IICA

LONG RUN FARM PLANNING

INVESTMENT ANALYSIS

IICA OFFICE IN JAMAICA

WHAT IS IICA?

The Inter-American Institute for Cooperation on Agriculture (IICA) is the specialized agency for agriculture of the inter-American system. The Institute was founded on October 7, 1942 when the Council of Directors of the Pan American Union approved the creation of the Inter-American Institute of Agricultural Sciences.

IICA was founded as an institution for agricultural research and graduate training in tropical agriculture. In response to changing needs in the hemisphere, the Institute gradually evolved into an agency for technical cooperation and institutional strengthening in the field of agriculture. These changes were officially recognized through the ratification of a new Convention on December 8, 1980. The Institute's purposes under the new Convention are to encourage, facilitate and support cooperation among the 32 Member States, so as to better promote agricultural development and rural well-being.

With its broader and more flexible mandate and a new structure to facilitate direct participation by the Member States in activities of the Inter-American Board of Agriculture and the Executive Committee, the Institute now has a geographic reach that allows it to respond to needs for technical cooperation in all of its Member States.

The contributions provided by the Member States and the ties IICA maintains with its twelve Permanent Observer Countries and numerous international organizations provide the Institute with channels to direct its human and financial resources in support of agricultural development throughout the Americas.

The 1987-1991 Medium Term Plan, the policy document that sets IICA's priorities, stresses the reactivation of the agricultural sector as the key to economic growth. In support of this policy, the Institute is placing special emphasis on the support and promotion of actions to modernize agricultural technology and strengthen the processes of regional and subregional integration.

In order to attain these goals, the Institute is concentrating its actions on the following five programs: Agricultural Policy Analysis and Planning; Technology Generation and Transfer; Organization and Management for Rural Development; Marketing and Agroindustry; and Animal Health and Plant Protection.

These fields of action reflect the needs and priorities established by the Member States and delimit the areas in which IICA concentrates its efforts and technical capacity. They are the focus of IICA's human and financial resource allocations and shape its relationship with other international organizations.

The Member States of IICA are: Antigua and Barbuda, Argentina, Barbados, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Dominica, the Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, the United States of America, Uruguay and Venezuela.

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PREFACE

This series of training manuals are the result of class notes used in the training of Ministry of Agriculture personnel. The training manuals were developed by the Ministry of Agriculture Farm Management Section and the Inter-American Institute for Cooperation on Agriculture for the purpose of enhancing Ministry of Agriculture extension personnel skills in areas of farm planning and monitoring of farm plans implementation.

Training was implemented in modules of three days workshops covering the areas of farm plan preparation, investment analysis and control of the farm plan implementation. During the first workshop the participant is exposed to concepts of enterprise budgets and the development of the best farm plan given farmers goals and resources. The emphasis is on the development of farm plans with annual crops.

The second workshop covers the aspects of farm investment decision making. Concepts of capital budgeting and the Net Present Value method to compare between investment alternatives in permanent crops are presented and illustrated with examples.

The third workshop deals with the aspects of the control of the farm plan implementation. During this workshop the emphasis is on the presentation of a recordkeeping system to monitor the technical and financial implementation of the farm plan and on how to use the information to improve the farm operation.

The publication of this series of training manuals is for the purpose of contributing to the improvement of farm management skills of small farmers in Jamaica. Those interested in expanding the information for training purposes will find the list of sources of information used in the preparation of these materials very useful.

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FARM PLANNING AND BUDGETING

I. Short Run Planning

Review

There is no doubt that all farmers have a plan for the use of their land, labour and other resources, for the choice and combination of enterprises and for the implementation of daily operations. Many farmers do not put their plans on paper, and they do not translate their plans into dollars and cents in order to draw up budgets. Nevertheless, farm planning and budgeting is not an innovation only recently made by modern agricultural economists. Technology and economic development in the last decades have made farm planning and budgeting an indispensable tool.

The techniques in making plans for the optimum choice and combination of farm enterprises, for the most efficient use of available resources for maximum income, and to the financial budgets showing the most probable income and expenditure to be expected from these plans, forms the framework of "Farm Planning".

A farm plan is a program for the operation and organization of a farm business with a description of the enterprise combination, technology and resources needed to implement the plan. In broad terms it may mean any change in the methods or practices currently being followed in the farm operation or it may even lead to the complete reorganization of the farm business. Partial budget and whole farm budgets may be prepared to compare the cost and returns resulting from the use of new tools or equipment or the improvement of soil productivity by the application of fertilizers or the installation of irrigation system; but it may also be prepared to determine the future expenses and income resulting from a complete change in the choice and combination of farm enterprises and a complete re-allocation of farm resources.

Making a Farm Plan and Farm Budget

Farm planning and budgeting involves the setting out of the desirable changes in the organization and operation of the entire farm, the formulation of schemes for carrying them out and the estimating of receipts, expenses and net farm income, for each of the alternative farm plans, according to principles and procedures already outlined (Please refer to the Farm Planning Manual).

Making Cropping Plans and Budgets

The first step in farm planning is the making of crop and/or livestock plans. That is, the choice and combination of crops in accordance with the principles covered in previous Farm Planing Workshops.

Important considerations in making a crop plan are:

1. Food requirement of the farm household especially in areas where subsistence farming prevails.
2. Feed requirement of farm animals, including productive and working animals.
3. Maximum total net value of crop production to be determined by deducting total variable cost or operating crop expenses from the total estimated gross value of crop production.
4. Soil conservation and the maintenance of soil fertility.
5. Labour and capital potentials of the farm and household
6. Government policies, regulations, taxation, price support, etc.

Importance of Farm Planning and Budgeting

As mentioned before, all farmers have plans for carrying out their daily operations and long-range programs for achieving their goals. The primary purpose of planning and budgeting for individual farmers, therefore, is to improve the organization and operations of their farms in order to attain their goals.

In the following sections we will cover concepts and procedures of long run farm planning which involve changes that will affect the whole farm and the whole farm budget.

Whole farm budget techniques for an annual farm plan were the subject of Farm Planning Workshops last year. In this workshop we will be dealing with planning new investments (capital budgeting) which will give a stream of benefits over a number of years.

We will be dealing with the factors of time, the time value of money, construction of long run (more than one year) enterprise and whole farm budgets and the analysis of the financial feasibility of the planned changes.

II. Long Run Planning, Implementation and Control

Planning investments is an important part of long run planning, since these investments are long run in nature. Special procedures have been devised for planing these

investments especially the **choice between different investment alternatives.** These procedures have generally been described under the term **Capital Budgeting.**

Long Run Farm Planning:

Long run planning involves the following steps:

Step 1: Goal setting (Presented in Farm Planning Workshop and training manual)

- Review of the farmer's long run goals in relation to actual farm plan.

Step 2: Inventory of the resources available (Farm Planning and Recordkeeping training materials)

- Land
- Labour
- Assets (buildings, machinery)
- Financial situation
- Managerial capacity

Step 3: Prepare enterprise budgets for actual farm plan. Develop a whole farm budget and estimate income for actual farm plan. (Budgeting techniques for annual crops and farm plan are presented in Farm Planning training materials)

Identify alternative enterprises, production systems, and marketing systems that fit farmer's goals, abilities and physical resources. Outline alternative plans.

For investments in permanent crops and capital assets, **carry out a capital budgeting** process to select the best investment opportunities taking into consideration the **time value of money.** Make the decision on the best alternatives. **Select the best long run farm plan.**

Do short term and intermediate term budgeting if there are major changes in the actual farm plan.

- This determines the transition period between the actual situation and the proposed long run plan

Step 4: Develop a detailed annual farm plan to implement in the next cropping season and prepare a whole farm budget.

Step 5: Implement recordkeeping system and select indicators of performance to compare with actual recorded results during annual plan implementation. Start and complete implementation of the farm plan.

Step 6: Make necessary adjustments to long run farm plan and to annual farm plan based on farm records analysis during farm plan implementation and at the end of the short run planning period (farm plan control function).

Step 7: Before implementing the next production period, repeat steps four to six for planning the next short run plan period.

Long Run Farm Plan Implementation

Step 1: Organize resources (for implementation of annual farm plan)

Step 2: Implementation of farm plan (annual or seasonal)

Long Run Farm Plan Control

Step 1: Monitoring and control of farm plan implementation (farm records).

Keep production, marketing and financial records. Make decisions to correct deviations and changes required to attain annual and long run goals.

Step 2: Analysis and interpretation of farm records. Compare actual results with goals established in the farm plan.

The planning tasks described in steps one to three have been developed in the farm planning training materials in detail. The emphasis in the farm planning manual was in budgeting techniques to compare investment alternatives in annual crops.

In this manual emphasis will be in the use of capital budgeting to compare investment alternatives in permanent crops.

Comparison of Long Run Investment Alternatives

Two issues or steps in long run planning shall now be dealt with in some more detail because of their importance in the long run planning process. They are:

- The identification of profitable long run alternatives;
- and **Capital budgeting** - the comparison and choice among long run alternatives.

1. Identification of Alternatives

Several factors are important in the identification of profitable long run alternatives on the farm. We will confine our discussions here to the identification of profitable crop and livestock enterprises although it might be realized that some profitable alternatives also exist in the rental or purchase of farm assets such as tractors, buildings and in the processing of farm products.

The major factors will be discussed:

(i) Suitability of enterprises to the micro-environment of the farm.

For long-run profitability, the enterprise must be suited to the environment of the farm. If the crop or livestock will not grow or produce on the farm, it can never be profitable.

One easy guide to the identification of enterprises suitable to the environment of the farm is to observe those enterprises which other farmers in the area have been producing profitably.

(ii) Trends in the demand for the enterprise.

Once alternative enterprises are judged to be suitable to the soil and climate of the farm, the next most important factor to consider is the long-run demand for the crop.

Many factors affect the demand for a product. The most profitable enterprises in the long run will be those enterprises where:

(a) there is a growing taste or preference for the commodity in the population

(b) no close substitutes for the commodity exist and none are likely to be developed in the near future (for example, coffee)

(c) the demand for the commodity increases rapidly with the increases in income.

It is obvious that the ability to forecast these demand factors in the future will always be difficult and so an assessment of the demand prospects for enterprises is always subject to error.

(iii) Trends in supply for the enterprise

The final set of major factors that determine the long-run profitability of alternative enterprises are the trends in the supply of the commodity. The most important factors affecting the long run supply of commodities are:

(a) Technological change or the development of new yield-increasing technology for the enterprise.

(b) Expansion in production of the commodity by increasing the acreage planted by farmers producing the commodity and/or by new farmers producing the commodity.

2. Capital Budgeting

In the long run all inputs or factors used in production can change. Long run planning involves changes which will affect the whole farm and must be carried out using analysis involving the whole farm, like whole farm budgeting. Whole farm budgeting has been dealt with earlier so we will deal now with capital budgeting which will involve both the whole farm and the time perspectives.

Investments

An important aspect of long run planning is planning new investments on the farm. Investments are the additions of new assets on the farm which will give off a stream of benefits or returns to the farm over a number of years.

Farm investments can take two major forms:

(i) Perennial Enterprises

Annual enterprises yield revenue and incur costs within one year, so that at the end of the year, the enterprise is completed. Perennial enterprises are enterprises which generate returns and incur costs over a number of years. They have the characteristic that costs are incurred over the entire life of the crop (life-span) but revenues usually start after some years have passed.

Sugar cane and bananas when planted do give off returns and incur cost over a number of years before there is

need to replant. However, in both of these enterprises, it is possible to get revenue and incur costs within one year of planting and every year thereafter until re-planting. These enterprises are therefore **special** with characteristics of annual and perennial enterprises. Livestock enterprise are also special enterprises. These special enterprises for planning purposes are usually treated as annual enterprises.

In farm planning annual enterprises are selected using budgeting and partial budgeting techniques. Perennial enterprises require capital budgeting techniques.

(ii) Durable goods

Durable or capital goods give off a series of services over a number of years. An example of a durable good is a tractor which once properly maintained will be able to be used for many years to provide services such as transportation, ploughing, pumping, and so forth. The loss of productive service over the years is referred to as **depreciation.**

Durable goods can be contrasted with non-durable inputs which are consumed in their use e.g. fertilizer, herbicides or seeds. For durable goods however, the initial costs to purchase them is usually great (e.g. land). However, they yield benefits or services over a long number of years. Hence, again special methods are needed to decide whether to purchase or invest in durable goods.

The same methods that can be used to choose perennial enterprises can be used to decide whether to invest in durable assets. The key factor is that time is crucial to such decision making.

Planning Investments

Planning investments as we have already stated is an important part of long-run planning, since these investments are long range in nature. Special procedures have been devised for planning these investments especially the **choice between different investment alternatives.** These procedures have generally been described under the term **Capital Budgeting.**

Capital Budgeting is a method used to allocate scarce capital among alternative investments. It is also called **Investment Analysis** or **Project Appraisal** and involves several steps:

1. A search for profitable investment opportunities.

2. Determination of the amount of initial capital required by each alternative.

3. Determination of the stream of annual costs that will result from each alternative over its life-span.

4. Determination of the stream of annual benefits or returns that will result from each alternative over its life-span.

5. A method for evaluation of the profitability of each investment over its life-span.

6. The choice of the most profitable investment.

7. A final analysis to verify the likely success of the investment within the context of the operations of the whole farm.

Before dealing in detail with the Capital Budgeting process, we will discuss two major principles that are important in Capital Budgeting:

(i) The importance of time, and

(ii) A method of evaluation of the profitability of investment: **The Net Present Value Method.**

(i) Time Value of Money

Money available today is more valuable than money available at some future time. Money received today can be invested or spent. Money received in the future involves the sacrifice of waiting before it can be used or invested. The compensation for waiting is the **time value of money**, called **interest.**

INTEREST = PRINCIPAL X INTEREST RATE

Compound Interest

Compound interest occurs when interest is earned and allowed to build up. The interest earned during the previous period itself earns interest in the next and subsequent periods. For example, if $1,000 is placed into a savings account paying 10 percent interest per year, interest accumulates as follows:

Principal invested in first year	$1,000
Interest for first year, $1,000 x .10	100
Amount available at end of first year	$1,100
Interest for second year, $1,100 x .10	110
Amount available at end of second year	$1,210

The interest earned in the second year is greater than $100 because it is earned on the principal **plus** the first year's interest, which remains on the deposit.

Compounding of interest may take place more frequently than once a year. For example, if the savings account mentioned above pays 10 percent interest compounded quarterly, 2.5 percent interest is added to the account each quarter. The more frequent the compounding, the more interest is earned.

To deal with compound interest problems, we define the following terms:

P = the principal sum that earns interest
i = the interest rate per period
n = the number of periods during which compounding takes place. A period can be any length of time.

Future Value of $1

A sum of money invested today at **compound interest** accumulates to a larger sum at the end of some future time period. The sum at the end of the future period is called **future value** (FV). For example, the future value of $1,000 invested at 10 percent compounded annually for two years is $1,100 shown above. The future value includes the original principal and the accumulated interest.

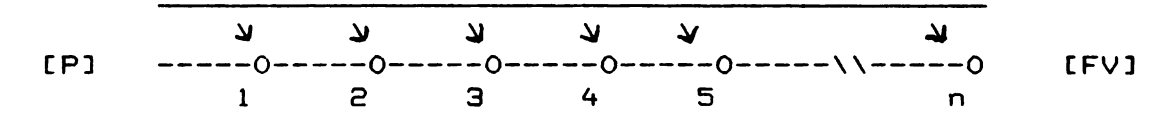
$$
\begin{aligned}
FV &= P + (P \times i) \\
&= P + Pi \\
&= P\,(1 + i) \\
&= \$1{,}000\,(1 + .10) \\
&= \$1{,}100
\end{aligned}
$$

The future value varies with the interest rate, the compounding frequency, and the number of periods. If we know the future value of a $1 principal investment, we can use it to calculate the future value of any amount invested. It is easy to construct a table of future values for a $1 investment for a variety of interest rates and time periods. For example, at 10 percent interest per period, $1 accumulates as follows:

FV of $1 at 10% for 1 period = $1.0000 x 1.10 = $1.1000
FV of $1 at 10% for 2 period = $1.1000 x 1.10 = $1.2100
FV of $1 at 10% for 3 period = $1.2100 x 1.10 = $1.3310
FV of $1 at 10% for 4 period = $1.3310 x 1.10 = $1.4641

The above table can be diagrammed as follows:

Interest is added to principal
at the end of each period



The end of each period is designated by a circle (0). The arrow pointing to the end of each period indicate that payments are made into the investment.

The computations above show that at the end of the first period, the future value of $1 is $1.10; at the end of the second period, it is $1.10 x 1.10, or $(\$1.10)^2$; at the end of the third period, it is $(\$1.10)^3$, and so on. From this we derive the general formula for the future value of $1, with n representing the number of compounding periods.

$$\text{Future Value (FV)} = 1\ (1 + i)^n$$

The future value table shows values for many common interest rates and time periods. To obtain the future value of any principal other than $1, it is only necessary to multiply the principal by the factor $(1 + i)^n$:

$$\text{Future Value (FV)} = \text{Principal (P)} \times \text{Factor } (1 + i)^n$$

Where $(1 + i)$ is the factor in the future value of $1 table, with interest rate "i" and number of periods "n". (See Table I: Amount of 1 at Compound Interest in Appendix)

PROBLEM: Mr. Smith invests $10,000 in a certificate of deposit that earns 12 percent interest per year, compounded quarterly. What will be the future value of this investment at the end of six years when he plans to buy additional farm land?

SOLUTION: Since compounding is quarterly and there are six years, the number of periods is 24. The quarterly interest rate is one-fourth of the 12 percent annual rate, or three percent (3%). Using the table, with i=3% and n=24, the factor in the table is 2.0938. Multiplying this factor by the principal investment, we get:

$$FV = P\ (\ 1+i\ )^{n}$$
$$= \$10{,}000 \times 2.0938$$
$$= \$20{,}938$$

Discounting

If $1 can be invested at 10 percent today to become **$1.10 in** the future, then $1 is the **present value** of the future **amount**

of $1.10. The present value of future receipts of money is very important in investment decision making. Frequently it is necessary to decide how much future receipts are worth today in order to determine whether an investment should be made or how much should be invested. Finding the present vale of future receipts involves discounting the future value to the present. **Discounting** is the opposite of compounding. Instead of finding how interest accumulates, discounting involves finding the present value of some future amount of money that is assumed to include interest accumulations.

From the discussion of compound interest you know that the future value of $1 at 10 percent for one period is $1.10. Then the present value of $1.10 discounted for one period at 10 percent is $1. We obtain the present value (PV) as follows:

$$\text{Present Value (PV)} = \frac{FV}{1+i} = \frac{\$1.10}{1+.10} = \$1$$

where i = discount rate and $\dfrac{1}{(1+i)} = \$1$

Present Value of $1

It is very useful to know the present value of $1 because then the present value of any amount can be computed merely by multiplying the amount by the present value of $1. To illustrate the computation of the present value of $1, assume an interest rate of 10 percent per period. A table of present values of $1 can be constructed as follows:

PV of $1 discounted 1 period at 10% = $1.0000 ÷ 1.10 = $.9091
PV of $1 discounted 2 period at 10% = $0.9091 ÷ 1.10 = $.8264
PV of $1 discounted 3 period at 10% = $0.8264 ÷ 1.10 = $.7513
PV of $1 discounted 4 period at 10% = $0.7513 ÷ 1.10 = $.6830

The first value is obtained by dividing $1 by 1.10. The second value is obtained by dividing $1 by (1.10), and so on. The general formula for the present value of $1 is:

$$\text{Present Value (PV)} = \frac{\$1}{(1 + i)^n}$$

To find the present value of any future amount, the appropriate factor from the table is multiplied by the amount. (See present value of $1 in Table II in Appendix)

$$\text{Present Value (PV)} = \frac{FV}{(1+i)^n}$$

PROBLEM: Mr. Harrison can invest at 16 percent compounded quarterly. He will need $30,000 five years from now as a down payment for the purchase of a second vehicle. How much must he invest today?

SOLUTION: Since the compounding is quarterly and there are five years, the number of periods is 20. The quarterly interest rate is one-fourth of the 16 percent annual rate, or 4 percent. Using the table, with n=20 and i=4, the factor $1/(1+i)$ is 0.4564.
Multiplying this factor by the future value needed, we find he must invest $13,692 today.

$$\text{Present Value (PV)} = FV \times 1/(1+i)^{20}$$
$$\$30,000 \times 0.4564$$
$$= \$13,692$$

(NOTE: we could also have solved this problem by using the Future Value formula and solving for the unknown "P". From Table I, n=20 and i=4, $(1+i) = 2.1911$.

$$\text{Future Value (FV)} = P \times (1+i)^{20}$$
$$\$30,000 = P \times 2.1911$$
$$\$30,000/2.1911 = P$$
$$\$13,691.75 = P$$

The slight difference in the answer is due to rounding off figures in the tables to four decimal places.

Net Present Value

The net present value is the present value of the costs subtracted from the present value of the revenue and gives an indication of the profitability of perennial enterprises and durable goods.

Net Present Value = PV (Revenue) - PV (Costs)

Decision Rules

If an investment is profitable then its net present value is greater than zero. If comparing two or more investments then the investment with the highest net present value is the best one.

To calculate the net present value, both the stream of revenues over the years and the stream of costs over the years have to be discounted **by the same discount rate.**

For example. consider the case of a farmer who has to decide whether to buy a tractor (durable good) with a five-year life-span, which the farmer can use to carry out land preparation of other farmers' fields as a source of revenue.

In this case:

$$PV\ (Revenue) = R_1 \left(\frac{1}{1+i}\right) + R_2 \left(\frac{1}{1+i}\right) + R_3 \left(\frac{1}{1+i}\right) + R_4 \left(\frac{1}{1+i}\right) + R_5 \left(\frac{1}{1+i}\right)$$

(Where: R is the revenue in in years one to five).

$$PV\ (Cost) = C_0 + \frac{C_1}{(1+i)} + \frac{C_2}{(1+i)} + \frac{C_3}{(1+i)} + \frac{C_4}{(1+i)} + \frac{C_5}{(1+i)}$$

Where C_0 is the initial investment and C is the operating cost in years 1 to 5.

The discount factor $\left(\frac{1}{1+i}\right)$ in any year is multiplied by the revenue in that year to give the discounted revenue, and multiplied by the costs in that year to give the discounted costs.

Table 1. Net Present Value of Tractor an Hypothetical Case

(1) Year	(2) Revenue	(3) Discount Factor 12%	(4) PV Revenue	(5) Cost	(6) PV Cost
0	0	1.0	0	25,000	25,000
1	10,000	.893	8,930	2,000	1,786
2	10,000	.797	7,970	2,000	1,594
3	10,000	.712	7,120	2,500	1,780
4	10,000	.636	6,360	2,500	1,590
5	10,000	.567	5,670	3,000	1,701
Total			36,050		33,451

Column (4) = Column (2) x Column (3)
Column (6) = Column (5) x Column (3)
Net Present Value = PV (Revenue) - PV (Cost)
= 36,050 - 33,451
= 2,599

Thus over the five years the farmer will make an expected profit of $2,599 from investing in the tractor in our case, so that the farmer should go ahead and make the decision to buy the tractor.

This simple example illustrates several points.

First, to use the net present value method to decide **at the present time** whether to buy a durable good or to go into a perennial enterprise requires that the **future costs and future revenues are known** at the present time. This means that we have to forecast or predict what future costs and future revenues are likely to be.

Forecasting is never an easy task because of the existence of risk and uncertainty. We are never absolutely sure of the future so that there is always a possibility that our forecasts will not be exactly accurate. If our forecasts are very inaccurate, then we may make the wrong decision.

For example, if our forecast of the revenue stream in Table 1 were wrong, then our decision to buy the tractor could be a bad one. For example, if the revenues for Years 3, 4 and 5 turn out to be $7000 each year instead of the $10,000 in Table 1 then the Present Value of Revenue will be $30,305 and the Net Present Value will be a loss of $3,146 or (-$3,146) and the farmer should not have bought the tractor.

Secondly, as important as the need for forecasting, is the need for information when we have to decide on investment. In order to make a correct decision about whether to buy a tractor we need to have information about the tractor.

Information like:

(a) How much the tractor will cost, that is its initial cost.
(b) The length of its productive life, its life-span.
(c) The revenue stream expected from the tractor.
(d) What the maintenance and operating costs are likely to be, i.e. its operating cost stream.

Lack of information is the main reason why proper decisions are not made, and why methods such as the net present value are not used as often as they should be in helping farmers make proper investment decisions.

Thirdly, Table 1 also illustrates another important point, that is, revenues received (or cost incurred) in the distant future are worth less than revenues received (or cost incurred) at the present time.

For example, in Table 1, $10,000 received in Year Five is only worth $5,670 with a 12 per cent discount rate whereas the same $10,000 received after one year at the same 12 per cent discount rate is worth $8,930.

It may also be noted that the higher the discount rate the smaller the Present Value. At the discount rate of 10 per cent $10,000 received after five years is worth $6,210 today, whereas it is worth $5,670 at a discount rate of 12 per cent.

Choosing Perennial Enterprises

Farmers are being encouraged to go into the production of perennial enterprises especially crops like cocoa, coffee and fruits such as mangoes, citrus and other exotic types. Many farmers are reluctant to go into perennial crop production because they are unsure about the profitability or feasibility of such enterprises. The net present value method can estimate the profitability of perennial enterprises and so is very useful in providing a logical basis for farmers' decision making.

We will consider an example of a farmer who is thinking of going into cocoa production. The farmer should decide to go into cocoa production, if it is more profitable than his or her present enterprise mix and does not limit his capability to meet personal and financial goals Since cocoa is a perennial crop, to decide whether it is profitable, we will have to discount the revenues and costs of the enterprise to the present time and calculate the net present value.

We can assume that the farmer has gone to his extension agent for assistance and the agent has provided him with the information on which to base his decision which is given in Tables 2 and 3.

Table 2. Net Present Value Calculation for Cocoa Production (Per Acre)

Year	Yield of Cocoa (lb.)	Revenue $	Cost $	Discount Factor at 12%	PV Revenue	PV Cost
0	0	0	1800	1.0		1800
1	0	0	1400	0.8929		1250
2	0	0	1300	0.7972		1036
3	200	800	1200	0.7118	569	854
4	400	1600	1100	0.6355	1017	699
5	800	3200	1050	0.5674	1816	596
6	1000	4000	1100	0.5066	2026	557
7	1200	4800	1150	0.4523	2171	520
8	1500	6000	1200	0.4039	2423	485
9-20	1500	6000	1200	2.5018	15011	3002
Total					25033	10799

Notes: (a) Price of cocoa $4/lb. over the 20-year life-span.
(b) For years nine to 20 the Discount Factor is the sum of the individual discount factors for the 12 years = 2.502.
(c) It is assumed that for years nine to 20 the cocoa will give the same yield and incur the same costs.
(d) The figures are given for one acre of cocoa.

Net Present Value = PV (Revenue) - PV (Cost)
= 25033 - 10799= $14234 /acre

It is seen in Table 2 that the Net Present Value per acre of cocoa is $14234. Given that the costs included in Table 3 (and Table 2) do not include the cost of land, the farmer should be willing to buy land at up to $14,000 at the present time and go into cocoa production, since the discounted returns will exceed the discounted costs.

Table 3. Costs for Cocoa Production ($ per acre)

Cost Items	0	1	2	3	4	5	6	7	8	9-20
1.Labour	1200	900	800	750	750	725	750	800	800	800
2.Materials	600	500	500	400	300	250	250	250	300	300
3.Marketing	0	0	0	50	50	75	100	100	100	100
Total	1800	1400	1300	1200	1100	1050	1100	1150	1200	1200

It should be noted however, that the feasibility of growing cocoa shown in Table 2 is based on the price of cocoa remaining at $4 per pound over the 20 years. If for example the price of cocoa were to fall to $2 per pound over the years 9-20 then the present vale of the revenue will drop to $17,532.20 and the Net present Value will fall to $7,585.05. Given this lower price therefore, it is not a good decision to buy land at $15,000 per acre to go into cocoa production.

As stressed earlier therefore, forecasting prices and yields and obtaining a reliable source of information are important ingredients for using the net present value method to determine the feasibility of perennial enterprises.

Finally, it must be stressed that the examples used in this exercise are merely for illustration of principles and methods and do not represent real situations in any country. As such the data contained in the examples are not suitable for extension advice.

The Capital Budgeting Process

The Capital Budgeting Process in general is similar to any budgeting process in that it involves a search for alternatives and the choice among these alternatives of the one which best meets the goals of the farmer.

We will now briefly examine the steps of the capital budgeting process given earlier.

1. **Search for profitable investment opportunities.**
   The process by which profitable investment opportunities can be identified has been discussed earlier especially in the case of the identification of perennial enterprises.

2. **Determination of the amount of initial capital required by each alternative.**
   The initial capital required for an enterprise is important since it largely determines the amount of indebtedness the farmer will have to incur to make the particular investment.

   In most investments the future revenues obtained from the investment must pay for the operating costs of the investment as well as for the initial capital required by the investment.

   Information on the amount of initial capital required by each alternative is usually quite easy to obtain.

3. **Determination of the stream of annual costs that will result from each alternative over its life-span.**
This information is much more difficult to obtain since it involves forecasting future conditions with respect to the enterprise as discussed earlier. Such information may be obtained from other extension agents, or research personnel who have been engaged in the enterprise and who have good forecasting ability. Given the constant trend of inflation in most countries today, it is a fair guide that annual costs of operating an investment could be expected to be increasing over time.

4. **Determination of the stream of annual benefits or returns that will result from each alternative over its life-span.**
This is the most difficult set of information to obtain, since prices and yields of commodities generally vary quite markedly over time. Forecasting of these yields and prices is hence quite tentative. However, these forecasts are essential since Revenue or Returns = Price x Yield of Enterprises.

For durable goods, quantification of the benefits or returns from the goods, such as a new farm house or a new cocoa drying house, is sometimes difficult to state in monetary terms.

Again the best guide to the determination of the stream of annual return is the experience of a knowledgeable farmer or researcher in the enterprise, although techniques are available for forecasting these returns also.

5. **Use of a method to evaluate the profitability of each investment over its life-span.**
One particular method the net present value was discussed in detail earlier. Other methods are available like the internal rate of return which is an alternative technique to the Net Present Value.

6. **The choice of the most profitable enterprise.**
This choice is made possible by the method of comparison used, for example, the net present value method as described earlier.

7. **A final analysis to verify the likely success of the investment within the context of the operations of the whole farm.**

Like all budgeting exercises, the results of capital budgeting should not be implemented until a final

analysis is carried out to examine the consequences of the implementation on the operations of the farm as a whole.

Important considerations are:

(a) The impact on labour use on the farm
(b) The impact on managerial time
(c) The impact on other enterprises on the farm.

In general, investments should only be made where the capital budgeting exercise indicates that they are likely to be profitable and financially feasible and where an analysis of the impact of the investment on the farm shows that it is most likely to bring more benefits to the farm than it will cost the farm as a whole.

Financial Feasibility

Once the choice of the most profitable enterprise by the method of net present value is made, its financial feasibility should be evaluated. The purpose of financial feasibility analysis is to determine whether or not the investment project will generate sufficient cash income to pay back the principal and interest on borrowed funds used to finance the project. **If a loan is not required, then financial feasibility analysis is unnecessary.**

The first step in financial feasibility analysis is to determine the annual net cash flow for the project. This is done as part of the profitability analysis when the net present value analysis is used. The second step is to determine the annual principal and interest payments based on the loan repayment plan. Then, the annual net cash flow is compared to the annual principal and interest payments to determine if a cash surplus or deficit will occur.

If a cash surplus results, the investment project will generate sufficient cash to make the loan payments, and the project is financially feasible as well as economically profitable. If a cash deficit results, the project is not financially feasible. Cash deficits do not mean that the investment is not profitable, they mean that loan repayment will present some problems.

Cash deficits can be reduced or eliminated in a number of ways. Extending the loan terms will result in lower annual payments. If the deficit cannot be reduced or eliminated, then the project must be financed with cash from some other source to make it financially feasible.

An analysis of investment in blue mountain coffee will be presented next to illustrate the use of net present value and financial feasibility analysis.

NET PRESENT VALUE

Projecting cash flows

Projecting the cash flows is the most time consuming part of the analysis. Separate budgets should be prepared for each year, or for group of years, in which different cash flows are expected. The important point to remember is that all receipts and expenses that result from the investment should be included.

Before estimating net cash flows, the length of the planning period for the investment must be determined. The length of the planning period should be based on the useful life of the permanent crop considered in the analysis. For our example we will assume that the useful life for the blue mountain coffee plantation will be 10 years.

Cash outflows and inflows estimates per year are based in the cost of production data presented in the next page.

Accounting Convention

The discounting process assumes that every transaction falls at the end of the accounting period. If all transactions are considered to fall at the end of the accounting period, then we must allow for the availability of the needed cash for the establishment cost and needed operating expenditures at the beginning of the cropping season. This is accomplished by incorporating into the analysis an entry for establishment cost (capital investment cost) and operating cost (working capital) at the end of the previous year (Year Zero).

Incremental Residual Value

In the last year of the investment analysis, the residual value of capital assets (buildings,machinery,equipment) is included among the cash inflows and credited to the project investment. Another residual value is the working capital and the value of items that have a substantial useful life remaining at the end of the project.

Cash Outflows

The most obvious cash outflow is that required to make the investment. In this example, it is the establishment cost. If equipment needs to be replaced before the end of the planning period, the cash required for those replacements should be entered as outflows in the year that they will be made.

Cash Inflows

The cash inflows are the benefits expected (Revenue) from the investment. Another cash inflow included at the end of the planning period is the expected residual value of the investment and the working capital.

Depreciation and Interest

Depreciation and interest are not included in net cash flow projections. When the investment project involves a depreciable asset the entire cash flow is included to purchase the asset at the beginning of the planning period. Moreover, inclusion of depreciation in the annual net cash flows would result in double counting.

If the investment is financed with borrowed money, the interest on the loan is cash expense, **but it is not included.** In net present value analysis, the interest charge is considered in the discount rate. If interest paid were also included in the cash flow, interest would be charged against the investment twice.

Choosing the Discount Rate

The selection of the discount rate is a key step in net present value analysis. A high discount rate lessens the present value of future receipts and expenses. In choosing the appropriate discount rate, it is important to consider that the investment could be financed with borrowed money. The cost of that borrowed money (interest rate) is the farmer's minimum acceptable rate of return and is used to discount the net cash flow.

Inflation

Inflation is one of the factors contributing to the fluctuation of the value of money and prices over time. Inflation affects the analysis of investment in two ways:

a) interest rates tend to increase; and

b) prices of inputs and outputs tend to increase affecting future annual cash flows.

Two approaches can be used to account for the impact of inflation on investment analysis:

a) Use a discount rate that includes the inflation premium and cash flows that reflect the expected future rates of inflation in prices.

b) The real cash flows are expressed in dollars of constant purchasing power.

Both of these approaches are correct. In our example we will assume that inflation will affect prices in the same proportion and express cash flows in dollars of constant purchasing power. This assumption can be removed later on and a sensitive analysis can be conducted to see how the conclusions of the analysis are affected by changes in prices of inputs and outputs and interest rates.

Table 5. Net Present Value Calculation- Inflows and Outflows
Blue Mountain Coffee- 10 Acre Model

	YEARS										
	0	1	2	3	4	5	6	7	8	9	10
INFLOWS											
Revenue	--	--	--	10500	42000	132300	168000	231000	231000	231000	231000
Working capital											44090
OUTFLOWS											
CAPITAL INVESTMENT:											
I .Labour	24360										
II.Materials	22240										
TOTAL INV.	46600										
Incremental working capital	44090										
OPERATING EXPENSES											
Labour		12950	14300	18000	24000	33000	34800	36780	36780	36780	36780
Material		18350	18670	21950	21950	21950	21950	21950	21950	21950	21950
Others		12790	8300	9000	9600	10500	10680	10870	10870	10870	10870
TOTAL OPERATING EXPENSES		44090	41270	48950	55550	65450	67430	69600	69600	69600	69600
TOTAL OUTFLOWS	90690	44090	41270	48950	55550	65450	67430	69600	69600	69600	69600
NET CASH FLOW	(90690)	(44090)	(41270)	(38450)	(13550)	66850	100570	161400	161400	161400	205490

NET PRESENT VALUE CALCULATION FOR

BLUE MOUNTAIN COFFEE PRODUCTION

YEAR	(INFLOWS) REVENUE $	(OUTFLOWS) COST $	DISCOUNT Factor at 20 %	PV Revenue	PV Cost
0	0	90690	1.0	0	90690
1	0	44090	0.8333	0	36740
2	0	41270	.6944	0	28657
3	10500	48950	.5787	6076	28327
4	42000	55550	.4823	20256	26792
5	132300	65450	.4019	53171	26304
6	168000	67430	.3349	56263	22582
7	231000	69600	.2791	64472	19425
8	231000	69600	.2326	53730	16188
9	231000	69600	.1938	44768	13488
10	231000	69600	.1615	37306	11240
10	44090	(working Capital)	.1615	7120	
TOTAL				343162	320433

NET PRESENT VALUE= 343162 - 320433 = $ 22729

The results indicate a positive net present value. Therefore, then the investment in coffee would be profitable given the cost of capital. Let's assume that land charges ($250) in the blue mountain coffee budget represents other expenditures than land charges, then, given that the cost does not include the cost of land, the net present value would represent the return on his capital in land or what the farmer should be willing to pay for the 10 acres of land up to $22729 at the present time and go into coffee production.

However this investment may not be the most profitable alternative for his capital. Other investment possibilitie must also be considered.

Let's analyze the financial feasibility of the investment next.

FINANCIAL FEASIBILITY

The first step is to determine the annual net cash flows for the project based on the inflows and outflows and including the amount of money borrowed by the farmer. This was done in Table 5 (NET CASH FLOW row).

Lets assume that the farmer will borrow $70,000 in Year Zero, at an annual rate of interest of 15 per cent for a period of five years with a grace period of two years on the principal and annual payments of principal and interest on the outstanding balance

The Surplus or Deficit for Year Zero will be:

Net Cash Flow for Year Zero + Borrowed funds
= Surplus/(Deficit)

($90,690) + (-$70,000) = ($20,690)

Surplus or Deficit for Year 1

Net Cash Flow for Year 1 + Principal + Interest) =

($44,090) - (0 + $10,500) = ($54,590)

The next table shows the financial feasibility of the project including the loan repayment plan.

Table 7. Financial Feasibility

Year (1)	Annual Net Cash Flow (2)	Loan (3)	Payment Schedule Principal (4)	Interest (5)	Total (6)	Surplus/ (Deficit) (2+3-6)
0	(60690)	+ 70000				(20690)
1	(44090)		--	10500	10500	(54590)
2	(41270)		14000	10500	24500	(65770)
3	(38450)		14000	8400	22400	(60850)
4	(13550)		14000	6300	20300	(33850)
5	66850		14000	4200	18200	48650
6	100570		14000	2100	16100	84470
7	161400					161400
8	161400					161400
9	161400					161400
10	205490					205490

From this we see that the project does not generate enough cash to make the loan payments and the deficit will have to be financed with the farmer's own funds. If the farmer does not have enough cash, or finds other sources of financing for the project even though it is profitable, it will not be financially feasible for this particular farmer.

ANNEX

TABLES I and II

APPENDIX TABLE I: Amount of 1 at compound interest

$$V_n^{\mathfrak{r}} = (1 + i)^n$$

n	1%	2%	3%	4%	5%	6%	n
1	1.0100	1.0200	1.0300	1.0400	1.0500	1.0600	1
2	1.0201	1.0404	1.0609	1.0816	1.1025	1.1236	2
3	1.0303	1.0612	1.0927	1.1249	1.1576	1.1910	3
4	1.0406	1.0824	1.1255	1.1699	1.2155	1.2625	4
5	1.0510	1.1041	1.1593	1.2167	1.2763	1.3382	5
6	1.0615	1.1262	1.1941	1.2653	1.3401	1.4185	6
7	1.0721	1.1487	1.2299	1.3159	1.4071	1.5036	7
8	1.0829	1.1717	1.2668	1.3696	1.4775	1.5938	8
9	1.0937	1.1951	1.3048	1.4231	1.5513	1.6895	9
10	1.1046	1.2190	1.3439	1.4802	1.6289	1.7908	10
11	1.1157	1.2434	1.3842	1.5395	1.7103	1.8983	11
12	1.1268	1.2682	1.4258	1.6010	1.7959	2.0122	12
13	1.1381	1.2936	1.4685	1.6651	1.8856	2.1329	13
14	1.1495	1.3195	1.5126	1.7317	1.9799	2.2609	14
15	1.1610	1.3459	1.5580	1.8009	2.0789	2.3966	15
16	1.1726	1.3728	1.6047	1.8730	2.1829	2.5404	16
17	1.1843	1.4002	1.6528	1.9479	2.2920	2.6928	17
18	1.1961	1.4282	1.7024	2.0258	2.4066	2.8543	18
19	1.2081	1.4568	1.7535	2.1068	2.5269	3.0256	19
20	1.2202	1.4859	1.8061	2.1911	2.6533	3.2071	20
21	1.2324	1.5157	1.8603	2.2788	2.7860	3.3996	21
22	1.2447	1.5460	1.9161	2.3699	2.9253	3.6035	22
23	1.2572	1.5769	1.9736	2.4647	3.0715	3.8197	23
24	1.2697	1.6084	2.0328	2.5633	3.2251	4.0489	24
25	1.2824	1.6406	2.0938	2.6658	3.3864	4.2919	25
26	1.2953	1.6734	2.1566	2.7725	3.5557	4.5494	26
27	1.3082	1.7069	2.2213	2.8834	3.7335	4.8223	27
28	1.3213	1.7410	2.2879	2.9987	3.9201	5.1117	28
29	1.3345	1.7758	2.3566	3.1187	4.1161	5.4184	29
30	1.3478	1.8114	2.4273	3.2434	4.3219	5.7435	30
31	1.3613	1.8476	2.5001	3.3731	4.5380	6.0881	31
32	1.3749	1.8845	2.5751	3.5081	4.7649	6.4534	32
33	1.3887	1.9222	2.6523	3.6484	5.0032	6.8406	33
34	1.4026	1.9607	2.7319	3.7943	5.2533	7.2510	34
35	1.4166	1.9999	2.8139	3.9461	5.5160	7.6861	35
40	1.4889	2.2080	3.2620	4.8010	7.0400	10.2857	40
45	1.5648	2.4379	3.7816	5.8412	8.9850	13.7646	45
50	1.6446	2.6916	4.3839	7.1067	11.4674	18.4201	50
55	1.7285	2.9717	5.0821	8.6464	14.6356	24.6503	55
60	1.8167	3.2810	5.8916	10.5196	18.6792	32.9877	60

APPENDIX TABLE I *(continued)*: Amount of 1 at compound interest

$$V_n^i = (1 + i)^n$$

n	7%	8%	9%	10%	11%	12%	n
1	1.0700	1.0800	1.0900	1.1000	1.1100	1.1200	1
2	1.1449	1.1664	1.1881	1.2100	1.2321	1.2544	2
3	1.2250	1.2597	1.2950	1.3310	1.3676	1.4049	3
4	1.3108	1.3605	1.4116	1.4641	1.5181	1.5735	4
5	1.4026	1.4693	1.5386	1.6105	1.6851	1.7623	5
6	1.5007	1.5869	1.6771	1.7716	1.8704	1.9738	6
7	1.6058	1.7138	1.8280	1.9487	2.0762	2.2107	7
8	1.7182	1.8509	1.9926	2.1436	2.3045	2.4760	8
9	1.8385	1.9990	2.1719	2.3579	2.5580	2.7731	9
10	1.9672	2.1589	2.3674	2.5937	2.8394	3.1058	10
11	2.1049	2.3316	2.5804	2.8531	3.1518	3.4785	11
12	2.2522	2.5182	2.8127	3.1384	3.4984	3.8960	12
13	2.4098	2.7196	3.0658	3.4523	3.8833	4.3635	13
14	2.5785	2.9372	3.3417	3.7975	4.3104	4.8871	14
15	2.7590	3.1722	3.6425	4.1772	4.7846	5.4736	15
16	2.9522	3.4259	3.9703	4.5950	5.3109	6.1304	16
17	3.1588	3.7000	4.3276	5.0545	5.8951	6.8660	17
18	3.3799	3.9960	4.7171	5.5599	6.5435	7.6900	18
19	3.6165	4.3157	5.1417	6.1159	7.2633	8.6128	19
20	3.8697	4.6610	5.6044	6.7275	8.0623	9.6463	20
21	4.1406	5.0338	6.1088	7.4002	8.9492	10.8038	21
22	4.4304	5.4365	6.6586	8.1403	9.9336	12.1003	22
23	4.7405	5.8715	7.2579	8.9543	11.0263	13.5523	23
24	5.0724	6.3412	7.9111	9.8497	12.2391	15.1786	24
25	5.4274	6.8485	8.6231	10.8347	13.5855	17.0000	25
26	5.8074	7.3964	9.3992	11.9182	15.0799	19.0401	26
27	6.2139	7.9881	10.2451	13.1100	16.7386	21.3249	27
28	6.6488	8.6271	11.1671	14.4210	18.5799	23.8838	28
29	7.1143	9.3173	12.1722	15.8631	20.6237	26.7499	29
30	7.6123	10.0627	13.2677	17.4494	22.8923	29.9599	30
31	8.1451	10.8677	14.4618	19.1943	25.4104	33.5551	31
32	8.7153	11.7371	15.7633	21.1138	28.2056	37.5817	32
33	9.3253	12.6760	17.1820	23.2251	31.3082	42.0915	33
34	9.9781	13.6901	18.7284	25.5477	34.7521	47.1425	34
35	10.6766	14.7853	20.4140	28.1024	38.5748	52.7995	35
40	14.9745	21.7245	31.4094	45.2592	65.0008	93.0508	40
45	21.0024	31.9204	48.3273	72.8904	109.5301	163.9873	45
50	29.4570	46.9016	74.3575	117.3908	184.5645	289.0015	50
55	41.3150	68.9138	114.4082	189.0590	311.0017	509.3196	55
60	57.9464	101.2570	176.0312	304.4812	524.0562	897.5950	60

APPENDIX TABLE II: Present value of 1 at compound interest

$$V_n^P = \frac{1}{(1+i)^n}$$

n	1%	2%	3%	4%	5%	6%	n
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	1
2	0.9803	0.9612	0.9426	0.9246	0.9070	0.8900	2
3	0.9706	0.9423	0.9151	0.8890	0.8638	0.8396	3
4	0.9610	0.9238	0.8885	0.8548	0.8227	0.7921	4
5	0.9515	0.9057	0.8626	0.8219	0.7835	0.7473	5
6	0.9420	0.8880	0.8375	0.7903	0.7462	0.7050	6
7	0.9327	0.8706	0.8131	0.7599	0.7107	0.6651	7
8	0.9235	0.8535	0.7894	0.7307	0.6768	0.6274	8
9	0.9143	0.8368	0.7664	0.7026	0.6446	0.5919	9
10	0.9053	0.8203	0.7441	0.6756	0.6139	0.5584	10
11	0.8963	0.8043	0.7224	0.6496	0.5847	0.5268	11
12	0.8874	0.7885	0.7014	0.6246	0.5568	0.4970	12
13	0.8787	0.7730	0.6810	0.6006	0.5303	0.4688	13
14	0.8700	0.7579	0.6611	0.5775	0.5051	0.4423	14
15	0.8613	0.7430	0.6419	0.5553	0.4810	0.4173	15
16	0.8528	0.7284	0.6232	0.5339	0.4581	0.3936	16
17	0.8444	0.7142	0.6050	0.5134	0.4363	0.3714	17
18	0.8360	0.7002	0.5874	0.4936	0.4155	0.3503	18
19	0.8277	0.6864	0.5703	0.4746	0.3957	0.3305	19
20	0.8195	0.6730	0.5537	0.4564	0.3769	0.3118	20
21	0.8114	0.6598	0.5375	0.4388	0.3589	0.2942	21
22	0.8034	0.6468	0.5219	0.4220	0.3418	0.2775	22
23	0.7954	0.6342	0.5067	0.4057	0.3256	0.2618	23
24	0.7876	0.6217	0.4919	0.3901	0.3101	0.2470	24
25	0.7798	0.6095	0.4776	0.3751	0.2953	0.2330	25
26	0.7720	0.5976	0.4637	0.3607	0.2812	0.2198	26
27	0.7644	0.5859	0.4502	0.3468	0.2678	0.2074	27
28	0.7568	0.5744	0.4371	0.3335	0.2551	0.1956	28
29	0.7493	0.5631	0.4243	0.3207	0.2429	0.1846	29
30	0.7419	0.5521	0.4120	0.3083	0.2314	0.1741	30
31	0.7346	0.5412	0.4000	0.2965	0.2204	0.1643	31
32	0.7273	0.5306	0.3883	0.2851	0.2099	0.1550	32
33	0.7201	0.5202	0.3770	0.2741	0.1999	0.1462	33
34	0.7130	0.5100	0.3660	0.2636	0.1904	0.1379	34
35	0.7059	0.5000	0.3554	0.2534	0.1813	0.1301	35
40	0.6717	0.4529	0.3066	0.2083	0.1420	0.0972	40
45	0.6391	0.4102	0.2644	0.1712	0.1113	0.0727	45
50	0.6080	0.3715	0.2281	0.1407	0.0872	0.0543	50
55	0.5785	0.3365	0.1968	0.1157	0.0683	0.0406	55
60	0.5504	0.3048	0.1697	0.0951	0.0535	0.0303	60

APPENDIX TABLE II (*continued*): Present value of 1 at compound interest

$$V_n^p = \frac{1}{(1+i)^n}$$

n	7%	8%	9%	10%	11%	12%	*n*
1	0.9346	0.9259	0.9174	0.9091	0.9009	0.8929	1
2	0.8734	0.8573	0.8417	0.8264	0.8116	0.7972	2
3	0.8163	0.7938	0.7722	0.7513	0.7312	0.7118	3
4	0.7629	0.7350	0.7084	0.6830	0.6587	0.6355	4
5	0.7130	0.6806	0.6499	0.6209	0.5935	0.5674	5
6	0.6663	0.6302	0.5963	0.5645	0.5346	0.5066	6
7	0.6227	0.5835	0.5470	0.5132	0.4817	0.4523	7
8	0.5820	0.5403	0.5019	0.4665	0.4339	0.4039	8
9	0.5439	0.5002	0.4604	0.4241	0.3909	0.3606	9
10	0.5083	0.4632	0.4224	0.3855	0.3522	0.3220	10
11	0.4751	0.4289	0.3875	0.3505	0.3173	0.2875	11
12	0.4440	0.3971	0.3555	0.3186	0.2858	0.2567	12
13	0.4150	0.3677	0.3262	0.2897	0.2575	0.2292	13
14	0.3878	0.3405	0.2992	0.2633	0.2320	0.2046	14
15	0.3624	0.3152	0.2745	0.2394	0.2090	0.1827	15
16	0.3387	0.2919	0.2519	0.2176	0.1883	0.1631	16
17	0.3166	0.2703	0.2311	0.1978	0.1696	0.1456	17
18	0.2959	0.2502	0.2120	0.1799	0.1528	0.1300	18
19	0.2765	0.2317	0.1945	0.1635	0.1377	0.1161	19
20	0.2584	0.2145	0.1784	0.1486	0.1240	0.1037	20
21	0.2415	0.1987	0.1637	0.1351	0.1117	0.0926	21
22	0.2257	0.1839	0.1502	0.1228	0.1007	0.0826	22
23	0.2109	0.1703	0.1378	0.1117	0.0907	0.0738	23
24	0.1971	0.1577	0.1264	0.1015	0.0817	0.0659	24
25	0.1842	0.1460	0.1160	0.0923	0.0736	0.0588	25
26	0.1722	0.1352	0.1064	0.0839	0.0663	0.0525	26
27	0.1609	0.1252	0.0976	0.0763	0.0597	0.0469	27
28	0.1504	0.1159	0.0895	0.0693	0.0538	0.0419	28
29	0.1406	0.1073	0.0822	0.0630	0.0485	0.0374	29
30	0.1314	0.0994	0.0754	0.0573	0.0437	0.0334	30
31	0.1228	0.0920	0.0691	0.0521	0.0394	0.0298	31
32	0.1147	0.0852	0.0634	0.0474	0.0355	0.0266	32
33	0.1072	0.0789	0.0582	0.0431	0.0319	0.0238	33
34	0.1002	0.0730	0.0534	0.0391	0.0288	0.0212	34
35	0.0937	0.0676	0.0490	0.0356	0.0259	0.0189	35
40	0.0668	0.0460	0.0318	0.0221	0.0154	0.0107	40
45	0.0476	0.0313	0.0207	0.0137	0.0091	0.0061	45
50	0.0339	0.0213	0.0134	0.0085	0.0054	0.0035	50
55	0.0242	0.0145	0.0087	0.0053	0.0032	0.0020	55
60	0.0173	0.0099	0.0057	0.0033	0.0019	0.0011	60

APPENDIX TABLE II (*continued*): Present value of 1 at compound interest

$$V_n^p = \frac{1}{(1+i)^n}$$

n	13%	14%	15%	16%	18%	20%	n
1	0.8850	0.8772	0.8696	0.8621	0.8475	0.8333	1
2	0.7831	0.7695	0.7561	0.7432	0.7182	0.6944	2
3	0.6931	0.6750	0.6575	0.6407	0.6086	0.5787	3
4	0.6133	0.5921	0.5718	0.5523	0.5158	0.4823	4
5	0.5428	0.5194	0.4972	0.4761	0.4371	0.4019	5
6	0.4803	0.4556	0.4323	0.4104	0.3704	0.3349	6
7	0.4251	0.3996	0.3759	0.3538	0.3139	0.2791	7
8	0.3762	0.3506	0.3269	0.3050	0.2660	0.2326	8
9	0.3329	0.3075	0.2843	0.2630	0.2255	0.1938	9
10	0.2946	0.2697	0.2472	0.2267	0.1911	0.1615	10
11	0.2607	0.2366	0.2149	0.1954	0.1619	0.1346	11
12	0.2307	0.2076	0.1869	0.1685	0.1372	0.1122	12
13	0.2042	0.1821	0.1625	0.1452	0.1163	0.0935	13
14	0.1807	0.1597	0.1413	0.1252	0.0985	0.0779	14
15	0.1599	0.1401	0.1229	0.1079	0.0835	0.0649	15
16	0.1415	0.1229	0.1069	0.0930	0.0708	0.0541	16
17	0.1252	0.1078	0.0929	0.0802	0.0600	0.0451	17
18	0.1108	0.0946	0.0808	0.0691	0.0508	0.0376	18
19	0.0981	0.0829	0.0703	0.0596	0.0431	0.0313	19
20	0.0868	0.0728	0.0611	0.0514	0.0365	0.0261	20
21	0.0768	0.0638	0.0531	0.0443	0.0309	0.0217	21
22	0.0680	0.0560	0.0462	0.0382	0.0262	0.0181	22
23	0.0601	0.0491	0.0402	0.0329	0.0222	0.0151	23
24	0.0532	0.0431	0.0349	0.0284	0.0188	0.0126	24
25	0.0471	0.0378	0.0304	0.0245	0.0160	0.0105	25
26	0.0417	0.0331	0.0264	0.0211	0.0135	0.0087	26
27	0.0369	0.0291	0.0230	0.0182	0.0115	0.0073	27
28	0.0326	0.0255	0.0200	0.0157	0.0097	0.0061	28
29	0.0289	0.0224	0.0174	0.0135	0.0082	0.0051	29
30	0.0256	0.0196	0.0151	0.0116	0.0070	0.0042	30
31	0.0226	0.0172	0.0131	0.0100	0.0059	0.0035	31
32	0.0200	0.0151	0.0114	0.0087	0.0050	0.0029	32
33	0.0177	0.0132	0.0099	0.0075	0.0042	0.0024	33
34	0.0157	0.0116	0.0086	0.0064	0.0036	0.0020	34
35	0.0139	0.0102	0.0075	0.0055	0.0030	0.0017	35
40	0.0075	0.0053	0.0037	0.0026	0.0013	0.0007	40
45	0.0041	0.0027	0.0019	0.0013	0.0006	0.0003	45
50	0.0022	0.0014	0.0009	0.0006	0.0003	0.0001	50
55	0.0012	0.0007	0.0005	0.0003	0.0001	0.0000	55
60	0.0007	0.0004	0.0002	0.0001	0.0000	0.0000	60

APPENDIX TABLE II (*continued*): Present value of 1 at compound interest

$$V^{n}_{n} = \frac{1}{(1+i)^{n}}$$

n	25%	30%	35%	40%	45%	50%	*n*
1	0.8000	0.7692	0.7407	0.7143	0.6897	0.6667	1
2	0.6400	0.5917	0.5487	0.5102	0.4756	0.4444	2
3	0.5120	0.4552	0.4064	0.3644	0.3280	0.2963	3
4	0.4096	0.3501	0.3011	0.2603	0.2262	0.1975	4
5	0.3277	0.2693	0.2230	0.1859	0.1560	0.1317	5
6	0.2621	0.2072	0.1652	0.1328	0.1076	0.0878	6
7	0.2097	0.1594	0.1224	0.0949	0.0742	0.0585	7
8	0.1678	0.1226	0.0906	0.0678	0.0512	0.0390	8
9	0.1342	0.0943	0.0671	0.0484	0.0353	0.0260	9
10	0.1074	0.0725	0.0497	0.0346	0.0243	0.0173	10
11	0.0859	0.0558	0.0368	0.0247	0.0168	0.0116	11
12	0.0687	0.0429	0.0273	0.0176	0.0116	0.0077	12
13	0.0550	0.0330	0.0202	0.0126	0.0080	0.0051	13
14	0.0440	0.0254	0.0150	0.0090	0.0055	0.0034	14
15	0.0352	0.0195	0.0111	0.0064	0.0038	0.0023	15
16	0.0281	0.0150	0.0082	0.0046	0.0026	0.0015	16
17	0.0225	0.0116	0.0061	0.0033	0.0018	0.0010	17
18	0.0180	0.0089	0.0045	0.0023	0.0012	0.0007	18
19	0.0144	0.0068	0.0033	0.0017	0.0009	0.0005	19
20	0.0115	0.0053	0.0025	0.0012	0.0006	0.0003	20
21	0.0092	0.0040	0.0018	0.0009	0.0004	0.0002	21
22	0.0074	0.0031	0.0014	0.0006	0.0003	0.0001	22
23	0.0059	0.0024	0.0010	0.0004	0.0002	0.0001	23
24	0.0047	0.0018	0.0007	0.0003	0.0001	0.0001	24
25	0.0038	0.0014	0.0006	0.0002	0.0001	0.0000	25
26	0.0030	0.0011	0.0004	0.0002	0.0001		26
27	0.0024	0.0008	0.0003	0.0001	0.0000		27
28	0.0019	0.0006	0.0002	0.0001			28
29	0.0015	0.0005	0.0002	0.0001			29
30	0.0012	0.0004	0.0001	0.0000			30
31	0.0010	0.0003	0.0001				31
32	0.0008	0.0002	0.0001				32
33	0.0006	0.0002	0.0001				33
34	0.0005	0.0001	0.0000				34
35	0.0004	0.0001					35
40	0.0001	0.0000					40
45	0.0000						45

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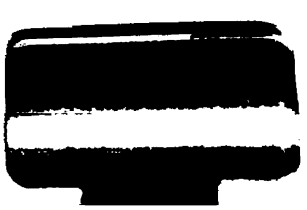

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