

COLLABORATION FOR ENVIRONMENTAL EVIDENCE

Systematic reviews for conservation and environmental management



CONTEXT

Rates of deforestation and forest degradation are high in many countries. To maintain and enhance the economic, social and environmental values of forests, many nations have devolved full or partial forest management authority to local communities.

Does such Community Forest Management (CFM) supply global environmental and local welfare benefits in these developing countries?

*This question was addressed by a **systematic review** of the accessible scientific peer-reviewed and grey literature. The systematic review takes into account the quality of the research and possible biases, in order to provide a rigorous, transparent, replicable and updatable review of the scientific evidence.*

From the CEE
Library



FINDINGS

Community Forest Management (CFM) does not consistently deliver positive impact on forest cover compared to other management systems.

Tree basal area and stem density were greater in CFM-forests and plantations compared to state-managed or non managed forests, but there was **no consistent effect of CFM on species richness or diversity.**

Too few studies were available to provide consistent evidence of an improvement of livelihoods in local populations under CFM.

There were insufficient data to investigate the relative effects of different types of management used in CFM programmes.

Many factors impacted the results (e.g. activities, history and topography of the sites...).

The shortcomings of experimental design in many studies means that **it is not possible to say whether the positive outcomes reported are due to the project intervention itself, whether they will persist over time, or if they would have occurred anyway.**

BENEFITS OF COMMUNITY FOREST MANAGEMENT

POLICY BRIEF
from
Systematic
Review

CEE 08-011

RECOMMENDATIONS

To build-up evidence, there needs to be consensus on, and standard measurement of, indicators of the success of CFM (including appropriate comparators, timeframe, experimental design, measurement of effect modifiers). This would greatly aid synthesis of its effectiveness.

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Conducted by



Methodology

What was studied?

Forest ecosystems.

What type of intervention?

Community forest management programmes in less developed countries.

What was compared?

Forests/villages with CFM compared to forests/villages without CFM implementation or forests/villages before/after CFM implementation.

What was reported?

- Changes in forest condition, resource extraction, forest cover.
- Livelihoods: income level & sources, social capital, source of fuelwood/time spent collecting, village infrastructure changes.

Protocol of the systematic review :

- Peer-reviewed and grey literature were searched to obtain the largest number of articles addressing the question.**
- Articles relevant to the question were appraised according to the quality of the methodology, the likelihood of biases and how they complied with the standards for good scientific research design, in order to take this into account when drawing conclusions.**
- When included studies contained enough data of the same parameter (e.g. means and variance), a **meta-analysis was conducted** to provide a quantitative synthesis.
- When this was not possible, a narrative synthesis was undertaken. Because they are based on fewer or more diverse studies, conclusions based on narrative synthesis must be examined with caution.**

A narrative synthesis differs from a traditional literature review because it benefits from the previous steps (systematic and explicit search, objective and transparent application of inclusion criteria) of a systematic review as set out in the systematic review protocol (for more details read the full Review referenced at the end of this brief), or refer to the CEE Guidelines (www.environmentalevidence.org/Authors.htm).

RESULTS

The synthesis has been built on research studies published until autumn 2009.

42 articles reported studies with relevant comparisons (90% from peer-reviewed journals, mostly published after 2001) and were included in the review, of which 34 reported data on forest condition or cover, 8 on resource extraction (fuelwood collection and number of cut stems) and 12 on livelihoods (no study examined impacts on wider aspects of welfare, such as health). Some studies measured more than one outcome type.

Only 23% of the studies compared outcomes before/after the implementation of CFM, 77% compared CFM outcomes with alternative management approaches (state management, protected areas, unspecified non CFM management).

CAUTION: SELECTION BIASES AND EFFECT MODIFIERS

Most studies suffer from problems associated with **selection bias**: absence of baseline data before the CFM was imposed, absence of independent replicates, sites sometimes not selected at random but as pairs with no or unclear description of selection criteria and possible leakage of the outcomes of management across the paired sites; no detailed justification of selection of some villages or participants. Only 10 studies investigated **effect modifiers (indirect factors that could confound results)**, e.g. elevation, history of sites, activities, slope, soil type... 13 studies did not report the length of time CFM had been implemented before assessment. The only study analyzing the effect of CFM over time reported a non significant trend in decline in the percentage of cut poles and trees.

TOO FEW STUDIES + TOO MANY EFFECT MODIFIERS/BIASES → impossible to know exactly if the result observed is caused by the CFM intervention itself or the impact of one or several of these modifiers.



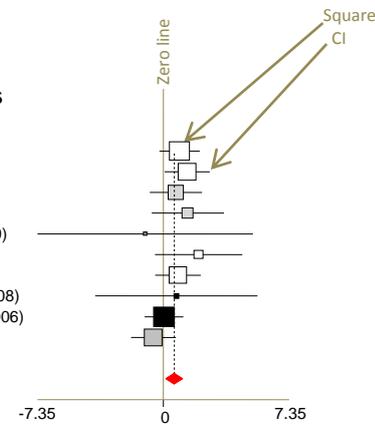
FOREST CONDITION

More data were available on measures of forest condition and these were synthesized in a meta-analysis. Interpretation of these results must be made with caution because of problems of selection bias and other potential confounders.

Basal area of trees

- Aggarwal et al. (2006)
- Aggarwal et al. (2006)
- Blomley et al. (2008)
- Patel et al. (2006)
- Persha and Blomley (2009)
- Sudha et al. (2006)
- Sudha et al. (2006)
- Sudtongkong & Webb (2008)
- Tiwari & Kayenpaibam (2006)
- Tucker et al. (2007)

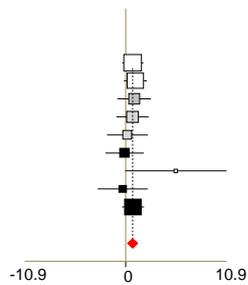
Basal area of trees is greater under CFM by $0.63\text{cm} \pm 0.5$, on average



Tree density

- Aggarwal et al. (2006)
- Aggarwal et al. (2006)
- Blomley et al. (2008)
- Patel et al. (2006)
- Persha and Blomley (2009)
- Nagendra (2002)
- Sudha et al. (2006)
- Sudtongkong & Webb (2008)
- Tiwari & Kayenpaibam (2006)

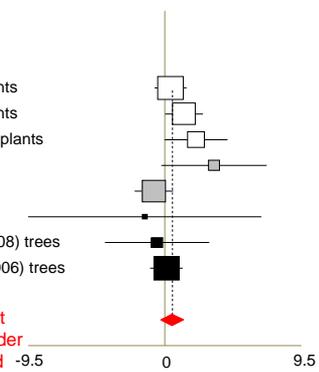
Tree density is greater under CFM by $0.74 \text{ trees} \pm 0.5$ on average



Species richness

- Aggarwal et al. (2006) plants
- Aggarwal et al. (2006) plants
- Mishra & Banerjee (1997) plants
- Patel et al. (2006) plants
- Tucker et al. (2007) trees
- Nagendra (2002) trees
- Sudtongkong & Webb (2008) trees
- Tiwari & Kayenpaibam (2006) trees

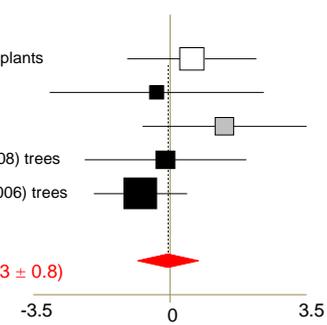
Species richness is not significantly greater under CFM ($+ 0.53 \pm 0.5$) and results are not consistent across studies



Species diversity

- Mishra & Banerjee (1997) plants
- Nagendra (2002) trees
- Patel et al. (2006) plants
- Sudtongkong & Webb (2008) trees
- Tiwari & Kayenpaibam (2006) trees

Species diversity is not modified by CFM ($- 0.53 \pm 0.8$)



Understanding the figures

- Each square ■ represents the standardised mean difference between the parameter measured in CFM and similarly measured in the comparator site.
- The zero line represents a null difference (no effect).
- The size of a square reflects the weight given to each study according to the size or variance of the study sample (larger size = result more reliable).
- The horizontal lines represent the 95% confidence interval CI (variability) around the means.
- The diamond ◆ represents the « weighted average » overall effect of the intervention .

Shading refers to the type of site that CFM is compared with:

- black = state or other management;
- white = no silvicultural management;
- grey = mixed comparator or unclear.

Interpreting the figures

Basal area of trees

10 studies

In 8 out of 10 cases, the mean basal area of trees was greater in forests with CFM (sometimes including plantations) than in their comparators, and no significant heterogeneity was detected. Too few studies were available to tease apart the effect of different management (state management, other, unclear, mixed), but 2 studies comparing a form of CFM with sites with no silvicultural management tended to find larger than average basal area of trees under CFM.

Tree density

9 studies

In 7 out of 9 cases, the tree density was greater under CFM and there was little heterogeneity among studies. Too few studies were available to tease apart the effect of different management (state management, other, unclear, mixed), but studies comparing CFM with no silvicultural management tended to find a larger effect than other studies.

Species richness and diversity

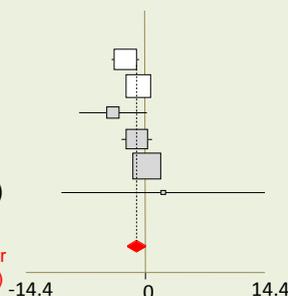
There was no consistent effect of CFM on species richness - 7 studies - or diversity - 5 studies. The variability of the results seemed more important than for the previous outcomes, yet it could not be explored due to insufficient data. Two studies (3 results) suggested a positive effect on richness when compared to the absence of management but the remaining studies (other comparator management) were more equivocal. Similarly, no consistent effect was obtained for diversity when CFM was compared to other forms of management (3 studies).

RESOURCE EXTRACTION (STEM-CUTTING AND FUEL WOOD)



Aggarwal et al. (2006)
Aggarwal et al. (2006)
Patel et al. (2006)
Blomley et al. (2008)
Blomley et al. (2008)
Persha & Blomley (2009)

Stem-cutting is not significantly reduced under CFM (- 1.06 stems \pm 1.13)



Stem cutting was not significantly reduced in forests under CFM but the low number of studies and the variability in comparator conditions may hide effects suggested by the figure.

Only four studies presented data on fuelwood collection and two of these suggested greater collection amounts with CFM.

FOREST COVER

4 studies

Four studies compared percentage forest cover measured using satellite sensing before and after CFM. Three showed an increase in forest cover and one, a slight decrease. Six studies also compared percentage cover with a similar area of forest under alternative management; three studies reporting on deforestation showed a consistent trend that deforestation is lower under CFM, and three studies found only moderate differences in forest cover between the different management systems.

LIVELIHOODS

Articles investigating the impact on livelihoods were very variable in the type of data they collected and presented, which prevented quantitative synthesis.

DATA TYPES WERE GROUPED INTO DIFFERENT CATEGORIES

Financial capital - Income sources : 2 studies

Financial capital - Levels of income: 5 studies

Social capital: 3 studies

Human capital: 2 studies

Physical capital: 3 studies

Cost-benefit analysis of CFM: 3 studies

Extrapolating from the low number of studies and from variable outcome measures must be done with great caution. Most data were on financial capital but these show no consistent evidence that CFM results in increased income. There is insufficient evidence to conclude what effect CFM has on other aspects of local livelihoods or welfare in general.

Please note: the opinions expressed in this document are those of the Centre for Evidence-based Conservation and do not necessarily reflect the views of any persons or other organisations involved in the review.

MORE INFORMATION ...

About this review: Bowler, D., Buyung-Ali, L., Healey, J.R., Jones, J.P.G., Knight, T., Pullin, A.S., 2010. The evidence base for community forest management as a mechanism for supplying global environmental benefits and improving local welfare. *Environmental Evidence* CEE 08-011.

Available at the CEE library: www.environmentalevidence.org/SR48.htm

About systematic reviews: www.cebc.bangor.ac.uk & www.environmentalevidence.org

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NARRATIVE SYNTHESIS

NARRATIVE SYNTHESIS

