

Team : Valuing Ecosystem Services for Sustainable Land Management

Assignment : Final Project

Project Proposal Presented to Thathar Watershed Committee

Introduction

The case under presentation is a watershed project in Thathar village which lies in western province of India i.e Haryana. It is one of the dry regions in the country. The implementation of watershed project in this village through soil and moisture works has improved the ecological situation in the form of groundwater availability and forest regeneration. However, to improve the economic condition of the people in this watershed, a new project is proposed which acts as a supplementary to the existing project. An attempt was made therefore with some economic indicators, to find out whether the new project proposed is worth under taking by the watershed committee which looks after the welfare and development activities in the village.

The Scenarios

Without Project Scenario (Business as Usual)

The total area of this watershed was 209 ha out of which the net sown area was 77 ha and the gross sown area was 123 ha. The total number of households in this village was 124, out of which the number of small ¹, medium, large farmers and landless agricultural labourers were 28,14, 5 and 77 respectively. They cultivate 16 ha of land under irrigation and 61 ha of land under rained during kharif². During Rabi, they raise the crops with supplementary irrigation provided through an irrigation tank (56 ha) and bore wells (21 ha). The crops raised during kharif were sorghum, paddy and maize. The crops raised during winter/ rabi were wheat, mustard, berseem, vegetables etc. There were about 126 milch animals in the watershed. The type of cultivation is mono cropping with chemical fertilizers. Farmers have raised 475 fruit trees on the bunds of the farms which were providing fruits. The area under cultivable waste lands was 19 ha which is used for grazing purpose for 123(no) sheep and goat together. The owners of these small ruminants were also allowed to get their livelihood, with the sale of fuel wood in the forest fringe land.

With Project Scenario

The people of this watershed consume the fruits of a plant locally called "Arogyapacha"³ available in their forest as they know that these fruits give them instant energy. Knowing about this ITK, the Tropical Botanical Garden Research Institute (TBGRI) discovered through their research that the plant (particularly the fruit and leaves) has anti-stress and immune-stimulating properties. TBGRI

named this formulation “Jeevani,” which means “giver of life” and this was patented by them. The product comes in granules and can be mixed with hot water or milk. The commercial production of the patented product was given to a company i.e. AryaVaidya Pharmacy Ltd (AVP) which has agreed to pay a licensing fee of USD 50,000 and two percent royalty on the sale of Jeevani to TBGRI. TBGRI has made a benefit sharing agreement with the WC, by sharing USD 12,500 of the licensing fee. The AVP has come forward to make an agreement with the watershed committee (WC) to procure the leaves from the villagers @5 tonnes per month, in addition to providing USD 40 @ one plant for sustainable management of these plants.

The farmers in this watershed have been practicing mono cropping of the same crop for years together which is eroding the fertility of their lands. If leguminous crops are introduced in their cropping pattern, these crops besides acting as a main source of supplementary protein to human beings, enriches the soil by adding nitrogen and improves the chemical, biological and chemical soil properties. The crops such as pigeonpea and greengram can be introduced as intercrop with sorghum and maize during kharif and black gram, pigeon pea and lentil as an intercrop with mustard and lentil during rabi and green gram during summer.

Assessment of the worth of the Project

Benefits and costs of both with project scenario and without project scenario were considered to assess the worth of the project. The benefits associated with agriculture were the crop yields times the number of hectares cropped times the price per ton of crop. Both variable and fixed costs were calculated for the costs. The variable costs here are cost of production, cost of feed etc. The fixed costs are cost of land, machinery, cost of animals etc. Cost of depreciation was not taken into account for land and machinery. This is the limitation of the study. Net Present Value (NPV) is estimated to know the present value of future benefits associated with the project. A discount rate of 10% is considered to give more weight to the current value of the benefits. The discount factor is calculated with the formula

$$\text{Discount Factor} = 1/(1+r)^{(t-1)}$$

The discounted value of the incremental net benefit is computed taking year 1 as the year of reference and a 10% discount rate. The NPV of With Project Scenario and Without Project Scenario are calculated and presented below.

Table1: Computation of Timing of Benefits and Net present Value (Value in USD)

	Year 1	Year 2	Year 3	Year 4
With Project				
Benefit	5,66,000	5,76,000	5,80,000	5,90,000
Costs	1,78,800	1,68,000	1,90,000	1,80,000
Net Benefits	3,87,200	4,08,000	3,90,000	4,10,000
Without Project				
Benefits	5,11,500	5,12,500	5,13,500	5,14,000
Costs	2,30,246	2,10,140	2,25,000	2,15,000
Net Benefits	2,81,254	3,02,360	2,88,500	2,99,000
Incremental Net Benefits	1,05,946	1,05,640	1,01,500	1,11,000
Present Value of Incremental benefit(10% discount rate)	1,05,946	96,037	83,879	83,394
Economic Net Present value (10% DR)	1,05,946 +96,037+83,879+83,394 = 3,69,256			

As the NPV is greater than zero, it can be concluded that the project is worth undertaking. However, NPV does not allow for comparisons across alternative projects, but only to make a decision on whether a given project is worth undertaking or not. To assess whether undertaking this project is better when compared to the without project scenario, benefit – cost analysis was calculated, discounted at the opportunity cost of capital.

Table 2: Timing of Benefits and Computation of Benefit Cost Analysis (Value in USD)

	Year 1	Year 2	Year 3	Year 4
With Project				
Benefit	5,66,000	5,76,000	5,80,000	5,90,000
Costs	1,78,800	1,68,000	1,90,000	1,80,000
Without Project				
Benefits	5,11,500	5,12,500	5,13,500	5,14,000
Costs	2,30,246	2,10,140	2,25,000	2,15,000
Incremental Net Benefits	54,500	63,500	66,500	76,000
Present Value of Incremental net benefit(10% discount rate)	54,500	57,727	54,955	57,098
Incremental Net Cost	-51,446	-42,140	-35,000	-35,000

Present Value of incremental Net Cost (10% Discount Rate)	-51,446	-38,309	-28,924	-26,295
Benefit to Cost Ratio	$\frac{54,500+57,727+54,955+57,098}{51,446+39,309+28,924+26,295} = \frac{2,24,280}{1,44,974} = 1.54$			

Sensitivity Analysis to Assess Risk and Resilience

A Benefit Cost ratio of 1.54 for the project indicates its potentiality, and can be strongly recommended to undertake. The above analysis was made with an assumption of positive external factors and it relies on average values of benefits and costs. However, the field situation is not really so. It is more risky in case of agriculture related projects which depends highly on external factors such as drought or cyclones. Therefore, it is necessary to run the sensitive analysis through the project to assess its resilience at times of risks. A combination of negative scenarios are assumed for both the projects during the first four years and presented in the Matrix below. The negative scenarios may arise out of climate change in both the cases and withdrawal of leaf procurement by the AVP due to business problems.

Table 3: Matrix of Negative Scenarios

Year	With Project	Without Project
First Year	License Fee by TBGRI +Leaf Procurement by AVP	Normal Year
Second Year	No License Fee + Leaf Procurement	Drought Year
Third Year	No License Fee + No Leaf Procurement	Normal Year
Fourth Year	No License Fee + No Leaf Procurement	Drought Year

Sensitive analysis is now conducted with change in quantity of products, prices and income as a result of above situations. The average values originally used in the cost benefit analysis are changed to the new extreme values and the NPV is recalculated to assess whether the project remains economically worth implementing. Table below presents the NPV of the project under extreme conditions.

Table 4: Computation of Timing of Benefits and Net present Value under Extreme Conditions (Value in USD)

	Year 1	Year 2	Year 3	Year 4
With Project				
Benefit	5,66,000	2,27,500	4,81,359	1,97,359
Costs	1,78,800	1,68,000	1,90,000	1,91,000
Net Benefits	3,88,000	59,500	2,91,359	6359
Without Project				
Benefits	5,11,500	1,96,800	5,13,500	1,96,800
Costs	2,30,240	1,91,100	2,25,000	2,15,000
Net Benefits	2,81,260	5700	2,88,500	-18200
Incremental Net Benefits	1,06,740	53,800	2,859	-11841
Present Value of Incremental benefit(10% discount rate)	1,06,740	48,909	2362	-8896

Economic Present (10% DR)	Net value	$1,06,740+48,909+2362-8896 = 1,49,115$
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The value of NPV in case of these extreme situations was USD 1, 49,115 which proved that the project could still be worth undertaking. Therefore, it is recommended to the Watershed committee of the Thathar watershed, to take up the project for improving the livelihoods of their stakeholders.

Notes

1. Size of holding - Small Farmer 1-2 ha, Medium Farmer 2-4 ha, large farmer > 4 ha.
2. The farmers raise crops during two seasons. i.e. Kharif (June/July to September/October) and Rabi (October/November to February/March).
3. Scientifically known as *Trichopuszeylanicus* ssp. *Travancoricus*

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