

## **INVESTMENT ANALYSIS**

Evaluating the Profitability of Capital Investments in Machinery, Improvement and/or Expansion Plans (Capital Budgeting)

# INVESTMENT ANALYSIS (Making the best use of capital)

### 

# DISINVESTMENTS

### FINANCING

#### How Does Time Affect Economic Analysis

Present and Future Value of Money

# Net Present Value Income and/or Expenses in the Future

Internal Rate of Return of Income and Expenses in the Future

#### **3 MAJOR PROBLEMS CONCERNING CAPITAL**

# **1**HOW TO GET IT

## **2HOW TO USE IT**

# **3HOW TO KEEP DOING IT**

### **INVESTMENT IS:**

# Trading known dinars today for expected (but unknown) additional dinars <u>in the future</u>

#### **INVESTMENT IS ADDING DURABLE ASSETS TO YOUR BUSINESS TO:**

# Maintain and/or replace Depreciated Capital Items

- Reduce production costs
- Expand production
- Other

### **GETTING CONTROL OF ASSETS**

Lease
 Custom Hire
 Purchase

#### CHARACTERISTICS OF INVESTMENT DECISION

- Large outlay of money today that results in flow of returns over time in future EXAMPLE -- investments in machinery and equipment
- 2. Investment decision made INFREQUENTLY
- 3. Can result in either LARGE PROFITS OR LOSSES
- 4. After decision is made there may be no going back -- INFLEXIBILITY

## THE TIME VALUE OF MONEY

# One dinar today is worth more than one dinar tomorrow!

### WHY?

# INFLATION & INTEREST

# **COMPOUNDING IS:**

# **Procedure for determining**

# ★ FUTURE VALUE ★

#### **Compounding is procedure for determining future value**

#### Example:

- Put ID 148,000 in a bank at 6% for 3 years.
- What will it accumulate to?
- ✓ Vn = Po (1 + i)<sup>3</sup>
- ✓ V<sup>3</sup> = ID 148,000 (1 + .06)<sup>3</sup>
- From Table 1 in Appendix A we find that:
   (1 + .06)<sup>3</sup> = 1.191
- Therefore:
  - V3 = ID 148,000 (1.191)
- ✓ = ID 176,268
- Our account will have ID 176,268 in it at the end of 3 years.

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# **DISCOUNTING IS:**

# **Procedure for determining**

# ★ PRESENT VALUE ★

Discounting is procedure for determining present value of sum of money to be received in future.

#### Example:

How much would you be willing to pay for ID 444,000 to be received in 2 years?

 $Vo = Pn(1 / (1 + i)^{n})$ 

$$Vo = ID \ 444,000 \ (1 \ / \ (1 \ + \ .06)^{n})$$

(Note: 6% was assumed as discount rate, or cost of capital, or required rate of return.)

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# WHAT IS CAPITAL BUDGETING

# It is an orderly series of steps that produces information to aid you in making

# A GOOD INVESTMENT DECISION

(Better)

(The Best)

#### **Capital Budgeting and the Time Value of Money**

- 1. Investments give off flows of returns/costs over time.
- 2. Compounding and discounting used for valuing these returns/costs at common point in time.
- 3. Objective of Capital Budgeting Investment Analysis is to:
  - a. Maximize present value of return flow
  - b. Minimize present value of cost flow
  - c. Maximize present value of difference between returns and costs

# THE CAPITAL BUDGETING PROCESS (A RECIPE)

- **1. Identify Investments**
- 2. Choose a Capital Budgeting Criteria (Net Present Value)
- 3. Get Needed Data
- 4. Do Capital Budgeting Calculations
- 5. Apply Decision Rules
- 6. Do 4 and 5 again with different returns/costs
- 7. Identify Sources of Risk
- 8. Check Financial Feasibility
- 9. ★★ MAKE THE DECISION! ★★
- **10. Follow up to check actual results**

# ANNUITIES

#### **Example**

#### How much will I accumulate in a savings account if I deposit ID 1,776,000/year for 10 years at 8% interest rate compounded annually?

### Solution

ID 25,728,135

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# ANNUITIES

#### **Example**

### What is the present value of an investment which will generate ID 148,000 of returns for each year for 5 years assuming a discount factor of 8%?

Solution

ID 590,921

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# EXERCISE Repayment Capacity

You have several years of historical records. After reviewing your income generating capacity, you have determined that you could pay ID 2,960,000 per year without creating undue hardship or increasing your risk.

A.How much can you afford to borrow on a 5 year note assuming an interest rate of 13%? ID 10,411,005

B. How much can you afford to borrow on a 10 year note assuming an interest rate of 13%? ID 16,061,681

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# EXERCISE Repayment Capacity (continued)

#### B. How much can you afford to borrow on a 10 year note assuming an interest rate of 13%? ID 16,061,681

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# AMORTIZATION

## The process by which the level of debt is reduced when equal periodic debt payments that cover interest and principal are made.

## EXAMPLE

A.If you borrow ID 14,800,000 on a 5 year note at 13%, what are your annual principal and interest payments? ID 4,207,855

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## **Investment Analysis Exercise**

- 1. You plan to replace a buffalo herd bull and are considering the purchase of one of the two following alternatives:
  - a. Regular: Bull ID 1,776,000

b. High Performance tested bull ID 2,960,000

- 2. Other information:
  - a. You plan to use this bull to service 25 buffalo cows and you have been averaging an 85% calf crop.
  - b. You are convinced that, with all other things being equal, the performance tested bull will wean buffalo calves averaging 9 kg heavier than the commercial bull but are concerned whether this benefit is worth the extra ID 1,184,000.
  - c. Either bull will have a useful life of 5 years.

## **Investment Analysis Exercise** (continued)

- d. Your banker is offering a 10% rate of return on Certificates of Deposits and you are wondering if this is a better investment alternative for the ID 1,184,000.
- e. In addition, the Certificates of Deposits are safe whereas the bull purchase carries risk so you want a 2% compensation for risk.
- f. Assume buffalo calves sold @ ID 2,302 / kg.
- g. Assume the salvage value of both bulls is the same.

### REQUIREMENT

Complete an investment analysis of this investment.

# **Solution**

### 25 cows x 85% calf crop x 9 kg extra = 191.26 kg additional annual production 191.26 kg x ID 2,302 = ID 440,300

### **Cash Flow**

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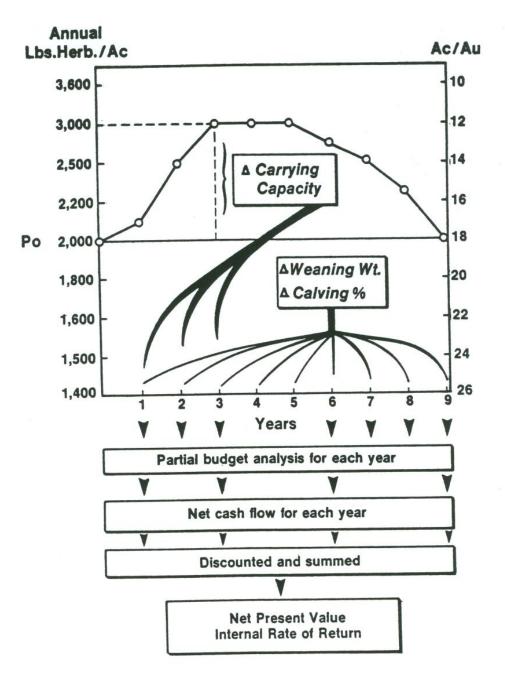
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# **EXERCISE** Range Improvement Investment

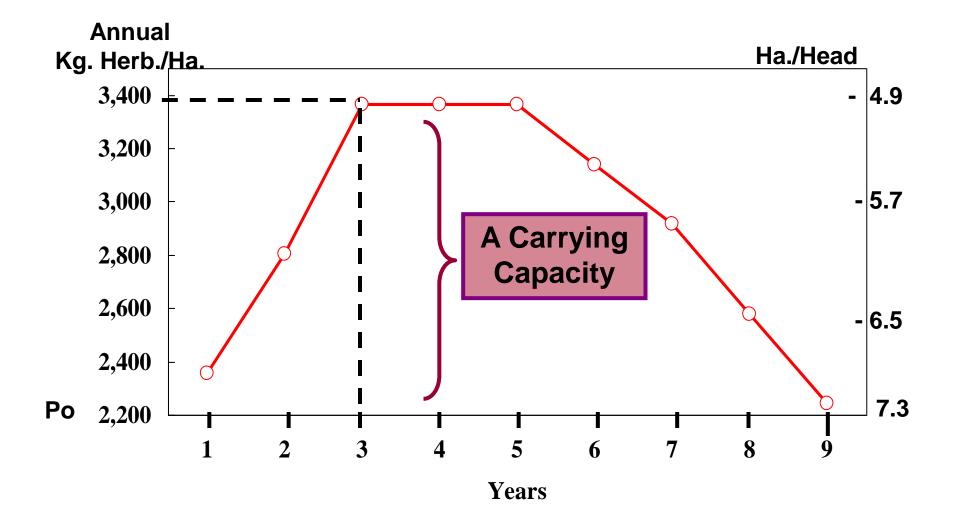
You are producing about 907.2 kilograms of forage per acre to produce cattle. You are contemplating investing in a treatment of the range which will cost ID 73,143/hectare to reduce woody species. Data shows that by removing woody species, the treatment will allow you to gradually increase forage production to 3,362.4 kg/hectare and gradually decline over nine years to the current level.

You want to know if the ID 73,143/acre investment will be profitable.

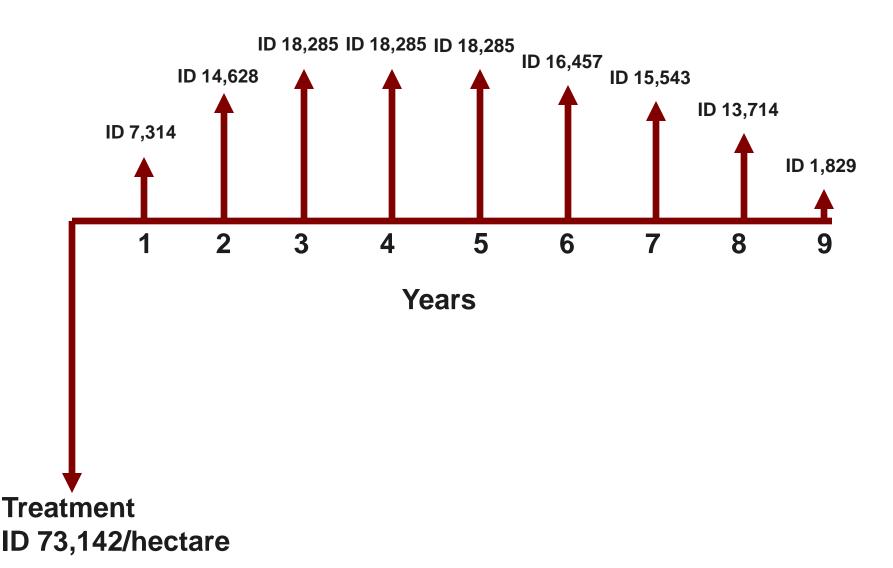
#### **RANGE IMPROVEMENT INVESTMENTS**



### RANGE IMPROVEMENT INVESTMENTS



### RANGE IMPROVEMENT INVESTMENTS (continued) Revenue/Hectare



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Initial	D	iscount	Net	Internal														
Investmen	nt	Rate	Present	Rate of														
			Value	Return														
73,14	2	8%	13,274	13%														
		(73,142)																
		7,314									_							
		14,628									_							
		18,285		<u> </u>														
		18,285									_							
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		16,457																
		15,543 13,714																
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# **Practical Application**

A buyer is offering you ID 518,000,000 for property you own.

Another buyer offers to pay you ID 4,440,000/year in rent for 17 years and a lump sum payment of ID 1.48 billion at the end of the 17 year period. You select to use a 5% discount rate.

What are the financial consequences of selling your property to the second buyer?

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A	В	С	D	E	F	G	Н		J	K	L	M		
Initial	Discount	Net	Internal											
Investment	Rate	Present	Rate of											
		Value	Return											
518,000,000	5%	151,359,623	7%											
	Income													
Years	Stream													
	(518,000,000)													
1	4,440,000													
2       4,440,000														
3       4,440,000         4       4,440,000														
4       4,440,000       Image: Constraint of the second se														
5 4,440,000														
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6       4,884,000         7       4,884,000														
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10	4,884,000													
11	4,884,000													
12	4,884,000													
13	5,402,000													
14	5,402,000													
15	5,402,000													
16	5,402,000													
17	5,402,000													
Lump Sum Payment	1,480,000,000													
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### **Cash Flows for Three Investments**

Year	Investment A	Investment B	Investment C
0 - present	- ID 29,600,000	- ID 29,600,000	- ID 29,600,000
1	2,960,000	8,584,000	14,800,000
2	5,920,000	8,584,000	11,840,000
3	8,880,000	8,584,000	8,880,000
4	11,840,000	8,584,000	4,440,000
5	14,800,000	8,584,000	1,480,000

#### Simple Rate of Return

- Back Pay Period
- Net Present Value
- Internal Rate of Return

### **Cash Flows for Three Investments**

Year	Investment A	Investment B	Investment C
0 - present	- ID 29,600,000	- ID 29,600,000	- ID 29,600,000
1	2,960,000	8,584,000	14,800,000
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3	8,880,000	8,584,000	8,880,000
4	11,840,000	8,584,000	4,440,000
5	14,800,000	8,584,000	1,480,000

Simple Rate of Return (SRR)

$$SRR = \frac{Y}{T}$$

Where Y = average annual profits (depreciation has already been subtracted)

and I = initial or average investments over the investment's life

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	Simple Rate														
Year		(29,600,000)	(29,600,000)												
1	2,960,000	8,584,000	14,800,000												
2	5,920,000		11,840,000												
3	8,880,000	8,584,000	8,880,000												
4	11,840,000	8,584,000	4,440,000												
5	<u>14,800,000</u>	<u>8,584,000</u>	<u>1,480,000</u>												
Sum	14,800,000	13,320,000	11,840,000												
Avg. over 5 years	2,960,000	2,664,000	2,368,000												
Divided by initial inv.	29,600,000	29,600,000	29,600,000												
Simple Rate of Return	10.0%	9.0%	8.0%												
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Year	Investment A	Investment B	Investment C
0 - present	- ID 29,600,000	- ID 29,600,000	- ID 29,600,000
1	2,960,000	8,584,000	14,800,000
2	5,920,000	8,584,000	11,840,000
3	8,880,000	8,584,000	8,880,000
4	11,840,000	8,584,000	4,440,000
5	14,800,000	8,584,000	1,480,000

Back Pay Period (P)

$$P = \frac{I}{E}$$

Where I = initial investment "and E = projected cash flow per period<sup>(n)</sup> from the investment

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A	В	С	D	E	F	G	Н		J	K	L	M	
			k Pay Period										
Initial Investment			(29,600,000)		(29,600,000)								
1	2,960,000	2,960,000			14,800,000								
2	5,920,000	8,880,000			11,840,000								
3		17,760,000		25,752,000		35,520,000							
4	11,840,000	29,600,000		34,336,000	4,440,000								
5	<u>14,800,000</u>		<u>8,584,000</u>		<u>1,480,000</u>								
Years		4.0		3.4		2.34							
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0 - present	- ID 29,600,000	- ID 29,600,000	- ID 29,600,000
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3	8,880,000	8,584,000	8,880,000
4	11,840,000	8,584,000	4,440,000
5	14,800,000	8,584,000	1,480,000

Net Present Value (NPV)

Where: INV = initial investment; and

$$NPV = -INV + \frac{P_1}{1+I} + \frac{p_2}{(1+I)^2} + \frac{p_n}{(1+I)^n} + \frac{V_n}{(1+I)^n}$$

P<sup>n</sup> = the net cash flows attributed to the investment that can be withdrawn each year; and V<sub>n</sub> = any salvage or terminal investment value; and N = the length of planning horizon; and I = the interest rate

Simplified: NPV= -INV+A[USPV<sub>i,n</sub>] +  $V_n/(1+i)^n$ 

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	Net Present					0			J	r.	
Discount Rate	8%		8%							+	† †
Initial Investment	(29,600,000)							+		1	1
1	2,960,000		14,800,000							1	
2	5,920,000	8,584,000	11,840,000							/	
3	8,880,000	8,584,000	8,880,000								
4	11,840,000	8,584,000	4,440,000								[]
5	<u>14,800,000</u>	<u>8,584,000</u>	<u>1,480,000</u>							[]	ļ/
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Net Present Value	3,741,483	4,327,243	5,161,686							'	ļ/
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### Cash Flows for Three Investments

Year	Investment A	Investment B	Investment C
0 - present	- ID 29,600,000	- ID 29,600,000	- ID 29,600,000
1	2,960,000	8,584,000	14,800,000
2	5,920,000	8,584,000	11,840,000
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4	11,840,000	8,584,000	4,440,000
5	14,800,000	8,584,000	1,480,000

Internal Rate of Return (IRR)

$$O = -INV + \frac{P_1}{1+I} + \frac{p_2}{(1+I)^2} + \dots + \frac{p}{(1+I)^n} + \frac{V_n}{(1+I)^n}$$

Where: INV = initial investment; and  $p_n$  = the net cash flows attributed to the investment that can be withdrawn each year; and  $V_n = any salvage or terminal investment value; and$ N = the length of planning horizon

The IRR calculation equates the present value of the cash flow series to the initial investment by solving for i (the interest rate).

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	nternal Rate												
Discount Rate	8%	8%	8%										
Initial Investment													
1		8,584,000											
2		8,584,000											
3	8,880,000	8,584,000	8,880,000										
4	11,840,000		4,440,000										
5	<u>14,800,000</u>	<u>8,584,000</u>	<u>1,480,000</u>										
IRR	12.0%	13.8%	17.6%										
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### **Capital Budgeting Results for Three Investments**

Criterion	Investment A	Investment B	Investment C
Simple rate-of-return	10%	9%	8%
Payback	4.0 years	3.4 years	2.3 years
Net present Value @ 8%	3,741,440	4,327,520	5,162,240
Internal rate-of-return	12.01%	13.82%	17.57%

# SUMMARY

- **CAPITAL BUDGETING**
- Important Investment Analysis Concept
- TIME VALUE OF MONEY @
   INTEREST OR DISCOUNT RATE
  - \* Present/Future value of lump sum payments
  - \* Present/Future value of a uniform series of payments
  - \* Present/Future value of a non-uniform series of payments
  - Internal rate of return
- Amortization