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Re-Greening Ethiopia: History, Challenges and Lessons

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Abstract: In Ethiopia, deforestation rates remain high and the gap between demand and domestic supply of forest products is expanding, even though government-initiated re-greening efforts began over a century ago. Today, over 3 million hectares (ha) of degraded forest land are under area enclosure; smallholder plantations cover 0.8 million ha; and state-owned industrial plantations stagnate at under 0.25 million ha. This review captures experiences related to re-greening practices in Ethiopia, specifically with regards to area enclosure and afforestation and reforestation, and distills lessons regarding processes, achievements and challenges. The findings show that farmers and non-governmental organizations (NGOs) are the main players, and that the private sector has so far played only a small role. The role of the government was mixed: supportive in some cases and hindering in others. The challenges of state- and NGO-led re-greening practices are: inadequate involvement of communities; poorly defined rehabilitation objectives; lack of management plans; unclear responsibilities and benefit-sharing arrangements; and poor silvicultural practices. The lessons include: a more active role for non-state actors in re-greening initiatives; more attention to market signals; devolution of management responsibility; clear definition of responsibilities and benefit-sharing arrangements; and better tenure security, which are all major factors to success.

Keywords: area enclosure; community; NGOs; markets; plantations; smallholders; tenure

1. Introduction

Large areas of the world's forests have been lost or degraded, and the problem continues unabated. According to the Food and Agriculture Organization of the United Nations (FAO), around 13 million hectares (ha) of forest were converted to other uses or lost through natural causes each year between 2000 and 2010 compared to 16 million ha per year in the 1990s [1] though marked variations are observed across regions. Due to natural expansion and plantations, the annual net forest loss remains at about 5.2 million ha. The overall effect of such a loss and widespread forest degradation is a decline in environmental goods and services, including climate stabilization and loss of biodiversity and reduction in human well-being in general [2]. The fragile state of most tropical forests and the implications of forest degradation and deforestation are widely acknowledged and have been subject of discussion for several decades. Though not adequate to reverse the trend at a global level, various measures are being taken, including restoration and rehabilitation of degraded forest lands. South East Asian countries, notably China and Vietnam, have made significant gains in tree planting initiatives and reduced forest losses. Asia and South America account for 91% of the 4.5 million ha of annually planted area globally. In Africa, plantations are expanding, but at a much lower rate. Between 1990 and 2000, the area of forest plantation in Africa increased by less than 5%, while in Asia it grew by about 20%—from 45 million ha to 60 million ha [3]. In these Asian countries, the state is moving away from forest protection towards creating an enabling environment for non-state actors to play the lead role in plantation forestry [4]. In Africa, studies about forest rehabilitation efforts are scant.

Recently, Ethiopia has begun taking measures to rehabilitate degraded forests and forest lands. Deforestation is severe and has a long history in Ethiopia, especially in the central and northern highlands where subsistence farming and settlements have been changing landscapes for millennia. Most of the remaining natural high forests of the country are found in the southwest, which was remote and inaccessible until recently. Up to the beginning of the 20th century, people and political capitals tackled scarcity of forest products, notably wood, by moving close to forested landscapes [5]. However, in the 1890s, an alternative approach involving re-greening through reforestation and afforestation (RA) was promoted by the emperor of Ethiopia, Menilik-II [5]. This marks the first formal re-greening [6] attempt by the government in the history of Ethiopia.

A number of other factors also justify the need for re-greening in Ethiopia. The country is home to more than 90 million people. Over 90% of the population's energy requirement is obtained mainly from biomass [7]. Unsustainable harvest from natural forests and woodlands has reduced the supply of woody biomass, further widening the gap between supply and demand. The low level of industrial wood supply from in-country production is compensated by a large volume of imports. For instance, in 2010/11 Ethiopian Fiscal Year (that begins on July 7 2010 and ends on July 6 2011), the import bill for wood products reached [8] Birr 1.8 Billion (US\$ 115 million), creating an additional challenge for a country struggling to increase its foreign currency earnings.

There is a growing recognition that deforestation and forest degradation should be reduced. In its strategy document of December 2011, the Government of Ethiopia (GoE) identified the forestry sector as one of the pillars of the green economy that the country is planning to build by 2030 [7]. The government also set the following major targets for the forestry sector: afforestation on 2 million ha, reforestation on 1 million ha and improved management of 3 million ha of natural forests and

woodlands. Through proper management of 5 million ha of forests and woodlands, Ethiopia hopes to achieve 50% of its total domestic greenhouse gas (GHG) emissions abatement potential by 2030 [7]. To this end, the country is engaged in various re-greening undertakings, and plans to scale-up good practices. However, little is known about the effectiveness and sustainability of these re-greening practices. The objective of this paper is to explore the different re-greening practices in the Ethiopian forestry sector in order to capture experiences and distill lessons for governing forest restoration [9]. A review of literature and official reports, as well as discussions with key informants and experts, constituted the major means of generating information used in the study. Although most of re-greening practices covered in the paper do not satisfy the definition of forest restoration, the lessons may guide and improve actual and future programs devoted to assist the recovery of native ecosystems in Ethiopia and elsewhere. While much remains unknown about how these re-greening practices could be modified to enhance restoration objectives, this paper proposes options to make forest systems more sustainable.

2. Drivers, Agents and Objectives of Re-Greening Practices

In Ethiopia, demand for wood is increasing owing to population and economic growth. However, domestic supply continues to decline due to deforestation and low level of investment in plantation forests. Consequently, the gap between supply and demand is expanding. This has been perceived for many years and led to government-initiated re-greening efforts by the end of the 19th century. The principal drivers are: the rising demand and dwindling supplies of forest products; and increased recognition by policy makers of the importance of expanding forest cover to increase the supply of forest products, conserve biodiversity and reduce the decline in forest-based ecosystem services.

Though one would expect the state to be the lead agent in re-greening, it is mainly non-state actors, notably non-governmental organizations (NGOs), and farming households that are playing the major role in Ethiopia. The state influences the actions of these agents through its institutions and legal framework. In some cases, the state's policies are supportive of re-greening undertakings, while in other cases they are obstructive, e.g., rules constraining transportation of wood products from selected indigenous trees. Re-greening practices driven by NGOs and bilateral and United Nations (UN) agencies primarily emphasize environmental rehabilitation, while farmers undertake re-greening activities largely for economic gains with little, if any, focus on ecological objectives.

Why do non-state actors emphasize environmental objectives in their re-greening projects? The extent and severity of land degradation in Ethiopia is unprecedented. Major land-cover changes resulting from improper practices are taking place on the rugged topography that characterizes most of the Ethiopian highlands, which have accelerated land degradation and soil erosion. This has left vast areas severely degraded, while the loss of fertile topsoil, estimated at 1 billion cubic meters (m³) per year, significantly reduces agricultural productivity and continues to threaten food security at household and national levels [10]. An earlier estimate by FAO [10] put the degraded area on the highlands at 27 million ha, of which 14 million ha are very seriously eroded and 2 million ha of the seriously eroded lands have reached a point of no return. This large-scale land degradation and its impact on agricultural productivity are believed to have contributed to the catastrophic famines that hit Ethiopia following droughts in the 1970s and 1980s. Consequently, UN agencies, notably the World Food

Programme (WFP), alongside environmental NGOs, led initiatives for soil and water conservation as well as for forest land rehabilitation. Some of these rehabilitation projects later became national programs run by the government with financial assistance from donors. An example is the MERET Project (Managing Environmental Resources to Enable Transitions to More Sustainable Livelihoods Project), a national land rehabilitation program of the government supported by WFP. This also set the stage for a national Sustainable Land Management Program led by the Ministry of Agriculture and supported by a coalition of donors.

3. Major Types of Re-Greening Practices

Though re-greening practices in Ethiopia are diverse, this paper grouped them into two broad categories: area enclosure and afforestation/reforestation. Area enclosure is the dominant type of re-greening practice promoted by NGOs, as well as by multilateral and bilateral donors, on degraded lands whereas afforestation/reforestation includes small-scale and industrial plantations. Recently, the government has also begun promoting area enclosure activities across the country. These activities seek primarily to rehabilitate degraded forest land and its biodiversity, and ensure a continued supply of forest products and services. On the other hand, afforestation/reforestation activities through small-scale plantations are re-greening practices initiated and run by farmers themselves. Small-scale plantations mainly on degraded lands have become important particularly since the mid-1990s, while industrial plantations are still project-based state initiatives. The government continues to encourage industrial and peri-urban plantations to meet national industrial, construction and fuel wood demands.

4. Attributes, Challenges and Achievements of the Major Re-Greening Practices

4.1. Area Enclosures

Area enclosure is one of the most widespread forms of re-greening in Ethiopia today. It involves protecting areas mainly through social fencing from any form of cultivation, cutting trees and shrubs, or grazing by livestock. This is meant to allow regeneration and foster natural ecological succession for the rehabilitation of deforested areas or degraded forests. Two types of area enclosure management are observed. The first one involves no additional management activities other than protecting enclosed areas against livestock and human interference. Ecological succession will occur from buried or dispersed seeds. The second type, which is the most common, involves planting of seedlings (exotic or indigenous species), aerial seeding and construction of soil water conservation structures to speed up succession through the modification of microclimatic and soil conditions. Besides producing wood for subsistence and markets, planted trees create an environment conducive for nursing some indigenous tree species. As a result, diverse woody and non-woody plant species re-emerge, landscape greenness increases, soil erosion declines, sediment deposition downstream declines and water infiltration and stream discharge increase [11–15]. As the enclosure age increases, the density of woody species rises and canopy cover expands, suppressing herbaceous plants. Farmers find this discouraging since it significantly reduces the volume and quality of livestock feed harvested from area enclosures.

Re-greening through area enclosure is employed in a wide range of forest ecosystems—from dry forests and woodlands to the sub-humid Afromontane forests. In 1996, there were only about 143,000 ha of enclosure in Ethiopia [16]. However, in Tigray regional state alone the area under area enclosure reached 895,220 ha in 2011 [17]. Regional states are rapidly increasing areas put under enclosures, and by the end of 2013, enclosures covered 1.54 million ha in Tigray [18] and 1.55 m ha in Amhara [19].

4.2. Governance of Area Enclosures

Most area enclosures were not initiated either by the state or by communities, but were rather driven mainly by aid agencies and NGOs. At the beginning, there was little or no involvement of communities in defining the objectives and the course of the process. Prominent actors in this regard have been the WFP, the German aid agency GIZ (*Deutsche Gesellschaft fuer Internationale Zusammenarbeit*) and, more recently, NGOs associated with the ruling party like the Relief and Emergency Society of Tigray and the Organization for the Rehabilitation and Development of Amhara.

The soil and water conservation works associated with most area enclosure initiatives require huge labor investment, and need support to cover at least part of this cost. If not, these large-scale re-greening attempts are not feasible [16]. Over the last three years, the government has begun mobilizing communities to secure free labour during the dry season to undertake massive soil and water conservation work in their respective watersheds, and to plant rehabilitated areas and open spots in the watersheds with tree seedlings. Official reports indicate that annually large areas of land are rehabilitated and planted with hundreds of millions of seedlings. The value of farmers' labour in rehabilitating degraded lands and planting them with tree seedlings during the dry season of 2013/14 Ethiopian Fiscal Year, was estimated by the Ministry of Agriculture to be Birr 10 billion (~0.5 billion USD).

The management of area enclosures remains largely top-down. During the socialist *Derge* regime (1974–1991) government agencies made decisions, and communities were simply informed and expected to collaborate. Although the approach has changed slightly since 1991, proposals for area enclosures still come usually from government agencies or NGOs, and communities are consulted with the expectation they will agree to such proposals. Sites are supposed to be selected jointly, by involving communities, but development agents (DAs) of the District Office of Agriculture together with *kebele* (the lowest administrative unit in Ethiopia) administrators reportedly dominate the process. Consulting with farmers implies convincing them to implement the development programs planned by the government in federal or regional capitals [20,21]. This is partly because government sets targets (e.g., areas under area enclosure) that the district and *kebele* administrators have to meet. Thus, local authorities tend to push farmers to participate in such initiatives and to fulfill quotas imposed centrally upon them. Under certain circumstances, local authorities use strategies to ensure that households participate in these undertakings. Some use their administrative power on those who fail to participate to reduce their benefits from government support programs or to limit their access to credit and agricultural inputs [22]. This undoubtedly affects the outcome and sustainability of area enclosures.

Some enclosures are protected by guards paid by contributions made by communities managing area enclosures [22]. In addition, check points are established along roads to discourage transportation of wood from enclosures. Communities are allowed to use grass through cut and carry, and to harvest

honey from bee hives placed inside area exclosures. Nearly all area exclosures lack management plans, and little work has been done to find out options to improve management of exclosures to speed up their re-greening process and also their economic returns. Hence, one would expect limited annual growth and low yield levels. Also, systematic studies are lacking to determine whether current incentives alone would outweigh the cost of establishing and managing exclosures and meet the expectations of communities involved.

Some believe that allowing communities to use exclosures will simply destroy them, and rehabilitating the environment needs to be seen as separate from people [22]. This does not seem to be the view of regional states [23]. For instance, in Tigray some 63,000 ha of hillside areas under exclosure have been taken from the community and allocated to landless youth to manage and use [18]. This, however, has been identified as a possible disincentive for engaging communities in area exclosure activities in the future. On the other hand, the Amhara Regional Bureau of Agriculture reported having transferred the management and ownership rights of 27,800 ha of state-owned plantation forests on degraded lands to the communities that were involved in their establishment and protection [19].

Based on experiences in area exclosure management, the following points are suggested to enhance the effectiveness of practices:

- i. Policy makers and practitioners need to move from a purely environmental orientation towards also ensuring socio-economic benefits, since unmet community expectations are likely to be major challenges for sustaining area exclosures [24,25]. In some areas, communities complain that closing off area exclosures for many years is affecting their livelihoods negatively [22].
- ii. All exclosures need to have negotiated and clearly defined objectives, as well as agreed-upon management plans. Currently, neither communities nor the government agencies know for how long the areas will remain closed, how they will be managed for better economic and ecological outcomes, and what indicators should be used to measure socio-economic and environmental gains.
- iii. Devolving responsibilities to lower levels of community organizations are likely to result in better area exclosure management. Area exclosures are managed at various levels of community organization, ranging from individuals, to village, *kebele* or district levels. These different levels vary in their degree of effectiveness to facilitate collective action. Gebremedhin *et al.* [24] reported that collective action was stronger and socio-economic benefits greater, among smaller groups such as villages than among higher-level ones such as districts. Consequently, most communities prefer to divide communal lands into smaller individual plots for better management, including tree planting [25,26]. This indicates that cooperation for re-greening practices is likely to be more effective among small groups as the members tend to be more homogenous.
- iv. The management and user rights aspects of area exclosures need to be defined better and formal agreements made between government agencies and communities regarding their respective rights and responsibilities. Increased conflicts are reported between members of communities regarding access to and use of area exclosures and in recognizing and protecting their boundaries [17]. Recently, some regional states began allocating area exclosures to landless youth. This is likely to cause disappointment among communities that established and managed these area exclosures. This will also discourage communities from participating in such re-greening practices in the future.

- v. Dependency on external support needs to be reduced. The activities of external organizations assisting the establishment and management of area exclosures may, under certain circumstances, reduce local effort to engage in re-greening activities as communities may expect external support to initiate and sustain collective actions in establishing and managing area exclosures.

4.3. Afforestation and Reforestation

The total area of plantation forests in Ethiopia is estimated at 972,000 ha (Table 1). Afforestation/reforestation (AR) practices are meant primarily to increase the supply of wood products in the country. These practices comprise mainly three forms: industrial plantation, peri-urban energy forestry and small-scale plantations (Table 1). The former two are mainly government-driven, while the third is undertaken principally by farming households.

Table 1. Area under Plantation Forests (ha) in Four Major Regional States of Ethiopia (Source: [27]).

Regional State	Industrial Plantations	Non-industrial Small-scale Private Plantations	Peri-urban Energy Plantations	Total
Oromia	78,800	27,800	26,700	133,300
Amhara	44,600	639,400		684,000
Southern Nations, Nationalities and Peoples	27,300	64,000		91,300
Tigray	39,700	23,700		63,400
Total	190,400	754,900	26,700	972,000

Major industrial plantations are found in south-central and south-western regions, while peri-urban plantations were established around major cities such as Addis Ababa, Adama, Dessie, Gondar and Bahir Dar, with support obtained from the United Nations Development Programme (UNDP), the Swedish International Development Agency (Sida) and the World Bank. In some cases, industrial plantations were established on degraded forest lands bordering remnant natural forests such as Munessa Shashamane and Belete Gera forests. These plantations had dual objectives of providing round industrial wood and reducing pressure on natural forests.

Small-scale plantations have expanded, especially since the 1970s when the number of farming households planting trees began increasing significantly [25,26]. These plantations cover an estimated area of 754,900 ha (Table 1), making the rural landscape greener than it was some decades ago. They supply the largest volume of wood products used in the construction sector (such as poles and posts) and a significant portion of the biomass fuel consumed in the country. Small-scale plantations are established for two purposes: to satisfy household demands for wood and to generate additional household income from sales. For instance, in the Arsi highlands of central Ethiopia, wood from *Eucalyptus* grown by smallholder farmers contributes to 92% of the poles, 74% of the timber, 85% of the firewood, 40% of the charcoal, 83% of the posts and 91% of the farm implements used by a rural household. It also accounted for 74% of firewood, 100% of poles, 100% of posts and 21% of charcoal coming to Huruta town on market days from surrounding rural areas [28]. Income from *Eucalyptus*

sales contributes on average up to 25% of total household annual cash income [28–30], and for poor households up to 72% of the total annual cash income [28], which is the largest non-agricultural source of household income [31,32]. In some areas, high rate of return from plantations compared to other farm enterprises [26,31] is leading to the conversion of croplands and grazing fields to *Eucalyptus* woodlots [33]. Also, having a woodlot of *Eucalyptus*, bamboo and other tree species accords a household head good societal respect, better self-esteem and pride. For instance, among the Gurage community in southern Ethiopia having a *Eucalyptus* woodlot bestows a considerable reputation and social value to the owner, and this reputation grows as the size of the woodlot increases [34]. According to Gemechu [35], some farmers are also inspired to have woodlots by observing others who planted it, and to secure societal respect besides economic returns.

A limited number of species from four genera (*Eucalyptus*, *Cupressus*, *Pinus* and *Acacia*) account for the majority of plantation forests in Ethiopia. *Eucalyptus*, in particular, covers more than 90% of the total planted forest area in Ethiopia [27]. Typical biological attributes that attract farmers to *Eucalyptus* include fast growth, coppicing ability, ease of management (such as non-palatability to cattle), established market demand for its wood, its ability to grow well even on degraded landscapes and its better growth performance than most indigenous tree species on degraded lands [31]. Moreover, farmers with limited farm sizes plant *Eucalyptus* in high density—up to 40,000 stems per hectare [28,33]—and yet stands show relatively good growth performance. *Eucalyptus* is also the first exotic tree species to be formally introduced to Ethiopia [5]. Since its introduction in the 1890s, its area coverage has expanded from about 5000 ha [36] to 894,240 ha in 2011 [27]. Close to 60 different species of the genus are reported to have been introduced to Ethiopia, but *E. globulus* and *E. camaldulensis* are the most widespread of all.

The dominance of exotic species in plantation development is also related to legal constraints. Policies to manage natural forests are mainly conservation-oriented. Thus, local communities are not allowed to use wood from natural forests for commercial purposes. They can use non-timber forest products (NTFPs) only. Harvesting and transporting of woods from some indigenous trees, including high-value indigenous timber tree species such as *Cordia africana*, are prohibited. Proponents of this restriction argue that in the absence of guidelines or a certification scheme to help distinguish between timber harvested from natural forests and that produced from trees on-farm, lifting restrictions would simply aggravate deforestation of natural forests. On the other hand, having indigenous species in plantations remains a disadvantage as farmers are prevented from harvesting and selling native timber. This is the case even though farmers have the knowledge to raise seedlings, plant and tend them, and that the economic value of these species in the long term could outweigh that of exotics. Ownership of indigenous trees outside forests, such as those on communal grazing lands, is also vaguely defined. Such policies discourage farmers from growing native timber species on their farm lands, and force them to continue planting mainly exotic species.

In contrast, recent changes in legal frameworks are having strong positive effects on re-greening. Prominent among these legal instruments is the Rural Land Administration Proclamation that improved tenure security among farming households through agricultural land registration and certification. As tenure insecurity was among the major deterrents for tree planting in the past [37], land certification improved the sense of tenure security, which in turn led to more tree planting [38–40]. Holden *et al.* [40], for instance, report a positive relationship between land certification and investment

in land management, including tree planting. Similarly, Gebreegziabher *et al.* [38] note that tenure security is one of the major factors that positively and significantly affects tree planting and the amount of trees planted by rural households in Ethiopia. The forest policy, issued in 2007, also encourages tree planting as it proposes tax incentives to farmers for planting trees. Fearing that plantations will expand and take over productive agricultural fields, some regional states discourage farmers from planting *Eucalyptus*. These measures are not popular with farmers, and researchers are challenging their rationale. Recently, however, emergence of insect pests affecting *Eucalyptus* seedlings [41] has raised the concern of authorities and farmers. Thus, the challenges associated with the expansion of mono species plantations need to be identified and addressed.

5. Conclusions and Implications

5.1. Conclusions

Assessment of the major re-greening practices and their performance in Ethiopia reveal the following:

- i. Ensuring that re-greening practices generate sufficient economic incentives for communities is key to their sustainability. If re-greening is only for environmental goals, it is less likely to encourage the participation of communities, especially the poor. Poor households can hardly afford to lose short-term economic gains for long-term environmental benefits unless they are properly compensated for that loss. When individuals are likely to generate direct and tangible benefits, they will be motivated to participate in re-greening initiatives, be it individually or collectively. Also, community participation needs to be inclusive and equitable.
- ii. Getting the policy environment right is crucial. The commitment of the Government of Ethiopia to rehabilitate degraded lands is indicated in recent documents such as the Climate-Resilient Green Economy Strategy, the Rural Land Administration Proclamation and the current five-year development plan. Policies like land certification are having a strong positive effect on re-greening practices. Better tenure security, clear user rights, and devolution of responsibilities to lower levels of organization (individual household or smaller community) help facilitate collective action for better re-greening initiatives in communal systems.
- iii. Market signals play important roles. Markets have been the major driving force behind the expansion of small-scale plantations across the highlands of Ethiopia. High return on investment in plantations is driving the conversions of even farm and grazing lands to woodlots in some areas in the central and western highlands. In some cases, however, markets—especially the labor market—may negatively influence plantations by increasing the opportunity cost of labor.
- iv. The role of non-state actors was important in re-greening Ethiopia. The non-state actors, notably NGOs, played a key role in initiating and supporting re-greening practices, notably area exclosures. NGOs also advocated for policy reforms. However, since they were hardly learning from each other, some contradictory messages were given to communities and policy makers (e.g., on harvesting wood from natural forests). This undermined their capacity to help policy makers make informed decisions.

5.2. Implications for Policy and Practice

Based on the findings, the following measures are suggested to improve policy and practice to enhance the effectiveness of re-greening practices:

- i. Policy makers need to consider the likely impacts of allocating communally-managed area exclosures to individuals. Recently, some regional governments have started to allocate to landless youths area exclosures that have been rehabilitated and managed by local communities. This could erode the trust of the community in the government in terms of ownership arrangement of area exclosures, and may affect their willingness to be engaged in re-greening communally-owned but degraded forest lands in the future. Thus, we recommend closer examination of the impacts of such exercises.
- ii. The influence of the current policy and the prevailing market signals on re-greening practices and on the sustainability of impacts needs to be investigated further. Policies that encourage farmers to plant indigenous tree species and enable them to sell native woods from sustainably managed plantations or restored forests are needed, along with a mechanism of control so that such policies do not aggravate degradation and deforestation of natural forests.
- iii. More incentives should be put in place, especially in terms of access to land and credit, to encourage private sector engagement in re-greening practices. Value-added processing options to increase returns from re-greening practices need to be explored and supported.
- iv. Linking research to policy should be given special attention and knowledge needs to be translated into practice to enhance effectiveness, efficiency and equity aspects of re-greening practices.
- v. Re-greening practices in Ethiopia lack coordination, both technically and managerially. Capacity building on restoration research in general, and on nationally important re-greening practices in particular, is critically needed. This would enable measures to enhance economic returns to communities and help identify, test and promote options to better achieve restoration objectives. Studies so far are exploratory and simply describe current vegetation succession, and how to speed it up. Also clearly lacking are indicators of success, and key silvicultural practices for management plans. Such practices could guide operations to enhance succession of vegetation types, as well as ensure benefits to local people and the environment. Re-greening practices must provide optimum ecological and socio-economic benefits. Achieving these objectives by managing trade-offs requires concerted efforts of researchers, development practitioners and policy makers.

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Author Contributions

Both authors contributed equally in writing the paper and approved the accepted version.

Conflicts of Interest

The authors declare no conflict of interest.

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