

## Scenario-based land management options for the highland of Ethiopia: a decision support tool to implement rural land use plans

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### ABSTRACT

*The implementation of locally acceptable improved land management practices is crucial to improve the livelihoods of local communities and reduce the degradation of ecosystem services (ESs). This study was conducted in Tara Gedam watershed, northwestern Ethiopia, to identify suitable land management options from four ecosystem service-based scenarios: business as usual (BAU), transition agriculture (TAG), intensified agriculture (INA) and optimized ecosystem services (OPE) using the Analytic Hierarchy Process method of Multi-criteria Decision Analysis tools. A stakeholder workshop and group discussions with farmers and agricultural experts were conducted to set criteria for selecting the best management option. Livelihood benefits and environmental improvements were rated highest and are therefore the most influencing factors for the selection of land management options. These two criteria were responsible for the best performance of the OPE and INA. INA and/or TAG were also the preferred options by the perspective of farmers. This is attributed to the fact that these options provide benefits within a shorter period of time compared to OPE. Smallholder farmers should be provided with financial and technical support to implement improved management options such as OPE. The results of this study will contribute to the knowledge base of agricultural experts for future implementation of Ethiopian rural land use planning.*

**Key words:** Analytic hierarchy process, Ecosystem services, Optimized ecosystem services

## INTRODUCTION

## **MATERIALS AND METHODS**

### **Study Area**

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**Land  
management  
options**

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**Description**

**Business as  
usual (BAU)\***

**Transition  
agriculture**

**(TAG)\*\***

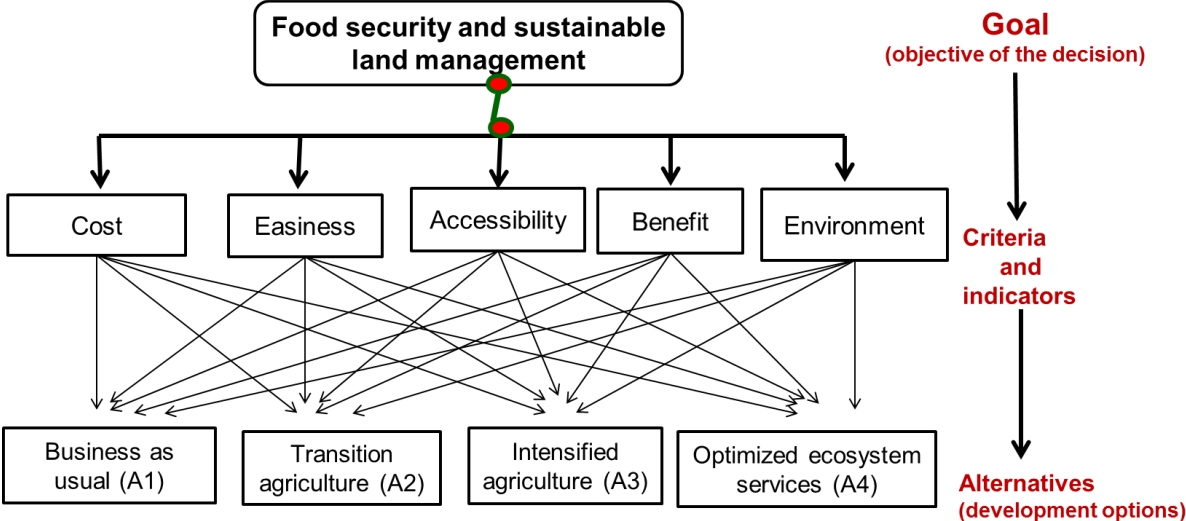
**Intensive  
agriculture**

**(INA)\*\*\***

**Optimized  
ecosystem  
services (OPE)**

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# Selecting the Best Land Management Option or Scenario



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**Criteria****Description**

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**Cost****Easiness****Accessibility****Economic benefit****Environmental  
improvement/ecosystem  
service**

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$$\begin{pmatrix} \frac{w1}{w1} & \frac{w1}{w2} & \cdot & \cdot & \cdot & \frac{w1}{wn} \\ \frac{w2}{w1} & \frac{w2}{w2} & \cdot & \cdot & \cdot & \frac{w2}{wn} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \frac{wn}{w1} & \frac{wn}{w2} & \cdot & \cdot & \cdot & \frac{wn}{wn} \end{pmatrix} \Rightarrow \begin{pmatrix} 1 & a12 & a13 & a14 \\ \frac{1}{a12} & 1 & a23 & a24 \\ \frac{1}{a13} & \frac{1}{a23} & 1 & a34 \\ \frac{1}{a14} & \frac{1}{a24} & \frac{1}{a34} & 1 \end{pmatrix} \dots$$

$$\lambda \quad \frac{CI}{RI} \quad \frac{\lambda_{max} - n}{n-1}$$

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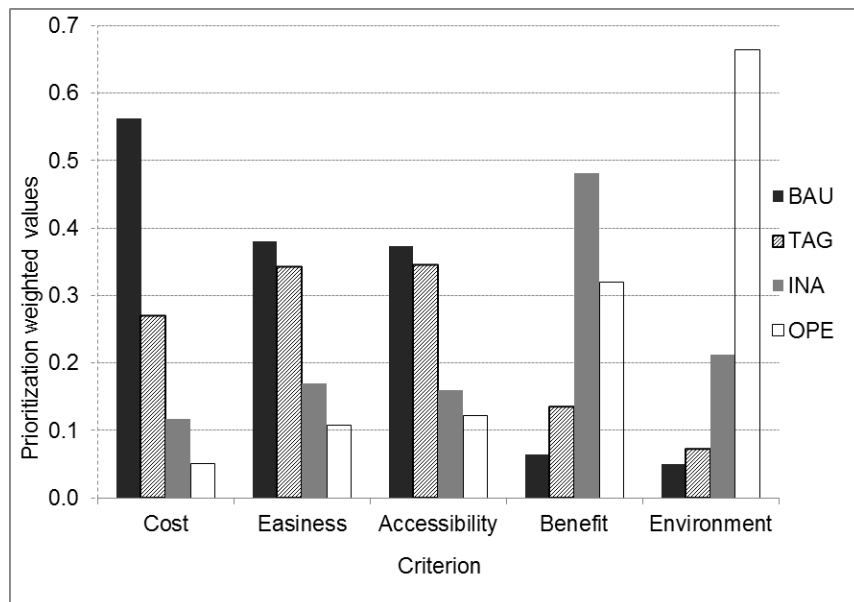
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## RESULTS AND DISCUSSION

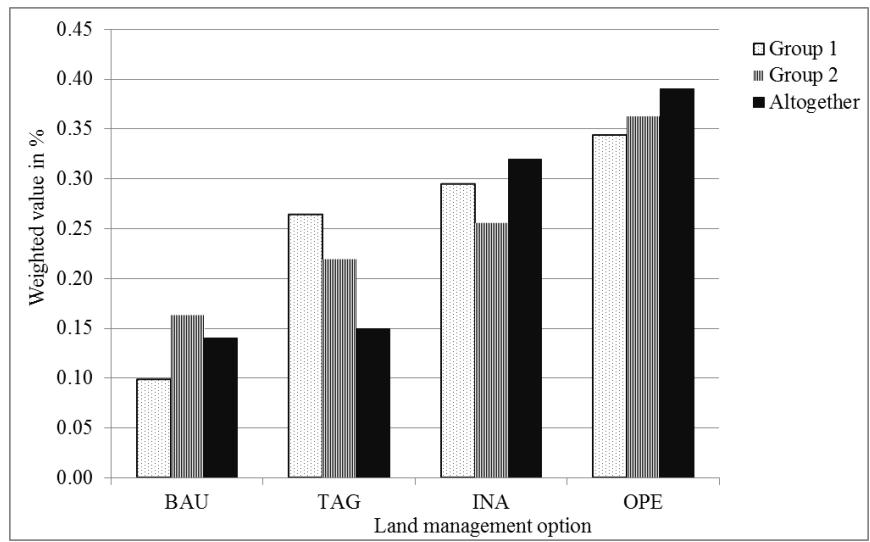
### Importance of Criteria Used to Evaluate Land Management Options

							$\lambda$
	■						
	■	■					
	■	■	■				
	■	■	■	■			
	■	■	■	■	■		

### Evaluation of Land Management Options







## **Implications for Future Interventions**

## **CONCLUSIONS**

## **ACKNOWLEDGEMENT**

## REFERENCES



