Determination of benefit-cost ratio in Economic Analysis of Ngamoeyeik Irrigation Project, Myanmar

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1.Introduction

A comprehensive cost-benefit analysis requires that estimates be made of both the direct and indirect costs and the tangible and intangible benefits of a project. The costs and benefits must then be translated into a common measure, usually (but not necessarily) a monetary unit. Costs and benefits are then compared by computing:(1) a benefit-cost ratio (benefits divided by costs), (2) net benefits (benefits minus costs), or (3) some other value (such as an internal rate of return) which summarizes the results of the analysis. The given adequate estimates, cost-benefit analysis offers a relatively straightforward assessment of the economic efficiency, providing information on which to base decisions regarding the effective allocation of available resources among economically desirable options. The costs and benefits occurring at different points in time must be made commensurable, that is translated into a common unit of measurement. It is not sufficient merely to add the estimated benefits and subtract the estimated costs.

2.Cost-benefit analysis

Evaluating a project with cost-benefit analysis is essentially comparing the project's benefits to its cost. One tries to identify and value the costs and benefits that will arise or have arise with a certain project and to compare them with the situation as it would be without the irrigation project. These results are in the incremental costs, the incremental benefits and the incremental net benefits. Suppose we want to evaluate an irrigation project, we have to compare the incremental benefits due to the project with its incremental costs. Because of the irrigation crops will have higher yields which results in an incremental benefit but on top of that the farmers will be able to grow during a second season, so crop intensity will rise which also results in an incremental benefit (a benefit over the normal benefit, which is the benefit without the project). Most often, the costs and benefits of an agricultural project are spread over a number of years. In order to compare these costs and benefits on the same basis, we need to discount the values of the costs and benefits in the different years to the same moment, mostly the start of the project. The benefit-cost ratio is obtained when the present worth of the benefit stream is divided by the present worth of the cost stream. The equation is shown below;

$$b/c = \frac{\sum_{t=1}^{n} \frac{B_t}{(1+i)^t}}{\sum_{t=1}^{n} \frac{C_t}{(1+i)^t}}$$

3.Economic Analysis of Ngamoeyeik Irrigation Project

The test farm with Ngamoeyeik irrigation system is located in Hlegu, which is about 31 km northeast of Yangon. The catchment area of reservoir is 414.5 km^2 and total irrigated area is

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Keywords; Benefit-cost ratio, Economic analysis, Irrigation

about 22,000 ha. It is divided into three sub-systems such as Right Main Canal (RMC), Left Main Canal (LMC) and Distributary Canal of LMC (DY-2) as shown in Fig.1.

The following assumptions have been used in the economic analysis such as (a) The project life has been assumed to be 30 years. Project implementation would require seven years.

(b)Prices for internationally trade goods are valued at a shadow exchange rate (SER) to reflect the scarcity value of the goods. SER that has been used is 10 Kyats =US$1.(Kyats: Myanmar currency). Local costs and locally valued benefits were valued at the official exchange rate of 7.85 Kyats=US$1. (c)The incremental crop benefits were based on estimates provided by the most probable yields attainable with project investments, with assumed buildup rates. (d)Capital costs were expressed on a border basis and taxes and duties were excluded. (e) The adjustments were made to the crop production cost stream to reflect realistically the staggered incurrence of costs and generation of benefits in agricultural activities. Based on the previous study on Economic Analysis of Ngamoeyeik Irrigation Project, land redistribution through farm size reduction will increase the cropping intensity, thus it would be financially attractive to the farmers, producing large cash surpluses and especially if the project is in full development. The cost-benefit analysis of four different discount rates at 4%, 8%, 12% and 16% were calculated. Table.1 shows an example of calculation at discount rate 12%. The results of the benefit-cost ratios for 4%, 8%, 12% and 16% are 1.17, 1.09, 1.01 and 0.95 respectively.

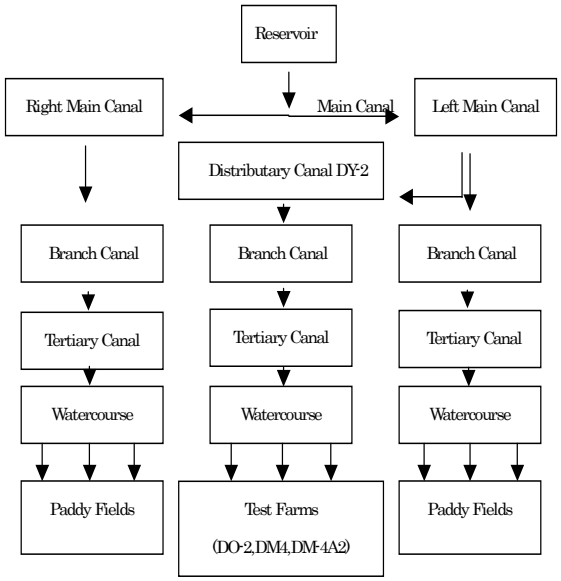

Fig.1 Layout of Ngamoeyeik Irrigation System

Table.1 Calculation of cost-benefit analysis at discount rate 12%

Year	Incr.C (a)	Incr.B(b)	Und. CF (c=b-a)	D.F (12 %) $\frac{1}{(1+i)^t} = d$	D. Incr.C (a*d=e)	D.Incr.B (b*d=f)	D.C.F (f-e=g)
1	230	50	-190	0.893	205.39	44.65	-160.74
2	140	80	-60	0.797	111.58	63.76	-47.82
3	75	110	35	0.712	53.4	78.32	24.92
4	200	140	-60	0.636	127.2	89.04	-38.16
5	73.5	170	96.5	0.567	41.675	96.39	54.715
6	45	200	155	0.507	22.815	101.4	78.585
7	15	230	215	0.452	6.78	103.96	97.18
					Σ568.84 (C)	Σ577.52 (B)	Σ8.68 (A)

NPV=B-C= A=8.68 ,B/C=1.01>1.0

4.Conclusion

Ngamoeyeik Irrigation Project can be best achieved with an economic internal rate of return (IRR) at 12%, which is close to the minimum requirement for an annual rate of interests from Asian Development Bank for funding large developing projects. From the calculated cost-benefit analysis the project is economically feasible.