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Abstract

Voluntary carbon markets, including Chicago Climate Exchange (CCX) were worth $90 million in 2006. This paper finds that community forestry interventions of Seva Mandir, Foundation for Ecological Security, and the International Small Group and Tree Planting Program in India are eligible to sell carbon sequestration credits on the CCX. Their combined annual sequestration potential is 108,925 tCO_2, worth $435, 700. Although it will be difficult to realize this value immediately, it does indicate the potential for improving rural incomes in India. These benefits can be actualized by first linking small pilot projects with CCX before scaling up operations. Projects will also need to reduce transaction costs to share a higher proportion of carbon revenue with farmers. Diversion of land to raise tree crops needs to be balanced with food security concerns. A viable alternative would be to take up carbon plantations on common lands and share revenue with concerned agencies.

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I. Introduction

This paper looks at the potential for community forestry projects in India to sell carbon sequestration credits[1] in voluntary carbon markets. Ever since the ratification of the Kyoto Protocol in 2005, there has been an expectation that forestry projects in developing countries could improve local incomes by selling carbon sequestration credits to industrialized countries[2]. However, the slow approval of forestry projects by the Protocol's Executive Board has meant that the Kyoto-based market for carbon sequestration credits has hardly taken off (IISD, 2006)[3]. Instead a new opportunity that needs to be recognized is the emergence of voluntary carbon markets in many parts of the world.

Voluntary carbon markets pertain to trading in all carbon offsets that are not required by regulation. Unlike compliance markets such as the European Union Emission Trading Scheme, they represent voluntary attempts by individuals and organizations to reduce their carbon emissions (Bayon *et al.*, 2007). These markets have shown impressive growth in recent years. Volume wise they grew by 200 percent between 2005 and 2006, and are now valued at more than US$ 90 million (Hamilton *et al.*, 2007). An important constituent of the voluntary markets is the US based Chicago Climate Exchange (CCX). CCX is a voluntary cap-and-trade program, which requires its members (business and other large entities such as Ford, DuPont, IBM, Motorola, and the city of Chicago) to reduce their carbon emissions by 1 percent every year below their

[1] Carbon credits or offsets are units of carbon dioxide (CO_2) that forests absorb (or sequester) from the atmosphere.
[2] The Protocol requires industrialized countries to reduce their carbon emissions by an average of five percent by 2012. Under its Clean Development Mechanism, developing countries can sell carbon sequestered by their forests to industrialized countries as carbon credits or carbon offsets (UNEP, 2004).
[3] Called the LULUCF sector, i.e. land use, land use change and forestry.

average annual emissions from 1998-2001. Members that cannot reduce their own emissions can buy carbon credits from others. Since its inception in 2003, CCX has traded 26.3 million tons of carbon dioxide (tCO_2), with 10.3 million tCO_2 worth $36.1 million transacted in 2006 alone, making it one of the largest carbon markets in the world (see table 1). A key point to note is that voluntary carbon markets including CCX have sourced a significant proportion of their carbon credits from forestry projects in the form of sequestration credits (Hamilton *et al.*, 2007). This provides a viable opportunity for community forestry projects to target the voluntary carbon market as a potential place for selling carbon credits.

However, most researchers and policy makers in India and elsewhere appear to be unaware of the growth of the voluntary carbon sector. While there are several studies that look at the eligibility for selling carbon credits under Clean Development Mechanism (e.g. Aune *et al.*, 2005; Poffenberger *et al.*, 2001), there are hardly any that explore the feasibility of linking forestry projects with CCX or any other voluntary market. The aim of this paper is to fill this gap in literature by looking at how forestry projects can sell carbon sequestration credits in voluntary markets. Although, the focus of the paper is on India, the discussion here is relevant for community forestry projects in other developing countries as well. For preserving clarity in discussions and with a view towards practical applicability, the paper mainly considers the case for selling carbon credits on the CCX. However, wherever necessary, the paper also considers broader issues and areas of concern. It is based on our field research with three prominent organizations in India – Seva Mandir (SM), Foundation for Ecological Security (FES), and the International

Small Group and Tree Planting Program (TIST)[4]. These organizations provide diverse institutional backdrop for the study. SM and FES are non-government organizations (NGOs) that implement forestry activities but haven't traded any carbon credits. TIST, on the other hand, is one of the few organizations in India to successfully sell forest-based sequestration credits. We compare and contrast experiences of the three organizations to draw lessons for others that wish to enter carbon markets. What kinds of forestry projects are eligible to sell carbon credits? What important rules govern such sales? We also focus on economic benefits from carbon trading by estimating additional income that local farmers can make from selling carbon credits. Finally, we look at policy implications of important issues such as leakage, permanence, and transaction costs that will affect the sustainability of carbon sequestration projects.

Table 1: Status of the Voluntary Carbon Markets

	2006 Volume (Million tCO_2)	**2006 Value (US$ Million)**
Over the Counter trades	13.4	54.9
Chicago Climate Exchange	10.3	36.1
Total Voluntary Carbon Market	**23.7**	**91**

Source: Hamilton *et al.*, 2007; and http://www.chicagoclimatex.com

[4] Research data were collected through field visits to selected project sites, followed by open-ended discussions with community representatives, respective organization staff, and senior officials of the state Forest Department. Critical challenges and areas of concern were identified through a multi-stakeholder workshop in Udaipur, India, attended by senior officials of various organizations.

II. The context: community forestry initiatives in India

All three organizations SM, FES, and TIST, implement various kinds of forestry activities in India. The common aim behind these activities is to strengthen rural livelihoods by improving the productivity of local resources. SM works in more than 580 villages, of Udaipur and Rajsamand districts in south Rajasthan, to reverse the ecological degradation of village common lands[5], which are often over-exploited and unable to fulfill local needs (Seva Mandir, 2006). Productivity is restored through:

- ***Pastureland development*** on *panchayat* grazing lands. The village institution obtains permission from the local *panchayat*[6] to manage the land after new plantations are undertaken to improve tree density. Villagers can partake grass, dried tree branches, and bamboo shoots through manual harvesting.

- ***Joint Forest Management (JFM)*** on forestlands under the new forest policy (1990), which allows local communities to manage forestlands. SM assists village institutions in obtaining permission from the state forest department before constructing a boundary wall and taking up tree plantations. Villagers can harvest grass and other non-timber forest products (NTFPs) from the forestland, along with a fixed share of final timber harvest.

- ***Plantations on private lands*** under which small and marginal farmers receive financial and technical support for tree plantations on small patches of land that are usually less than 1 ha in size.

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[5] Apart from privately owned lands, there exist several kinds of common lands in India – revenue lands (owned by the government revenue department), forestlands (owned by the state forest department), and *panchayat* grazing lands (owned by the revenue department, but the village *panchayats* are the custodians) – Kerr *et al.* (1997).

[6] *Panchayats* are democratically elected village councils in India.

FES works towards restoring about 73,000 hectares of degraded lands in ecologically fragile areas across seven states in India[7]. Target beneficiaries consist of about hundred thousand rural households, eighty percent of which belong to landless, small and marginal farmer categories. Through its work, FES has been able to generate more than 4.4 million days of employment for these poor households (FES, 2005):

- ***Regeneration of panchayat grazing lands and revenue wastelands*** through plantation and protection activities. Village communities obtain permission from respective *panchayats* or from the revenue department (in case of revenue wastelands) before initiating the work. Villagers have access to all NTFPs from regenerated sites.
- ***Joint Forest Management*** activities of FES are similar to those of SM, one major difference being that FES works in different agro-ecological zones in India while SM works in only one region.
- ***Watershed development***[8] consisting of several different interventions such as soil and moisture conservation, afforestation, and construction of water harvesting structures on contiguous patches of land that include both private and common lands.

TIST is a community forestry initiative of the US based Clean Air Action Corporation and Institute for Environmental Innovation. It was initiated in Tamil Nadu, India in 2003 with an objective to help local farmers improve incomes through carbon sequestration activities on their farms. Participating farmers are organized into small groups and are encouraged to take up tree plantations. The major tree species preferred by these groups include Casuarina (*Casuarina equisetifolia*), Neem (*Azadirachta indica),*

[7] These are Gujarat, Rajasthan, Orissa, Madhya Pradesh, Andhra Pradesh, Karnataka and Uttaranchal.

[8] SM too has a watershed development program. The area covered under its forestry sub-component is already included in the above estimates.

various Eucalyptus spps., and fruit trees such as Mango (*Mangifera indica)*. Each of the groups has a separate contract with TIST under which carbon sequestration credits are transferred by the group members to TIST in return for annual payments of Rs.1.48 ($0.034) per live tree[9]. TIST then sells these carbon credits to various business entities at a price of $5 to $20 per tCO_2, depending on volume and timing (Hawn, 2006). In recent years, TIST has even sold carbon credits to individuals through web portal eBay. In all, TIST has formed 260 groups consisting of about 2,500 local farmers in India. These groups manage more than 600,000 trees and receive a total annual carbon payment of Rs.880, 000 (about $20,000) for protecting these trees.

III. Trading carbon on CCX

CCX is one of the few carbon markets to allow trading in carbon sequestration credits from land use and forestry projects (called as CCX forest carbon emission offsets). In order to sell carbon credits on CCX, forestry projects (1) need to have been initiated after January 1, 1990 on unforested or degraded land, (2) conservation projects are eligible if taken in conjunction with forestation on a contiguous site, (3) are required to demonstrate long-term commitment to maintain carbon stocks in forestry and are designated on the basis of their annual carbon sequestration potential; projects that sequester less than 2000 tCO_2 per annum as small, between 2000 tCO_2 and 12,500 tCO_2 per annum as medium, and with more than 12,500 tCO_2 per annum as large forestation projects. Size determines monitoring requirements for each project, with independent third-party verification of carbon stocks required for large projects. If these rules are satisfied, the three forestry

[9] These payments are distributed in four quarterly installments of Rs.0.37 per tree so that farmers receive money on a regular basis rather than a single annual payment.

projects in India can potentially sell carbon credits through CCX on the basis of their annual carbon sequestration potential.

III a. Estimating carbon sequestration potential

Carbon sequestration potential is the amount of CO_2 fixed by plants through their photosynthetic activity. Although plants fix CO_2 both as above-ground biomass and below-ground soil carbon, CCX rules currently allow for trading in only above-ground biomass contained in live plants. Poffenberger *et al.* (2002) estimate that in India, the above-ground mean annual growth in degraded forests from protection and plantation was 3 tons C per ha (carbon per hectare)[10]. Similarly, Murali *et al.* (2002) quote Seebauer (1992) to report a national mean annual increment (MAI) of 3.6 tons C per ha for plantations. Aggarwal *et al.* (2006) arrive at a higher estimate of 5.24 tons C per ha for Rajasthan, but their sample plots also include primary forests under protection, which tend to add an upward skew to their calculations. In comparison, fewer estimates are available for plantations on revenue or *panchayat* lands. A relevant study by FES reports an MAI of 1 to 3 tons of C per ha (Mondal *et al.*, 2005). Annual carbon sequestration is usually taken as 0.5 times the MAI (Poffenberger *et al.*, 2002). By taking lower bounds of the above estimates (to account for various uncertainties related to species mix, survival rates, specific soil conditions), the total carbon sequestration potential of the three organizations works out to 108,925 tCO_2 per year (tables 2 and 3).

[10] 1 ton C = 3.67 t CO_2

Table 2: Carbon sequestration of SM and FES, India

	Seva Mandir	FES	Total
Total area under post-1990 plantations (ha)	7,878	33,415	41,293
Annual above-ground biomass growth (tons)	8,950	42,096	51,046
Carbon sequestration (tCO_2/year)	16,468	77,457	93,925
Annual market value at CCX at US$ 4/tCO_2	$ 65,872	$ 309,828	$ 375,699

Table 3: Carbon Sequestration potential of TIST-India

Total Number of live trees	670,000
Carbon sequestration – tCO_2/year	15,000
Potential annual market value at CCX at US$ 4/tCO_2	$ 60,000

Source: Based on field data and project monitoring reports (SM, 2005; FES, 2005), and www.tist.org

III b. Compatibility with CCX rules

All the three organizations have significant number of carbon sequestration credits that can potentially be sold through CCX. Since these credits pertain to post-1990 plantations on unforested (in case of *panchayat*, revenue, or privately owned lands) or degraded (in case of forestlands) lands, they satisfy the first rule.

The second rule is important for plantations on forestlands. Typically, forestlands in India have a residual rootstock that can quickly regenerate through protection (Ravindranath *et al.*, 2001, Poffenberger *et al*., 2002). Both SM and FES encourage regeneration of old trees through construction of a boundary wall and other conservation measures. These organizations also take up new tree plantations on the same forestlands.

This qualifies their projects under rule two of CCX, which states that forest conservation is eligible in conjunction with new forestation efforts on contiguous sites.

Finally, if the three organizations decide to market their entire annual carbon sequestration potential through CCX, they would fall under the category of large forestation projects. This requires them to instill independent monitoring and verification procedures. At present, most of the monitoring is done by field staff in conjunction with community representatives. A third-party verification process would therefore induce additional costs for them. Although, it is difficult to estimate the exact escalation in monitoring costs, it is bound to be substantial due to existence of non-contiguous sites spread over a large area[11].

III c. Additionality, leakage and permanence

Review of CCX rules indicates that SM, FES, and TIST are eligible to sell carbon sequestration credits from their forestry activities. Typically, international trading in carbon sequestration credits also requires fulfilling additionaility, leakage and permanence clauses (UNEP, 2004).

Additionality requires proving that carbon sequestration credits being claimed by a project are additional to any that would occur in absence of the project. There are various ways to ascertain additionality, one of them being the timing of the project, requiring developers to demonstrate that they initiated the project after a specific date (Bayon *et al.*, 2007). CCX follows this method by allowing carbon trading from forestry projects that were setup after January 1, 1990. Since only the post-1990 forestry activities

[11] In case of FES, this would cover different geographic regions that are far apart from each other.

of the three organizations are considered in this study, they qualify under the additionality clause.

Carbon trading requires sequestration projects to prove there is no ***leakage*** of carbon dioxide and that all carbon stocks are permanent. No leakage means that project beneficiaries do not cut any trees, even outside the project boundary. This is a contentious issue as local communities often depend on forest resources for their livelihood needs, such as obtaining fodder for livestock, firewood for energy needs, and fruits for selling in nearby markets. Leakage occurs if people simply shift tree-cutting to lands not under contract. ***Permanence*** refers to a long-term commitment to protect carbon plantations. For local communities, permanence is thus inextricably linked with leakage. If communities are allowed to harvest a certain percentage of the annual biomass growth in terms of dead and fallen trees, manually harvested grass, and mature bamboo poles, they may be more willing to protect the growing trees. In this case, carbon sequestration credits can be calculated by subtracting annual biomass harvest from total annual biomass growth on a specific project site.

The CCX already incorporates this element by paying for only 80 percent of the eligible forestry offsets. The balance 20 percent is saved in a CCX forest carbon reserve pool, to account for any net losses in the carbon stocks. These 20 percent reserves may thus be sufficient to fulfill the annual biomass needs of the local communities.

IV. Sustainable development from carbon trading

Carbon credits generated by SM and FES are worth about US$ 375,000 per year on the CCX (table 2), all of which would be additional income for local farmers. Since TIST already sells sequestration credits to international buyers, US$ 60,000 per year may not represent additional income (table 3), but it does indicate an increase in benefits for local farmers from the US$ 20,000 per year that they currently make from non-CCX carbon sales.

These additional incomes have the potential to extend local conservation efforts, reduce livelihood pressure on forests, and provide sustenance needs of many poor families. TIST's experience demonstrates that, for many farmers, carbon sales are the primary source of cash income. Farmers often reinvest these incomes in agriculture or use them to pay for important household expenses. For instance, TIST formed "Salsa" group in 2003 with 12 farmers. Since then, they have planted 28,923 trees and have encouraged many neighboring farmers to form groups and grow trees. Over the last three years, the Salsa group has received Rs.57, 114 ($1,270) as carbon payments from TIST. This money has improved the economic status of many group members and has helped them to reinvest it in agriculture.

Similarly, many community members from FES and SM's work area say that carbon payments will give them a direct incentive to conserve local forests. For instance, in village Chitravas (Rajasthan), Joint Forest Management activities over 276 hectares of forestland, have yielded benefits for local villagers mainly as non-timber forest products and some employment opportunities from FES. However, the sale of 1,266 tCO_2 per year of carbon credits from these forests could generate an additional income of $5,064 per year. This would be equivalent to a 15 percent increase in the average cash income for many of the poor households in the village.

IV a. Additional funding support for forestry

Carbon payments also represent opportunities for attracting additional funding support. Many NGOs in India are actively involved in forestry interventions and are in constant need for financial assistance. SM, for example, submits regular project proposals to international donor organizations to fund its forestry activities (Seva Mandir, 2006). Similarly, FES receives financial support from National Dairy Development Board, India and from some international organizations. However, this funding support is often limited and unable to meet local requirements.

Carbon markets, on the other hand are growing rapidly (Point Carbon, 2007). Demand for carbon credits on CCX has risen sharply with trade of 11.85 million tCO_2 during the first six months of 2007 already exceeding the total volume of 10.27 million tCO_2 transacted in 2006 (CCX, 2007). Combined with an increase in average price of more than 300 percent from less than \$1 per tCO_2 in January 2004, to \$4 per tCO_2 in January 2007, CCX presents an attractive opportunity for forestry projects to raise money through sale of carbon sequestration credits. A relationship with CCX can in fact help the SM and FES to learn the intricacies of international carbon trading, while it will help all the three organizations find more carbon buyers to generate additional financial support for their forestry programs. As international carbon rules are still being formulated, these organizations also have an opportunity to share their own experience of how these rules actually play out in the field and suggest necessary modifications.

IV b. Benefits for CCX and its members

CCX is a voluntary emission reduction program. However, increasing environmental awareness, growing threat of global warming and changing market perceptions have convinced more and more firms to commit for emission reduction programs, leading to increasing demand for carbon credits at CCX. Till date, CCX has mainly met this demand for carbon credits from emission reduction and carbon sequestration programs within the US. However, judging from the recent growth of CCX, demand will outstrip supply in not too distant future. The CCX has therefore started looking for additional suppliers of carbon credits and the three organizations covered in this study are well qualified to fulfill this role.

Striking a relationship with these organizations will help CCX to tap into a relatively large supply of carbon sequestration credits. On its part, CCX will also get to experience the particulars of a relationship with grassroots forestry projects, which may gain more significance as carbon markets continue to grow. Finally, CCX members can gain satisfaction (and goodwill) from the fact that their carbon payments are able to contribute towards sustainable development initiatives among poor communities in India.

V. Issues concerning carbon trading

Community based forestry projects in India can not only generate timber and NTFPs for rural poor but also yield additional benefits by selling carbon sequestration credits on CCX. However, there are various challenges that need to be addressed to ensure that these potential benefits actually reach the rural poor. Foremost among them is the need to reduce transaction costs so that a higher proportion of carbon revenue is shared with farmers. Similarly, food security concerns need to be balanced with taking out agricultural land to raise long gestation tree crops. Another critical issue in India is how various categories of common lands can be utilized by local communities for carbon forestry. This section looks at these issues in detail and discusses some relevant alternatives.

V a. Reducing transaction costs

Transaction costs include costs of negotiating, contracting, implementing, and monitoring any carbon sequestration project. These costs are usually high when new projects are being set up or when projects are looking to sell carbon credits through the more formal compliance markets governed by Kyoto Protocol. For instance, Krey (2004) estimates that emission reductions projects in India that wish to sell carbon credits through the Clean Development Mechanism, face an average transaction cost of $74,885 per project. In case of the three community forestry projects considered here, even though some of the cost components such as validation and adaptation fee will not apply, the monitoring and verification costs are still expected to be substantial at about $16,000 per project. Accounting for these costs will reduce the proportion of carbon revenue that ultimately reaches local farmers.

One way to reduce these costs is by aggregating carbon credits from individual farmers and then selling them in one lot. The aggregator thus avoids the cost of setting multiple contracts by establishing a single contract with CCX on behalf of all the local participants. TIST already plays this role by purchasing carbon offsets from local farmers and then selling them to international buyers in a single lot. Since FES and SM will be new to carbon trading, they can consider forming a federation that can act as a common aggregator for their target participants. This federation will also be able to ensure that poor households can participate in the sequestration program and that there is an equitable sharing of carbon benefits amongst the community members.

A major transaction cost is monitoring and verification costs. These costs are substantial for SM and FES where individual carbon sites are located far away from each other. One possible solution is to introduce site-specific monitoring through handheld GPS (geographical positioning system). These GPS devices are relatively inexpensive, easy to use, and can help in more rigorous tracking of carbon plantations. For instance, TIST has trained village-based volunteers to take field measurements through GPS. A single carbon expert in the central office then uses these field measurements to calculate sequestration credits for each site.

V b. Food insecurity and land tenure concerns

Many smallholders in India meet their food requirements from their farms and local forests. As the rural population continues to grow, there is a demand for additional agricultural land to grow food crops. If this land is locked in multi-year carbon plantations, local communities will be threatened with food insecurity. Carbon sequestration activities will thus need to be balanced with food security concerns for the local population. TIST addresses this issue by promoting carbon sequestration primarily on marginal and low-productivity lands. These lands have a low substitutability for agriculture and are thus well suited for long gestation carbon plantations.

Another related concern is that many poor households often depend on lands over which they have limited tenure rights. As carbon sequestration services become more valuable, powerful landowners may grab these lands and drive the poor away, further threatening their livelihoods (Kerr *et al.*, 2006). In this regard, taking up carbon sequestration through farmers' cooperatives can be a viable alternative. FES has worked extensively with such cooperatives to develop local pastures across several states in

India. These cooperatives obtain long-term lease from local governments to regenerate pastures and to share benefits amongst their members. As a result, these cooperatives are not only successful in improving the productivity of local resources but also in securing tenure rights for their members.

V c. Carbon sequestration on common lands

A large proportion of the land in rural India exists as common land, including revenue lands, forestlands, and *panchayat* grazing lands. Although village communities can obtain permission from respective authorities to manage these lands for a fixed period of time, there is no provision to carry out carbon sequestration projects on them. As carbon payments become more significant, there is a possibility that the Forest Department and local *panchayats* may in fact stop transferring management rights to local communities.

For example, Nayakheda village in Rajasthan obtained permission from the local *panchayat* to take up plantations on 29 hectares of common pastureland. The villagers also planted trees on 100 hectares of individually owned lands. These plantations are sequestering 236 tCO_2 per year, worth $ 946. However, the *panchayat* is now threatening to take over the pastureland. This is a potential area for conflict that needs to be resolved soon. A practical solution may be to share carbon payments between local communities and respective authorities.

V d. Broad-leaved versus intensive plantations

TIST's carbon payments to local farmers are calculated on the basis of actual number of live trees, irrespective of the tree species being planted. Even though broad-leaved trees such as Mango (*Magnifera indica)* are long-gestation crops, ensuring the relative permanence of carbon stocks, they still receive the same carbon payments as closely spaced Eucalyptus and Casuarina (*Casuarina equisetifolia)*. However, farmers tend to look at carbon payments on a per acre basis rather than per tree. For instance, an acre of densely planted Casuarina (1600 trees per acre) can earn $52.4 per annum as compared to an acre under Mango (planted at the rate of 100 trees per acre) that earns only $3.3 per annum. Secondly, intensive plantations can be ecologically harmful, especially if they are raised as monocultures and comprise species like Eucalyptus that require large quantities of water. Instead, experts recommend slow growing indigenous species that do not disturb the local ecology (Farley *et al*., 2005). Therefore, as TIST-India's carbon initiative grows, it may need to strike a balance between ease in making carbon payments and providing economic incentive to local farmers to take up ecologically diverse tree crops.

VI. Conclusion

Kyoto rules for carbon sequestration projects are often perceived as too rigid and difficult to follow (IISD, 2006). In comparison, rules for carbon sequestration projects on CCX are relatively simple and easy to follow. However, from the perspective of the local communities, some modifications in these rules will make them even more relevant and effective. For instance, CCX only allows trading in aboveground carbon stored in live matter. However, forests often fix substantial amounts of carbon in the soil as organic matter. If trading is allowed for below-ground carbon, it may provide an even higher economic incentive for local communities to participate in carbon sequestration activities.[12]

[12] Although CCX allows for trading in soil carbon, it is restricted to no-till agriculture in the US.

All these three organizations, SM, FES, and TIST, can potentially sell carbon sequestration credits on the CCX. Establishing a relationship with CCX may in fact open avenues for carbon trading with other international players. A viable strategy in this regard will be to start with simple payment arrangements on small contiguous sites that are easy to monitor and administer. Experience gained during these pilot projects may be handy in expanding the scale of operations when international demand for carbon sequestration credits rises further. Such performance-based payments may also ensure that local communities have a long-term stake in conserving these plantations. For the global society, this relationship may open ways to achieve a win-win situation between environmental conservation and economic development.

Finally, and most importantly, carbon sequestration programs have the potential to alleviate rural poverty. This potential will, however, remain unfulfilled unless policy makers and various carbon players make conscious efforts to elicit participation from the poor. This also requires changes in carbon accounting as well as innovations that can reduce transaction costs. Institutions such as farmers' cooperatives and NGO-led federations can further ensure that carbon payments are channeled to the poor. Only then can carbon sequestration truly lead to sustainable development at the local level.

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