



# An economic valuation of agroforestry and land restoration in the Kelka forest in Mali

Sustainable land management interventions that can reverse the current trend of forest and land degradation are increasingly necessary, but large scale interventions need to be grounded in solid assessments of their potential economic and financial value to the local and the global society. To address this need, the study presents an ex-ante cost benefit analysis of large-scale agroforestry and reforestation in the Kelka forest in Mopti, Mali to inform decision-makers about the value and importance of changing current land use practices.

## Introduction

The majority of livelihoods in Mali are dependent on rainfed agriculture systems which are vulnerable to events such as droughts, storms, and floods. The frequency of such events is expected to rise; therefore, alternative income sources and livelihoods are of utmost importance for households of Mali, including the Kelka forest.

The Kelka forest in the Mopti region of Mali is important for the provision of ecosystem services like carbon sequestration and maintenance of the hydrological cycle. Due to climatic and human induced factors the forest resources and soil fertility of the forest are declining.

## Method

To assess the potential contribution from agroforestry and reforestation initiatives to societal wellbeing, the authors undertook an ex-ante economic valuation of agroforestry and land restoration intervention scenarios, compared to the present situation in the Kelka forest. The analysis is based on high-resolution remote sensing techniques, an explicit spatially

distributed hydrological model, and a crop growth model, developed to assess the impact of land use change on firewood availability, soil moisture, carbon sequestration, and nitrogen fixation.

To collect relevant baseline information for the study, authors developed a field sampling design to estimate the availability and household dependency on forest resources, and conducted expert interviews to estimate the costs of agroforestry and reforestation. Authors then visited the field site, met with key stakeholders, implemented the field survey, and gathered socioeconomic data. The community had about 90 households, and a total of 85 household heads were interviewed.

On the basis of this cost-benefit analysis, the net present value of Kelka to the local communities as well as to society as a whole is estimated as the sum total of the value of enhanced firewood production, carbon sequestration, nitrogen fixation, soil moisture and water infiltration, less the implementation and management costs, for three different discount rates.

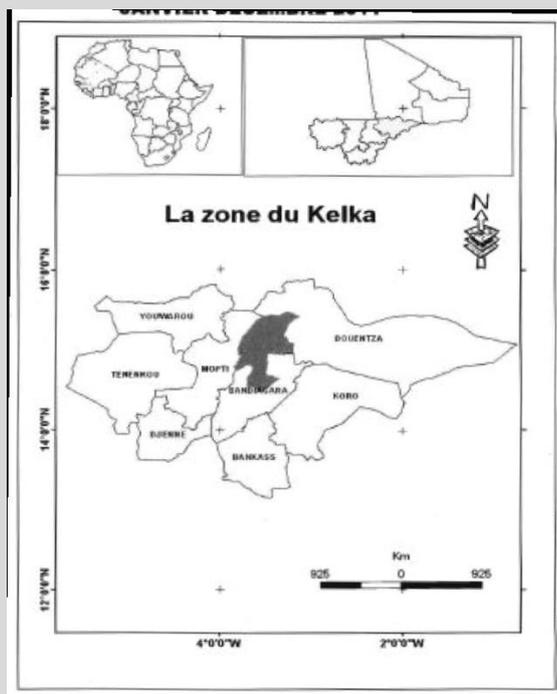


1. Farmer in the Kelka area  
[left]

2. Aerial photography from the  
study area [right]

*Photographies from the main  
publication*

## Kelka Forest in Mopti, Mali



The Kelka forest area comprises more than 300,000 hectares with 15 villages within and around its boundaries.

### Results and Limitations of the Study

The study demonstrates that the benefits of large-scale landscape restoration from acacia reforestation and agroforestry in the Kelka area largely outweigh the costs both at the local and global levels for a time horizon of 25 years. Every invested dollar may create a 6 dollar benefit to local farmers and even a 13 dollar benefit to global society due to advanced ecosystem services and carbon sequestration. Even though the net present values estimated in this study do not include diffuse benefits from agroforestry and are under-estimated rather than full comprehensive benefits. Furthermore, the study was based on simulated climatic data of the past 20 years and does not consider the possible influence of changing climatic conditions.

However, different constraints to the uptake of agroforestry practices remain. Cash-constrained

farmers are unlikely to switch directly to agroforestry if they have to bear the implementation and management costs themselves.

The need to water young trees as well as the impact from wandering animals that do not allow young tree seedlings to develop are some other constraints discovered. At the cultural level another barrier exists: while farm crops are considered the private ownership of the household having planted them, resources from trees on the cropland, such as wood and forage resources, are considered communal property. Due to this reason it is socially unacceptable to exclude other community members from the use of wood and tree forage.

### Main considerations emerging from the study

1. The usefulness of agroforestry practices needs to be practically demonstrated to smallholders in the Kelka forest. Appropriate approaches to agroforestry should be considered, particularly the low cost options provided by farmer-managed natural regeneration (FMNR), to avoid propping up extension with unrealistic subsidies.
2. As some of the benefits of restoration accrue to a broader stakeholder group, benefit transfer mechanism to incentivize the local population should be considered. Also strong institutional arrangements would be necessary to ensure that communities have sufficient incentives to undertake restoration activities.
3. FMNR needs to be expanded in order to work with farming communities and to address constraints at the socio-cultural level. This could ensure farmers to legitimately appropriate the benefits that on-farm trees provide in the absence of outsider encroachment on perceived "public resources".

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