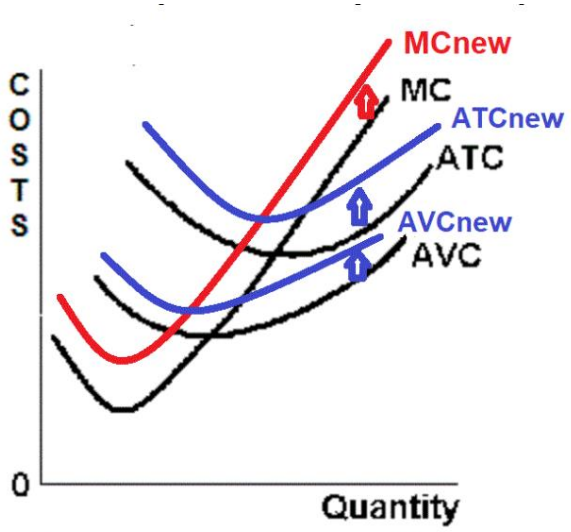


- Minimum of AVC is the maximum of APP (at the same output levels)
- The minimum point of the MC is the same level of output at the maximum point on MP
- When productivity curves are falling, corresponding cost curves are rising.
- Reason :-
  - As productivity falls → Costs per unit ↑
  - As productivity increases → Costs per unit ↓

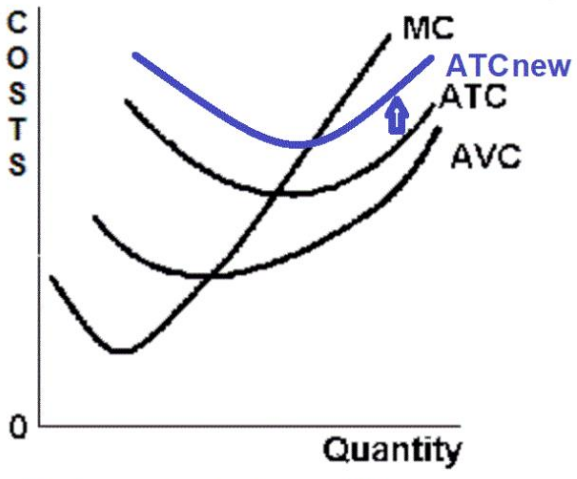
Economics of scale

Production	Cost
When MPP> APP , APP ↑ If MP< AP then AP is falling When MPP= APP , APP maximum	If MC > ATC , then ATC ↑ If MC = ATC , ATC minimum If MC < ATC , then ATC ↓ If MC > AVC , then AVC ↑ If MC = AVC , AVC is minimum If MC < AVC , AVC is ↓

Shift in Cost Curves



A change in variable costs (like an increase in wages or an increase in energy costs) will change AVC, ATC and MC.



A change in fixed costs (like an increase in rent) will only affect ATC. It will not change MC.

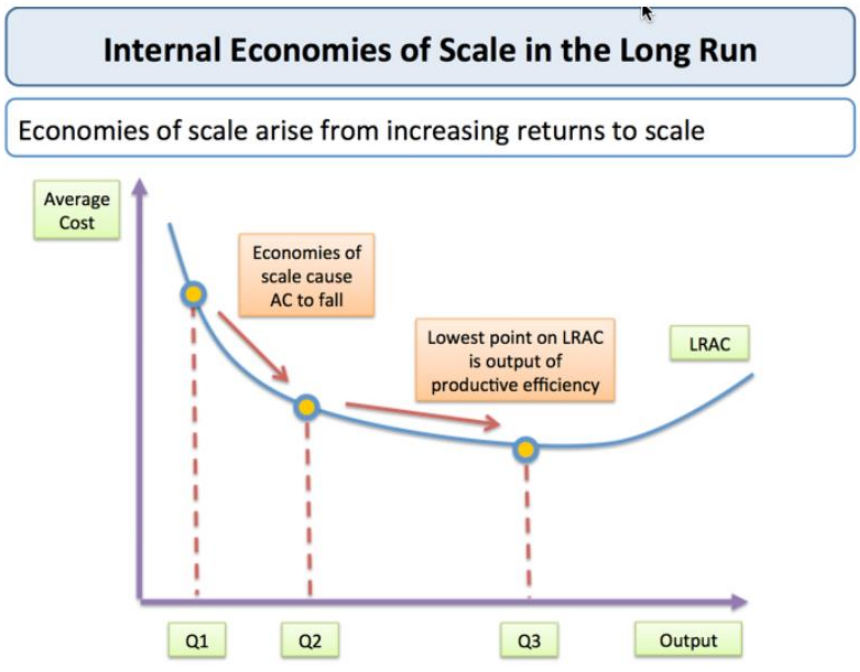
Long-Run Cost Curves

- The law of diminishing marginal returns doesn't apply to the long run since in the long run all inputs are variable.
- The most important determinant of economic efficiency in long run → Economies of scale

When long-run ATC decrease as output increase

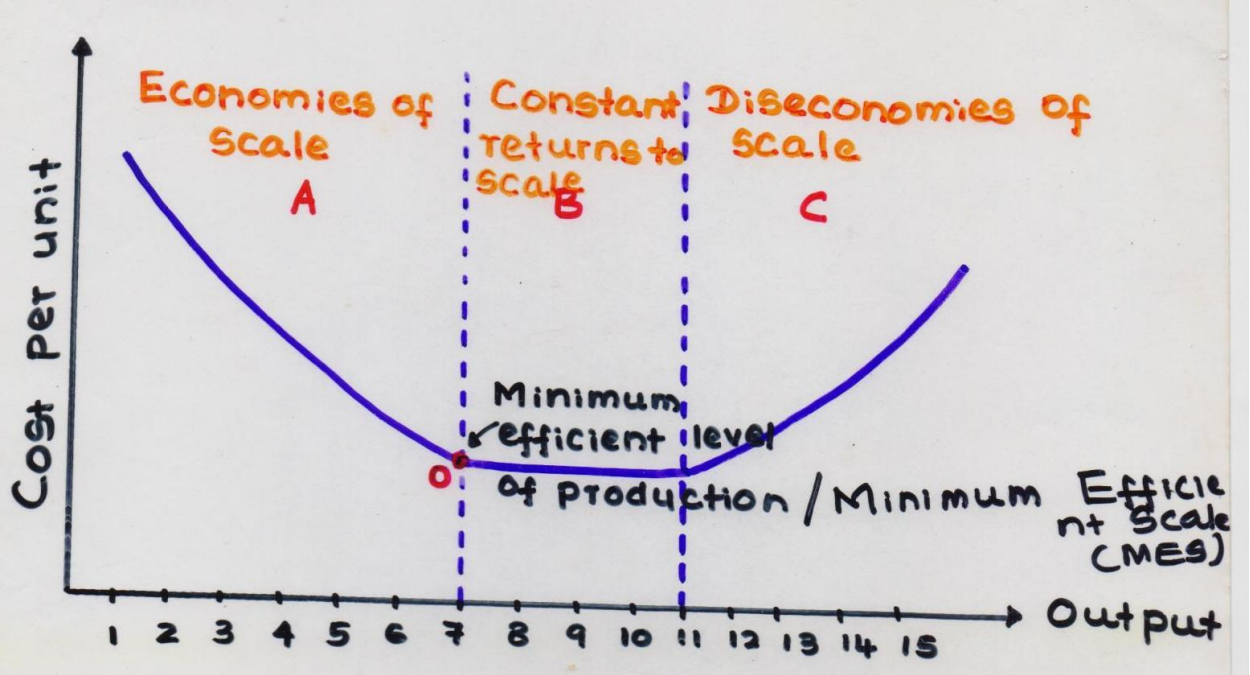
5.5 Economies of Scale and Long Run Average Cost (LRAC)

- In the long run all costs are variable and the scale of production can change (i.e. no fixed inputs)
- Economies of scale are the cost advantages from expanding the scale of production in the long run. The effect is to reduce average costs over a range of output
- These lower costs represent an improvement in productive efficiency and can give a business a competitive advantage in a market. They lead to lower prices and higher profits.
- We make no distinction between fixed and variable costs in the long run
- As long as the long run average total cost curve (LRAC) is declining, then internal economies of scale are being exploited.



The long run average cost curve with economies and diseconomies of scale

The typical Long-run Average Total Cost Curve

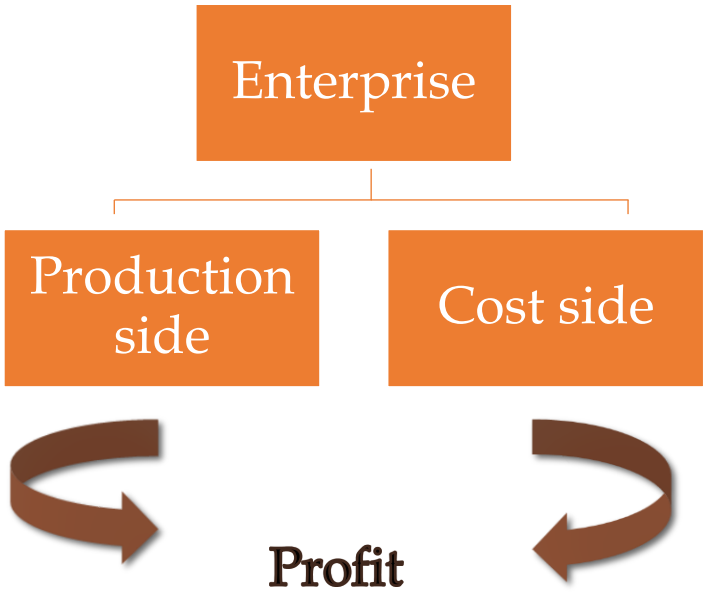


- In the long run , all inputs are variable, so only economies of scale can influence the shape of the long run cost curve.

Businessmen prefer "Minimum efficient level of production"

- The minimum efficient scale (MES) is the lowest point on a cost curve at which a company can produce its product at a competitive price. At the MES point, the company can achieve the economies of scale necessary for it to compete effectively in its industry.
- Price at which they expect to be able to sell a good.
- The market has expanded to a size, large enough for the firms to take advantage of all economies of scale.

LECTURE 06
Profit Function



6.1 TR in terms of output

Profit = Total Revenue (TR) − Total Cost (TC)

$TR = P_y . Y$ P_y = Price , Y = Total physical product

$TVP = P_y . Y$ at Perfectly competitive market.

Total Value Product

6.2 TC in terms of input

$TC = v . X$ at Perfectly competitive market

v = Input price, X = Amount of inputs

$TFC = v . X$

Total Factor Cost

6.3 Profit

Profit (π) = TVP − TFC

In profit maximization, manager behave as,

$$\frac{d(\pi)}{d(x)} = \frac{d(TVP)}{d(x)} - \frac{d(TFC)}{d(x)}$$

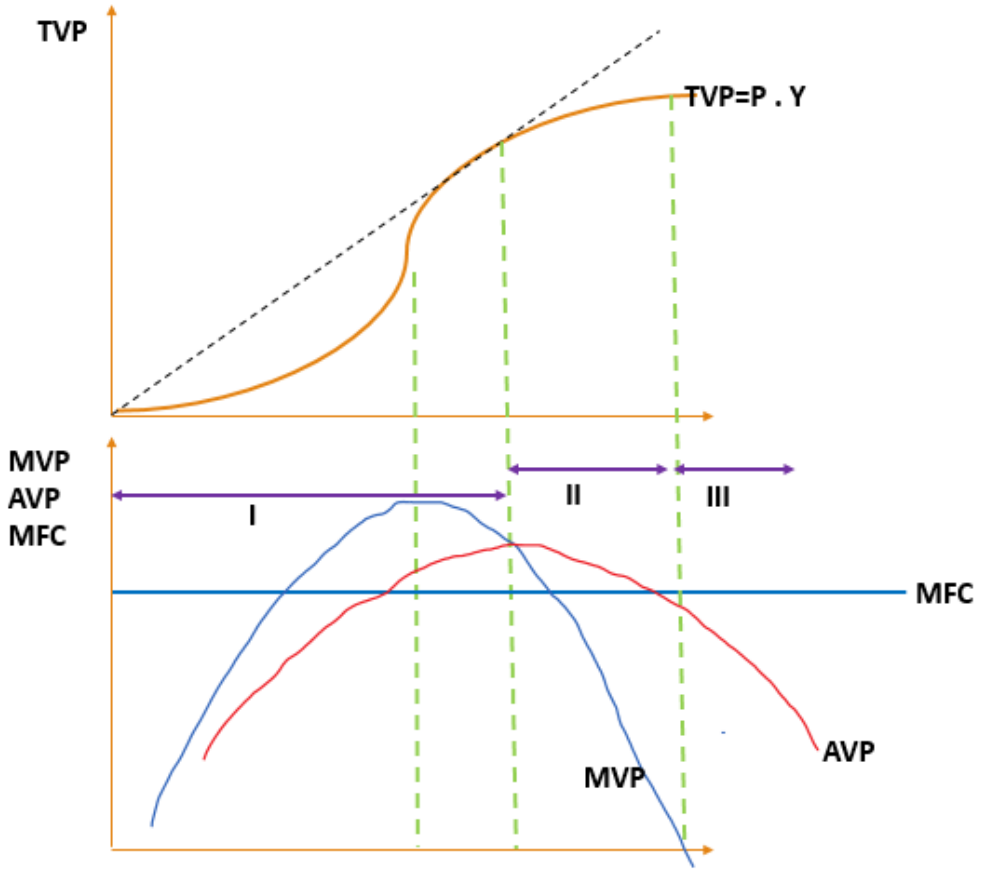
$$= MVP - MFC = 0$$

Derivative of TVP = MVP (Marginal Value Product)

Derivative of TFC = MFC (Marginal Factor Cost)

◉ At profit maximization...

$$\boxed{MVP = MFC}$$



Question 1

Given production function

$$Y = 10 + 8X - 2X^2$$

$$P_y = 4\ (Rs\ per\ unit\ of\ output)\ and\ P_x = 8\ (Rs\ per\ kg\ of\ urea\ fertilizer)$$

Find the input levels at which,

a) Production is maximized

b) Profit is maximized

Question 2

You are thinking of start a juice bar near the University.

Using historical data from other stores plus survey information in the local area on demand for your juice, you have following data for what you believe relate to cost and daily sales at your new store.

Quantity (Glasses of juice)	Total Fixed Cost (LKR)	Total Variable Cost (LKR)
0	120	0
10	120	20
20	120	30
30	120	50
40	120	80
50	120	130
60	120	230
70	120	380
80	120	690

Assumptions made in analyzing this case are

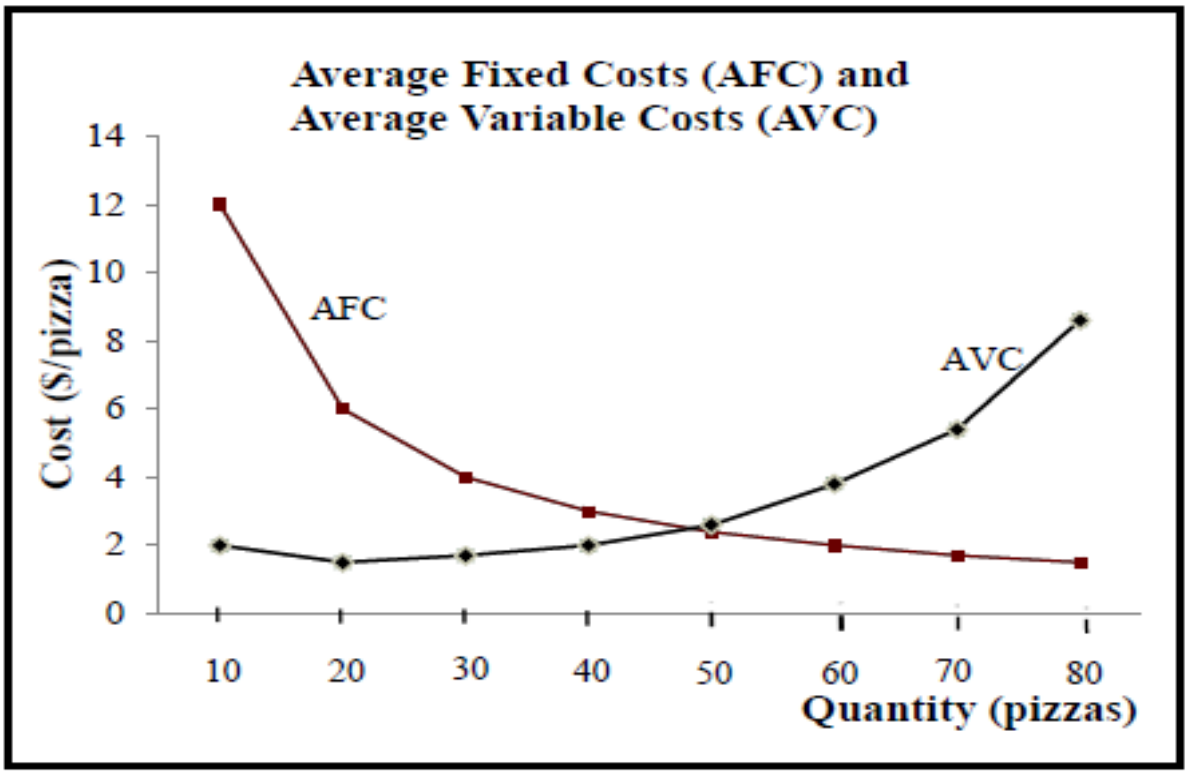
- The operations are occurring in the short run (the shop size, number of refrigerators is fixed and not be able to changed in the near future.
- The larger quantities of juice can be made only by employing more casual staff (a high variable cost component thus being wages).

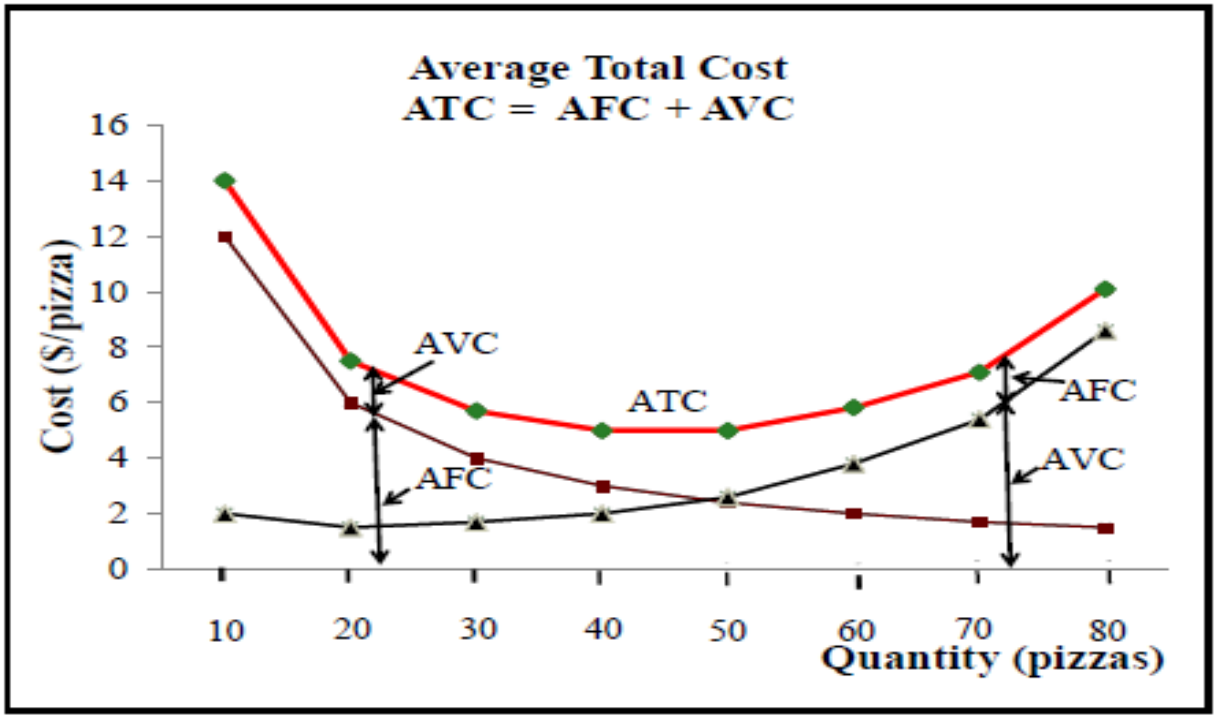
Quantity (Glasses of juice)	Total Fixed Cost (LKR)	Total Variable Cost (LKR)	TC (LKR)	AFC LKR/Glass of juice	AVC LKR/Glass of juice	ATC LKR/Glass of juice	MC LKR/Glass of juice
0	120	0					
10	120	20					
20	120	30					
30	120	50					
40	120	80					
50	120	130					
60	120	230					
70	120	380					
80	120	690					

Measured Costs data → ← Calculated Costs data

A	B	C	B+C	B/A	C/A	$\frac{(B+C)}{A}$	
Quantity (pizzas)	TFC ($)	TVC ($)	TC ($)	AFC ($/pizza)	AVC ($/pizza)	ATC ($/pizza)	MC ($/pizza)
0	120	0	120	-	-	-	-
10	120	20	140	12	2	14	2
20	120	30	150	6	1.5	7.5	1
30	120	50	170	4	1.7	5.7	2
40	120	80	200	3	2	5	3
50	120	130	250	2.4	2.6	5	5
60	120	230	350	2	3.8	5.83	10
70	120	380	500	1.7	5.4	7.1	15
80	120	690	810	1.5	8.6	10.1	31

Note: if TFC = constant, MC results only from an increase in TVC


Average Fixed Costs (AFC) and
Average Variable Costs (AVC)
Cost ($/pizza)
14
12
10
8
6
4
2
0
AFC
AVC
10
20
30
40
50
60
70
80
Quantity (pizzas)


Average Total Cost
ATC = AFC + AVC
Cost ($/pizza)
16
14
12
10
8
6
4
2
0
AVC
ATC
AFC
AFC
AVC
10
20
30
40
50
60
70
80
Quantity (pizzas)

LECTURE 07
Farm Records

7.1 Record Keeping

- Keeping, filing, maintaining, and categorizing financial and production information.

7.2 Why Keep Records?

- ✓ **Proof-** To provide a proof of income expenses and inventory whenever asks
- ✓ **Decision – aids –** Balance sheet, cash flow, and income statements aids in making more informed decision
- ✓ **Institutional Requirements-** Leading agencies and government bodies require records to be maintained over number of years
- ✓ **Environmental Regulation** – Many agricultural establishments are asked to keep records on chemical use, livestock waste management and irrigation

7.3 Basic types of records

- Financial
- Production

7.3.1 Financial Records

- Product sales
- Operating expenses
- Equipment purchase
- Accounts payable
- Inventories
- Depreciation records
- Loan balances
- Price information

7.3.2 Production Records

- Crop Yields
- Plant populations
- Calves born
- Pounds of milk produced
- Weaning weights
- Death loss

7.4 Determining a Record Keeping System

- There is no right of wrong record system
- Depend on the expected use of the records
- A good record keeping system should
  - ✓ provide accurate and necessary information
  - ✓ Fit into the farm organization
  - ✓ Be able to fit in a form to aid in decision making

7.5 Components of a Complete Record System

- Inventory
- Depreciation schedule
- Financial statement
- Receipt record
- Expense record
- Profit and loss statements
- Cash flow
- Production records
- Account payable
- Accounts receivable

Additional Records

- Loan outstanding
- Payments on social security
- Family living accounts

7.6 Record Keeping by Hand

- Advantages include
  - low in cost
  - can be easily implemented

- Disadvantages include
  - time consuming
  - creates greater chance of making mistakes

- Journal format include
  - Date
  - Item involved
  - Cash involved

7.7 Record keeping by Computer

- Advantages
  -accurate
  -can be a powerful analysis tool

- Disadvantages
  -higher in cost
  -may require training

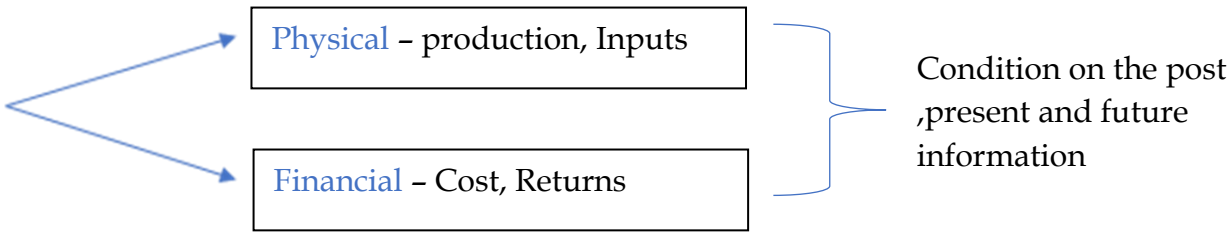
- Select program based on type of farming operation
  -some programs calculate payroll for employees
  -some programme have income tax operations

7.8 Record Analysis

- Assists in decision making
- Analysis tools include
  - Balance sheet
  - Income statement
  - Project monthly cash flow statement

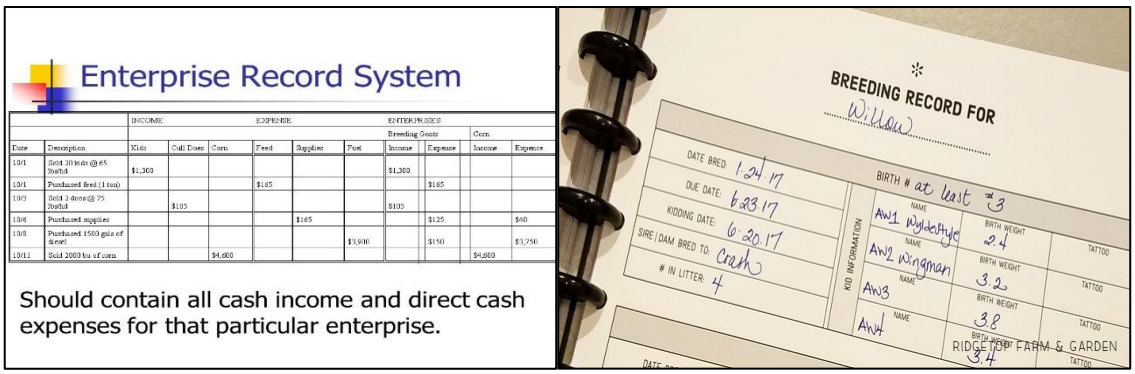
7.9 Farm Records

- Primary purpose- provide information for management decisions
- Understanding of economic principles will help to obtain more value
- Accurate and efficient farm management decision making requires extensive information concerning



7.10 Types of record system

1. **Enterprise Record System(ERS)**
2. **General Farm Record System (GFRS)**



7.11 Labour records

- One of the major input
- Efficient management and use of labour is important
- to the successful management of farm
- Labour is combined with other factors of production

7.12 Objective of labour management

- Use all the factors of production to achieve the farmer's objectives more efficiency

Labour productivity

✓ Getting more output from essentially the same inputs

$$\text{Productivity} = \frac{\mathbf{Y}(production)}{\mathbf{L}(Labour)}$$

Y ↑

L ↑

$$\frac{Y}{L} = \frac{Y}{A} * \frac{A}{L}$$

Substitute k for L

K/L ↑ π ↑

Where,

A=Area

K= Machinery

- ➢ Improve the accuracy ,suitability and use of equipment for doing work
- ➢ Organize the work routine for full and effective use of men and machinery
- ➢ Work simplification
- ➢ Incentive payment soon after it is earned
- ➢ Constant application of human relationship
- ➢ The calendar of operations is important for the purpose of making more efficient use of both labour and capital item

7.13 Partial Budget(PB)

- A **partial budget** helps farm owners/managers evaluate the financial effect of incremental changes (Demonstrate the marginal effect on an existing activity)
- A **partial budget** only includes resources that will be changed. It does not consider the resources in the business that are left unchanged
- Assumes the proposed change does not affect to the fixed cost

Adjustment

I. Adding to an enterprise

II. Introducing a new enterprise

III. Purchasing a new machine

- PB is simple(less details) quick (Impact) and easy (less time)

Rules to be kept in mind

1. Establish clearly what comparison
2. How much information to gathered
3. Include meaning full information

7.13.1 Partial budget outline

Compare the effect on net income of the enterprise dropped with one being added. Estimate the profit from buying a sprayer.

Debit	Rs	Credit	Rs
Reduced Receipts Soya Add cost Sprayer Chilli cultivation Extra profit	5 5 15 20	Reduced cost Soya Hiring cost Add receipts Chilli	2 3 40
	45		45

IRR= (20000/25000)*100=80%

- Partial Budget: Add 50 cows to cow-calf operation and convert 100 acers to forage

Benefits	Cost
Additional Revenues 23 steer calves,18heifer calves and 5 cull cows = $18,899	**Additional Cost** Fixed and variable costs for 50 more cows and needed bull = $8,200
Cost Reduced Variable inputs for grain production = $ 8,320	**Revenues Reduced** Revenue from corn-soybean production=$18,500
Total Benefits $27,219	Total cost $26,700
	Net Benefit $519

7.13.2 Partial Budget Purpose

- To estimate the net benefits from a small change to a far operation in order to guide a farm decision
- Fine tune your current operation: Hold all else fixed and evaluate effect of small change
- Partial budget focuses only on the time things that change
  - Do not budget each enterprise completely, but build on enterprise budgets
- Other names that are essentially the same: Marginal Analysis or incremental analysis

7.14 Enterprise Budget

- An **enterprise budget** is a listing of all estimated income and expenses associated with a specific **enterprise** to provide an estimate of its profitability. A **budget** can be developed for each existing or potential **enterprise** in a farm or ranch plan.

LECTURE 08
Labour and Capital Resources

8.1 Labour resource

- **Labour supply** → No of workers
- Labour supply is determined by
    - Hours worked/day
    - Number of days each worker available/year
- Different types of labour
    - Hired labour
    - Family labour - farm operator
    - Supplemental labour - from family members

8.2 Factors affecting worker output

- Quality of labour force
- Degree of mechanization

8.3 Labour productivity

- Worker output can be measured by "Labour Productivity"
- Productive factors
    - Value of production per full time worker
    - Labour per tillable acre
    - Labour per animal unit
    - Labour cost per unit of gross production

8.4 Labour availability

- Labour availability : The time at which labour is available
- More important than labour supply.
- **Labour availability Vs. Labour supply**

8.5 Fixed Vs variable labour

- Fixed labour: Labour that has no alternative employment is fixed as these labour can be hired on a full-year basis.
- Variable Labour: Labour who has alternative employment

8.6 Labour flexibility

- This is an important part of the labor market.
- It allows farms to make certain decisions about changing their labor force as a response to fluctuations in the market and to help boost production.
- Depends on
  - Capability, Attitude of labour, Level of mechanization, Age and health of worker
  - If employees or family members who are well paid and happy with their work are more likely to be flexible.

8.7 Problems associate with labour resource

- A dynamic resource
- Changing economic conditions within the community → Hired labour become less available.
- Marginalization of agricultural workers
- Wages and income
- Low wages for women labor
- High incidence of child labour????
- Increase in labour migration
- Indebtedtness

8.8 Labour estimate worksheet

- Means of estimating labour supply by period.

8.9 Capital resource

- Livestock
- Building and equipment

- Farm machinery
- Tools and shop
- Money used to operate the business

8.10 Good quality capital items

- Good quality capital items: Capital items which are adequate, reliable, and in good condition.
- Good quality capital items contribute to
  - ➢ increased production through improved timelines
  - ➢ increased price through improved quality
  - ➢ increased price through storage
  - ➢ reduced labour cost
  - ➢ improved labour productivity (because jobs are made easier, more jobs can be done in the same amount of time)

8.11 Capital resource quantity vs quality

Quantity

Relates to availability of borrowed funds buildings
Borrowing power
Interest rates

Quantity

State of repair of machinery and

8.12 Capital resource is vary in availability and flexibility

- Availability
  - ✓ How operationally useful the capital items
  - ✓ Whether lend to an efficient operation

- Flexibility
  - ➢ Quality of having alterative uses
    - ✓ I.e. Field and power equipment that is too small for the job is available but uneconomical to use.
    - ✓ A tractor cannot be simultaneously used for plowing and powering a grinding mixer.
    - ✓ Money tied up in crop production is not available for livestock investment.
    - ✓ The degree of flexibility apply also to use of money. i.e. an operator with heavy debt loan in land, equipment, and facilities has little flexibility.

8.13 Future value of capital goods

- Most items depreciate with time.
- Inventory taken a year from now will differ from the one taken today.
- Assessing the quality and usefulness of capital resources at some future time is required in addition to current assessment.

8.14 Capital inadequacies

- If occur, manager must evaluate the feasibility of
  - ✓ Borrowing money
  - ✓ Leasing machinery, equipment or facilities
  - ✓ Hiring someone else to provide the item
  - ✓ Building up a cash reserve for a down payment on a needed item.

Need Budgeting and Cash flow planning

LECTURE 09
Cash Flow Budgeting

9.1 Cash flow budgeting

Cash Flow Statement	
Cash inflows	930
Sales	1000
- delta clients	-70
Divestments	0
New capital	0
New borrowings	0
Cash outlays	900
Purchases	500
- delta suppliers	-20
Cash operating charges	250
Interest, taxes & divid.	60
- delta other creditors	-40
LT investments	100
ST investments	50
Cash variation	+30

- A cash flow budget or projection indicates the ability of a business to generate cash inflows to meet cash outflows during a specified period of time.
- Generally projects into the future.
- Useful tool to money managers/financial managers

Cash Flow	Jan	Feb	Mar
Cash Received			
Cash from Operations			
Cash Sales	$40	$51	$62
Cash from Receivables	$198	$205	$230
Subtotal Cash from Operations	$238	$256	$293
Additional Cash Received			
New Other Liabilities	$7	$0	$0
New Long-term Liabilities	$0	$0	$100
New Investment Received	$0	$25	$0
Subtotal Cash Received	$245	$281	$393
Expenditures	Jan	Feb	Mar
Expenditures from Operations			
Cash Spending	$47	$47	$47
Bill Payment	$225	$36	$59
Subtotal Spent on Operations	$272	$83	$106
Additional Cash Spent			
Principal Repayment of Current Borrowing	$0	$0	$90
Long-term Liabilities Principal Repayment	$3	$3	$3
Purchase Long-term Assets	$25	$0	$15
Subtotal Cash Spent	$300	$86	$213
Net Cash Flow	($55)	$195	$180
Cash Balance	$1	$196	$376

9.2 Cash inflows

SALES

BORROWED MONEY

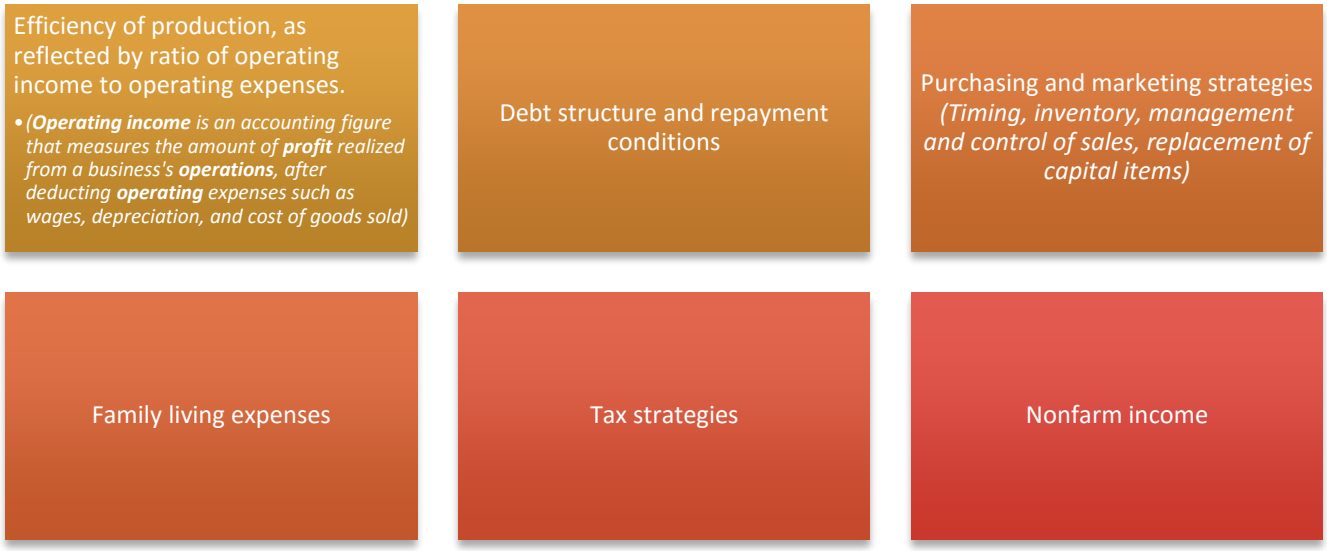
WITHDRAWALS FROM SAVINGS

SALE OF CAPITAL ITEMS

9.3 Cash outflows

- Cash expenses
- Principal and interest payments on debt
- Capital purchases
- Salaries
- Family living expenses

9.4 Cash flow is influenced by



Cash flow statement – differs from financial statement and profit and loss statements

- A cash flow statement reflects all the cash transfers that occur in a business. It differs from the financial statement and profit and loss statement in several ways.

Purchasing of a New Tractor How to Record??

- **Cash flow statement:** Cash transaction is recorded. Only the amount of payment. Not the full value
- **Cash flow statement:** Cash transaction is recorded. Only the amount of payment. Not the full value
- **Financial statement:** Include the value of the tractor as an asset and debt against it as a liability.

BARRY'S SUPERSTORE
Comparative Year-End Income Statements

	Prior Year	Current Year
Net Sales	$100,000	$120,000
Cost of Goods Sold	50,000	60,000
Gross Profit	50,000	60,000
Rent Expense	5,000	5,500
Depreciation Expense	2,500	3,600
Salaries Expense	3,000	5,400
Utility Expense	1,500	2,500
Operating Income	38,000	43,000
Interest Expense	3,000	2,000
Income Tax Expense	5,000	6,000
Net Income	$ 30,000	$ 35,000

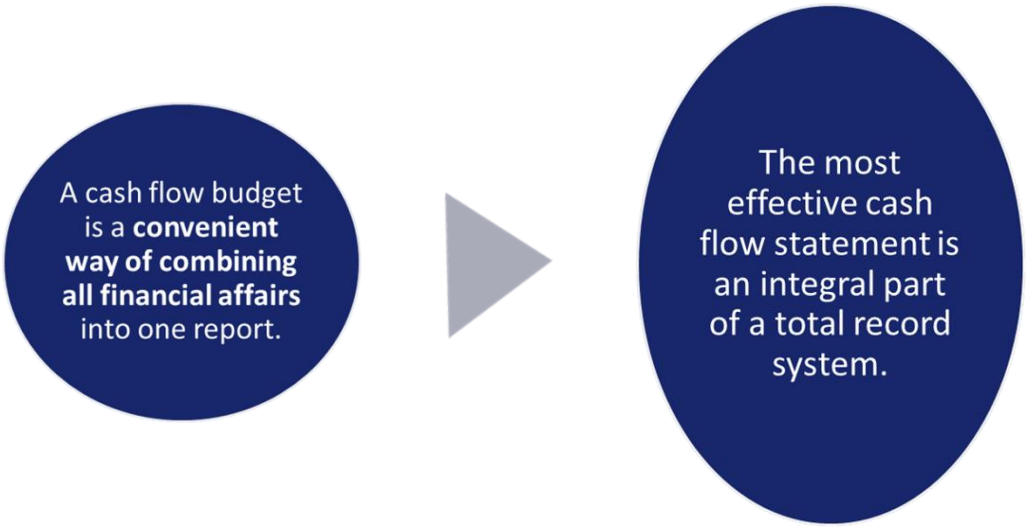
BARRY'S SUPERSTORE
Comparative Year-End Balance Sheets

	Prior Year	Current Year
Assets:		
Cash	$90,000	$110,000
Accounts Receivable	20,000	30,000
Inventory	35,000	40,000
Short-Term Investments	15,000	20,000
Total Current Asstes	160,000	200,000
Equipment	40,000	50,000
Total Assets	$200,000	$250,000
Liabilities:		
Accounts Payable	$ 60,000	$ 75,000
Unearned Revenue	10,000	25,000
Total Current Liabilities	70,000	100,000
Notes Payable	40,000	50,000
Total Liabilities	110,000	150,000

Innovative Products, Inc.
Statement of Cash Flows (Indirect Method)
For Year Ending December 31, 2012

Operating Activities	
Sales Receipts	$50,00,000
Payments for Products	($25,00,000)
Payments for Operations	($20,00,000)
Interest Payments	($1,00,000)
Taxes	($2,27,500)
Extraordinary Items	$2,00,000
Net Cash Flow from Operating Activities	***$3,72,500***
Investing Activities	
Purchase of New Fixed Assets (Property/Machinery)	($21,00,000)
Interest Received	$50,000
Net Cash Flow from Investing Activities	***($20,50,000)***
Financing Activities	
Short-term Debt	$7,00,000
Long-term Debt	$11,00,000
New Equity Issued	$5,00,000
Net Cash Flow from Financing Activities	***$23,00,000***
Net Increase (Decrease in Cash)	$6,22,500
Cash at the Beginning of the Year	$1,00,000
Cash at the End of the Year	**$7,22,500**

Cash flow budgeting contnd…



Family living considerations in cash flow

- Many farm businesses are family businesses and the main source of family income.
- Living expenditure must be accurately estimated if cash flow planning is to be most useful in planning for the future.
- Family living expenditure → Affects to the growth of the business
- Excessive family living expenditure → Compete with business expenditure that would generate additional earnings.

9.5 Advantages of cash flow budgeting

LECTURE 10
Farm Business Analysis – Part I

10.1 Capital budgeting and investment decisions

- Four basic resources of production
  - Land, Labour, Capital, and Management

- Resources are scarce, but have a lot of alternative uses.

10.2 Long term investment decisions for capital

1. Analysis of investment alternatives
   a. i.e. Crop, Livestock, Poultry, ...

2. Invest in the most profitable alternative

10.3 Assumptions

- Only fixed assets are considered.
- Expenditure involving a commitment for at least one year are generally considered.

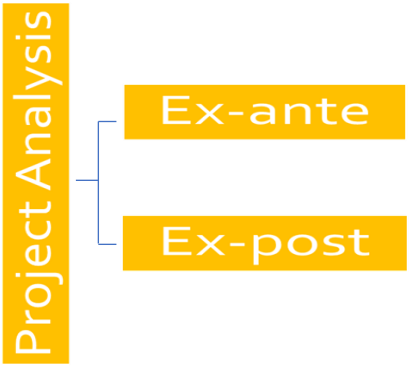
10.4 Items to be included in capital budgeting

- Expenditure on new capital equipment.
- Creation of long-term assets by a new firm.
- Expenditure on expansion or diversification of assets and addition to the existing stock of capital by existing firm.
- Expenditure on replacement of depreciated capital.
- Expenditure on advertisement which bears fruits over time.
- Expenditure on research, development and innovations.

10.5 Prior to the investment...

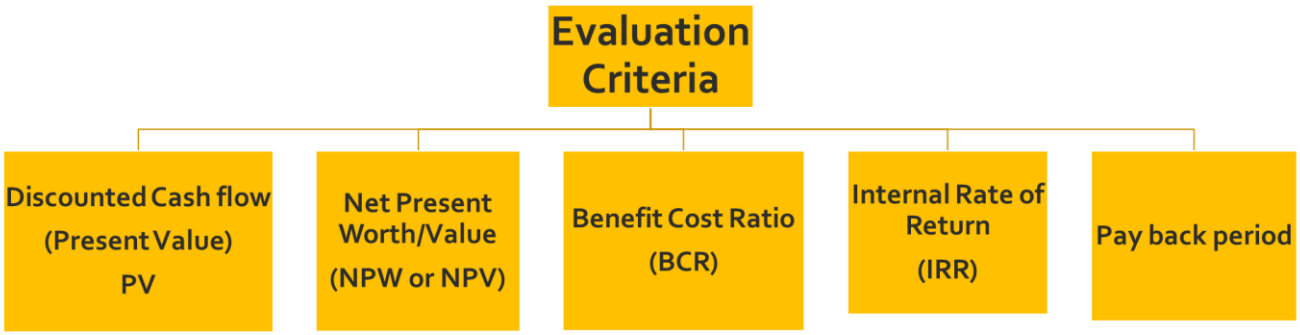
- Sound investment decision

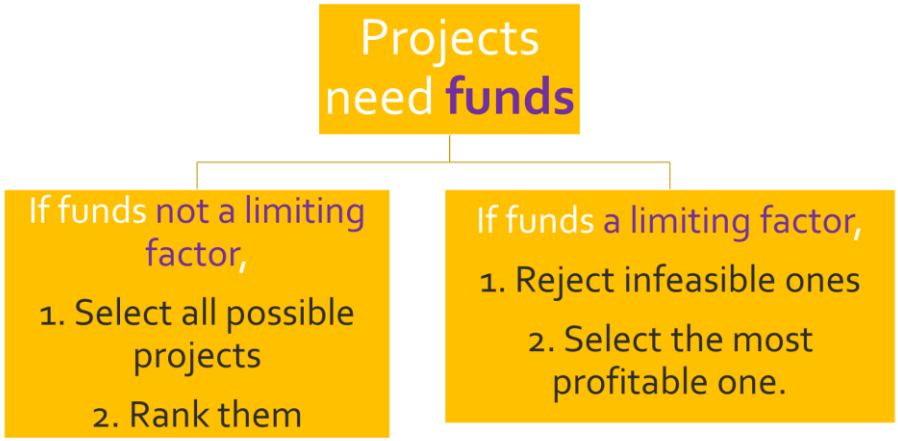
- Steps
  1. Define objectives of the investment
  2. Selecting a criteria for evaluating the investment/project



3. Deciding on the approach for final selection

10.6 Evaluation criteria





10.7 Data required for capital planning and budgeting

- Cost of capital projects
- Expected rates of return
- Availability of alternative projects
- Period of maturity and overall longevity of alternative projects
- Market rates of interest
- Degree of uncertainty

- As projects need funds, there is a demand for capital.

Demand for capital depends on,

- Demand for goods and services that capital can produce
- Productivity of capital
- Cost of capital

10.8 Demand for capital – a derived demand

- In the society, there is a demand for goods and services that capital can produce
- Therefore there is a demand for capital
- Hence the demand for capital is a derived demand.
- Demand for goods and services that capital can produce is a primary demand.

10.9 Evaluation criteria

1. Pay-back period/ pay-out period/ pay-off period

- Length of time that requires the gross earnings to cover the initial investment.

- $$\textbf{Pay-back period} = \frac{(\textbf{Total investment outlays})}{(\textbf{Gross returns per period})}$$

- If a project produces varying amounts of revenue in different years, pay-back period for that project is the number of years required the cumulative gross returns to cover the initial investments.

- Rank the projects

From the lowest pay-back period → **Longer pay – back period**

- This method is good for risky situations

Pay-back period Example 1;

Given the cash flows of the four projects, A, B, C, and D, and using the Payback Period decision model, which projects do you accept and which projects do you reject with a three year cut-off period for recapturing the initial cash outflow?

Projects	A	B	C	D
Cost	$10,000	$25,000	$45,000	$100,000
Cash Flow Year One	$4,000	$2,000	$10,000	$40,000
Cash Flow Year Two	$4,000	$8,000	$15,000	$30,000
Cash Flow Year Three	$4,000	$14,000	$20,000	$20,000
Cash Flow Year Four	$4,000	$20,000	$20,000	$10,000
Cash Flow year Five	$4,000	$26,000	$15,000	$0
Cash Flow Year Six	$4,000	$32,000	$10,000	$0

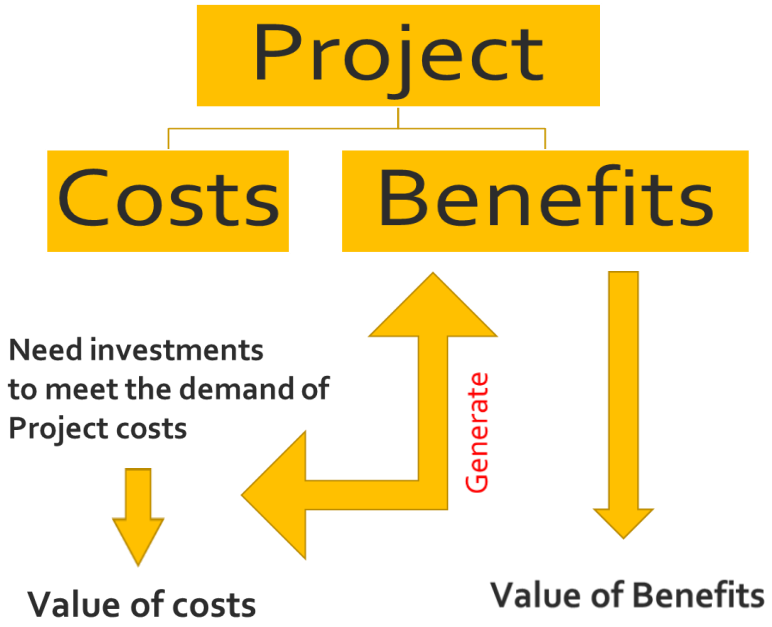
Pay-back period Example 2;

What are the Payback Periods of Projects E, F, G and H? Assume all cash flows are evenly spread throughout the year. If the cut-off period is three years, which projects do you accept?

Projects	*E*	*F*	*G*	*H*
Cost	$40,000	$250,000	$75,000	$100,000
Cash Flow Year One	$10,000	$40,000	$20,000	$30,000
Cash Flow Year Two	$10,000	$120,000	$35,000	$30,000
Cash Flow Year Three	$10,000	$200,000	$40,000	$30,000
Cash Flow Year Four	$10,000	$200,000	$40,000	$20,000
Cash Flow year Five	$10,000	$200,000	$35,000	$10,000
Cash Flow Year Six	$10,000	$200,000	$20,000	$0

LECTURE 11
Farm Business Analysis – Part II

11.1 Net Present Value (NPV)



As the project life span is more than one year, need to consider the following…

Project year	Cost	Benefit
Year 1	.....	.....
Year 2	.....	.....
Year 3	.....	.....
...	.....	.....

In order to take the investment decision before the project,

- Value of the future cash flows should be brought into today's value
- This is called "DISCOUNTING"
- Consider the time value of money

Discounting Factor

- **Discounting Factor=** $\frac{1}{1+r}$ **r = interest rate**
- **Therefore, present value of a stream of income/benefit over n years…**
- $PV = \sum_{j=1}^{n} \frac{B_n}{(1+r)^n}$
- **If the project life span is 5 years and benefit/year is 50, and benefits occur at the end of first year,**
- **PV of benefits over 5 years,**
- $PV = \frac{50}{(1+r)^1} + \frac{50}{(1+r)^2} + \frac{50}{(1+r)^3} + \frac{50}{(1+r)^4} + \frac{50}{(1+r)^5}$
- **If benefits occur at the beginning of the year**
- $PV = \frac{50}{(1+r)^0} + \frac{50}{(1+r)^1} + \frac{50}{(1+r)^2} + \frac{50}{(1+r)^3} + \frac{50}{(1+r)^4} + \frac{50}{(1+r)^5}$
- **Present value of costs**
- $PV = \sum_{j=1}^{n} \frac{C_n}{(1+r)^n}$

- NPV = The difference between the present value of benefits and the present value of costs.
  - $NPV = \sum_{j=1}^{n} \frac{B_n}{(1+r)^n} - \sum_{j=1}^{n} \frac{C_n}{(1+r)^n}$
  - $NPV = \sum_{j=1}^{n} \frac{B_n - C_n}{(1+r)^n}$

NPV selection criteria

- If NPV > 0 → Project is profitable
- If you have NPV > 0 for more number of alternatives,
- Choose the project with largest NPV as higher the value of NPV, greater the profitability of the project.

11.2 Benefit Cost Ratio (BCR)

- Benefit-Cost Ratio (BCR) is the ratio between present value of benefits to present value of costs.
- $$\boldsymbol{BCR = \frac{Present\ Value\ (PV) of\ benefir\ expected\ from\ the\ project/investment}{Present\ Value\ (PV) of\ Cost\ of\ the\ prpject/investment}}$$
- $$\boldsymbol{BCR = \frac{\sum_{j=1}^{n} \frac{B_n}{(1+r)^n}}{\sum_{j=1}^{n} \frac{C_n}{(1+r)^n}}}$$
- If that investment or the project has a **BCR value that is greater than 1** then the project can be expected to return or deliver a positive NPV i.e. net present value to the business or the firm and their investors.
- If BCR value is less than 1, then the project cost can be expected to higher than the returns and therefore, it should be discarded.

11.3 Internal Rate of Return (IRR)

- Internal rate of return (IRR) is the interest rate at which the net present value of all the cash flows (both positive and negative) from a project or investment equal zero.
- Internal rate of return is used to evaluate the attractiveness of a project or investment.
- If the IRR of a new project exceeds a company's required rate of return, that project is desirable. If IRR falls below the required rate of return, the project should be rejected.
- Or
- If IRR>Market value of interest ⟶ Worthwhile to invest in the project

QUESTIONS

1. Swanson Industries has four potential projects all with an initial cost of $2,000,000. The capital budget for the year will only allow Swanson industries to accept one of the four projects. Given the discount rates and the future cash flows of each project, which project should they accept?

Cash Flows	Project M	Project N	Project O	Project P
Year one	$500,000	$600,000	$1,000,000	$300,000
Year two	$500,000	$600,000	$800,000	$500,000
Year three	$500,000	$600,000	$600,000	$700,000
Year four	$500,000	$600,000	$400,000	$900,000
Year five	$500,000	$600,000	$200,000	$1,100,000
Discount Rate	5%	9%	15%	22%

2. Campbell Industries has four potential projects all with an initial cost of $1,500,000. The capital budget for the year will only allow Swanson industries to accept one of the four projects. Given the discount rates and the future cash flows of each project, which project should they accept?

Cash Flows	Project Q	Project R	Project S	Project T
Year one	$350,000	$400,000	$700,000	$200,000
Year two	$350,000	$400,000	$600,000	$400,000
Year three	$350,000	$400,000	$500,000	$600,000
Year four	$350,000	$400,000	$400,000	$800,000
Year five	$350,000	$400,000	$300,000	$1,000,000
Discount Rate	4%	8%	13%	18%

3. Given the discount rates and the future cash flows of each project, which projects should they accept using Benefit Cost Ratio (BCR)?

Cash Flows	Project A	Project B	Project C	Project D
Year zero	-$1,500,000	-$1,500,000	-$2,000,000	-$2,000,000
Year one	$350,000	$400,000	$700,000	$200,000
Year two	$350,000	$400,000	$600,000	$400,000
Year three	$350,000	$400,000	$500,000	$600,000
Year four	$350,000	$400,000	$400,000	$800,000
Year five	$350,000	$400,000	$300,000	$1,000,000
Discount Rate	4%	8%	13%	18%

LECTURE 12
Decision Making Under Risk

When analysing investment alternatives, risk and uncertainty should be taken into consideration.

12.1 Significant differences between the concepts of risk and uncertainty

Risk	Uncertainty
Implies that probabilities can be associated with deviations from the expected or point values an outcome or situation	The outcome is indeterminate. Not certain to occur. Estimates of prob. Cannot be attached to any deviation from expected outcome.

Risk	Uncertainty
Can be measured	Cannot be measured
Chances of outcome are known	The outcome is unknown
Controllable	Uncontrollable
Can minimize	Cannot minimize
Probabilities are assigned	Probabilities are not assigned
Eg: Games – winning or loss Risk from using one option over another option Production risk	Eg: Outcome of a war Natural disasters Damage by fire, flood Economic downturn Bankruptcy

- From an individual manager's point of view, the deviations due to either risk or uncertainty are very similar, except when a deviation from the expected value can be covered by insurance.

Need for Risk adjustment Techniques

(1) Risk-Adjusted Discount Rate

- The value of the discount rate is increased so as to cover the risk factor

risk free PV of future cash flows

Select projects if ;

Risk adjusted PV > Initial Investment outlays

- The risk adjusted discount rate = d

$$d = \frac{1}{1+r+u}$$

u = Degree of risk

If r = 7%, u = 3%

$$d = \frac{1}{1+0.07+0.03} = \frac{1}{1.1} = 0.91$$

Higher the risk → Lower the discounted PV

(2) Mean- Standard Deviation Method

- Discounted PV of future streams of returns is calculated on the basis of their mean value, instead of actual cash flows.
- Discounted PVs and standard deviations re considered.
- Investment is risky if

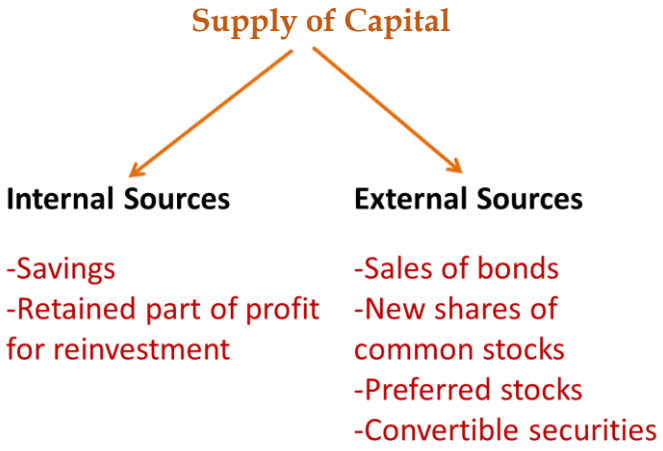
  the mean value is low
  standard deviation is high

(3) The Finite Horizon Method

- Assume that the terminal date for the life of capital is fixed.
- Expected returns/gains prior to the termination date are considered.
- Gains beyond the terminal date is ignored.

(4) The Probability Theory Approach

- Consider a large number of alternative cash flows and the associated probabilities for each time period under consideration.



12.2 Ownership Costs

The DIRTI 5

- Cost per unit product is affected by volume of pdn.
- Cost control ⟶ to profitable farm business

Why a special attention is needed for ownership costs ?

Fixed or ownership costs are incurred regardless of volume of pdn.

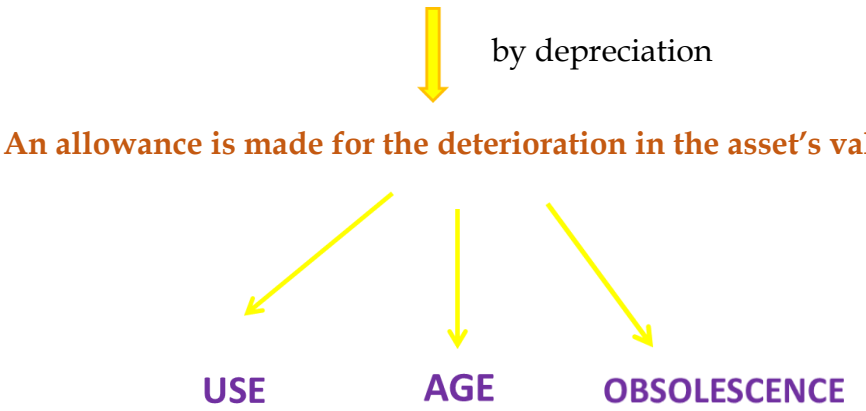
Components of Ownership costs-DIRTI 5

- **Depreciation**
- **Interest**
- **Repairs**
- **Taxes**
- **Insurance**

12.3 Depreciation

- Durable assets can contribute to pdn over several pdn cycles.
- Therefore, their costs should be charged out over the useful life of the asset.

Depreciation: A procedure for allocating the used up value of durable assets over the period they are owned by the business or until they are salvaged.



- Net worth statement :

  Show the true value of depreciable assets

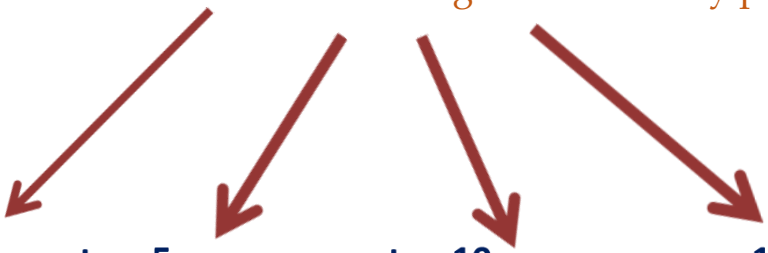
12.3.1 Methods of calculation

1. Accelerated cost recovery system (ACRS)
2. Straight line method
3. Declining balance method
4. Sum of the year digits method

1. ACCELERATED COST RECOVERY SYSTEM (ACRS)

- ACRS applies equally to both new and used property
- Prime objective is tax saving
- Little consideration is given to actual year-to-year change in value

Properties are classified according to the recovery period



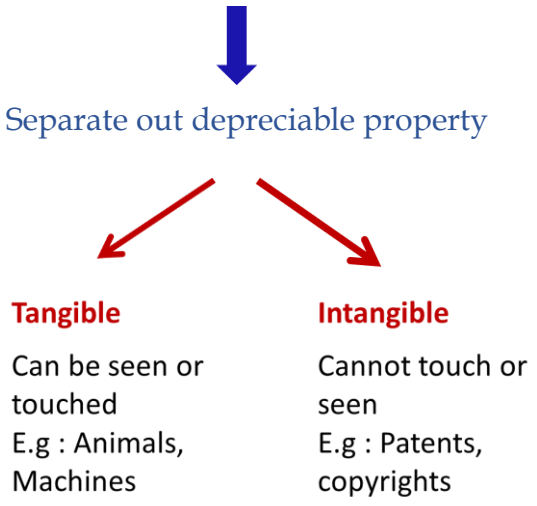
3-year property	5- year property	10-year property	15-year property
-Automobiles -Light duty trucks -Special tools -Depreciable property with midpoint life of 4 years or less	-Farm equipments -Grain bins -Breeding beef -Dairy cows -Office equipments -Office furniture	-Some items used in agriculture	- Eg: Buildings

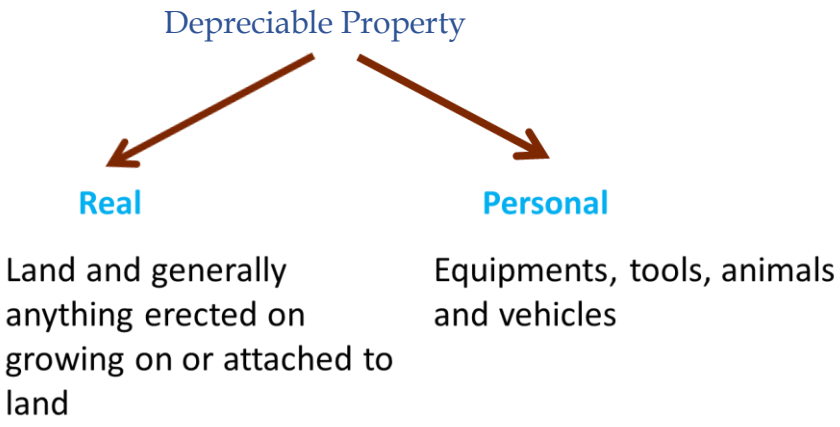
Characteristics of properties which can be claimed for depreciation

Depreciation can be claimed only property used in your trade or business or other income-producing activity.

E.g: Buildings, equipments, breeding stock etc.

1. It should be used in business or to earn rent or royalty income.
2. Wears out, decays, gets used up or become obsolete.
3. Has a determinable useful life of more than 1 year.





- Land itself is never depreciable
- Figuring ACRS :- Using tables of IRS

Other methods of calculating depreciation

2. Straight line method

$$D_s = \frac{OC - SV}{L}$$

OC – Original cost or basis

SV- Salvage value

L - Expected life of the asset in the business

Assume equal amount is depreciated annually

3. Declining balance method

$$D = RV \times R$$

RV - Un-depreciated value of the asset at the start of the accounting period

R - The depreciation rate (It may be twice the rate decline 1/L , allowed under straight line method)

4. Sum of the year-digits method

$$D = \frac{Rr}{s}(OC - SV)$$

Rr - Estimated years of useful life remaining

S - Sum of the numbers representing years of useful life

i.e : for an asset with 5 years useful life,

S = 1+2+3+4+5 =15

Exercise :

Compare the depreciation that would be taken with each of the three methods for a $ 1000 asset with an estimated 10 years life and projected salvage value of 10% of the original cost. Compute the first three years depreciation.

There are pluses and minuses for each of the depreciation method

E.g: Straight line method

Advantages : Simple to compute

Disadvantage : Annual depreciation constant throughout the life span

⬇

Preserve more depreciation for the last half of the life of an asse

⬇

Affects to tax considerations

- Assets held for the duration of their expected life, the total depreciation allowed is the same regardless of the method chosen.
- But different in tax consideration for each method.
- To pay the legal minimum tax, a manager would use the legal maximum rate of depreciation.

12.4 Interest

- Money invested in durable assets is tied up and cannot be used for other purposes.
- Necessary to calculate an interest for capital tied up with long-term inventories.
- In this case, the charge would be an opportunity cost or opportunity interest.
- Money invested has alternative productive uses.

$$\textit{Annual fixed interest (i)} = \frac{OC+SV}{2} \times r$$

Where r is the appropriate interest rate

- r ⟶ Likely depends upon the going interest rate on borrowed money and the rate of return expected from alternative investments in the business.
- If there are several alternate investments with various expected yields (rates of return) use the highest rate of return as r.

- An operator with limited financial resources would use the going interest rate on borrowed funds as the minimum value for r.

12.5 Repaires

- Most people think repairs as variable cost that depend upon the use level of an asset, that is wear and tear.

- Some durable assets, however, deteriorate with time eventhough they are not used.
  - E.g : Buildings
    Fences

On some farm machinery

- Annual fixed repair charge

  E.g : 5% of new cost

  for buildings < 0.5%

Some managers prefer to include shelters as another fixed ownership cost. They recognized that if machinery is not housed, depreciation and maintenance costs will be higher.

- Benefit of sheltering can be enjoyed at selling of that machinery

  - E.g : Trade in value of five yr old machinery that had been sheltered from the weather has been 10-25 % greater than similar machinery that was left outside.

12.6 Taxes and Insurance

- Real property taxes for lands and buildings.
- These are annual taxes, which are not related to the level of use of the asset.
- Taxes should be included in investment analysis.
- Insurance : A fixed cost
  protection against fire, weather, theft etc.

12.7 Fixed costs can eat into profits

- Ownership costs are important in decision making because of the big investment required in farming.

Harvesting Machine

Eg : Purchasing price = Rs. 80,000

Life time = 8 years

Salvage value = Rs. 10,000

Calculate total annual cost (r= 12%, repairs 1.5% of new costs, taxes 0.3% and insurance 0.5% of new costs)

Once the ownership cost is calculated, the manager can decide whether he should buy a new one or a reconditioned one or hire a machine instead of buying.

As a result of ownership cost

↓

COP ↑

↓

Assess profit margin and decide whether buy a machine or hire

↓

BREAK EVEN ANALYSIS

12.8 Break Even Analysis

A manager may need to estimate total cost for the business in order to choose a business plan that will yield adequate sales to cover costs.

Manager wants to estimate total costs per AC, in order to compute break even income needed.

↓

How many acres he must harvest in order to own a machine rather than hiring it

Breakeven Formula

$$Custom\ rate\ per\ acre = \frac{Annual\ fixed\ cost}{acres} + VC \text{ per Ac}$$

Eg: Total annual ownership cost = Rs.15,990
(Fixed cost)

Hiring cost = Rs. 22/Ac

Variable cost in operating the
own machine = Rs. 10/Ac

How many acres should be harvested in order to indifferent between ownership and hiring ?

LECTURE 13
Final Accounts

13.1 Composition of Final Accounts

Final accounts are the accounts that produced at the end of the financial year. It comprises of the following accounts.

- ✓ Trading account
- ✓ Profit and loss account
- ✓ Balance sheet

So far we have looked at the format of financial accounts and the recording of different types of transactions. All that we have covered is usually carried out by the book-keeper. We will now see how the financial accountant takes to a further stage the information prepared by the book-keeper. The financial accountant will use the information from the accounting system, which is summarized in the trial balance, in order to produce the financial accounts of a business. The financial accounts can be produced more often than once a year in order to give information to the owner(s) on how the business is progressing. However, it is customary to produce annual or final accounts for the benefit of the inland revenue, bank manager and other interested parties.

The starting point for preparing final accounts is the trial balance prepared by book-keeper. All the figures recorded on the trial balance are used in the final accounts. The trading account and the profit and loss account are both "accounts" in terms of double-entry book keeping. This means that amounts recorded in these accounts must also be recorded elsewhere in the book keeping system. By contrast, the balance sheet is not an account, but is simply a statement of account balances remaining after the trading and profit and loss accounts have been prepared. To help us with the preparation of final accounts we will use the trial balance.

Trial Balance

If the journal entries are error-free and were posted properly to the general ledger, the total of all of the debt balances should equal to the total of all the credit balances. If the debits do not equal the credits, then an error has occurred somewhere in the process. The total of the accounts on the debt and credit side is referred to as the **trial balance**.

Advantages of preparing a trial balance

- Evidence of arithmetic accuracy
- Detects errors of,
  - ✓ Falling to enter twice

- ✓ Mistakes in ledger totals
- ✓ Journals to Ledger error

- Provide data to final accounts

To calculate the trial balance, first determine the balance of each general ledger account as shown in the following example.

Cash

Date	Particulars	Amount	Date	Particulars	Amount
1/9		7500	15/9		1000
17/9		400	28/9		500
25/9		425		Bal c/d	6825
	Bal b/f	6825			

Parts Inventory

Date	Particulars	Amount	Date	Particulars	Amount
8/9		2500	18/9		275
				Bal c/d	2225
	Bal b/f	2225			

Accounts Receivable

Date	Particulars	Amount	Date	Particulars	Amount
17/9		700	25/9		425
				Bal c/d	
	Bal b/f	275			

Accounts Payable

Date	Particulars	Amount	Date	Particulars	Amount
28/9		500	8/9		2500
	Bal c/d	2000			
				Bal b/f	2500

Capital

Date	Particulars	Amount	Date	Particulars	Amount
28/9	Bal c/d	7500	1/9		7500
				Bal b/f	7500

Revenue

Date	Particulars	Amount	Date	Particulars	Amount
28/9	Bal c/d	1100	17/9		1100
				Bal b/f	1100

Expenses

Date	Particulars	Amount	Date	Particulars	Amount
15/9 18/9		1000 275	1/9	Bal c/d	1275
	Bal b/f	1275			

Trail Balance

Account Title	**Debit**	**Credit**
Cash	6825	
Account receivable	275	
Parts inventory	2225	
Accounts payable		2000
Capital		7500
Revenue		1100
Expenses	1275	
	……	……
	10600	10600

In this example, the debits and credits balance. This result does not guarantee that there are no errors. For example, the trial balance would not catch the following types of errors:

- ✓ Transactions that were not recorded in the journal
- ✓ Transactions recorded in the wrong accounts

- ✓ Transactions for which the debit and credit were transposed
- ✓ Neglecting to post a journal entry to the ledger

If the trial balance is not in balance, then an error has been made somewhere in the accounting process. The following is listing of common error that would result in an unbalanced trial balance; this listing can be used to assist in isolating the cause of the imbalance.

i) Summation error for the debits and credits of the trial balance
ii) Error transferring the ledger account balances to the trail balance columns
   - Error in numeric value
   - Error in transferring a debit or credit to the proper column
   - Omission of an account
iii) Error in the calculation of a ledger account balance
iv) Error in posting a journal entry to the ledger
   - Error in numeric value
   - Error in posting a debit or credit to the proper column
v) Error in the journal entry
   - Error in a numeric value
   - Omission of part of a compound journal entry

The more often that the trial balance is calculated during the accounting cycle, the easier it is to isolate any errors; more frequent trial balance calculations narrow the time frame in which an error might have occurred, resulting in fewer transactions through which to search.

13.2 Trading Account

The main activity of a trading business is to buy goods at one price and then to sell the same goods at a higher price. The difference between the two pieces represents a profit known as gross profit. Instead of calculating the gross profit on each item bought and sold, we have seen how the bookkeeping system stores up the totals of transactions for the year in either purchases account or sales account. Further, any goods returned are recorded in either purchases returns account or sales accounts. At the end of the total of purchases and sales accounts, together with purchases returns and sales returns are used to form the trading account. It is also necessary to take note of the value of stock of goods for resale held at the beginning and end of the financial year.

Trading account is set out as follows:

TRADING ACCOUNT OF WYVERN WHOLESALERS FOR THE YEAR CLOSED 31 DECEMBER 20-1

	Rs:	Rs:	Rs:
Sales			250,000
Sales returns			5,400
Net sales (or turnover)			244,600
Opening stock		12,350	
Purchases	156,000		
Carriage In			
Purchase returns	7,200		
Net purchases		148,800	
		161,150	
Closing book (31 December 2020)		16,300	
Cost of goods sold			144,850
Gross profit			99,750

- Sales and purchases only include items in which the business trades – items to be kept use in the business such as machinery are not included in sales and purchases but are classified as fixed assets.
- Adjustments are made for the value of stock in the store or warehouse at the beginning and end of the financial year. The opening stock is added to the purchases because it has been sold during the year. The closing stock is added to the purchases because it has been sold during the year. The closing stock is deducted from purchases because it has not been sold: it will form the opening stock for the next financial year, when it will be added to next year's figure for purchases.

    - ✓ The figure for cost of goods sold often written as "cost of sales") represents the cost to the business of the goods which have been sold in this financial year. Cost of goods sold is,

        Opening stock:

        + purchases

+ carriage in

(-) Purchase returns

(-) closing stock

= cost of goods sold (or cost of sales)

- ✓ Gross profit is calculated as:

Sales:

(-) sales returns

= net sales

(-) cost of goods sold

= gross profit

- If cost of goods sold is greater than net sales, the business has made a gross loss.
- Carriage in is the expense to the business of having purchases delivered eg if you buy from a mall order company, you often have to pay the post and packing – this is the 'carriage in cost). The cost of carriage in is added to purchases.

Net sales often described as turnover) is:

Sales: Sales returns

Net sales

Net purchases is: purchases

Carriage in

Purchase returns

Net purchases

13.3 Profit and Loss Account

In the profit and loss account are listed the various running expenses or revenue expenditure) of the business. The total of running expenses is deducted from gross profit to give net profit for the year. Net profit is an important figure; it shows the profitability of the business after all expenses and how much has been earned by the business for the owner (s). It is on this profit, after certain adjustments, that tax liability will be based.

The profit and loss account follows on from the trading account and is set out as follows:

PROFIT AND LOSS ACCOUNT OF WYVERIN WHOLESALLERS FOR THE YEAR ENDED 31 DECEMBER 2020

	Rs:	Rs:
Gross profit		99,750
Add discount received		2,500
		102,250
Loss expenses:		
Discount allowed	3,700	
Salaries	46,000	
Electricity and gas	3,000	
Rent and rates	2,000	
Sundry expenses	4,700	
Net profit		59,400
		42,850

Notes:

- The various running expenses shown in the profit and loss account can be listed to suit the needs of a particular business: the headings used here are for illustrative purposes only.
- Amounts of income are also included in profit and loss account, eg discount received in the example; these are added to gross profit.
- The net profit is the amount the business earned for the owner (s) during the year; it is important to note that this is not the amount by which the cash/bank balance has increased during the year.
- If the total of expenses exceeds gross profit (and other income), the business has made a net loss.
- Drawing by the owner(s) is not listed as an expense in profit and loss account – Instead, they are deducted from capital.
- If the owner of the business has taken goods for his or her own use, the amount should be deducted from purchases and added to drawings. The trading account and the profit and loss account are usually combined together in today's context.

13.4 Balance Sheet

The trading and profit and loss account shows two types of profit – gross profit and net profit, respectively – for the financial year (or such other time period as may be chosen by the business). A balance sheet, by contrast shows the state of the business at one moment in time. It lists the assets and the liabilities at a particular date, but is not part of the double-entry book-keeping system. The balance sheet of Wyvern Wholesalers using the figures from the aforementioned trial balance is as follows:

BALANCE SHEET OF WYVERN WHOLESALERS AS AT 31ST DECEMBER 2020

	Rs:	Rs:	Rs:
Fixed Assets			
Properties			100,000
Equipment			30,000
Vehicles			21,500
			151,500
Current Assets			
Stock		16,300	
Debtors		23,850	
Cash		125	
		40,275	
Current Liabilities			
Creditors	12,041		
Value added tax	3,475		
Bank overdraft	851		
	16,367		
Working Capital or Net Current Assets			23,908
			175,408
Less Long-term Liabilities			
Loan			33,000
Net assets			142,408
Financed by:			
Capital			110,000
Opening capital			42,850
Add net profit			152,850
			10,442
Less drawings			142,408

Notes:

Assets

Assets are items or amounts owned or owed to the business, and are normally listed in increasing order of liquidity, ie the most permanent assets are listed first. Fixed assets are long-term assets purchased for use in the business and used over a long period (more than 12 months) to generate profits. They are divided between tangible fixed assets, which have material substance such as premises, equipment, vehicles and fixed assets such as goodwill.

Current assets are short-term assets held for less than 12 months. They change continually from day-to-day such as stock which will be sold and replaced with new stock), debtors (who will pay the amounts due and will be replaced by further amounts as credit sales are made), bank (if not overdrawn) and cash. The balance of VAT account is a current asset if the account has debit balance.

Intangible fixed assets

Intangible fixed assets (not shown in the balance sheet above) will appear on some balance sheets, and are listed before the tangible fixed assets. An intangible asset does not have material substance, but belongs to the business and has value. A common example of an intangible fixed asset is goodwill, which is where a business has bought another business and paid an agreed amount for the existing reputation and customer connections (good will).

Liabilities

Liabilities are assets or amounts owed by the business. Current liabilities are amounts owing at the balance sheet date and due for repayment within 12 months or less (eg creditors, value added tax, bank overdraft). Long-term liabilities are where repayment is due in more than 12 months (eg: loans, bank loans).

Capital and working capital

Capital is money owed by the business to the owner. It is usual practice to show on the balance sheet the owner's investment at the start of the year plus net profit for the year less drawings for the year; this equals the owner's investment at the end of the year ie at the balance sheet date.

Working capital is often referred to as net current assets – is the excess of current assets over current liabilities. Without working capital, a business cannot continue to operate.

Significance of the balance sheet

The balance sheet shows the assets used by the business and how they have been financed:

Fixed assets
Plus working capital
Minus long term liabilities
Equals net assets
Equals capital

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