



Application Development For Economic Analysis of Watershed Programmes

KEYWORDS

Watershed development, Economic analysis, Benefit cost ratio, Visual Basic

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ABSTRACT *Economic analysis of water shed programmes is essential for selection, planning, execution and evaluation and decision making of activities for watershed projects. It has also gained importance in view of making investment decisions for soil and water conservation projects. Economic evaluation is also necessary to study consequential effects of water shed development on social welfare needs and environmental enhancements. Present paper deals with the development of a Visual Basic based application which efficiently reduces the mathematics of economic analysis.*

INTRODUCTION

Development of watershed programme in India has been taken in a big way during the last four decades or so, for rural development through conserving natural resources in problem areas. Application of sound and comprehensive programs of soil and water conservation within the natural boundaries of watershed is termed as water shed management. Since financial resources of the country are limited therefore the government agencies and NGOs have to set priorities for taking up watershed projects based on economic criterion. Watershed development and management generates productive, protective, environmental, ecological and social benefits[1].

This paper deals with development of a desktop application which will compute the discounting factors and hence facilitate complex mathematical calculations involved in the procedure of economic analysis of these projects. Watershed harvesting project is considered economically feasible if the total benefits flowing from the project exceed those which would have been obtained without the project by an amount in excess of the project cost.

METHODS OF SOCIO ECONOMIC ANALYSIS

- 1) **With and without Principle:** This evaluation draws a comparison between the events likely to occur if the project is taken and in case the same is not taken up. Consequences of alternatives of doing nothing and implementing the project are compared using this principle.
- 2) **Project planning horizons:** The period of analysis is the length of time over which; project consequences are included in a particular study. Economic life of the project ends when incremental benefits from continued use of resources no longer exceed the incremental cost of continued operation.
- 3) **Costs:** Cost stream of a water shed project consists of fixed type and annual both. Annual cost comprises of contingency normally taken as 2% or so of the fixed cost and operational expenses.
- 4) **Discount rate:** Discount rate is inverse of the interest rate prevalent in market. Interest rate is used to convert present value to future value, whereas discounting is used to convert future values to a present value.

STEPS OF ECONOMIC ANALYSIS

- 1) Estimate (asses/predict) benefits and cost resulting from each alternative including that of doing nothing.
- 2) Assign monetary value to each physical consequence based on market price.
- 3) Select appropriate discount rate to convert the cost and

benefit streams to an equivalent single number.

- 4) Choose a proper time horizon of the project, which normally varies between 10 and 30 years for watershed projects.
- 5) Compare discounted total benefits and cost to arrive at conclusion with the help of the selected indicators.

DISCOUNTING FACTORS

1) **Single Payment Compound Amount Factor (SPCAF):** This indicates the number of rupees which will have accumulated after N years for every rupee initially invested at a rate of return of i percent. For P as a present and F as a future amount, the formula is given as:

$$F=P(1+i)^N$$

Here $(1+i)^N$ is called discount factor for single payment compound amount.

2) **Single Payment Present Worth Factor (SPPWF):** This indicates the number of rupees one must initially invest at i percent to have a rupee after N years. The formula is given as :

$$P=F/(1+i)^N$$

Here $1/(1+i)^N$ is the discount factor.

APPLICATION DEVELOPMENT FOR CALCULATING DISCOUNTING FACTORS AND PRESENT WORTH

Figures 1 and 2 represent screenshots of an application developed to compute discounting factors and present worth respectively. It is Visual Basic 6.0 based desktop application which is easy to use, efficient, and accurate and has a user friendly appeal.

Visual Basic is a third-generation event-driven programming language and integrated development environment (IDE) from Microsoft. Visual Basic was derived from BASIC and it enables the rapid application development (RAD) of graphical user interface (GUI) applications[2].

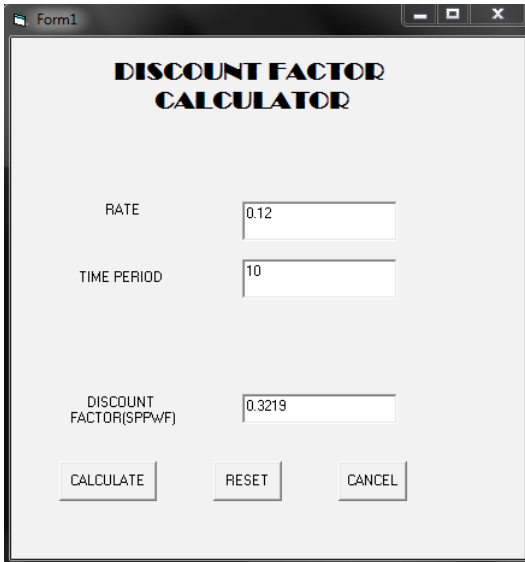


Figure 1: Discount Factor Calculator

ECONOMIC INDICATORS

Economic indicators measure economic health of a project. Three indicators have been listed below[3]:-

1) **Benefit, Cost Ratio:** Economic analysis of the watershed projects is carried out for arable and non arable lands separately and also for the watershed as a whole, using the discounted benefit and cost values. B/C ratio is defined as the as the ratio of the present value of additional gross benefits to the present value of additional gross cost.

Benefit, Cost Ratio (BCR):

$$\sum_{t=1}^n [B_t / (1+i)^t] / [\sum_{t=1}^n C_t / (1+i)^t]$$

Where, B_t and C_t are the additional benefits and cost at time 't'

i is the discount rate in % and n is the life of the project.

Projects with $BCR > 1$ are considered economically viable. Economic soundness increases with increase in value of BCR.

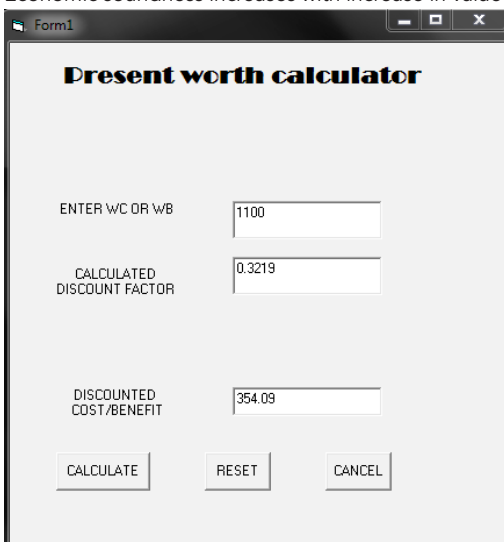


Figure 2: Application for calculating discounted costs/ benefits

2) **Net Present Value (NPV):** NPV is the discounted value of additional gross benefits minus the discounted value of additional costs.

n

$$NPV = \sum_{t=1}^n (B_t - C_t) / (1+i)^t$$

$t=1$

Where, B_t and C_t are additional benefit and costs at time 't', 'i' is discount rate in% and 'n' is the life of the project. Higher the value of NPV, more economically viable the project is. A project with negative value of NPV is economically not viable.

3) **Internal Rate of Return (IRR):** IRR is the rate of discount to be determined which makes the present value of benefits equal to the present value of costs.

n

$$\text{Thus, } IRR = \sum_{t=1}^n (B_t - C_t) / (1+i)^t = 0, \text{ for}$$

$t=1$

the value of 'i' to be determined and that is the IRR.

Value of IRR can be determined by hit and trial selecting values of 'i' or graphically or through interpolation.

CONCLUSION

Economic analysis of watershed projects is done at the proposal stage, mid-term stage as well as at the post project stage. To facilitate the calculations involved in the mathematics of these analyses, a desktop application has been designed in Visual Basic 6.0. It is a user friendly, GUI application which acts as a handy tool for economic evaluations of these projects.

REFERENCE

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