

Criteria and Indicators for Sustainable Management of Agroforestry Systems: A Case of Akola District, Maharashtra, India



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Introduction

The first Earth Summit at Rio in 1992, it was realized that Sustainable Forest Management (SFM) is an important element of Sustainable Development. The population of India is increasing at an alarming rate which crossed 1.37 billion (WPR, 2019). Similarly the demand and supply of wood and wood based products are widening day by day (59%), moreover the domestic supply of the wood is insufficient to fulfill its growing demand (Ahuja, 2016). On the other hand the forest are shrinking at the rate of 1.5 million per ha per year (Parthiban *et al.*, 2011). However out of total availability of wood, **near about 62.5% comes from agroforestry sector**, hence putting tremendous pressure on agroforestry and forest wealth (Soujanya Srivastava and Saxena, 2017). **Therefore, it is an imperative now to preserve the tree resources on farmlands** and manage them sustainably so as to ensure livelihood security of the marginal farmers. With view to harness the degradation and overexploitation of forest resources in Agroforestry systems, its periodic monitoring is essential. **The Criteria and Indicators (C&I) is one of the world-recognized tools for SFM.**

Objectives

- Identify set of criteria and indicators for Sustainable Management of Agroforestry systems practiced in Akola district, Maharashtra, India and.
- Study the factors responsible for increase and decrease value of indicators

Methodology

Study area :

The present study was conducted in Patur Block of Akola district in Vidarbha region of Maharashtra, India (Fig 1)

Methodological frame work for C&I

The **modified methodological framework of IIFM, Bhopal were used** for evolving criteria and indicators for sustainable management of agroforestry system in Akola districts with community participation and different stakeholders together with participatory approach for their data collection and analysis of sustainability.

Filters for C&I

To arrive at the region specific Agroforestry plantation at Akola district level **C&I will be filtered** using the following filters (Fig 2);

Equation for calculating Sustainability Index

$$SI = \frac{\sum \{(WC1 \times C1), (WC2 \times C2).....(WCn \times Cn)\}}{\sum \{(WC1 \times WC2.....(WCn)\}}$$

Where,
SI = Sustainability Index,
WC_n = Weight of the nth Criterion
C_n = Score of nth criterion

Results

- The results showed that, out of 12 criteria, 8 criteria were accepted along with 40 indicators and 4 criteria were rejected (Table 1).
- It is observed from the study that data for 10 indicators (25%) were available in records; whereas data on 18 indicators (45 %) need little efforts and 12 indicators (30%) required detail research.
- **In total 8 criteria along with 40 set of indicators had been identified for sustainable management of agroforestry systems in Akola district** (Table 1).
- The similar kind of finding were also recorded by Prasad and Prasad.(2001) and Solanki and Bisaria (1999).
- Further, the data given in Fig 3 and Table 1 revealed that, **the criteria 4 showing highly sustainable condition**, criteria 2, 5 and 7 showing near to highly sustainable condition, where as criteria 3, 6 and 8 showing sustainable condition and **criteria 1 showing unsustainable condition**.
- **The sustainability index for agroforestry systems for Akola District were 7.49** which showed that the performance of the sustainability agroforestry system were had 'Sustainable condition'. Hence, the proper efforts should be taken to maintain the sustainable condition (Table 1 and Fig 3).

Fig. 1 Location map of study area



Fig. 2 Filters used for evolving C&I



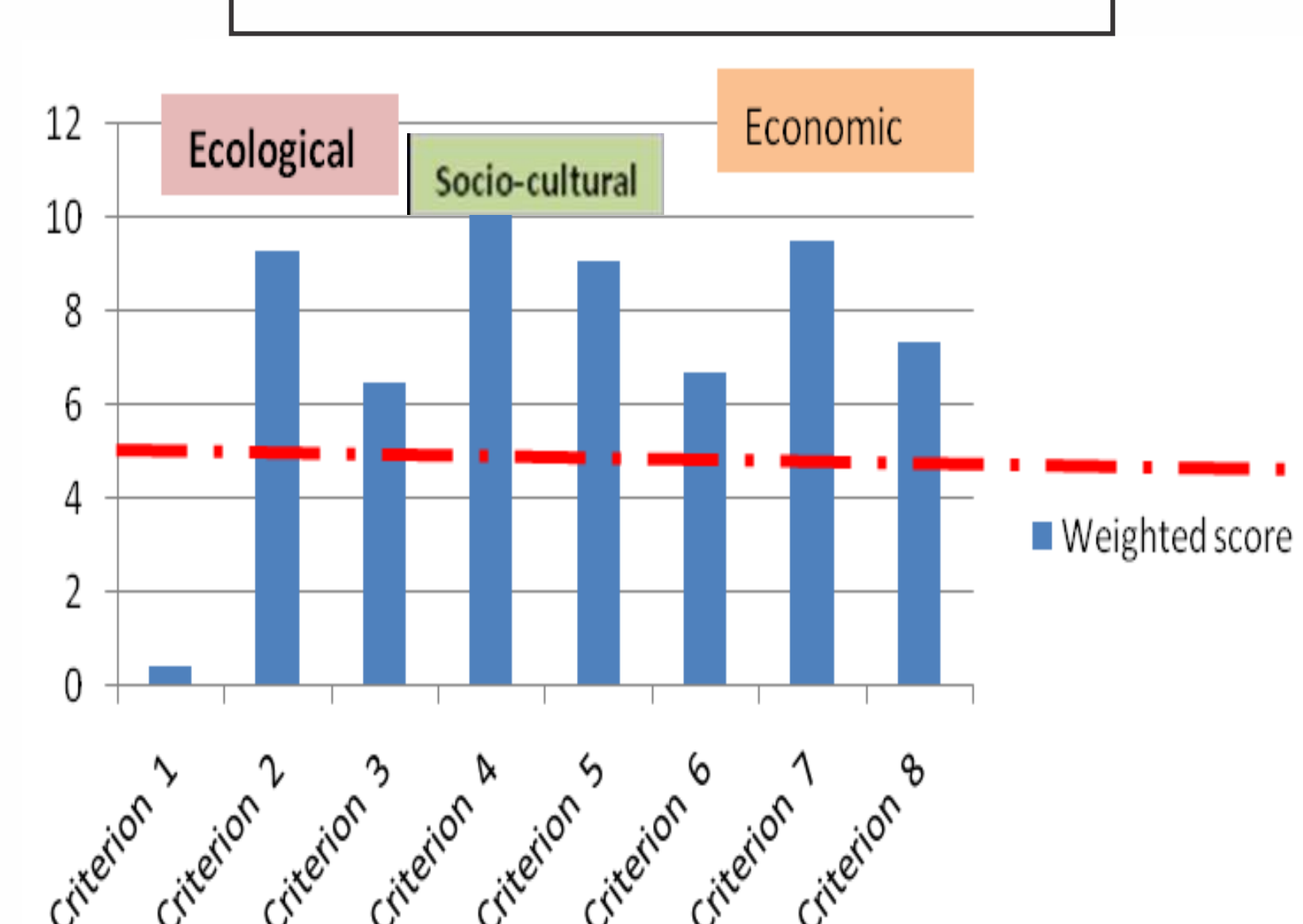
Table 1 : List of Identified criteria and set of indicators for sustainable management of agro forestry systems in Akola district, Maharashtra, India

Category	Sr. No.	Criteria	No. of Indicators	Weighted score
Ecological	1	Increased in the extent of forest resources through agroforestry	02	0.43
	2	Maintenance, conservation and enhancement of area under agroforestry components and biodiversity	05	9.3
	3	Maintenance and enhancement of health of agroforestry ecosystem and vitality	06	6.46
Socio - cultural	4	Maintenance and enhancement of social , cultural and economic benefits	03	11.13
Economical	5	Conservation and maintenance of soil and water resources through agroforestry system	04	9.09
	6	Maintenance and enhancement of productivity of agroforestry systems	04	6.69
	7	Maintenance and enhancement of productive functions and utilization of agroforestry system products	10	9.49
	8	Adequacy of policy, legal and institutional framework for establishment of agroforestry systems and their management on private land	06	7.36
Total			40	

Sustainability Index for Sustainable Management of Agroforestry systems in Akola district - 7.49

Interpretation: The systems is Sustainable (5.01 to 7.50)

Fig. 3 Sustainability Index



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Conclusion

Total **8 criteria and 40 indicators** had been identified for sustainable management of Agroforestry systems for Akola district of Maharashtra, India. Whereas, the performance of the sustainability of agroforestry system in Akola district was found to be 'Sustainable condition'. Hence, proper efforts needed to be taken to maintain the sustainable condition. Further, the outcome of the research were directly benefited to agroforestry farmers, forest dwellers and the government functionary for the assessment of the sustainability of the agroforestry systems in study area. However, **the agroforestry information systems needs to be developed** to determine parameters of a sustainable management and to measure and monitor the trends at the local level over a time period.

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