



Pressing the Imperata grasses using a lodging board is an easy and labour-saving technique. Photo by CO² Operate BV/B Angkawijaya

CHAPTER 29

Community Management for Agro-reforestation Under a Voluntary Carbon Market Scheme in West Sumatra

Paul Burgers and Ai Farida

Highlights

- Carbon payments can be an effective means to restore productive forest landscapes
- Indigenous structures, rooted in local contexts, can adapt to performance-based interventions
- Egalitarian cooperatives improve performance-based ecosystem rehabilitation. Combine short term profits and long-term sustainability to restore agroforests
- Assisted Natural Regeneration with tree planting accelerates forest restoration

29.1 Background

Land rehabilitation and improving the economies of communities living in and around degraded forests and other land-sector domains, such as agriculture, received a prominent position in the national Low Emission Development Strategies (LEDS). Landscape rehabilitation is to be achieved by restoring ecosystem functions and sustainable forest management (including social forestry) in degraded areas through the active participation of the private sector, civil society organizations, local communities and vulnerable groups, especially adat communities and women, both in the planning and implementation stages¹.

Estimates show that the forestry sector and land-use change in Indonesia contribute 53%–85% of Indonesia's total annual carbon emissions. Under the Indonesian climate plan, the Intended Nationally Determined Contribution (INDC) states that the Indonesian government aims to reduce emissions by 29% (i.e. 835 Mton CO_{2e} by 2030 compared to the Business as Usual (BaU) scenario. The term 'degraded' has been used in multiple contexts in Indonesian law and policy. It generally denotes land that contains less than 35 MG of carbon per hectare, or land that is legally designated as degraded^{2,3}. This chapter provides lessons on field experiences of agro-reforestation on degraded lands in designing and implementing a voluntary carbon market scheme with the indigenous communities in West Sumatra, Indonesia.



After 5 years, a dense foodforest has been established, providing wildlife habitat functions as well.

Photo: CO² Operate BV/Paul Burgers

29.2 Lake Singkarak in West Sumatra

West Sumatra province is one of the pilot provinces which joined Indonesia's effort to stop forest loss and enhance carbon sequestration through forest restoration and restoring ecosystems on degraded land. The province has a total area of 4.2 million ha, some 2.3 million of which are categorized as 'forest land', which includes degraded forest land. In addition, approximately 1.9 million ha of critical land lies outside 'forest lands'. The provincial government understands that rehabilitation efforts are equally important on non-forest lands, in particular where it concerns environmentally-critical areas covered with *Imperata* grasslands and impacts on the socio-economic conditions of local communities.

In line with the Indonesian and global climate change policies, a Dutch-based social enterprise named CO² Operate, has been running a Voluntary Carbon Mechanism (VCM) scheme in West Sumatra's Singkarak Lake watershed since 2009. The scheme is entirely financed through private-sector carbon offsetting as part of their environmentally conscious manufacturing activities. The Singkarak watershed covers 129 000 ha and is one of three high-priority watersheds for conservation in West Sumatra. It provides important ecological functions relating to biodiversity protection, socio-economic and hydrological functions.

Rice production is very important along the shores of the lake. At the end of the lake, the water supplies a 175-MW hydro-electricity power-plant⁴. Before its arrival, the surrounding hills were used for mixed-tree cultivation. Clove trees, fruit trees and government-sponsored pine trees were most common. Nowadays, the hills are treeless, covered with *Imperata* grasslands. Pests and wildfires killed the trees, while local people claimed that soils dried up after pine was planted⁵. Increased water run-off and soil erosion are major problems, severely affecting the environmental functions of

the watershed. This is aggravated by increasingly erratic rainfall patterns, caused by a changing climate.

In close collaboration with the Forestry Department and other local Indonesian partners, the VCM scheme brings back tree cover to restore ecosystem functions on the degraded slopes. A combination of Assisted Natural Regeneration (ANR) and tree planting brings both environmental and livelihood improvements. In short, ANR gives small native trees a chance to grow among *Imperata* grass, which normally competes for light and nutrients with the young trees. This competition can be diminished by pressing the *Imperata* grass around the small trees down with a lodging board. Two years later, the native trees will stand over three metres tall, providing a favourable micro-climate for the economically valuable trees that farmers choose to plant. Mixtures of clove, fruit and timber trees are most common. These continue to grow into a thick forest-like structure after 4–5 years.

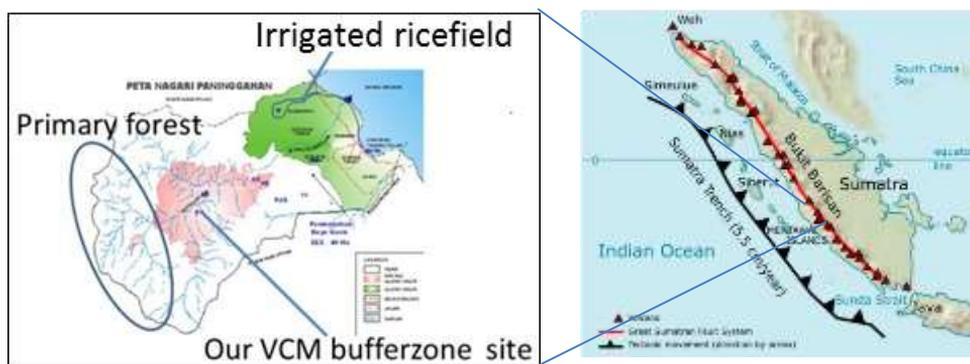


Figure 29.1 Location and hydrology map of Paninggahan village area

Sources: http://commons.wikimedia.org/wiki/File:Sumatra_Volcanoes.png; ICRAF SE Asia: RABA assessment report Paninggahan (unpublished)

29.3 Governing the lands: conflicting social relations

The stakeholder rainbow diagram below (Figure 29.2) represents the most important stakeholders and to what extent they affect, or are affected by, the VCM scheme. Firstly, CO² Operate will invest the carbon payments on behalf of the private-sector clients. The clients sign a carbon contract for five years. Annual carbon payments, made at cooperative level, allow farmers to bridge the income gap until year five, when various trees reach their productive stage. During the initial negotiation phase with the community, using Free Prior and Informed Consent (FPIC), farmers negotiated that annual carbon payments instalments should change. Instead of receiving tranches of 20% each year, farmers now want 60% of the total investment to be paid in year one, and gradually decreasing to 5% at the end of the fifth year when they can live off the land.

The VCM scheme was the first real-life carbon-trading scheme in Indonesia. It closely followed Indonesian climate change policy, earning it strong support from the authorities in dealing with procedures, permits and even seedling provision. The scheme is implemented on village land. The Minangkabau society of West Sumatra adheres strongly to indigenous ‘Adat’ law to govern the land. This indigenous system of land use and land delineation is recognized by the Indonesian government. In this respect, an Adat village council represents its people and works for overall prosperity of the village (‘nagari’). Negotiations on land use and tenure could therefore concentrate on the smallest, most affected and most affecting stakeholder ‘rainbow’, the nagari level, working directly with the Adat council and the farming households.

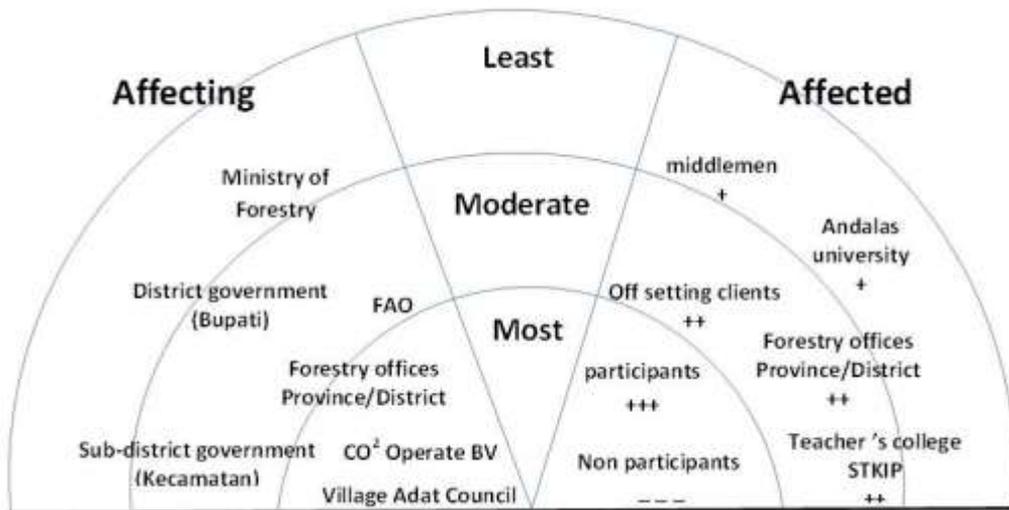


Figure 29.2 Stakeholder rainbow diagram and degree of affecting or being affected by the VCM scheme. Source: Burgers, Iskandar et al 2015⁶

~~**Figure 20.2** Stakeholder rainbow diagram and degree of affecting or being affected by the VCM scheme~~

The VCM institutional set-up was also discussed during the FPIC phase. Farmer groups were set up and coordinated by members of the Adat council. During the implementation phase, it emerged that the strong, hierarchical Adat chieftaincy has made individual farmers reluctant to discuss their growing discontent with the performance of the VCM scheme. One year later, discontent turned into open conflict with the Adat authorities. Seedlings, provided for free by the Forestry Department to support the VCM scheme, were not distributed by the Adat council members because of the growing disagreements. A lack of maintenance caused all seedlings to die in the compound of the office of 'wali nagari' (village head and member of the council). In a very emotional village meeting, the farmer-participants forced the council members to resign from the VCM scheme. The farmer groups suggested a democratic and transparent agreement with CO² Operate only.

The village council was taken out as a direct beneficiary of the scheme, but would continue to play their usual role of solving potential land tenure issues in the future. The farmer group members reorganized themselves with strong horizontal social relations (neighbours, relatives, friends, extended family members). The leader of each group was chosen by the group members. This allowed them to freely discuss any subject with each other, including those who were not performing well. With every new carbon contract, the cooperatives discuss, select, add or replace members.

Together with CO² Operate's field staff, the cooperatives have also achieved official cooperative status through the local government. This enables each cooperative to open a bank account. Carbon payments are thus made directly into the cooperative account. Performance is now beyond expectations.

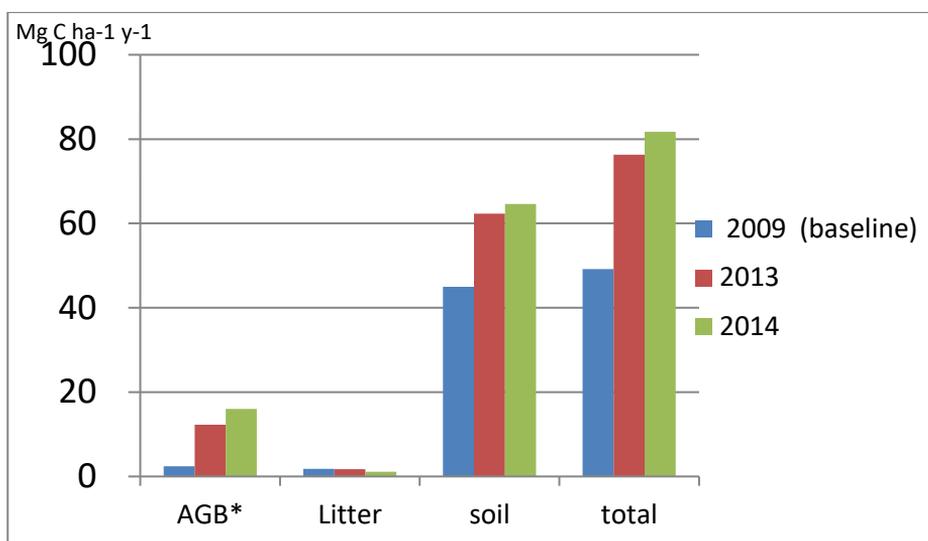


Support from the Forestry Department focuses on village nursery establishment and management.
Photo: CO² Operate BV/Paul Burgers

29.4 Carbon sequestration, biodiversity enhancement and livelihood improvement

Good management, together with the effects of ANR treatment showed good tree growth, allowing for quick gains in above-ground (ABG) carbon sequestration. The pressed *Imperata* grasses form a thick isolation blanket. The decaying grass adds nutrients to the soil, reduces soil temperatures and maintains soil moisture. Circular plots were used for above-ground biomass (AGB) measurements, analogous to a method developed by van Laar and Arparslan Akca⁷. Below-ground biomass (BGB) was estimated using the approach developed by Hairiah et al (2011)⁸. For uplands, a root shoot ratio of 10:4 is used, meaning that BGB is about 40% of the AGB. Soil samples were taken and analysed for carbon content in the laboratory of Andalas University, Padang. In the first five years, no less than 32.5 Mg of carbon were sequestered on one hectare (Figure 29.2).

Now that a thick forest has established on more than 30 ha of land, another interesting development unfolds. Ever more native plants and wild animals are found in the site. The camera traps that have been installed show various types of birds (including pigeons, owls and eagles), wild boar, various types of monkeys, small and large deer. The site is also frequently visited by the Sumatran tiger. The trophic structures and food chains seem to be improving.



*Above-ground biomass (the mass of living matter)
Source: own field data

Figure 29.3 Carbon sequestration ($\text{Mg C ha}^{-1} \text{y}^{-1}$) of the agro-reforestation sites during the first five years

29.5 Improving rural livelihoods

Besides the cost and labour savings from using ANR, annual carbon payments (around EUR 100–150 per hectare) could fill the gap between short-term income and long-term sustainability. The cooperatives have used the funds not only for the purchase of tools, which are shared among the members, some cooperatives also invested the funds in other productive activities, including cattle fattening or growing ginger in between the trees. These secure short-term cash and have enabled the cooperative to increase their financial means. In the first harvest year in 2014, members received an average of EUR 1000 from the sale of cloves and fruit. As production increases over the coming years, this figure is estimated to go up to EUR 7000–8000 per year (depending on market prices). With the official minimum wage for West Sumatra set at EUR 100 per month, the earnings will be well above this level. Some cooperatives have already decided to put a small percentage of the earnings in the cooperative account. This money will be used to expand the land rehabilitation activities, even without carbon payments. New members will be added as they can borrow money from the cooperative to establish their own agroforests.

29.6 Lessons learned

After six years of working on field implementation, the VCM scheme and carbon trading has provided some important lessons. The most important are:

1. Landscape restoration can be achieved through community action by setting up performance-based cooperative structures.
2. Indigenous structures are often championed for their role in sustainable natural resource management. However, indigenous hierarchical social structures do not necessarily fit performance-based activities, which require an open and democratic way of working together.

3. Members of cooperatives must be able to participate equally and fairly in performance-based activities. Horizontal linkages are needed to allow members to discuss any matter that will help to improve the performance of restoration activities and the cooperative.
4. A VCM scheme, including payment structures, must have the community's consent before the start, and allow adjustments to be made by the local community that fit their needs, aspirations and preferences. The VCM scheme shows that it could trigger autonomous development as the community has a strong sense of ownership.
5. Restoration efforts must strike a balance between the public good (e.g. CO₂ sequestration and ecosystem restoration) and short-term individual economic benefits (livelihood improvement), when tree products cannot yet be harvested.

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