

# Cost Benefit Analysis of Climate Change Adaptation Measures on Soil and Water Conservation in Northern Ghana

Baba Adam<sup>1</sup>, Alexander Nimo Wiredu<sup>2,1</sup>

<sup>1</sup>Universität Hohenheim, Institute of Farm Management (410a), Stuttgart (Germany)

<sup>2</sup>CSIR-Savanna Agricultural Research Institute, Ghana

## I. Introduction

- Climate change, characterized by rising temperature and rainfall variability, is already having significant effect on crop yields and livelihoods of farm households in the agricultural production systems of Ghana.
- Several technologies and indigenous adaptation strategies exist to mitigate the effect of climate change and to ensure adequate food production.
- Despite their importance in preventing nutrient loss, retaining soil moisture, increasing crop yield, and providing additional income for farm households, adaptation is an investment and requires that actors make the best decisions.
- This study examines the costs and benefits of the main climate change adaptation measures on Soil and Water Conservation (SWC) used by farmers.

## II. Research objectives

- Identify and describe the relevant climate change adaptation measures to protect against the principal climatic hazards
- Quantify the costs and benefits of the main adaptation measures to climate change.

## III. Methodology

- The study was based on data from 150 systematically selected farmers in northern Ghana. Information on household and farm operations were collected.
- Average values were used to conduct cost benefit analysis for the selected adaptation measures on SWC using Net present Value (NPV) and Benefit Cost Ratio (BCR).
- The NPV was calculated as follows: 
$$NPV = \sum_{t=0}^T \frac{B_t - C_t}{(1+r)^t}$$

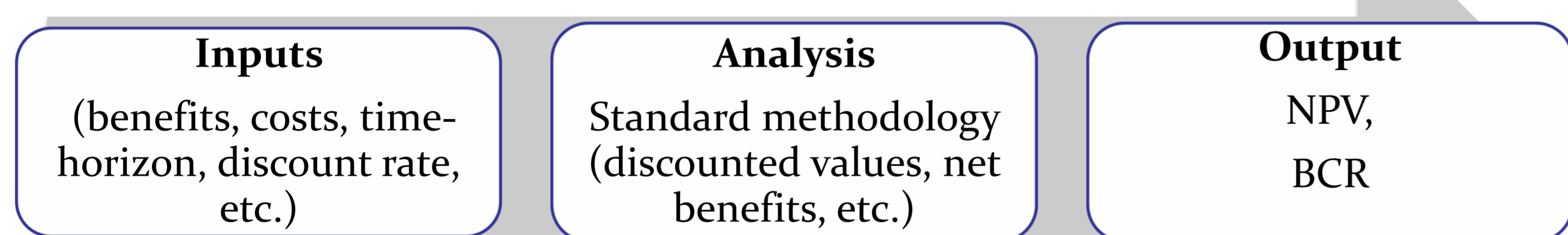


Figure 1: Sequence of cost benefit analysis



## IV. Findings

- CBA carried out for selected SWC adaptation measures for a 3-year period yielded a wide range of values for profitability (Table 1).
- 18% discount rate was used. This rate was obtained after deducting annual average inflation rate from interest rate on bank loans.
- Sensitivity analysis was conducted using different scenarios (12 percentage points increase and decrease in discount rate).
- Farmer yield estimates were used to calculate the percentage change in maize yield.

TABLE 1: CBA of selected SWC adaptation measures.

Adaptation measure	NPV per ha (US\$/ha)			BCR	Average maize yield estimate per ha (Mt)	% change in maize yield*
	Pessimistic Scenario (30% disc. rate)	Actual scenario (18% disc. rate)	Optimistic Scenario (6% disc. rate)			
Composting	359.62	400.54	454.05	1.31	2.28	24.53%
Manuring	304.81	340.52	387.23	1.31	2.10	14.53%
Stone bunding	365.82	406.17	458.95	1.33	2.24	22.35%
Grass stripping	10.55	37.59	72.96	1.04	2.04	11.35%
Mulching	12.00	29.42	52.22	1.02	1.84	0.62%
No adaptation	-425.39	-462.27	-510.51	0.60	0.91	-50.06%

\*: Reference value 1.83 Mt (overall regional average maize yield estimate)

Source: Based on own calculations. Field data, 2015

## V. Conclusion

- All measures except “No adaptation” have positive NPV and BCR >1, implying that they are economically sustainable.
- Farmers **without adaptation measures** experience decline in maize yield.

## VI. Policy recommendations

- Emphasis on proper ways of implementing these measures.
- Extension activities must be intensified to encourage farmers to implement adaptation measures.

### References

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Contact: Baba Adam  
Email: [baba.adam3@gmail.com](mailto:baba.adam3@gmail.com)

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Contact: Dr. Ernst Mill  
email: [ernst.mill@giz.de](mailto:ernst.mill@giz.de)