More Than Just Carbon: The Socioeconomic Co-Benefits of Large-Scale Tree Planting

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Research and Policy Question

Can large-scale tree planting generate meaningful poverty reduction alongside environmental gains? We evaluate the poverty impacts of the Philippines' National Greening Program (NGP), one of the largest reforestation initiatives ever implemented, which aimed to plant 1.5 billion trees across 1.5 million hectares nationwide from 2011. The NGP paid People's Organizations (POs) – village-level community groups – for three years to establish and maintain forestry plantations, after which communities assumed full managerial control and retained all associated revenues. The program thus embeds a conditional payment for ecosystem services within a public works scheme, creating both short-run wage income and long-run forest assets. We investigate whether this kind of bundled intervention can alleviate rural poverty, and whether the nature of the forest asset planted – productive versus protective – shapes long-run economic outcomes.

Methodological Approach

Using data from 2000 to 2018 and the geolocation of more than 102,000 plantation sites, we link NGP projects to two measures of poverty: official small-area poverty estimates and a novel remotely-sensed indicator based on the proportion of built settlements lacking nighttime luminosity. Since the NGP was rolled out in a staggered fashion across municipalities and villages, we implement the dynamic difference-in-differences estimator of Callaway and Sant'Anna (2021), comparing pre- and post-planting periods between treated NGP units and pools of not-yet-treated or never-treated units. To assess mechanisms, we use repeated cross-sections from the Philippines Demographic and Health Survey (DHS), estimating sectoral employment shifts between 2008 and 2017. Village-level spillover effects are identified by comparing control villages with a treated neighbour against those without, expanding on Ferraro and Simorangkir (2020). Finally, plantation sites are classified into productive (income-generating) species and protection (slow-maturing) zones using project records and official NGP guidelines, enabling a disaggregated analysis of how forest asset type shapes the trajectory of poverty reduction over time.

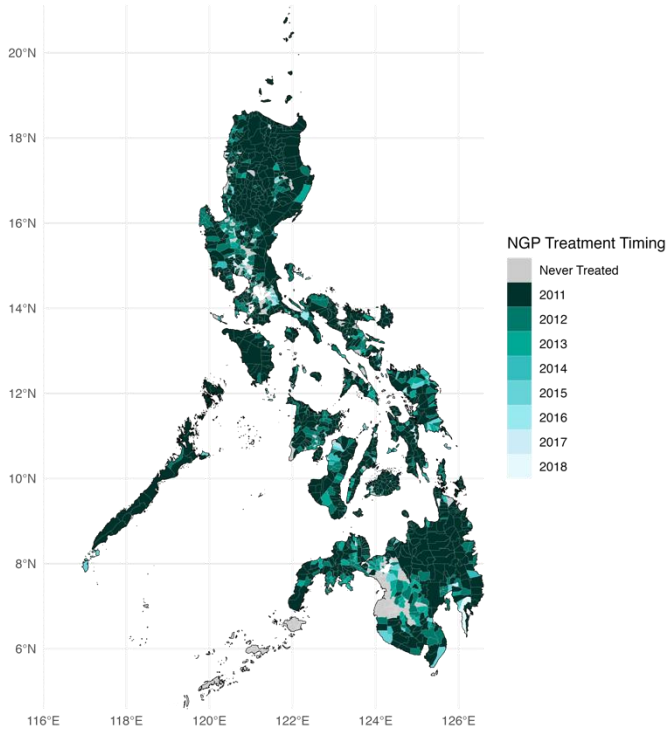

Figure 1: NGP rollout across Philippines' municipalities, 2011-2018

Findings

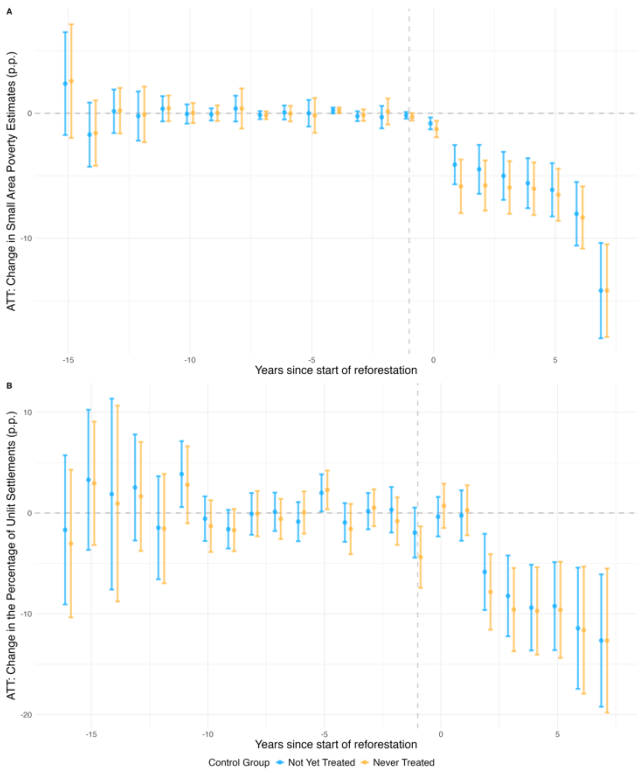

Figure 2: Dynamic DID estimates of the impact of the NGP on small area poverty estimates (Panel A) and unlit settlements (Panel B)

The NGP increased tree cover by 4 percent and generated substantial reductions in poverty. Treated municipalities experience a 6–7 percentage point decline in poverty incidence and a 7–8 percentage point reduction in the share of unlit settlements. Event-study aggregation confirms clean pre-trends and show that effects emerge within the first year of program implementation, deepen during the payment period, and persist beyond it. At the village level, the estimated reduction in unlit settlements reaches 10–11 percentage points. Positive economic spillovers are also detected: control villages neighbouring an NGP site experience a 5 percentage point decline in unlit settlements relative to villages without treated neighbours, consistent with local labour market spillovers. The channels through which the NGP reduces poverty involve labour reallocation: municipalities see a 7.9 percentage point decline in agricultural employment and commensurate increases in unskilled manual labour and services. These structural shifts are accompanied by gains in household income, non-food expenditure, and ownership of durable assets including televisions and refrigerators.

Productive vs. Protection Assets: Disentangling Cash Payments from Asset Transfers

A key contribution is the identification of the relative roles of direct payments and forest asset returns in sustaining poverty reduction. Both productive and protection villages exhibit comparable poverty declines during the three-year payment period. After payments end, however, trajectories diverge sharply. Protection villages plateau and their effects revert towards zero, consistent with the payments-only channel. Productive villages continue to experience significant and growing poverty declines, with the implied effect of forest asset returns reaching 5.5 percentage points by the end of the panel. This heterogeneity confirms that the long-run poverty reduction observed in NGP-treated areas reflects genuine returns to the maturing forest asset, not solely cash transfer effects.

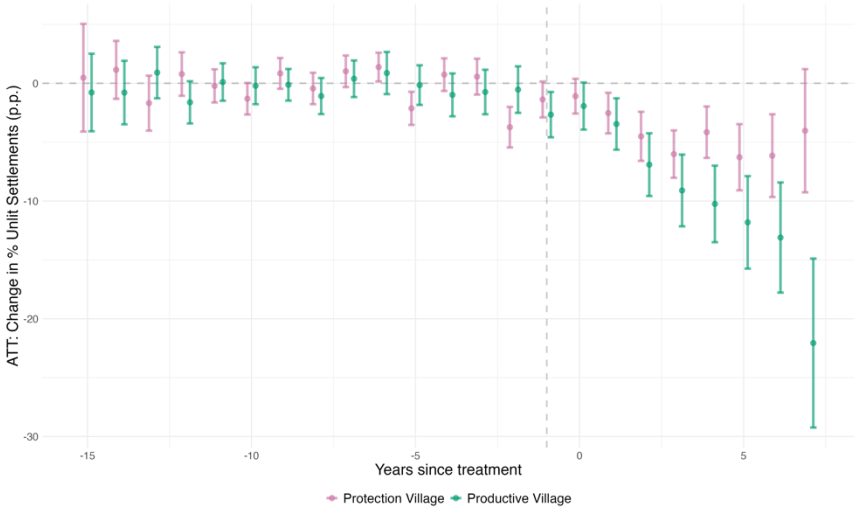

Figure 3: Event-study estimates comparing productive villages (income-generating species) to protection villages (slow-maturing species) for the impact on unlit settlements.

Policy Implications

These results offer three takeaways for the design of nature-based development interventions. First, bundling large-scale tree planting with conditional PES can generate poverty impacts of comparable or greater magnitude to benchmark public works programmes, as evidenced by the similarity of the NGP's effects to India's NREGS. Second, the poverty co-benefits of tree planting may extend beyond the payment window when communities are given managerial control over productive forest assets: designing programmes to include income-generating species can convert short-run transfers into lasting welfare gains. Third, the detection of positive spillovers implies that programme evaluations based solely on treated units may underestimate aggregate social returns. Taken together, these findings suggest that nature-based employment programmes, when designed to combine immediate payments with community ownership of productive natural assets, can serve as effective tools of rural development, with additional environmental and climate co-benefits that conventional public works schemes do not provide.