**DEBRE MARKOS UNIVERSITY, COLLEGE OF AGRICULTURE AND NATURAL RESOURCES**

**DEPARTMENT OF AGRICULTURAL ECONOMICS**

**PROJECT PLANNING AND MANAGEMENT HANDOUT**

**FOR III YEAR PLANT SCIENCE STUDENTS (2 CREDIT HOUR)**

1. **THE PROJECT CONCEPT**

##  Definition of Project

* Project is a set of planned activities within a given time and resources, to produce results in order to achieve a prior set project objective (s). or
* Project is a unique and time urgent work effort to provide a result according to a certain specification and within fixed time and budget limit.
* Agricultural development projects can be defined as *“A proposal for investment where a cost stream results in a certain flow of benefits over a specified period”* It is “a proposal for capital investment to create opportunities for producing goods and services”.

*“Generally, in agricultural projects we are thinking of an investment asset from which we can expect to realize benefits over an extended period of time”* (Gittinger, 1982).

Recent defined a development project as follows: *“A project is an instrument of change. It is a co-ordinate series of actions resulting from a decision to change resource combinations and levels so as to contribute to the realization of the country’s development objectives”.*

* Project can also be defined as an investment activity in which financial resources are expended to create capital assets that produce benefits over an extended period of time. A project is a complex set of activities where resources are used in expectation of return and which lends itself to planning, financing and implementing as a unit. Capital investment decisions have far reaching impact into the future. They are also characterized by irreversibility. Thus, a wrong capital investment decision often cannot be reversed without incurring substantial loss.

The definition of a development project should therefore be expanded to contain the notions of *interventions, participation* and *sustainability* for all stakeholders and participants (including the farmers, businesses, financial transactions and also the public and private sector investors).

### Classification of Development Projects

There are different types of development projects, which can be divided on different categories based on different criteria’s or basis such as temporal, spatial, function, output and so forth.

1. **Temporal classification of Development Projects** that is Based on time horizon of the project and it can be divided into
* short – term (Short duration projects),
* medium – term projects
* long – term (long duration projects.

2, **Output classification of Development Projects** .From point of view of their output/outcome i.e

* Projects producing goods
* Projects Producing service
* Projects Producing Knowledge
* Projects Producing information’s

3. **Spatial classification of Development Projects**

* Projects based on coverage
* Projects based on area specification

4. **Classification of Development Projects based on different economic sectors** such as

* Agriculture sector
* Manufacturing sector
* Service sector
1. **. Classification of Development Projects based on intensity of input used** such as
* Labor intensive project
* Capital intensive project

**6. Functional classification of Development Projects such** as;

* ***Projects aimed at technological innovation: -*** The objectives of this type of projects relate to the technical transformation of the agricultural sector. -improved productivity. i.e. the *“with new technology” and* *“without new technology”*
* ***Expanding the natural resource base: -*** aimed at change and development by unlocking natural resources such as water and land for production purposes. These projects are often tackled on a large scale and are often viewed as *“glamour projects”*.
* ***Improvement in the living conditions of previously disadvantaged groups: -*** aims to improve the general living conditions of specific groups. E.g. *agricultural credit, rural settlement, land reform, food production* and *integrated rural development* focusing on the designated target group(s) are included in this category.
* ***Improved market infrastructure: -*** Improvement in market infrastructure is extremely important in developing agriculture. Harvesting, grading, storage and transportation may lead to a considerable increase in surplus food and fiber.
* ***Institutional capacity development: -*** Modern agriculture requires a support system consisting of a number of functional components. These components are provided within an institutional framework. Institutional capacity is currently viewed as one of the most limiting factors in the process of agricultural and rural development.

- aims, in particular, to create a human and organizational infrastructure that strengthens and supports local initiatives so that decision-making, the choice and implementation of programs and projects, resource allocation and monitoring can take place on a more *decentralized* and informed basis. Within these types of projects, the focus is on three levels, via on macro or central level, regional level and on the level of participating groups and individuals.

**Agricultural Development Projects: The Cutting Edge of Rural Development?**

A good and well-designed project can indeed be the ***“cutting edge****”* in a development strategy (Gittinger, 1982). Some of the key issues related to this “cutting edge” ideal are:

 **Projects within the framework of development planning:** Agricultural development projects do not function in a vacuum. Projects can be regarded as the final link in the process of development planning and implementation. A project is seen as a concentrated and clearly defined action within a development programme. A project therefore originates from a certain strategy within the prevailing of agricultural and rural development policy.

 **Project multiplier and linkage effects:** Project investment seldom only results in direct impacts i.e. those which only affect the project beneficiaries. A whole range of effects can be recorded. These would include the direct or primary impacts on project participants (i.e. increased agricultural productivity) and a range of indirect or secondary impacts such as the multiplier effect generated by the increased income earned by project participants, wage laborers, professionals working on the projects, etc; employment linkages in up- and downstream activities required to serve the project, and a range of external effects which could include environmental, ecological, institutional and social impacts.

 **The equity status of projects:** Project development does not automatically lead to equity problems. If a project can facilitate a Pareto movement (i.e. the improvement of one group’s living conditions without affecting those of any other group) no objection can be raised from a wealth distribution point of view. However, if certain production factors are scarce, thus reflecting high opportunity costs in respect of alternative uses, the concentration of such production factors within the framework of one project benefiting a particular group, may result in a disproportionate distribution of income.

* 1. **The Linkage between Projects and Programs**

It is necessary to distinguish between projects and programs because there is sometimes a tendency to use them interchangeably.

A project is an investment activity where resources are used to create capital assets, which produce benefits over time and has a beginning and an end with specific objectives.

A program is an ongoing development effort or plan which may not necessarily be time bounded. E.g., *a road development program, a health improvement program, a nutritional improvement program, a rural electrification program, etc…*

A development plan is a general statement of economic policy. National development plans are further disaggregated into a set of sectoral plans.

A development plan or a program is therefore a wider concept than a project. It may include one or several projects at various times whose specific objectives are linked to the achievement of higher level of common objectives. For instance, a health program may include a water project as well as a construction of health centers both aimed at improving the health of a given community, which previously lacked easy access to these essential facilities. Projects, which are not linked with others to form a program, are sometimes referred to as “stand alone” projects.

Projects in such context are the concrete manifestations of the development plans in a specific place and time. One can think of projects as subunits and bricks of programs, which constitute the national plan (usually the direction is from plans to projects). We have to note that projects could be either public or private. It is the smallest operational element prepared and implemented as a separate entity in a national plan or program.

From the above discussion it can be seen that the major difference between a project and a program is not so much in objectives stated but lies more in scope, the details and accuracy. A project is designed with a high degree of precision and details as regards its objectives, features, calculation of returns and implementation plan. A program by contrast is general, lacks details and precision and aims at a broader goal often related to a spectral policy of a country or departmental policy of an organization.

Perhaps the distinction between **projects** and **programs** would be clear if we see the basic *characteristics* of projects. Projects in general need to be **SMART**.

**S – Specific**

* Specific in its objective.
* Specific activities.
* Specific group of benefits.
* Specific group of people (beneficiaries).

**M - Measurable**

Projects are designed in such a way that investment and production activities and benefits expected should be identified and if possible be valued (expressed in monetary terms) in financial, economic and if possible social terms. Though it is sometimes difficult to value especially secondary costs and benefits of a project, attempt should be made to measure them. Measure costs and benefits must lend themselves for valuation and general projects are thought to be measurable.

**A – Area bounded**

As projects have specific and identifiable group of beneficiaries, so also have to have boundaries. In designing a project, its area of operation must clearly be identified and delineated. Though some secondary costs and benefits may go beyond the boundary, its major area of operation must be identified. Hence projects are said to be area bounded.

**R – Real**

Planning of a project and its analysis must be made based on real information. Planner must make sure whether the project fits with real social, economic political, technical, etc situations. This requires detail analysis of different aspects of a project.

**T – Time bounded**

A project has a clear starting and ending point. The overall life of the project must be determined. Moreover, investment and production activities have their own time sequence. Every cost and benefit streams must be identified, quantified and valued and be presented year-by-year.

###  Project Analysis

A choice therefore has to be made among competing uses of resources based on the extent to which they help the country achieve its fundamental objectives. If a country consistently chooses allocations of resources that achieve most in terms of these objectives, it ensures that its limited resources are put to their best possible use.

Project analysis is a method of presenting this choice between competing uses of resources in a convenient and comprehensible fashion. In essence, project analysis assesses the benefits and costs of a project and reduces them to a common denominator.

Project planning and analysis has a long history in financial and business analysis; It has always been used as a means of checking the profitability of a particular investment by private firms and the recent experiences show that project analysis has attracted the attention of development economists.

Projects are now assessed from the economy’s viewpoint instead of only from the firm’s perspective and the selection criteria have also included economic criteria on top of financial criteria.

**Project planning and analysis is**

* “Seeking alternative choices” to reach an agreed upon set of objectives in the most efficient manner

Or.

* “Seeking alternative choices” is to avoid potential disaster if a project should fail (“fall down”) and all the project participants come “tumbling after”!

Project Planning Analysis Processes

The project planning analysis process followed by most development institutions (such as the World Bank), entail the following steps:

* The assessment of the proposed project in view of the agreed upon project objectives; project objectives would include financial, economic efficiency and societal considerations;
* The clear specification of project objectives and the relation of such objectives to a particular government or states’ overall policy and strategies;
* The description of the project in terms of the relevant economic, social, institutional, environmental, technical and financial features and the analysis thereof;
* The analysis of alternative project proposals;
* The comparison of these various alternatives;
* The selection of the most beneficial project proposal;
* Final decision-making by all major parties involved to implement the project;
* Project implementation according to the agreed upon project proposal; and

Monitoring and evaluation (including impact assessment Participatory planning and development is one of the fundamental building blocks for sustained growth and change. The participation of the beneficiaries at all stages of the project cycle is critical to ensure success. With the proper attention to detail and with the elimination of the mistakes listed above, projects should be viewed and could indeed be used as the *“cutting edge”* for development in the agricultural and rural environment. This will, however, require a sourced policy and institutional framework.

### PROJECT CYCLE

* 1. **Elements of the project cycle**

A project moves through stages. An idea germinates; then it passes through various steps which will clarify the concept; objectives and activities required to achieve the objectives; the appraisal of the alternative options and actions; decision making; implementation; monitoring; completion and final evaluation. The entire process from the first idea to the final evaluation is called a **PROJECT CYCLE**, to indicate the phased or cyclical nature of this process.

Project cycle refers to the various stages through which project planning proceeds from the inception to implementation. In other words, it is the life cycle through which a project advances from infancy to maturity. The main features of this cycle are information gathering, analysis, and decision-making. What is the primary preoccupation at each stage in the project cycle? Throughout the project cycle, the primary preoccupation of the analysis is to consider alternatives, evaluate them and to make decisions on which of them should be advanced to the next stage. According to World Bank, project cycle involves five stages; namely, project identification, preparation, appraisal, implementation, and evaluation

**Figure 1. ELEMENTS OF THE PROJECT CYCLE:**



**Main Stages of the Project Cycle**

Many international assistance institutions distinguish between five stages in the cycle of existence of a project, namely, *identification, preparation, appraisal and agreement, implementation*, and *monitoring and evaluation*.

1. **Identification**

At project identification the project idea is translated into a preliminary description of the project and it involves finding potentially fundable projects. Sources include technical specialists, local leaders, proposals to extend existing projects, rise in market price for products, projection of future demand, economic development plans with priority areas, separate sector surveys of the current situation in agriculture, and so on.

Different approaches to the project are identified, and a judgment made regarding which option should be taken forward to project preparation.

 Identification of promising investment opportunities requires imagination, sensitivity to environmental changes, and a realistic assessment of what the firm can do. This phase may take two forms. If the project is largely a private venture in a widely market economy context the initiating entity will define the concept, expectation and objectives of the project. On the other hand the project ideas can also immanent form government agencies in the context of government development plans. In the latter case sectoral information (i.e. the direct and indirect demands of sectors) is an import ant source of identification. In market economy context anticipated demand for the projects output is important. In addition assessment of appropriate technology, scale of the project, timing of the project etc. are important. All types of specialists’ input are required at this stage.

The planning phase of a firm’s capital investment is concerned with the articulation of its broad investment strategy and the generation and preliminary screening of project proposal. The investment strategy of the firm delineates the broad areas or types of investment the firm plans to undertake. This provides the framework, which shapes, guides, and circumscribes the identification of individual project opportunities.

In general there are four major sources from which ideas or suggestions for project may come:

1. Project ideas from technical specialists
2. Project ideas from local leaders
3. Project ideas from entrepreneurs
4. Project ideas from government policy and plans

Note that sometimes at identification stage there could be a number of alternatives that could be examined. Some of these projects may appear for reasons nothing to do with the national plan. In such circumstances its advantageous to understand the ‘political history’ of the project.

The identification of project ideas is based on several aspects of development.

1. Need - a need assessment survey may show the need for intervention
2. Market demand - domestic or overseas
3. Resource availability - opportunity to make available resources more profitable
4. Technology - to make use of available technology
5. Natural calamity - intervention against natural calamity such as flood or drought
6. Political considerations
7. **Preparation**

At project preparation the project is designed. Objectives, pre-requisites, inputs, outputs, organization, participants, clearances are all defined, costs and earnings are calculated, a financial plan is prepared, expected results are analyzed, the socio-economic and environmental impacts are estimated, and the provisional and final project documents are prepared.

1. **Appraisal**

At project appraisal and agreement appraisal documents are prepared from the project documents and a succession of appraisal meetings, clearances, and financing negotiations take place. This brings the project to the point of meeting the required start-up agreement conditions, sometimes after revision and adaptation of project schedule, cost, objectives, and financing.

1. **Implementation**

In project implementation the project management and lines of command are established, and various implementation procedures established. In the course of implementation project progress is monitored, revisions and adaptations are made for unexpected events, and finally the project is brought to completion.

After the project design is prepared negotiations with the funding organization starts and once source of finance is secured implementation follows. Implementation is the most important part of the project cycle. The better and more realistic the project plan is the more likely it is that the plan can be carried out and the expected benefits realized. At the project implementation phase tenders are let and contracts signed. Project implementation must be flexible since circumstances change frequently. Technical changes are almost inevitable as the project progresses; price changes may necessitate adjustments to input and output prices; political environment may change. Project analysts generally divide the implementation phase into three time periods.

 The investment phase, where the major investments are made. This may extend from three to five years.

 The development phase which may also extend from three to five years.

 The project life

The implementation phase for an industrial project, consists of several stages: (i) project and engineering designs, (ii) negotiations and contracting, (iii) construction (iv) training, and (v) plant commissioning.

Translating an investment proposal into a concrete project is a complex, time consuming and risk fraught task. Delays in implementation, which are common, can lead to substantial cost overrun. For expeditious implementation at a reasonable cost, the following are helpful.

1. *Adequate formulation of projects*. A major reason for the delay is inadequate formulation of projects. Put differently if necessary homework in terms of preliminary studies and comprehensive and detailed formulation of projects is not done, many surprises and shocks are likely to spring on the way. Hence the need for adequate formulation of the project cannot be overemphasized.

2. *Use of the principle of responsibility accounting*. Assigning specific responsibilities to project managers for completing the project within the defined time frame and cost limits is helpful in expeditious execution and cost control.

3. *Use of network techniques*. For project planning and control two basic techniques are available - PERT (program evaluation Review Technique) and CPM (Critical Path Method). These techniques have of late merged and are being referred to by common terminology that is network techniques. With the help of these techniques, monitoring becomes easier.

1. **Evaluation**

The final phase of the project is the evaluation phase. Many usually neglect this stage. The project analyst looks carefully at the successes and failures in the project experience to learn how better to plan for the future. In this stage it is important to examine the project plan and what really happened. Performance review should be done periodically to compare actual performance with projected performance. A feedback device, it is useful in several ways: (i) it throws light on how realistic were the assumptions underlying the project; (ii) it provides a documented log of experience that is highly valuable in future decision making; (iii) it suggests corrective action to be taken in the light of actual performance; (iv) it helps in uncovering judgment biases; (v) it induces a desired caution among project sponsors. Weakness and strengths should carefully be noted so as to serve as important lessons for future project analysis undertaking. Evaluation is not limited only to completed projects. Ongoing projects could also be evaluated to rectify problems when the project is in trouble. The evaluation may be done by the project management, the sponsoring agency, or other bodies.

At project evaluation, which takes place at a suitable time after the project has been implemented, project objectives, project implementation, and project benefits are appraised. This evaluation may result in the project being extended or in the identification of a new project, and may lead to a revision of the method(s) by which similar projects will be formulated in the future. There are other types of evaluation which may be carried out earlier in the project. Particularly in the case of technical assistance projects, many donor agencies carry out “mid-term reviews” of projects which may result in changes being adopted.

1. **Logical Framework Analysis (LFA)**
	1. **Elements of the logical framework of projects**

The LFA approach is a tool for planning, monitoring and evaluating projects. This is also a useful approach to link projects (at the micro level) to the broader context of regional development programs and national goals (ie. the macro level).

LFA is essentially used as a tool to clarify cause-effect relationships and to clarify the logical link between project inputs and objectives; project activities and outputs; broader purposes; and the ultimate goals a project could serve. LFA is therefore a systematic planning process based on logical deductions.

***The origins of LFA***

LFA as a planning technique was developed over the past three decades. Several organizations were involved in developing a scientific, standardized planning methodology. A logical framework was set up by USAID to form a matrix within which information is scientifically related to cause and effects. GTZ has worked out a planning method which combines this logical matrix with more systematic study of available data. METAPLAN has developed communication techniques and a participative planning formula which permits to involve representatives of the groups concerned in logical framework matrix development.

***LFA - A participative tool***

LFA aims at analyzing, planning, implementing and evaluating a development intervention with a view to improving quality, adopting a more systematic or logical approach and aiming at better communication and the capturing of knowledge and experience of the groups concerned during the planning phases.

The need for such a participative approach is borne out by the knowledge that in project planning:

the experience, know-how and skills of the groups in question must be put to optimum use;

consensus is vital since it is no use forcing people “for their own good” into a project; and that

Mahatma Ghandi’s motto: “something done for me but without me is something done against me” still holds true, particularly in development planning.

Development planners have found that interventions carried out without the participation of those directly concerned are regarded as the sponsor’s milk-cows, made for milking, not as tools with which the people concerned can take their own development in hand.

***LFA - Its potential and its limitations***

“It would be unfair to criticize a car because it does not fly”. The same applies to LFA which after all is a tool or method, but no more; yet without method, science would not exist and humankind would be out in the cold.

LFA helps those responsible for investigating interventions in a logical manner to improve the way in which they structure and formulate their thinking and to express their thoughts adequately, clearly and in a standardized way, i.e. a tool for improved planning. LFA has no ambitions beyond that.

Applied within bad policy or when using the wrong criteria, LFA *will highlight incoherence and shortcomings* but it *will not come up with a better policy or produce different criteria*.

LFA is a tool for users. Still, both its quality and its results depend on the quality of the users, on that of the preparatory surveys, on the accuracy of available data and on the commitment of those representing the groups concerned.

***LFA - Its scope***

The logic of the method is not, in principle, confined to a particular type of problem. In practice, however, the method is particularly appropriate to interventions such as technical and investment projects serving economic development and/or social ends.

For smaller interventions, the method may be applied on a reduced scale, i.e. amongst officials only. Large scale interventions (i.e. costly and/or complex interventions) on the other hand would benefit if the method were applied wholesale: for example a seminar would round off the preparatory work to compare the expert’s findings and adjust them to take on board the opinions expressed by the representatives of the groups concerned.

***LFA: A tool for the planning of change***

LFA is a tool for managing development processes. LFA can be used simply to structure and create an overview of the plan of a project on a single sheet of paper. LFA can also be used to foster commitment to transparent, structured, participatory and flexible development processes. LFA is not sufficient to achieve this alone. But it can function as a “master tool” for analysis of and dialogue about development issues.

**Problem analysis (Developing a problem tree):**

This is a methodological step which enables us to analyze an existing problem situation to identify the problems and put them into order and to highlight the cause-and-effect relationships in a diagram (problem tree).

*Description of important elements:*

|  |  |
| --- | --- |
| What is problem analysis? | It is establishing cause-and-effect linkages between the negative states of an existing situation. |
| What is an entity? | An entity is the whole group which determines the bounds of analysis: an economic reality, a geographical region, a social group etc. |
| How can we determine an entity? | In most cases, the entity is marked out by the government or by groups of a developing country. |
| How important is problem analysis? | Problem analysis seeks to identify real, important and priority bottlenecks for the groups concerned. Problem analysis is vital to the quality of planning since it maps out a course for the future intervention. A mistake at this stage will affect the entire planning process as well as the way in which the intervention is carried out |
| Who takes part in the analysis? | The groups affected by the problems in question and their representatives are identified during the investigation (when TOR is fixed and data compiled and correlated). They will participate in the analysis. |
| What does the problem analysis look like? | It looks like a tree. The trunk is the core problem. The branches and twigs are the effects and the roots are the causes of the situation which is perceived as a negative state. |
| What is the purpose of problem analysis? | It aims to shed light on the problems posed by an entity and on the way in which these relate to each other. |
| Which problems are selected? | The actual negative situations recorded by the experts and the groups affected. Priority problems of the target group. The problems must actually exist; future problems or negative solutions (ie. a lack of chemical fertilizers) will not do. |
| What do we do with the problems thus identified? | All problems mentioned are clearly formulated and checked against the views and problems of the other groups involved. We then try to find a single, clear way of formulating the problems mentioned which satisfies all the groups concerned. |

**Objectives analysis: The objective tree**

This is a methodological step which enables us to describe the future situation which will be achieved when the problems are solved; to identify the objectives and pinpoint their position in the hierarchy; to show the activity-ends linkages in a diagram (the objectives tree - Figure 0.4).

*Description of important elements:*

|  |  |
| --- | --- |
| What do we mean by objectives analysis? | Establishing resources-end linkages between positive states achieved in a targeted future situation. |
| What does an objectives analysis look like? | It looks like a tree. The trunk is the core objective. The branches and twigs are “ends” and the roots are “resources”. |
| Why do we make an objectives tree? | In order to obtain a clear overall picture of a targeted positive situation in the future. |
| Does the objectives tree show all possible solutions to given problems? | No. The objectives tree arises directly from the conversion of negative states into positive states, ie. objectives. Hence the tree may not necessarily show all possible solutions to the problems in hand. |
| How do we change a problem into an objective? | The negative state is converted into an improved (positive) state which is achieved (projected into the future). |
| Can all problems be changed into objectives? | In principle, all problems can be changed into objectives. However, unrealistic objectives (ie. enough rain) or ethically unacceptable objectives. |
| What happens to “controversial” objectives? | “Controversial” objectives sometimes result from lack of understanding or poor formulation of the problems. In this case, the problem must be formulated more carefully so as to enable us to formulate an objective we can agree on. If the objective remains controversial, we drop it for the time being until we can bring fresh ideas to the subject. |

* + 1. **The planning phase: Completing the logframe matri*x***

*Describing the matrix*

When we have analyzed the situation, our next step is to plan the intervention. The planning phase aims at setting up a logical framework (logframe), in the form of a summary matrix showing four vertical columns and four horizontal ones:

*LOGFRAME*

|  |  |
| --- | --- |
|  | **Columns** |
| **Intervention****Logic** |  | **Objectively****verifiable****indicators (o.v.i.)** | **Sources of****Verification (s.o.v.)** | **Assumptions** |
| **Goal** |  |  |  |  |
| **Purpose** |  |  |  |  |
| **Intermediate****Results (outputs)** |  |  |  |  |
| **Activities & inputs** |  | **Resources** | **Cost** |  |

Column one shows the (project) **INTERVENTION LOGIC (IL)** which follows from the objectives tree. It is a narrative summarizing:

**The goal:** The future state at a high level, to which several interventions will contribute.

**The purpose (or objective):** The future state targeted by the project intervention itself.

**The intermediate results (or outputs):** The future intermediate states or outputs to be brought about by the intervention and which together aim at achieving the purpose. The (project) intervention leader is responsible for achieving intermediate results.

**The activities:** The work which must be carried out as part of the intervention in order to achieve the intermediate result. The intervention leader is responsible for carrying out and managing these activities.

Column two shows the **OBJECTIVELY VERIFIABLE INDICATORS (OVI)**. These describe the goal, the purpose and the intermediate results in operational terms, i.e. in terms of quality, quantity, place and time. Indicators describe “milestones” of progress and enables detailed follow-up and monitoring. This column shows the **RESOURCES** needed to carry out the planned activities.

Column three shows the **SOURCES OF VERIFICATION**. These indicate where and in what form information may be obtained in order to verify progress towards achieving the goal, the purpose and the intermediate results. This column also includes the **COST** of the resources needed to carry out the activities.

Column four shows **ASSUMPTIONS**: External factors over which the intervention has no direct control but which are nevertheless important with a view of achieving the intermediate results, the purpose and the goal. The intervention leader is not responsible for these assumptions but must bear them in mind, monitor them closely, take them into account and if possible, exert some influence over them.

The logframe matrix summarizes the intervention in one (full) page as follows:

**WHAT IS THE GOAL** of the (project) intervention being carried out?

**WHAT IS THE PURPOSE** of the (project) intervention?

**HOW** does the intervention contribute to this objective (intermediate results)?

**WHAT WILL** the intervention **DO** (activities)?

**WHICH** crucially important external factors will determine the success, or failure, of the intervention (assumptions)?

**WHERE** can we find the data needed to administer, monitor and evaluate the intervention (sources of verification)?

**WHAT** resources – and their cost – are involved in the intervention?

*Description of the intervention logic*

The intervention logic comprises all stages contained within the (project) intervention, which need to be completed in order to achieve the goal:

intermediate results are achieved through the activities,

the purpose is realized through the intermediate results,

the goal is reached via the purpose.

The following sequence is adhered to:

|  |
| --- |
| **GOAL** |

* High-level objective, to which the intervention contributes

|  |
| --- |
| **PURPOSE****(objective)** |

* Objective pursued by the intervention itself

* Products (outputs) of the activities needed to achieve the purpose

|  |
| --- |
| **RESULTS****(outputs)** |

* Tasks of the intervention

|  |
| --- |
| **ACTIVITIES** |

***Description of important elements:***

*Which data are included in the intervention logic?*

The intervention logic comprises:

The overall goal of the intervention.

The immediate purpose of the intervention.

The way in which the intervention will contribute to the latter (intermediate results).

What the intervention will do (activities).

*How important is the goal?*

The goal is a focal reference, which enables us to determine the content of the interventions which will contribute to it.

*How important is the purpose?*

The purpose is a focal reference (or development objective) which enables us to administer the intervention and to gauge its chances of success or failure.

*Why is there only one purpose?*

There is only one purpose for each intervention in order: to prevent the intervention from becoming too sophisticated for proper management; to avoid a clash between purposes.

*From what/where do we deduce the results?*

The results (or outputs) are deduced from the objectives tree or else follow from specific technical surveys.

*How do we determine the activities?*

The activities are deduced from the objectives tree; follow from specific technical surveys carried out by members of the investigation mission; and are provided by the relevant groups after consultation.

*Why must we plan the activities?*

The activities must be sufficiently well-prepared for us to be reasonably confident about:

Drawing up a rough working schedule and calculating the likely duration of the intervention; deducing the human and material requirements; calculating the budge

*What is the procedure for determining the intervention logic?*

**To identify the goal:**

1. Study the objectives tree and select “the objective” situated at the head of a group of chains. This “objective” is now the goal. It is formulated as a positive state to be achieved; hence we should employ a past participle.

**To identify the purpose:**

1. Study the objectives tree and select “the objective” situated at the head of the chain. This “objective” has now become the purpose. It is formulated as a positive state to be achieved; we should therefore employ a past participle.

**To identify the results:**

3. Study the objectives tree and select those “objectives” which, reasoning along”resources-ends” lines, will become intermediate results. These are formulated as positive states to be achieved; we should therefore use past participles.

4. If necessary, you should now add other intermediate results to achieve the purpose. These may have been identified by the groups concerned or supplied by technical staff.

**To identify the activities:**

5. Study the objectives tree and select the “objectives” which, according to the “resources-ends” logic, will produce intermediate results. These “objectives” are now activities. They are formulated as steps to be taken; hence we should use verbs.

6. If necessary, you should now add other activities to achieve the intermediate results. These extra activities may have been identified by the groups concerned or suggested by technical staff.

7. Number the activities and the intermediate results to create a logical sequence.

**Assumptions:** Assumptions are factors not falling within the scope of the intervention which are not or barely affected by the intervention yet are important to bring it to a successful conclusion.

*Putting the intervention logic into operational terms:*

**Objectively Verifiable Indicators (OVI):** OVI are measures designed to objectivities (admitting of objective study) the goal, the purpose and the intermediate results.

**Description of important elements:**

Why do we define OVI?

 In order to:

Clarify the salient features of the goal, the purpose and the intermediate results.

Enable objective management of the intervention in order to achieve the intermediate results, the purpose and the goal.

Enable objective monitoring and a reasoned evaluation.

What criteria should OVI meet?

OVI should:

Be specific as to quantity and quality.

Be substantive (cover the main points).

Be independent and different one from the other; each OVI should relate to a single objective or result.

Be reliable, since their evaluation should provide a dependable pointer to the successful outcome of the intervention.

Be verifiable, ie. based on accessible (where and when?) data or on information to be collected by the intervention itself.

Is there only one OVI for each result or objective?

It is often necessary to define several indicators which between them will produce only one reliable piece of information on how to achieve the goal, the purpose and the intermediate results.

Can we always find OVI?

 A good OVI enables direct measurement. For example a “production increase” is calculated by adding up crop results. When there is no direct OVI, we must look for “approaching” OVI. For example to gauge the rise in the number of visitors coming to see a certain picture in a museum, measure the amount of wear and tear of the carpet in front of the picture. However, the OVI must give a reliable indication, since the picture may have been hung in a very busy spot, ie. on the way to the restaurant.

Can all objectives be quantified?

 It is not always easy to compute goals objectively, but you should try at all times to come up with quantifiable, specifiable and verifiable OVI. Any improvement in this respect is an important step towards easier and more objective management, inspection and evaluation. Quantification continues in the course of the intervention.

**Steps for establishing OVI:**

The key to the log frame in terms of effectiveness is the clear identification of indicators. Here an attempt is made to translate the general objectives to specific objectives, and attach one or more indicators. Here an attempt is made to translate the general objectives, and attach one or more indicators to each specific objective, thus, transforming the general objectives of the project into measurable performance targets. This should not be viewed as a one-shot activity. Indicators may change over time so that log frames may need to be refined in order to better reflect the changing environment of the network/research activity.

In the context of a development project, indicators are used for two main purposes:

In order to classify or rank societies and social groups based on indicators (macro-level) – quality of life, livelihood and poverty and

To measure progress relating to interventions for social and economic change at the project and program (micro-level).

Indicators are formulated to measure the achievements of the objectives for each output. Indicators are performance standards, and set the targets for a project.

Indicators are not always quantifiable but they should be very explicit, as precise as possible, and objectively measurable.

Indicators provide a basis for monitoring performance and for evaluation

In the early planning stage, indicators are just guiding values which must be reassessed when the project becomes operational.

More comprehensive impact studies may reveal unforeseen aspects of an intervention which should be turned into indicators for further monitoring.

Without having clear and measurable objective it is hard to have clear indicators.

**Sources of verification:** Sources of verification are the results of surveys and/or findings which give us the data we need to use the OVI.

Indicators are objective and specific measurements of the results of the project. Indicators of output are usually simple (e.g. number of units produced, person trained or verification done). However, measuring the developmental effect of project activities, the impact maybe highly **complicated?** and costly. In such cases qualitative and less objective assessments must be relied on – combination of objective indicators and subjective perceptions oriented indicators as emphasised in Participatory Impact Monitoring.

A good indicator is said to be:

Substantial in relation to an objective

Independent at the different levels of objectives

Factual rather than a subjective impression

Plausible i.e. the changes recorded can be directly attributed to the indicator

Based on obtainable data, preferably existing data

These criteria are difficult to fulfill simultaneously in all cases. Thus development impact is difficult to trace back to one particular indicator or even to one particular project.

The following steps can be considered:

1. Look for an appropriate indicator for each intermediate result, for the purpose and the goal. The indicator should meet the criteria listed on the preceding page.

2. Specify, for each intermediate result, for the purpose and for the goal:

The object or the target group: What, who, how many, what kind …?

The quantity: How many?

The quality: How?

The time: When?

3. **Check** whether the OVI gives full particulars of the goal, the purpose or the intermediate result. If the answer is **NO**, you should look for a new OVI or add a second (or a third).

4. **Check** whether the lower level OVI lead on to the higher-level OVI.

**Description of important elements:**

What should we look out for when describing the sources of verification?

It is wise to specify: Access: Where and when can we find the data?

Who is responsible for the data?

Why do we describe the sources of verification?

To find out what the intervention should do to obtain the data and at what cost.

Where can we find the sources of verification?

Outside the intervention; resources must be found to pay the “owner” of these resources. Within the intervention itself; activities should be planned within the intervention.

What can we do when there is no source of verification for an OVI?

Replace the OVI by another for which there is a source.

 What criteria do we have to evaluate the sources of verification?

The sources of verification must supply infallible, reliable and accessible data. The investigation should allow for the fact that verification will demand money, time and manpower. These elements will affect the resource requirements and the budget.

**Resources (inputs):** Resources comprise the (human and physical) input thanks to which the intervention will be able to carry out its activities.

* + 1. **The Advantages of LFA as a Planning Tool**

The LFA has the following advantages:

It tries to make the project appraisal transparent by explicitly stating the assumptions underlying the analysis, and by allowing a check on the proposed hypotheses and expected results in an ex-post analysis;

It deals explicitly with a multitude of social goals and does not require the reduction of the benefits into one figure;

It is understandable to non-scientists. The logframe, therefore, can be used as a tool to clarify tradeoffs, and thus, to ameliorate the decision-making process; and

It is flexible with regard to information and skill requirements. It can incorporate social benefit – cost analysis, use input-output tables, and partial models. But it can also be used with rudimentary information skills, albeit of the cost of more hypothesis and uncertainties.

* Thus, a log frame enables planners to:
* Set clear objectives.
* Define indicators of success:
* Performance standards.
* Incorporate change over time.
* Clarify logical linkages in the plan.

Define critical assumptions underlying the project.

Identify key activity groups.

Identify means of verifying project accomplishments.

Define resources required for implementation.

Set up a need-based monitoring and evaluation system.

**Data needs:** Based on the indicators identified, the data needs should be established. Data collection should be built in as a regular part of the on-going delivery activities. Decisions should be made on data collection methods, including timing, frequency, and who will collect the data. Data alone are not very useful. They need to be organised, analysed, and interpreted so that conclusions can be drawn on how well the projects are performing, and possibly recommendations made.

**A Few Tips on Measuring Results and Performance:** We measure performance to learn and improve. Performance measurement helps us to understand what is working and what is not. It is essential to the process of continuous improvement, i.e. provides a basis to take appropriate corrective measures. Developing evaluation measures should be a participatory exercise, and should measure both efficiency and effectiveness. Measuring the process may be useful to help us achieve greater efficiency, but this is of little value without effectiveness measures that focus on clients and impacts. In particular, we should look for the change in client behavior that usually precedes economic impact.

However, too many measures are no better than too few. We cannot measure everything, therefore, it is best and more practical to focus only on a limited number of key result indicators. Start “small” and then make appropriate adjustments to improve the process. It may be wise and efficient (cost effective) to start with a limited number of measures, then refine them and add new ones in order to build a measurement system progressively. One should look at immediate impact, medium (intermediate) term impact, and long-term/ultimate impact in terms of the initial operational targets, which may be an exercise that is challenging, but possible.

The initial attempt may be imperfect, but can be refined as experience is gained. Measuring performance costs time and money, but not measuring performance may cost more. In addition, one cannot show with any credibility, what is being achieved nor can one "fix” what is not working well.

Two “acid tests” for the quality of a performance measurement system are:

Assuming the degree of congruence between its objectives and its impact statements.

Simple observation of the use that is made of the performance information. A high degree of use may be a signal that the measures are right, ad that the performance information being generated is appropriate to the decision at hand.

3.2. **Why do developmental projects fail?**

The reasons for the failure of projects could be different. A comprehensive list of *“where things went wrong”* will include the following (see Gittinger, 1982; Tisdell, 1985; for more details):

1. A lack of local ownership and responsibility, i.e. participative planning and development.

2. Problems of project design and implementation.

3. The use of inappropriate technology, cropping systems and animal husbandry.

4. Inadequate or inappropriate infrastructure.

5. Failure to appreciate the social and political environment.

6. Administrative problems.

7. Changing economic situations and market conditions.

8. Externally driven project initiatives.

9. Problems related to poor project analysis.

10. Unrealistic expectations.

11. Unsupportive policy environment

1. **FINANCIAL ANALYSIS OF AGRICULTURAL PROJECTS**
	1. **Objectives of Financial Analysis**
* ***Assessment of financial impact***

The most important objective of financial analysis is to assess the financial effects the project will have on participants (farmer, firms, government, etc). This assessment is based on the comparison of each participant’s current and future financial status with the project against the projection of his future financial performance as the project is implemented.

* ***Judgment of efficient resource Use***

For management especially, overall return is important because managers must work within the market price framework they face. Investment analysis & financial ratio analysis provide the tool for this review.

* ***Assessment of Incentives***

The financial analysis is of critical importance in assessing the incentives for different participants of the project. Will participants have an incremental income large enough to compensate them for the additional effort and risk they will incur? Will private sector firms earn a sufficient return on their equity investment & borrowed resources to justify making the investment the project requires? For semipublic enterprises, will the return be sufficient for the enterprises to maintain a self-financing capability and to meet the financial objectives set out by the society?

* ***Provision of sound financial plan***

The financial plan provides a basis for determining the amount and timing of investment, debt repayment capacity, and also helps to coordinate financial contributions. Assessment of financial management competence especially for large projects, financial analysis will enable the analyst to judge the complexity of the financial management & the capability of managers so that he can judge what changes in organization and management may be necessary.

**4.2 Market Analysis**

The market analysis is also concerned with the arrangement for marketing the output to be produced and the arrangement for the supply of inputs needed to build and operate the project. Given the importance of market and demand analysis in project analysis it should be carried out in an orderly and systematic manner. The key steps in such analysis are as follows.

* Situational analysis and specification of objectives
* Collection of secondary information
* Conduct of market survey
* Characterization of the market
* Demand forecasting
* Market planning

**Situational analysis and specification of objectives**

In order to get a feel for the relationship between the product and its market, the project analyst may talk to consumers, competitors, middlemen, and other in the industry. He/she may also look at the preferences and purchasing power of consumer’s ´, actions and strategies of competition and practices of the middlemen.

If such a situational analysis generates enough data to measure the market and get a reliable projection of the demand and revenues a formal study may not need to be undertaken. In order to carry out such a study it is necessary to spell out its objective clearly and comprehensively. A helpful way of spelling out the objectives would be to structure the objective in the form of questions.

**Example**: suppose a given project aims at producing wheat in a given locality. The project initiator and implementer need information about where and how to market their product. The objective of the market and demand analysis in this case may be to answer some of the following questions.

* Who are the buyers of this product? (Consumers)
* What is the total current demand for wheat?
* How is the demand distributed temporally /pattern of sale over the year and geographically?
* What price will the consumers be willing to pay for the product?
* How can consumers be convinced that wheat could be substituted for other foodstuffs?
* What channels of distributions are most suited for the product?
* What trade margins will induce distributors to carry it out?
* What are the possible immediate sales?

**Collection of secondary information**

In order to answer the questions listed while delineating the objectives of the market study information may be obtained form secondary or primary sources. Secondary information is information that has been gathered in some other context and is already available. Secondary information provides the base and the starting point for market and demand analysis. It includes what is known and often provides clues for gathering primary information required for further analysis. Several sources of information’s including; census data, national sample survey reports, plan reports, statistical abstracts, industry specific sources of data etc.

**Conduct Market study**

Secondary information though useful, often does not provide a comprehensive basis for market and demand analysis. It needs to be supplemented with primary information gathered through a market survey, specific to the project being appraised. The market survey may be a census or a sample survey. The information sought in market survey may relate to one or more of the following.

* Total demand and rate of growth of demand
* Demand in different segments of the market
* Income and price elasticity’s of demand
* Motives for buying
* Purchasing plans and interventions
* Satisfaction with existing products
* Attitudes towards various products
* Socio economic characterization of buyers

**Characterization of the market**

Based on the secondary sources and through the market surveys the market for the product /service may be described in terms of the following

Effective demand in the past and present

* Breakdown of demand
* Prices
* Methods of distribution and sales promotion
* Consumers
* Supply and competition
* Government policy

**Demand Forecasting**

After gathering information about various aspects of the market and demand from primary and secondary sources, an attempt may be made to estimate future demand. A wide variety of forecasting methods is available to the market analyst. The methods may be divided into qualitative methods, time series projection methods and causal methods.

**4.3 Pricing Project Costs and Benefits**

Once costs and benefits have been identified, if they are to be compared they must be valued. Since the only practical way to compare differing goods and services directly is to give each a money value, we must find the proper prices for the costs and benefits in our analysis.

**4.3.1. Finding Market Prices**

Project analysis characteristically are built first by identifying the technical inputs and output for a proposed investment, then by valuing the inputs and outputs at market prices to construct the financial accounts, and finally by adjusting the financial prices so they better reflect economic values. Thus, the first step in valuing costs and benefits is finding the market prices for the inputs and outputs. The project will have to consult many sources such as merchants, consumers, experts, published statistical bulletins, etc.

* ***Point of first sale and farm-gate price***

In project analysis, a good rule for determining a market price for agricultural commodities produced in the project is to seek the price at the “point of first sale”. The increased value added of the product as it goes to higher markets in the channel arises as a payment for marketing services. Thus, if the project includes such marketing services in its design, we can take these higher prices. Even in this case, the analyst must make the project as small as possible and try to analyze the marketing service component independently of the production component. If the product is sold only in central markets, no local market, then the analyst must find out the value of marketing service to arrive at price at project site.

Prices for some products like agricultural products generally are subjected to substantial seasonal fluctuation. If this is the case as it may often is some decision must be made about the price in the seasonal cycle at which to choose the price to be used for the analysis. A good starting point is the farm-gate price at the peak of the harvest season. This is probably close to the lowest price in the cycle. The reasoning is that the rise in price is due to marketing services.

* ***Predicting Future Prices***

Since project analysis is about judging future returns from future investment, we have to judge what the future prices of inputs and outputs may be. The best starting point is to see the trend of these prices over the past few years. Having this data, the project analyst can forecast the price with certain degree of precision. However, even then judgment is important to arrive at what price we have to use to value inputs and outputs of the project. Moreover, we have to keep in mind that, as projects involve distant future, the prediction power of the model will decline as we go far from the present.

**4.3.2 Change in prices**

Change in prices could be general change in price or change in relative prices of goods.

* ***Change in relative price***

If relative price of inputs or outputs are variable over time, i.e.

 

Changes in relative prices have a real effect on the project objective and must be reflected in project accounts in the years when such changes are expected. This can be judged from past trend. For instance, the price of agricultur.al products to price of inputs (manufactured) may rise over time. This would have a real effect on the net benefit of the firm.

* ***Inflation: an increase in general prices of goods***

Inflation is common for every country although the magnitude may vary between countries. However, the approach most often taken is to work the project analysis in constant price. It is assumed that inflation will affect most prices to the same extent so that prices retain their same general relations. The analyst then need only adjust future price estimates for anticipated relative changes, not for any change in the general price level.

It is quit possible, however, to work the whole project analysis in current (not constant) prices. Its advantage is it will reflect the true costs and benefits of the project. Moreover, it is possible to quantify the financial requirement of the project. The problem with this approach is it involves predicting inflation rates of both domestic and foreign countries that would have substantial impact.

**4.3.3 Financial export and import parity price**

As indicated earlier, financial analysis will be made base on market price. The project may use imported inputs and export its output, to foreign markets. If there are domestic markets for these inputs and outputs, and if the firm is free to sell or buy at the domestic or world market, we take the domestic price with appropriate adjustment to reflect the price at the project site. If, on the other hand, commodities of the project are produced only for foreign market or if the domestic demand cannot absorb the firm’s output, we will take export-parity and import parity prices ever in financial analysis.

In financial analysis, we use export and import parity prices if the project will export its output to and import inputs from foreign markets. A project for several reasons may use imported inputs or export outputs even though there are domestic markets. In both cases what we need to determine is the amount of income the project receives from its exports or the amount the project pays for imports at the project location. Suppose a project exports coffee to Canada, we start with *c.i.f.* price at Canada port.

***Export Parity Price***

*C.i.f.* at point of import (say, Canada port)

 Deduct- unloading at point of import

 Deduct- freight to point of import (in this case ship freight)

 Deduct – insurance

Equals – *f.o.b.* at point of export (Djibouti port)

Convert foreign currency to domestic currency at official exchange rate (OER)

 Deduct –tariff (export duties)

 Add - subsidy

 Deduct - local port charges [[1]](#footnote-2)

 Deduct - local transport & marketing costs (if not part of project)

Equals *export parity price* at project boundary

 Deduct - local storage, transport & marketing costs (if not part of project cost)

Equal export parity price at project location (farm gate)

A parallel computation leads to the import parity price. Here the issue can be finding the price of project's output that is intended to substitute previous imports. If this import substitute would have to compete with foreign products when it is sold in the domestic markets. In this case we need to determine the import parity price of the project's output. Similarly if a project uses an imported input in bulk, we may want to know the import parity price. In either case, the import parity price can be derived as follows.

***Import Parity Price***

*F.o.b.* price at point of export

 Add-freight charges to point of import

 Add-insurance charges

 Add- unloading from ship to pier at port

*C.i.f.* Price at the harbor of importing countries

Convert foreign currency to domestic one (multiply by OER)

 Add-tariffs (import duties)

 Deduct-subsidies

 Add-local port charges

 Add-transport & marketing costs to relevant wholesale market

Equal price at wholesale market

 Add-local storage & other marketing cost (if not part of project cost) -this is the marketing margin between central market and the project site.[[2]](#footnote-3)

Equals *import parity price* at project location (Farm/project gate price).

OER (official exchange rate) is the rate at which one currency (say, Birr) is exchanged for another currency (say, Dollar). It is official because it is the rate established by monetary authorities of a country not by the market mechanism. In financial analysis the OER would always be used.

Before calculating the export or import parity price at the project site, we need to forecast the future *c.i.f.* or *f.o.b*. price at the border. This may require assessment of the past trend of this border price. After we determined the future *c.i.f.* or *f.o.b.* price, we then continue to calculate export parity price.

* 1. **Time value of money and Basic Techniques**

Present values are better than the same values in the future and earlier returns are better than later. This shows that money has time value. Thus, to include the time dimension in our project evaluation, we have to use discounting methods. **Discounting** is essentially a technique that ‘reduces’ future benefits and costs to their ‘present worth’. The rate used for discounting is called discount rate.

Suppose a bank lends 1567.05 Birr for a project at 5% interest rate. The project owner is supposed to repay the principal & interest rate after 5 years. How much the owner will have to pay at the end of 5 years?

At -= P (1 + r) t

At = total amount after t years

r = interest rate

t = time

A5 = 1567.05 (1 + 0.05)5

 = 2000 B

Suppose again a project is expected to obtain 2000 B after 5 years. Value of this money today can be calculated as:



The difference between this & the previous is only the viewpoint. The interest rate used for **compounding** assumes a viewpoint from here to the future, whereas discounting looks back ward form the future to the present.

**4.4.1 Simple interest rate**

Pt = Po (1+rt)

Po - initial loan, principal

r - Interest rate

t - Time

Pt - final amount

If the farmer borrowed 5,000 Birr at interest rate of 10 % per year repayment can be made in different ways. The following table shows two types of installments or debt servicing.

Repayment of equal amounts of principal (using simple interest rate)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year  | Loan Receipts  | Out stand balance  | Debt service (1) | Debt service (2)  |
| Principal  | Interest | Total | Principal  | Interest  | Total  |
| 01234567 | 5000------- | 50005000500050004000300020001000 | ---20001000100010001000 | ---500400300200100 | ---25001400130012001100 | ---10001000100010001000 | ---300400500600700 | ---13001400150016001700 |
| **Total** | **5000** | **2500** | **7500** | **5000** | **2500** | **7500** |

Case (1) - interest calculation on the out standing balance (declining interest payment)

Case (2) - interest calculation on the principal for the nth year

Year 0 to year 2 - are considered as grace periods (a period in which the borrower need not pay principal & sometimes the interest depending on their agreement). The simple interest rate is commonly applied for short-term credits lent for seasonal expenses.

**4.4.2. Compound interest**

This method is common in long-term credits which are lent by formal finical institutions; banks & similar credit institutions. The basic difference between simple a compound interest is that in the latter, the calculation of interest after year one (i.e. year two and then after), will be based on the total outstanding principal plus interest of the previous year. In short, interest calculation in year two will be (outstanding principal plus interest of year one) multiplied by interest rate. This means we calculate interest for the outs standing interest in addition to the principal.

The formula can be presented as follow



Po - Principal

r - Interest rate per period

t - Period or time

Pt - total amount

A loan of 5000 at interest rate of 10% that will be paid starting from year 3 can be calculated as:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | Loan receipt | Outstanding balance | Debt service (1) | Debt service (2) |
| Principal | Interest | Total | Interest | Principal | Total |
| 0 | 5000 | 5000 | - | - | - | - | - | - |
| 1 | - | 5000 | - | - | - | - | - | - |
| 2 | - | 5000 | - | - | - | - | - | - |
| 3 | - | 5000 | 1000 | 1655 | 2655 | 1000 | 331.0 | 1331.0 |
| 4 | - | 4000 | 1000 | 400 | 1400 | 1000 | 464.1 | 1464.1 |
| 5 | - | 3000 | 1000 | 300 | 1300 | 1000 | 610.5 | 1610.5 |
| 6 | - | 2000 | 1000 | 200 | 1200 | 1000 | 771.6 | 1771.6 |
| 7 | - | 1000 | 1000 | 100 | 1100 | 1000 | 948.7 | 1948.7 |

Case (1) interest on outstanding balance or declining balance

Case (2) interest on the principal paid at the nth year

The first 2 years are called grace periods.

The above calculation is on the assumption that the compounding period is a year. But if the compounding period is less than year; such as monthly, quarterly or biannually, the formula may be formulated as:



At = total amount including principal

r – Interest rate per year

c – Compounding period

t – Number of years

If for example the compounding period is monthly, we divide the interest rate by 12 and multiply the time by 12. In the above case, for the 3rd year



***Equal installments with interest being capitalized***

In some loan transactions, the lender can agree to ''capitalize'' the interest due during the grace period. This means, the borrower need not pay any interest during the grace period; the interest due is, in effect, added to the principal of the loan. When repayment begins, the amount borrowed plus the interest added to the principal during the grace period is then repaid in a serious of equal installments.

***Capitalization***

At = 5000(1+0.1)2 = 6050

The interest for the grace period is included with the principal. Starting from year 3, the project is expected to repay its total capitalized debt of 6050 in a serious of installments. The annual repayment can be calculated as follows.



Where r - is interest rate

 T - Time or period

 Am - annual payment of interest plus principal

 P\* - capitalized principal



Accordingly, the annual payment will be 1596.0 for 5 years. This method of installments is common in many formal financial institutions. It has the following advantages:

It balances the interest between borrower and lender in that it is in between the two compounding methods presented in case 1 and case 2. It is suitable for both the borrower and the lender because it eases both computation and the collection and repayment of the loan.

#  Measures of Project Worth

When costs and benefits have been identified, quantified and priced (valued), the analyst is trying to determine which among various projects to accept, which to reject. There are two methods for measuring the worthiness of projects: undiscounted & discounted methods. The arithmetic of these discounted methods, and the way we interpret the measures and their limitations, is exactly the same whether we are using them for financial analysis or for economic analysis.

Before embarking on the methods, it is important to note two critical points. First, there is no one best technique for estimating project worth; each has its own strength & weakness. Second, these financial and economic measures of investment worth are only tools of decision-making, i.e., they are necessary conditions & are not sufficient condition for final decision. There are many other non- quantitative and non-economic criteria for making final decision of whether to accept or reject a project.

## Undiscounted measures of project worth

###  Ranking by inspection

In some cases, we can tell by simply looking at the investment costs and the ‘shape’ of the stream for the net value of incremental production that one project should be accepted over another if we must choose. The analyst can sometimes simply choose one project among alternatives projects by examining the following:

* Total cost of investment and investment period;
* The structure, & amount of costs and benefits;
* The structure & total amount of the net incremental benefit;
* The lifetime of the project, etc.

The problem with this method is that the selection lacks objectivity.

* + - 1. **Payback Period**

The payback period is the length of time from the beginning of the project until the sum of net incremental benefits of the project equal to total capital investment. It is the length of time that the project requires to recover the investment cost.

The method is very simple. Moreover, it is a good measure when the project has problem of liquidity. The pay-back period is also a common, rough means of choosing among projects in business enterprise, especially when the choice entails high degree of risk. Since risk generally increases with futurity, the criterion seems to favor projects that are *prima facie* less risky.

This method has two important weaknesses: First, it fails to consider the time & amount of net benefits after the payback period. Second, it does not adequately take into account the time value of money even in the payable periods.

Consider the following alternative projects

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Alternative projects  | Year  | Investment cost  | Net incremental benefits  | Commutation net incremental benefits  |
| I | 12345 | 20000 | -20008000120009000 | 29000 |
| II | 12345 | 20000 | -20012000800012000 | 32000 |
| III | 12345678 | 20000 | -10005000600080001000050002000 | 37000 |

* Note that the incremental net benefit could be financial or economic incremental net benefits.

Project I & II have a payback period of 4 year. But project III has a payback period of 5 years. Thus, based on this criterion, project I & II have equal higher rank than project III. Therefore, the method fails to consider the time & amount of net incremental benefit after the payback period- project III. In addition, the method results equal rank for both project I and II. Yet we know by inspection that we would choose project II over project I because more of the returns to project II are realized earlier. This method is a measure of cash recovery, not profitability.

###  Rate of return on investment

The rate of return, also referred to as the average rate of return, has many variants due to differences in how it is computed. All the variants, however, have two features in common; (i) use of accounting concepts in calculating benefits and (ii) no adjustment for time value of money.

#### *Proceeds per unit of outlay*

Investments are ranked by the proceeds (cumulative of net incremental benefits) per unit of outlay (investment cost). It is the total net value of incremental net benefits divided by the total amount of investment. In the previous example, project I, II & III have a proceeds per outlay of 1.45, 1.6 and 1.85, respectively. Hence, according to this criterion, project III will be ranked first.

####  1. Average annual proceeds per unit of outlay

To calculate this measure, first the total net incremental benefits will be divided by the time it will be realized to arrive at average annual net incremental benefits, and then this average value will be divided by total investment costs. In this method, project I, II & III will have average annual proceeds per unit of outlay of 0.36, 0.40 and 0.26, respectively. Hence, project II will be chosen. This criterion has serious flaws. By failing to take into consideration the length of time of the benefit stream, it automatically introduces a serious bias toward short-lived investments with high cash proceeds.

####  2. Average income on book value of the investment

This is the ratio of average income to the book value of the assets (i.e. the value after subtracting depreciation) stated in percentage terms. This measure is useful and commonly used way of assessing the performance of an individual firm. It is also sometimes used as an investment criterion. This measure, as the previous one, does not take into consideration the timing of the benefit stream. In the above example, assuming strait-line deprecation for all projects, average income on book value can be calculated as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Project | Average net value of incremental benefit | Annual deprecation | Net average income | Average book value | Average income on book value |
| I | 7050 | 5000 | 2250 | 10000 | 0.225 |
| II | 8000 | 5000 | 3000 | 10000 | 0.300 |
| III | 5285.7 | 2857.1 | 2428.6 | 10000 | 0.242 |

## Discounted measure of project worth

### Net present values

The net present value of an investment proposal is the present value of expected future net cash flows, discounted at the costs of capital, less the initial outlay.



NPV- net present value

At = net cash flow for the year t

I - Cost of capital

n- Life of the project

If the investment period is longer, the investment cost must also be discounted. Thus the formula must be modified as:



***Choosing the discount rate***

To be able to use discounted measures of project worth we must decide upon the discount rate to be used for calculating the net present worth. For financial analysis, the discount rate is usually the marginal cost of money to the firm (project owner). This often will be the rate at which the enterprise is able to borrow money. If the incremental capital to be obtained is a mixture of equity and borrowed capital the discount rate will have to be weighted to take account of the return necessary to attract equity capital on the one hand and the borrowing rate on the other



For economic analysis, there are different alternative ways. Probably the best discount rate to use is the opportunity cost of capital. It is the return on the last or marginal investment made. If set perfectly, the rate would reflect the choice made by the society as a whole between present and future returns, & hence, the amount of total income the society is willing to save. In the net present value method, the higher the NPV, the more desirable the project is. All projects that have a positive NPV are accepted and projects that have a negative NPV are rejected.

However, in ranking mutually exclusive project (if one is chosen, the other cannot be undertaken), ranking based on NPV depends on the dissonant rate used. That is if we have two mutually exclusive projects, projects project A and project B - project A may be ranked first in some ranges of discount rates but may turn out to be second in some other ranges.

Assume a project has the following investment cost, operating cost and benefit streams

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year | Investment cost | Benefit streams | Cost streams | Net benefits | Discount factor | Present value |
| 0 |  | - |  | -40000 | 1.000 | -40000 |
| 1 |  | - |  | -50000 | 0.990 | -49500 |
| 2 |  | - |  | -25000 | 0.980 | -24500 |
| 3 |  | 75000 | 70000 | 5000 | 0.971 | 4855 |
| 4 |  | 80000 | 70000 | 10000 | 0.961 | 9610 |
| 5 |  | 90000 | 75000 | 15000 | 0.951 | 14265 |
| 6 |  | 100000 | 95000 | 20000 | 0.942 | 18840 |
| 7 |  | 110000 | 92000 | 22000 | 0.933 | 20526 |
| 8 |  | 120000 | 95000 | 25000 | 0.923 | 23075 |
| 9 |  | 130000 | 105000 | 25000 | 0.914 | 22850 |
| 10 |  | 120000 | 100000 | 20000 | 0.905 | 18100 |
|  | **NPV** |  |  |  |  | **18121** |

###  Internal Rate of Return (IRR)

The internal rate of return is defined as the rate of discount, which brings about equality between the present value of future net benefits & initial investment. It is the value of *r* in the following equation.

 

 I – investment cost

 At – Net benefit for year t

 R - IRR

 N - Life of the project

Illustration: Suppose a project has the following net benefit flows of its project life of 4 years.

|  |  |
| --- | --- |
| Year | Net Benefit |
| 0 | -100 |
| 1 | 200 |
| 2 | 400 |
| 3 | 500 |
| 4 | 700 |

The IRR can be calculated as:

 

 r can be found through trial & error method.

When r = 23.068 percent the value in the above equation in the right hand side will be equal to about 1000.00 which is equal to the value in the left hand side. The problem with this method is that the value of r (IRR) can only be found by trial and error.

The procedure can be described as follows:

1. Select an arbitrary value of r;
2. Calculate the value of the right hand side equation with this value of r.
3. If the RHS value is lesser than the value in the left hand reduce the value of r. If the RHS is greater than the LHS, increase the value of r; continue until this the RHS is very close to the LHS. When the RHS is more or less equal to LHS, it is that value of r, which is the IRR.

A project may result more than one possible IRR though it is extremely rare. This can only occur when a project has negative net returns after successive positive returns. This can arise, for instance, when there is a replacement investment around the mid way in the life of the project. In such instances, a project will have positive return then after. This condition may give rise to two IRR. This is one of the criticisms of IRR method since no similar problem exists with the other methods.

###  Benefit Cost Ratio

A third discounted measure of project worth is the benefit-cost ratio. This is the ratio obtained when the present worth of the benefit stream is divided by the present worth of the cost stream. The mathematical formula is given below.



Where - Bt - are the benefits in period t

 Ct - are the costs in period t

 n - Project life

 r - Discount rate

The formal selection criterion for the benefit-cost ratio measure of project worth is to accept all independent projects with a benefit-cost ratio of 1 or greater

If such a case exists in a particular project, using either the extended yield method or the auxiliary interest rate method can reverse the analytical problem. For further readings when the cost and benefit streams are discounted at the discount rate. In the case of mutually exclusive projects, the benefit - cost ratio can lead to an erroneous investment choice. The danger can be avoided most easily by using the net present worth criterion for mutually exclusive projects.

###  Net Benefit - investment Ratio

This criterion is suitable and convenient for ranking projects especially when sufficient budget is not available to implement all projects that satisfy other criteria. That is, two or more projects may all have a positive NPV, IRR that exceeds the discount rate, both financial and economic discount rates, and a benefit-cost ratio of greater than one. In this case, ranking could be made using net Benefit - investment ratio. This can be calculated as:

Net benefit - investment ratio = 

Where - Bt Benefits, Ct - costs, I- investment, r-discount rate, I-investment cost

Or it simply benefit cost ratio minus 1,i.e. NBIR= CBR-1

It is simply the present value of net benefits divided by the net present worth of the investment. The formal selection criterion for the net benefit - Investment ratio measure of project with is to accept all projects with a ratio of 1 or greater when they are discounted with appropriate rate - in order, beginning with the larges ratio value and proceeding until available investment funds are exhausted.

This ratio determines if project will have a net benefit greater than the investment at some stated amount of return on capital. In the previous example, using 12% discount rate, project A & B result NB 1 ratio of 1.298 and 1.266, respectively.

## Comparisons among Discounted Measures

The above measures of project worth may give different ranking if projects that are being comparing are different in their:

1. Cash flow structure
2. Magnitude of costs and benefits
3. Life time
4. Some projects may give high return in the early stage of the project & decline thereafter & some other projects may give lower return in the early stage & grow later in the life of he project. The former will be less sensitive to changes in discount factor as compared to the latter.
5. For some projects the costs & benefits could be large in magnitude than other projects. In this case ranking based on NPV & IRR may not give same result.
6. Some projects have shorter life than others. Here also the ranking could be different in different erasures.

If a firm or government has unlimited funds, which is rare in reality, these differences have no significant implication in the decision. In such cases, projects with a positive NPV, the IRR value of greater than opportunity cost of capital (discount rates), the B-C ratio & Net return-investment ratio of greater than one will all be chosen.

However, if there is a limited fund, as is often the case, and if different criterion gives rise to different results, a decision must be made as to which criterion to use for selection and/or as which criterion is then more appropriate to select among such mutually exclusive projects.

**Example: Hypothetical livestock projects (Undiscounted Measure)**

|  |  |  |  |
| --- | --- | --- | --- |
| Project | Cost of project | Revenue of project | Net value of project |
| I | 100,000 | 125,000 | 25,000 |
| II | 60,000 | 75,000 | 25,000 |
| III | 30,000 | 55,000 | 25,000 |

Based on ranking by inspection/cost of the project III is selected. Because with low amount of total cost of the project we can get the same amount of net value.

For the same investment project the total net value may be the same, but one project has more flow earlier in the time sequence. In that case we choose a project that gives earlier returns.

**Example: 2. Hypothetical irrigation projects**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project I** | **Period** | **cost** | **Value** | **Net value** | **Project II** | **period** | **cost** | **value** | **Net value** |
| 1 | 30000 | - |  | 1 | 30000 |  |  |
| 2 | 5000 | 7000 | 2000 | 2 | 5000 | 7000 | 2000 |
| 3 | 5000 | 19000 | 14000 | 3 | 5000 | 31000 | 26000 |
| 4 | 5000 | 31000 | 26000 | 4 | 5000 | 19000 | 14000 |
| **Total** | **45000** | **57000** | **42000** | **Total** | **45000** | **57000** | **42000** |

Which project would you select? Why? Project II is selected because project II has more flow earlier in the time sequence. In this case we choose a project that gives earlier returns.

**Example: 3. Payback period**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Project** | **Year** | **Initial cost** | **Total proceeds** | **Pay back period** | **Rank** |
| **I** | **1** | **20000** | **20000** | **1** | **4** |
|  | **2** | **-** | **-** | **-** |  |
| **II** | **1** | **20000** | **22000** | **0.94** | **3** |
|  | **2** | **-** | **-** | **-** |  |
| **III** | **1** | **20000** | **24250** | **0.844** | **2** |
|  | **2** | **-** | **-** | **-** |  |
| **IV** | **1** | **20000** | **24450** | **0.82** | **1** |
|  | **2** | **-** | **-** | **-** |  |

**Example 3. Proceeds per unit of outlay**

 

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Project  | Investment cost(A) | Net value of incremental productivity (B) | Proceeds per unit of outlayC= B/A  | Rank |
| I | 30,000 | 30,000 | 1.00 | 3 |
| II | 30,000 | 34,000 | 1.14 | 2 |
| III | 30,000 | 42,000 | 1.40 | 1 |

A project with highest proceeds per unit of outlay is preferred. Its short comings are**:**

* It does not consider timing, money to be received in the future weighted as heavily as money in hands today

**Example 4.Discounting Convention**

|  |  |  |
| --- | --- | --- |
| ProjectYear | Discounting from year 1 | Discounting from year 2 |
| Amount | Discounting period | Discount Factor (12%) | PV | Discounting period | Discount Factor (12%) | PV |
| 1 | 1 | 1 | 0.893 | 0.893 | 0 | 1 | 1.00 |
| 2 | 4 | 2 | 0.797 | 3.188 | 1 | 0.893 | 3.572 |
| 3 | 5 | 3 | 0.712 | 3.56 | 2 | 0.797 | 3.985 |
| 4 | 6 | 4 | 0.636 | 3.816 | 3 | 0.712 | 4.272 |
| Total | 11.457 |  |  | 12.829 |

 Discounting factor= where i= interest (discount) rate, n is project year

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year | Incremental cost | Discount factor(12%) | Present value of cost | Value of incremental production(Gross benefit) | Discount factor(12%) | Present value of cost |
| Capital investment | Operation & maintenance cost | Production cost | Gross costs |
| 1 | 1.09 | 0 | 0 | 1.09 | 0.893 | 0.97 | 0 | 0.893 | 0.00 |
| 2 | 4.83 | 0 | 0 | 4.83 | 0.797 | 3.85 | 0 | 0.797 | 0.00 |
| 3 | 5.68 | 0 | 0 | 5.68 | 0.712 | 4.04 | 0 | 0.712 | 0.00 |
| 4 | 4.5 | 0 | 0 | 4.5 | 0.632 | 2.84 | 0 | 0.632 | 0.00 |
| 5 | 1.99 | 0 | 0 | 1.99 | 0.562 | 1.12 | 0 | 0.562 | 0.00 |
| 6 | 0 | 0.34 | 0.33 | 0.67 | 0.507 | 0.34 | 1.67 | 0.507 | 0.85 |
| 7 | 0 | 0.34 | 0.63 | 0.97 | 0.452 | 0.44 | 3.34 | 0.452 | 1.51 |
| 8 | 0 | 0.34 | 0.96 | 1.30 | 0.404 | 0.53 | 5 | 0.404 | 2.02 |
| 9 | 0 | 0.34 | 1.28 | 1.62 | 0.361 | 0.58 | 6.68 | 0.361 | 2.41 |
| 10-30 | 0 | 0.34 | 1.61 | 1.95 | 2.727 | 5.32 | 8.38 | 2.727 | 22.85 |
| Total | 18.09 | 8.5 | 37.01 | 63.60 | 8.056 | 20.06 | 192.67 | 8.056 | 29.64 |
|  |

**Example 5. Computation of NPV (Net Present Value)**

**NPV at 12% discount rate= present value of benefit - present value of cost**

 **=29.64-20.06**

 **=$9.56 thus we accept the project**

To illustrate the calculation of IRR, consider the cash flows of a project being considered

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | 0 | 1 | 2 | 3 | 4 |
| Cash flow | (100,000) | 30,000 | 30,000 | 40,000 | 45,000 |

The IRR is the value of r which satisfies the following equation:



The calculation of r involves a process of trial and error. We try different values of r till we find that the right hand side of the above equation equals to 100,000. . let us, to begin with, by r = 15 percent. This makes the right hand side equal to:



This value is slightly higher than our target value, 100,000. So we increase the value of r from 15 percent to 16 percent. (In general, a higher r lowers and a smaller r increases the right hand side value). The right hand side becomes:



Since the value is now less than 100, 000, we conclude that the value of r lies between 15 percent and 16 percent. If a more refined estimate of r is needed, use the following procedures

1. Determine the net present value of the two closest rate of return

Example: NPV of 15 percent = 802

 NPV of 16 percent = -1,359

1. Find the sum of the absolute values of the net present values obtained in step 1.

802 + 1,359 = 2,161

1. Calculate the ratio of the net present value of the smaller discount rate, identified in step 1, to the sum obtained in step 2. That is 15 percent is the smaller discount rate in this example and its NPV equals to 802. 
2. Add the number obtained in step 3 to the smaller discount rate. 15 + 0.37 = 15.37

The internal rate of return, calculated in this manner, is a very close approximation to the true internal rate of return.

 **Decision rule for IRR**

**For financial analysis:**

* Accept the project: If the IRR is equal to or greater than the opportunity cost of capital( bank interest rate)
* Reject the project: If the IRR is less than the opportunity cost of capital( bank interest rate)

**For economic analysis:**

* Accept the project: If the IRR is greater or equal to t the opportunity cost of capital
* Reject the project: If the IRR is less than the opportunity cost of capital

**Alternative way for calculating IRR:**

If we are given two interest rates between which the IRR lies, the following formula can be used to compute it:

 

**Where:**

* r1 is the small discount rate and
* r2 is the biggest discount rate &
* The absolute value of the NPVs is taken in the calculation.

The formal selection criteria for the IRR measure of project worth is to accept all independent projects having an internal rate of return equal to greater than the opportunity cost of capital. Although the internal rate of return of projects will vary, projects cannot be ranked with full confidence on the basis of IRR. Only in a very general way will the IRR tell us that one project is better than the other, informs of its contribution to the national income in terms of the resources used.

Example: a project with IRR 25% is better than investment project with IRR 15%. But this is a rough estimation, if the opportunity cost of capital is 12% we would accept both 15% and 25%. If we have to choose between them because of limitation of funds, we could raise the cut-off rate for the opportunity cost of capital until the IRR is such that projects with IRR> the cut of rate would be implemented.

However, in the case of mutually exclusive projects, direct comparison of internal rate of return can lead to an erroneous (mistaken) investment choice. This danger can be avoided easily by using the net present worth criteria or by discounting the differences in the cash flow of alternative projects.

In addition, it is possible to have more than one discount rate that makes the present worth of the incremental net benefits to be equal to zero. This happens when following a period of positive cash flows sizable enough that the cumulative PV up to that point is positive, there then occurs negative cash flows such that the PV at the starting time of the cash flow from a given year onward is negative.

**Limitations of the IRR Method:** There are problems in using IRR. IRR may be misleading in some cases, and in some situations either multiple IRRs or no IRR become possible.

1. In the case of mutually exclusive projects, direct comparison of internal rate of return can lead to an erroneous (mistaken) investment choice. This danger can be avoided easily by using the NPV method.
2. It is possible to have more than one discount rate that makes the NPV equal to ZERO. This happens when the following a period of positive cash flows sizable enough that the cumulative PV up to that point is positive, there then occurs negative cash flows such that the PV at the starting time of the cash flow from a given year on ward is negative.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year | Incremental cost | Discount factor(18%) | Present value of cost | Value of incremental production(Gross benefit) | Discount factor(18%) | Present value of cost |
| Capital investment | Operation & maintenance cost | Production cost | Gross costs |
| 1 | 1.09 | 0 | 0 | 1.09 | 0.847 | 0.92 | 0 | 0.847 | 0.00 |
| 2 | 4.83 | 0 | 0 | 4.83 | 0.718 | 3.47 | 0 | 0.718 | 0.00 |
| 3 | 5.68 | 0 | 0 | 5.68 | 0.609 | 3.46 | 0 | 0.609 | 0.00 |
| 4 | 4.5 | 0 | 0 | 4.5 | 0.516 | 2.32 | 0 | 0.516 | 0.00 |
| 5 | 1.99 | 0 | 0 | 1.99 | 0.437 | 0.87 | 0 | 0.437 | 0.00 |
| 6 | 0 | 0.34 | 0.33 | 0.67 | 0.370 | 0.25 | 1.67 | 0.370 | 0.62 |
| 7 | 0 | 0.34 | 0.63 | 0.97 | 0.314 | 0.30 | 3.34 | 0.314 | 1.05 |
| 8 | 0 | 0.34 | 0.96 | 1.30 | 0.266 | 0.35 | 5 | 0.266 | 1.33 |
| 9 | 0 | 0.34 | 1.28 | 1.62 | 0.225 | 0.36 | 6.68 | 0.225 | 1.50 |
| 10-30 | 0 | 0.34 | 1.61 | 1.95 | 1.24 | 2.37 | 8.38 | 1.24 | 10.17 |
| Total | 18.09 | 8.5 | 37.01 | 63.60 | 5.516 | **14.67** | 192.67 | 5.516 | **14.67** |
|  |

**Example6. The internal rate of return (IRR)**

**NPV at 18% discount rate= present value of benefit- present value of cost**

 **=14.67-14.67**

 **=$0 thus, compares this18% discount rate value with its opportunity cost**

1. **Benefit –Cost Ratio (BCR)**

A third discounted measure of project worth is the benefit-cost ratio. BCR is obtained when the present worth of the benefit stream is divided by the present worth of the cost stream. The absolute values of the benefits cost ratio will vary depending on the interest rate chosen. The higher the interest rate, the smaller the resultant benefit cost ratio, and if a high enough rate is chosen, the benefit cost ratio will be driven down to less than 1.

The formal selection criteria for the benefit- coast ratio measure of project worth is to accept all independent projects with a benefit- cost ratio of 1 or greater when the cost & benefit streams are discounted at the opportunity cost of capital.

Benefit –cost ratio =Where: t= number of years; Bt= Benefit in each year

 Ct= cost in each year; r= interest (discount) rate

 From previous example: on table 4.9. , at 12 discount rate the present worth of the costs is 20.06 & present worth of the benefits is 29.64.

 

The BCR will vary depending on the interest rate chosen. The higher the interest rate, the smaller the resultant benefit- cost ratio. If high enough interest rate is chosen, the BCR will be driven down to less than 1.

To illustrate the calculation of this measure, let us consider a project which is being evaluated by 12 percent cost of capital.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | 0 | 1 | 2 | 3 | 4 |
| Cash flow | -1,000,000 | 25,000 | 40,000 | 40,000 | 50,000 |

The benefit cost ratio measures for this project are:



 **Decision rule**

* Accept the project if, BCR is greater than 1
* Indifferent the project if, BCR is equal to 1
* Reject the project if, BCR is less than 1

In the case of mutually exclusive projects, the BCR will lead to erroneous (mistaken) investment choice. This danger can be avoided most easily by using the net present worth criteria. The benefit cost ratio discriminates against projects with relatively high gross returns and operating costs, even though these may be shown to have a greater wealth generating capacity than that of alternatives with higher BCR.

The ***disadvantage*** of this tool is that it discriminates against projects with relatively high gross returns and operating costs.

**Summary: comparison of discounted measures of project worth**

|  |  |  |  |
| --- | --- | --- | --- |
| Item | NPV | IRR | B- C ratio  |
| Selection criterion | Accept all independent projects with NPV of zero or greater when discounted at opportunity cost of capital | Accept all independent projects with IRR equal to or greater than the opportunity cost of capital | Accept all independent projects with B/C ratio of 1 or greater when discounted at opportunity cost of capital |
| Ranking | Gives no ranking for order of implementation | May give incorrect ranking among independent projects | May give incorrect ranking among independent projects |
| Mutually exclusive alternatives | Accept alternative with largest NPW when discounted at the opportunity cost of capital. NPW is the preferred selection criterion for mutually exclusive alternatives | Cannot be used directly; must discount differences between incremental net benefit flows of mutually exclusive alternative projects | Cannot be used directly |
| Discount rate | Must determine a suitable discount rate, generally the opportunity cost of capital | Determined internally; must determine opportunity cost of capital to use as a cut-off rate | Must determine a suitable discount rate, generally the opportunity cost of capital  |

**5. Economic Analysis of Agricultural Projects**

Economic analysis of projects is similar in form to financial analysis in that both assess the profit of an investment. The concept of financial profit, however, is not the same as the social profit of economic analysis. The finances analysis of a project identifies the money profit accruing to the project operating entity, whereas social profit measures the effect of a project on the fundamental objectives of the whole economy. These different concepts of project are reflected in the different items considered to be costs and benefits and in their valuation. Thus, a money payment made by the project operating entity for, say wages is by definition a financial cost. But will be an economic cost only to the extent that the use of labor in this project implies some sacrifice elsewhere in the economy with respect to output and other objectives of the country. Conversely, if the project has an economic cost that does not involve money outflows from the project entity; it will not be considered as financial cost.

Similar comments apply to economic & financial benefits. It is important therefore to remember that some costs & benefits that may appear in the financial accounts may not appear in the economic accounts & vise versa. Similarly, some costs & benefits may be lower (higher) in financial but higher (lower) in economic analysis even though that the cost or the benefit appear in both economic & financial accounts. The extent to which economic costs & benefits diverge from their counterpart financial costs and benefits rests on the presence and extent of market imperfections, government interventions of various forms & the fundamental policy objectives.

It is important to note that judicious use of economic prices (shadow prices, efficiency prices, or accounting prices) is an important means for assessing the economic merits of a project to a country, but is not a substitute for careful analysis of its technical, organizational & managerial, commercial, financial and other relevant aspects to the outcome of a project.

Once financial price for costs and benefits have been determined and entered in the project accounts, the analyst estimates the economic value of a proposed project to the nation as a whole. The financial prices are the starting point for the economic analysis; they are adjusted as needed to reflect the value to the society as whole of both the inputs and outputs of the project.

When the market price of any good or service is changed to make it more closely represent the opportunity cost (the value of a good or service in its next best alternative) to the society, the new value assigned becomes the “shadow price” or “accounting price” or “economic price” or “efficiency price”.

In addition to adjustments made to correct market distortions and market imperfections, the adjusted price could further be weighted to reflect income distribution and savings objectives. Doing so will enable the analyst to consider other social objectives of the society other than the primary objective of maximizing national income.

Financial appraisal of a project may result a negative NPV but might render positive NPV when it is viewed form societies point of view - economic analysis. Relying on economic appraisal to justify such a project requires that the analyst pay special attention to the project’s financial variability. The project’s economic variability will be undermined if financial viability is not ensured and expenditures for operations and maintenance will inevitably suffer.

For projects that are justified because of their positive economic net present value, then, analyst must show explicitly.

The financial NPV & economic NPV

The amount of the financial short fall and the sources of funds to finance it; and

The sustainability of the arrangements.

**5.1 Purpose of Economic Analysis**

**5.1.1. Selection of alternatives**

The main purpose of project economic analysis is to help design and select projects that contribute most to the welfare of a country. When used solely, economic analysis serves only a very limited purpose and hence should not be the only basis for financial decision. Optimal decision must be made based on the relative merit of all aspects financial, economic, fiscal impact, environmental impact, etc.

The tool of economic analysis can help us answer various questions about the project’s impact on the entity undertaking the project, on society, on the fiscal impact and on various stakeholders, and about the projects risks and sustainability.

### Identification of winners and losers: who enjoys the music? Who pays the piper?

A good project contributes to the country’s economic output; hence it has the potential to make everyone better off. Nevertheless, normally not every one benefits, and some one may lose. Moreover, groups that benefits from a project are not necessarily those that incur the costs of the project. Identifying those who will gain, those who will pay and those will lose gives the analyst insight into the incentives that various stake holders have to see that the project is implemented as deigned.

### Environmental impact

A very important difference between society’s point of view and the private point of view concerns costs (or benefits) attributable to the project but not reflected in its cash flows. The effects of the project on the environment, both negative (costs) and positive (benefits), should be taken into account and if possible, quantified and assigned a monetary value. The impact of these costs and benefits on spearfish groups within socially is borne in mind.

## 5.2 Numéraire

The choice of currency and price level in which to conduct the analysis must be decided first. Financial analysis is usually conducted in the currency of the country undertaking the project and at the prevailing market prices. Economic analysis can be conducted in domestic or foreign currency and at domestic market price or at border price. However, when financial analysis is done in one unit of account and the economic analysis in another, the difference between the financial and the economic values have no meaning. Because comparison of financial and economic analysis conveys much information as gainers and losers, fiscal impact, extent of externalities, extent of market distortions & their policy implications, etc, it is advisable to use same (domestic) currency in both financial & economic analysis.

## 5.3 Economic and social cost benefit analysis

A project will be profitable to society if the economic/ social benefits of the project exceed the economic/ social costs or to put in another way, if the net present value of the project to society is grater than zero. The question is, how should a projects economic/ social benefits and costs be measured, and what common unit of account (or *num*é*raire*) should the benefits & cots be expressed in, given a societies objectives & the fact that it has trading opportunities with the rest of the world so that it can sell and bay outputs & inputs abroad (so that domestic & foreign goods will be made comparable). Broadly, there are two methods of measuring economic costs & benefits of a project: UNIDO approach and Little-Mirrlees approach.

## Approaches of measuring economic costs & benefits of a project

There is conceptual difference between social costs - benefits and economic cost - benefit analysis. The results of social cost-benefit analysis may diverge from the results of economic cost-benefit analysis. Economic costs and benefits when they are adjusted to consider other objectives of society as distributional consequences & other objectives, they become social costs & benefits of a project. This depends on the method used in the analysis. If the market prices are adjusted only for market distortions of various kinds; direct transfer payments & externalities, it is simply economic cost-benefit analysis. If on the other hand this adjustment process systematically considers other objectives as distributional aspects, it will become social cost-benefit analysis.

Hence, economic costs benefit analysis limits itself only to the analysis of effects of a project on real national income of the country. Some analysts simply adjust financial cost & benefits into efficiency prices and leave other social aspects for subjective judgments. Some others, particularly Squire & van der Tak (1992) recommend evaluating proposed projects first by using essentially the same efficiency prices then by further adjusting these prices to weight them for income distribution effects & for potential effects on further investment of the benefits generated. Still some others, Little and Mirrlees (1974), & UNIDO Guidelines for project evaluation (1972a), propose evaluating the project first by establishing its economic accounts in efficiency prices then by adjusting these accounts to weight them for income distribution and saving effects.

Making allowance for the effect of a project on income distribution & saving, however, involves some what more complex adjustments than those necessary to estimate ‘efficiency’ prices and it also unavoidably incorporates some element of subjective judgment.

### 5.4.1 UNIDO Approach

In this method economic benefits & costs may be measured at domestic prices using consumption as the *numiraire*, with adjustment made for divergence between market prices and economic values, and making domestic and foreign resources comparable using shadow exchange rate (SER). In this method, if commodities are traded, first all these traded goods will be adjusted for any distortions in the domestic markets. After this adjustment is made, the adjusted domestic price will be multiplied by SER to make domestic resources be comparable with foreign resources.

The easiest way for adjusting domestic market distortions is to use border prices, *c.i.f.*, for imports and *f.o.b.* for exports and then multiply this border price expressed in foreign currency by SER to arrive at economic border prices. But, if the commodities are non-traded, i.e. if *f.o.b.* prices are less than domestic prices & domestic prices less than *c.i.f.* prices and if the market prices are good estimates of opportunity cost or willingness to pay, we directly take the market price as economic value of the item. But if the prices of non-traded items (goods and services or factors of production) are distorted, we will adjust the market price to eliminate distortions and then use these estimates of opportunity cost as the shadow price to be entered in the economic analysis.

This method can be summarized by the following example. Suppose we have a project producing export item that uses both foreign & domestic inputs. The net benefit (ignoring discounting) would be estimated as:



Where X - border price of exports in foreign currency

 M - Border price of imported goods in foreign currency

 D - Adjusted (economic) values of domestic goods in domestic currency

SER - is the shadow exchange rate (assuming the official exchange rate does not accurately reflect the true value of foreign currencies to the economy).

***Shadow Exchange Rate***

The need to determine the foreign exchange premium arises because in many countries, as a result of national trade policies (including tariffs on imported goods & subsidies on exports), people pay a premium. This premium is not adequately reflected when the price of traded goods are converted to domestic currency equivalent at the official exchange rate. The premium, thus, represents the additional amount that users of traded goods, on average & throughout the economy are willing to pay to obtain one more unit of traded goods. The premium people are willing to pay for traded goods, then, represent the amounts that, on average traded goods are missing priced in relation to non-traded items when the official exchange rate is used to reconvert foreign exchange prices in to domestic values.

The derivation is a follows:



Where Pd - domestic price

 Pw - world price in foreign currency

To derive an average and representative, estimates of SER that can be applied across all traded goods, we need to take the weighted mean of relative value of all imported & exported goods. Thus:



- The weight of the ith  good

The weights (fi) are a function of the quantities imported and exported and of the elasticities of demand for the various imports and the elasticities of supply for the various exports.

### 5.4.2 Little-Mirrlees Approach

The other method of adjusting market prices into economic prices is the Little-Mirrlees approach (see Little & Mirrlees, 1969, 1974), In this approach benefits and costs may be measured at world price to reflect the true opportunity cost of outputs and inputs using public saving measured in foreign exchange as the *num*é*raire* (that is, converting everything into its foreign exchange equivalent). The fact that foreign exchange is taken as a *nureraire* does not mean that project accounts are necessarily expressed in foreign currency. The unit of account can remain the domestic currency, but the values recorded are the foreign exchange equivalent that is, how much net foreign exchange is earned.

The stimulus to valuing output (and inputs) at world prices (as a measure of true economic benefit) originally came in the context of import substitution policies pursued by many developing countries in the 1950s & 1960 when it becomes clear that large number of commercially profitable industries was producing goods at a much higher price than the alternatives available on the international market. It was thought that if a project was analyzed at world prices, this would give an indication first of whether it could survive in the long term in the face of international competition, and secondly of whether its output could be obtained more cheaply from international sources.

If world prices are used, the economic price at which to value a project’s output is its export price if it adds to exports or its import price if domestic production leads to a saving in imports. Similarly, on the cost side, the price at which to value a project input is its import price if it has to be imported, or export price if greater use leads to a reduction in exports.

The above adjustment applies for traded goods (imported or exported goods). But if the goods or inputs in question are non-traded goods, the analyst needs to use conversion factor to translate domestic prices into their border price equivalent. A conversation factor (CF) is the ratio of the economic (shadow) price to the market price, that is:

CF= 

So the economic price for a non-traded good is its market price multiplied by the conversion factor. How are conversion factors derived? The true cost of any good is its marginal cost to society. In principle, to find the world price of non-traded goods, each good could be decomposed into its traded and non-traded components in successive rounds - backwards through the chain of production. In practice, however, it is not feasible to differentiate conversion factors between all non-traded goods and only special outputs (and inputs) are treated this way because the procedure is difficult, time consuming and costly. Shortcuts are, therefore, needed that provide a reasonable approximation. In essence, all the shortcuts involve some degree of averaging for a group of non-traded items and, therefore, some degree of error if average or standard conversion factor is applied to a particular non traded good rather than its own specific conversion factor. The derivation is as follows:



SCF = 

Where Pd = domestic price in domestic currency

 Pw = world price foreign currency

 OER = official exchange rate

 SCF = standard conversion factor



 is the shadow exchange rate i.e., the price of goods in domestic currency relative to their world prices



 is the shadow price of foreign exchange (PF)



Where - Weights for the ith commodity

 Pdi- domestic price of the ith commodity in domestic currency

 Pwi- world price in foreign currency

 PF- shadow price of foreign exchange

Taking the following example can summarize Little-Mirrlees approach of adjusting domestic prices into economic prices. A project that produces export goods can be assessed as follows.

Net Present Value (NPV) = OER (X-M) - SCF.D

Where -OER- official exchange rate

 X- Exported goods in foreign currency

 M- Imported goods in foreign currency

 SCF- standard conversation factor

 D- Price of non-traded goods in domestic currency

To summarize, as long as SCF is the ratio of OER to SER, the two approaches - UNIDO and Little-Mirrless - differ only to the extent that SER is different from the actual exchange rate.

## Economic export and import parity price

***Export Parity Price***

*C.i.f.* at point of import (say, Canada port)

 Deduct- unloading at point of import

 Deduct- freight to point of import (in this case air freight)

 Deduct – insurance

Equals – *f.o.b.* at point of export (A.A)

Convert foreign currency to domestic currency at official exchange rate (OER) if you are using the L-M approach or shadow exchange rate (SER) if you are using UNIDO approach

 Deduct - local port charges

Deduct - local transport & marketing (if not part of project) at their economic price and multiply it by SCF in L-M approach

Equals *export parity price* as project boundary

 Deduct - local storage, transport & marketing costs (if not part of project cost)[[3]](#footnote-4) at their economic price and multiply it by SCF in L-M approach

Equal *economic export parity price at project location* (farm gate)

A parallel computation leads to the economic import parity price. Here the issue can be finding the price of project's output that is intended to substitute previous imports or the project will use imported inputs. In either case, the import parity price can be derived as follows.

***Import Parity Price***

*F.o.b.* price at point of export

 Add-freight charges to point of import

 Add-insurance charges

 Add- unloading from ship to pier at port

*C.i.f.* Price at the harbor of importing countries

Convert foreign currency to domestic one (multiply by OER) if you use L-M approach and SER if you use UNIDO approach

 Add-local port charges

Add-transport & marketing costs to relevant wholesale market at economic price and multiply it by SCF in L-M approach

Equal price at wholesale market

Deduct-local storage & other marketing costs at economic price and SCF in L-M approach (if not part of project cost) -this is the marketing margin between central market and the project site. If the project uses imported inputs, we have to add this cost to the project.

Equals *economic* *import parity price* at project location (Farm/project gate price).

## Valuation of non-traded goods

Any output or input whose value to the economy cannot be measured in terms of *f.o.b.* or *c.i.f.* border prices should be assessed in relation to its price in the home market. This applies to non-traded commodities, usually those with high transport costs, whose domestic supply prices, at the given level of local demand, are below the c.i.f. price of imports but above the f.o.b. price of exports. It also applies in cases in which government policy isolates commodities from foreign markets through import or export prohibitions or quotas. This price in the home market depends on local conditions of supply and demand, including market imperfections, monopolistic pricing, for example, affects power rates, as do import quotas on fuel imports and, less directly, general trade policies through their impact on such factor prices as wages.

As a result of market imperfections or indirect taxes, the marginal value (demand price) of non- traded inputs or outputs may differ from their marginal cost (supply price). The shadow price of such goods may be the demand price, the supply price, or somewhere in between-depending on whether project inputs or outputs affect the supply to other users, the demand from other producers, or both. To accurately account for both quantity and price effects the analyst need to assess both the demand and supply side of these non-traded inputs used and outputs produced by the project.

1. If port charge is in terms of foreign currency, we deduct it before it is multiplied by OER. [↑](#footnote-ref-2)
2. If the project produces import substitutes, this must be deducted because the project is will to have to compete with import substitutes [↑](#footnote-ref-3)
3. If the commodity is exported, say via Djibouti port, we will deduct local transport costs from port to A.A. market [↑](#footnote-ref-4)