# Linking community forestry projects in India With international carbon markets: *Opportunities and constraints*

Rohit Jindal

Shailesh Nagar*



* Rohit Jindal is Doctoral student at Michigan State University, and Shailesh Nagar is Senior Project Officer at Foundation for Ecological Security. The corresponding author can be contacted at jindalro@msu.edu

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## 1. Introduction

Community forestry projects have long been implemented in India with an aim to strengthen rural livelihoods by improving local natural resource base. Until now, the major benefits from these projects were in the form of timber and non-timber forest products (NTFPs) for the local communities. However, with the ratification of the Kyoto Protocol[1] in 2005, there has been a growing expectation that additional benefits could accrue by selling carbon sequestered by these projects in Kyoto-based markets (Poffenberger *et al*., 2001). Similarly, many new forestry projects were initiated with the express objective of selling carbon credits in international markets. Examples include TIST, Tamil Nadu[2] and Plan Vivo based Women for Sustainable Development, Karnataka (FAO, 2004). However, due to long delays in approval of land use sequestration projects[3], the Kyoto-based market for carbon sequestration credits hasn't really taken off (IISD, 2006). With the first commitment period under Kyoto ending in 2012, many of these projects may need alternate avenues for selling carbon sequestration credits. One viable market that has grown in recent years is the voluntary emission reduction programs, particularly the Chicago Climate Exchange[4].

The Chicago Climate Exchange (CCX) was set up in 2003 to provide an opportunity to business houses and other large entities to voluntarily reduce their carbon emissions. Members can trade in carbon credits to fulfill their yearly emission reduction targets. CCX has been growing rapidly; in 2005 alone, CCX traded 1.43 million tons of carbon dioxide (t $CO_2$) worth US$ 2.8 million, making it the third largest carbon market in the world (Point Carbon, 2006). This included trade in carbon sequestration credits from land use projects. Since the two larger carbon markets - European Union Emission Trading System and New South Wales GHG Abatement Scheme – are yet to trade in carbon

[1] Kyoto Protocol was ratified in 2005 to reduce emission of greenhouse gases into the atmosphere. Under its Clean Development Mechanism, developing countries can sell carbon sequestered by their forests to industrialized countries as carbon credits or carbon offsets. These are units of carbon dioxide that have been absorbed by forests from the atmosphere (UNFCCC, 2003).
[2] For details, see www.tist.org
[3] Called the LULUCF sector, i.e. land use, land use change and forestry.
[4] Other examples include New South Wales Greenhouse gas Abatement Scheme in Australia.

sequestration credits from forestry projects, CCX probably represents the single largest market for such credits. This is a welcome opportunity for community forestry projects in India which can potentially tap into this growing market for carbon credits. Likewise, CCX may also gain from linking up with these projects and expanding its supply base.

However, most researchers and policy makers in India appear to be unaware of CCX or of other voluntary programs that have come up in different parts of the world. Review of recently published literature suggests there are several studies in India that look at eligibility conditions for selling carbon credits in Kyoto markets, but none that explores the same for CCX or for any other voluntary market. What are the main requirements for selling carbon credits in these markets? Do community forestry projects sequester enough carbon to sell in these markets and what price schedules could they expect? Similarly, till date, these voluntary markets have restricted their supply of carbon credits to certain geographic regions. For example, CCX mainly meets its demand for carbon sequestration credits from farmers in the US. With the increase in demand for carbon credits, these markets will need to know more about potential suppliers elsewhere. Who are these suppliers? How many carbon credits can they sell and at what price? Do these suppliers have a long-term commitment to participate in the carbon market?

This paper attempts to answer some of these questions from the perspective of community forestry projects in India. 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 an extensive research with two prominent non-government organizations (NGOs) in India that have well established forestry projects – Seva Mandir and Foundation for Ecological Security.

Research data were collected through field visits to selected project sites, followed by open-ended discussions with community representatives, respective NGO staff, and senior officials of the state Forest Department. Secondary data sources consisted of recent reports on carbon markets, particularly CCX, and details on relevant protocols for

international carbon sequestration projects. Carbon sequestration potential for the two NGOs was calculated on the basis of their in-house monitoring studies and some recent literature on biomass accumulation rates in India. Finally, critical challenges and areas of concern were identified through a stakeholder workshop in Udaipur, India.

The rest of the paper is organized as follows: the next section provides useful information on forestry interventions of the two NGOs. This is followed by an estimation of annual carbon sequestration potential of these forestry projects and a review additionality, leakage, permanence, and monitoring issues to determine the relative feasibility of selling carbon sequestration credits on CCX. Section four identifies potential gains for local communities from sale of carbon credits. The paper ends with a discussion on important areas of concern such as food security and suggests some modifications in the present set up of rules.

## 2. Forestry initiatives of Seva Mandir & Foundation for Ecological Security

Seva Mandir is a prominent Indian NGO that works towards development of local communities in more than 580 villages, of Udaipur and Rajsamand districts in southern Rajasthan[5]. It aims to strengthen local livelihoods, build peoples' capabilities and promote sustainable village institutions in these villages (Seva Mandir, 2005). The organization works in partnership with village level institutions, which take responsibility for managing various activities implemented by the organization. Representatives of these institutions are regularly trained to improve their skill levels, and to seek their assistance in implementing different development projects. Since late 1980s, the organization has taken up several forestry initiatives to increase local incomes by improving the natural resource base in the area. The central focus of this work is to reverse the ecological degradation of village common lands[6], which are often over-

[5] For more details see www.sevamandir.org

[6] Apart from privately owned lands, there exist several kinds of common lands in Indian villages. Prominent among these are revenue lands (owned by the government revenue department), forestlands (owned by the state forest department), and *panchayat* grazing lands (revenue

exploited and unable to fulfill local needs (Seva Mandir, 2006). Productivity is restored through tree plantations and soil and water conservation measures. Seva Mandir's forestry interventions that can earn carbon sequestration credits include:

**(i)** ***Pastureland development*** on *panchayat* grazing lands. The village institution obtains permission from the local *panchayat*[7] to manage the land for a fixed duration of time (usually five to ten years), after which the permission needs to be re-sought. A boundary wall is constructed around the land to thwart open grazing and to encourage regeneration of rootstock. New plantations are undertaken to improve tree density. All activities are executed as per a management plan prepared by Seva Mandir staff in participation with the local community. Villagers can partake grass, dried tree branches, and bamboo shoots through manual harvesting. Since 1990, the organization has covered 1953 hectares of land[8] under pastureland development, spread over more than 50 villages.

**(ii)** ***Joint Forest Management (JFM)*** on forestlands under the new forest policy (1990), which allows local communities to manage forestlands. Seva Mandir assists village institutions in obtaining permission from the state forest department before constructing a boundary wall and taking up tree plantations. Plantation activities are carried out as per a long-term management plan, prepared in consultation with the forest department. Villagers can harvest grass and other non-timber forest products (NTFPs) from the forestland, along with a fixed share of final timber harvest. Usually, the productivity of forestlands is higher than *panchayat* lands. The total area covered under JFM activities since 1990 is 715 hectares (ha).

**(iii)** ***Plantations on private lands*** under which individual farmers receive financial and technical support from Seva Mandir to take up tree plantations. The organization

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department owns these lands, but the village *panchayats* are the custodians). For more details on different property regimes in India, see Kerr *et al.* (1997).

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

[8] CCX allows for trading in carbon sequestration credits from afforestation and reforestation activities initiated only after 1990 on previously un-forested lands.

usually favors small and marginal farmers over large farmers. Since 1990, 5210 ha of land have been covered under private plantations on patches of land that were usually less than 1 ha in size.

The Foundation for Ecological Security (FES) works towards restoring about 73,000 hectares of degraded lands in ecologically fragile areas across seven states in India[9]. It works in close participation with village communities to prioritize local needs and to plan various natural resource development interventions with them. Its 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). A major component of the organization's strategy is to work, as far as possible, on entire landscapes and promote natural regeneration. However, the organization does take up tree plantations, often in areas that are contiguous to naturally regenerating lands. Activities that aid in carbon sequestration include:

**(i)** ***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. Boundary wall is usually constructed to improve the survival rate of saplings by controlling open grazing. FES also prepares a long-term management plan for each project site that encourages sustainability of the intervention. Villagers have access to all NTFPs from regenerated sites, such as grass, firewood, and fruits. Since 1990, FES has worked on 5,808 ha of *panchayat* grazing lands and 18,810 ha of revenue wastelands.

(ii) ***Joint Forest Management*** activities of FES are similar in setup to those of Seva Mandir as they both follow standard guidelines of the forest department, the major difference being that FES works in different agro-ecological zones in the country while Seva Mandir's works in one particular region. The total forest area covered after 1990 is 5,787 ha.

[9] These are Gujarat, Rajasthan, Orissa, Madhya Pradesh, Andhra Pradesh, Karnataka and Uttaranchal. More details on FES are available on www.fes.org.in

(iii) ***Watershed development***[10] on contiguous patches of land that include both private and common lands. Watershed development is an integration of several natural resource interventions such as soil and moisture conservation, afforestation and reforestation, and construction of water harvesting structures. Since 1990, FES has implemented watershed development programs over 3,010 ha of land.

## 3. Feasibility of linking with Chicago Climate Exchange

CCX a voluntary emission reduction and trading program whose members are required to reduce their carbon emissions by 1% every year below their average annual emissions from 1998-2001. Its members include Ford, DuPont, IBM, Motorola, New Mexico, Chicago, and Universities of Minnesota and Iowa. Members that cannot reduce their own emissions can buy carbon offsets from other members that exceed their reduction targets and from farmers engaged in carbon sequestration[11]. Since its inception in 2003, CCX has traded more than 6.4 million $tCO_2$, including trade in carbon sequestration credits from land use projects and forestry plantations (called as CCX forest carbon emission offsets). Farmers and local communities can thus make money from their conservation efforts by selling carbon offsets to CCX members. The basic specifications for setting up such forest-offset projects are:

i. Forestation and forest enrichment projects should have been initiated on or after January 1, 1990 on unforested or degraded land.
ii. Forest conservation projects are eligible if taken in conjunction with forestation on a contiguous site.
iii. Demonstration of long-term commitment to maintain carbon stocks in forestry.
iv. Independent third-party verification of carbon stocks (where required).

[10] It is relevant to note that Seva Mandir too has a watershed development program, much similar to FES's approach. However, the area covered under forestry sub-component of Seva Mandir's watershed work is reported separately under different forestry heads and is thus included in the above estimates.
[11] For details, please see http://www.chicagoclimatex.com

If the above rules are satisfied, the two forestry projects can potentially sell carbon offsets through CCX on the basis of annual increase in the above-ground living biomass. But first, an estimation of carbon sequestered by them.

### 3.1 Annual carbon sequestration potential

Carbon sequestration potential is defined as the amount of carbon dioxide ($CO_2$) 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. Forestry projects are thus designated on the basis of their annual carbon sequestration potential; projects that sequester less than 2000 t $CO_2$ per annum as small, between 2000 t $CO_2$ and 12,500 t $CO_2$ per annum as medium, and with more than 12,500 t $CO_2$ per annum as large forestation projects. Size determines monitoring requirements for each project, as discussed below.

Detailed carbon analysis of the two projects was difficult due to time and resource constraints; both NGOs covered large number of project sites that were seldom contiguous. These sites varied with species mix, soil characteristics, mix of planted versus natural regenerating trees, and eventual survival rates of the trees. Although a high proportion of the project sites was believed to be managed in a sustainable manner, working out the exact percentage required an extensive survey in the area. Finally, the specific annual off take in the form of grass harvests, fuelwood and other NTFPs was not known across different sites. The present study therefore relied on recent estimates of biomass accumulations in somewhat similar agro-ecological conditions in India, to arrive at mean values of carbon sequestration for the two selected projects.

Poffenberger *et al.* (2002) estimate that the above-ground mean annual growth in degraded forests from protection and plantation was 3 tons C/ha (carbon per hectare)[12]. Similarly, Murali *et al.* (2002) quote Seebauer (1992) to report a national mean annual increment (MAI) of 3.6 tons C/ha for plantations. Ashish *et al.* (2006) arrive at a higher

[12] 1 ton C = 3.67 t $CO_2$

estimate of 5.24 tons C/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 were available for plantations on revenue or *panchayat* lands. A relevant study was found to be conducted by FES itself, which reported an MAI of 1 tons C/ha to 3 tons C/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 described above), the present study estimates that the current carbon sequestration potential of all forestry interventions taken together for Seva Mandir and FES is 16,421 $tCO_2$ per annum and 77,245 $tCO_2$ per annum, respectively (see table 1 below; for details see annex 1).

***Table 1: Current carbon sequestration from selected forestry projects in India***

| | **Seva Mandir** | **FES** | **Total** |
|---|---|---|---|
| Area under post-1990 plantations – ha | 7,878 | 33,415 | 41,293 |
| Annual above-ground biomass growth – t C | 8,950 | 42,096 | 51,046 |
| Carbon sequestration – t $CO_2$/annum | 16,424 | 77,245 | 93,669 |
| **Potential annual market value at CCX[13] @ \$4/t $CO_2$.** | **\$65,697** | **\$308,981** | **\$374,678** |

## 3.2 Compatibility with CCX rules

This section evaluates the extent to which FES and Seva Mandir's forestry interventions are compatible with the CCX rules described above. As the calculations in table 1 show, both FES and Seva Mandir have significant number of carbon sequestration credits that can potentially be sold through CCX or other international markets. Since, all these credits pertain to post-1990 plantations on unforested (in case of *panchayat* and revenue

[13] Price as on October 22, 2006.

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). Therefore, both Seva Mandir 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. Field visits to some of the project sites reveal that local communities have a long-term commitment to protect and conserve these forestry projects. In addition, self-documented case studies and published reports of the two organizations stress on sustainable management of the forestry interventions undertaken by them (FES, 2005; Seva Mandir, 2005). Therefore, the forestry initiatives of the two organizations also qualify under rule three. Finally, if both 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 the two organizations. 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[14]. A useful tool in this regard could be the new decentralized carbon models being developed by some researchers that make use of satellite imagery. However, most of these models are still in the pilot stage and it is difficult to compare their costs with those of conventional monitoring systems.

### 3.3 Additionality, leakage and permanence

The discussion in section 3.2 indicates that forestry interventions of Seva Mandir and FES qualify to sell carbon sequestration credits on the CCX. However, typically,

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

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 (UNEP, 2004). Most forestry interventions implemented by the two organizations include construction of boundary wall around the protected site. Field-observation of some of these sites shows that the biomass accumulation rates (and thus the carbon sequestration rates) are significantly higher inside the boundary wall than outside. This indicates that increased rates of carbon sequestration on project sites would not have happened in the absence of the protection measures induced by the project[15]. Thus additionality can be easily verified through site-specific biomass studies in the area.

***Leakage*** requires that project beneficiaries should not cut any trees, neither inside nor 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. To forego these benefits in lieu of the carbon payments would result in shifting of use to another piece of land, which in an overall context would be undesirable. On the other hand, if communities are allowed to harvest a certain percentage of the annual biomass growth in terms of dead and fallen trees, manual harvesting of grass, and mature bamboo poles, they may have a larger stake in protecting the growing trees. Therefore, a balance needs to be attained between short-run carbon sequestration benefits and long-term sustainability of the site.

It is relevant to note here that 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. This 20

[15] Acknowledgements to Esther Duflo at MIT for suggesting this innovative, yet cost-effective means to verify additionality. If accepted, this methodology may help in reducing transaction costs associated with carbon sequestration projects.

percent reserve may thus be sufficient to fulfill the annual biomass needs of the local communities for the selected forestry interventions in India.

***Permanence*** refers to long-term commitment to protect plantations. Current discussion on permanence has also focused on the option of producing temporary carbon credits versus long-term carbon credits (see IISD, 2006; UNEP, 2004). However, in voluntary carbon markets, commitment to protect plantations for about 20 years is usually sufficient to demonstrate permanence. In case of the two forestry projects in India, both have several sites where local communities have been successfully managing their forestry plantations for more than 15 years. In general, however, permanence is inextricably linked to leakage. As discussed above, if communities are allowed to harvest a proportion of the growing biomass for their sustenance needs, then tree plantations are much more likely to be protected for long durations of time.

## 4. Potential gains from trading in carbon sequestration credits

The previous section shows that forestry interventions undertaken by both Seva Mandir and FES are eligible to sell carbon sequestration credits on CCX. What are potential benefits from this carbon trading from the perspective of local communities, the two NGOs and international carbon investors?

### 4.1 Sustainable development benefits for local communities

Sale of carbon sequestration credits can often generate additional incomes for local communities. Recent literature documents livelihood and other development benefits of carbon sequestration projects in several developing countries across Africa and Latin America (e.g. see Jindal *et al.*, 2006; Rosa *et. al*., 2003; Smith and Scherr, 2003). Similarly, the two forestry interventions covered under this study in India can contribute towards sustainable development through carbon payments.

As table 1 shows, the total financial value of carbon sequestration credits from FES and Seva Mandir's forestry projects on CCX is $374,678 per annum. Admittedly, not all of this financial value is immediately realizable, as the total availability of carbon sequestration credits from the two projects (93,669 t CO2/annum) is much more than the current demand on CCX. In fact, only a small percentage of these carbon credits may actually find buyers in international markets. However, even small sales of carbon credits will generate additional incomes for local communities, while creating opportunities for bigger sales in the future. These incomes will be useful in extending local conservation efforts, in reducing livelihood pressure on forests and can provide for sustenance needs of many poor families.

For example, FES is implementing Joint Forest Management program in Chitravas and Rawach villages, in district Rajsamand (Rajasthan). Under this program, the local community obtained an approval from the state forest department to manage 276 ha of forestland. Since 2002, FES has helped the community construct a stone fence around this forest and in planting more than 50,000 trees of indigenous species. These plantations are managed by the village forest protection committee, which has banned all timber felling and allows for only manual cutting of grass and for collection of dead and decaying branches as firewood. The current carbon sequestration potential of this forestry initiative is estimated to be 1,266.2 t CO2 per annum, with a financial value of $5,064.8 per annum (or Rs.227,907 in the local currency). Discussions with community representatives revealed that this is a significant amount of money. If annual carbon payments were available to them, community members will have an enhanced economic incentive to protect these plantations and in taking up more conservation efforts. Since most farmers in the area were very poor, carbon payments will also provide them with additional sources of income.

### 4.2 Additional funding support for NGOs

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. Seva Mandir, 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 may not always meet local requirements.

Carbon markets, on the other hand are growing rapidly (Point Carbon, 2006). The Executive Board of the Kyoto Protocol recently approved the first carbon sequestration project, which is expected to finally boost the Kyoto-based markets for carbon sequestration credits. Similarly, the CCX has shown impressive growth and is now the third largest carbon market in the world. Since its inception in 2003, the carbon price on CCX has increased by an impressive 300 percent. There are thus increasing opportunities to raise money through sale of carbon sequestration credits through CCX and other international markets. A relationship with CCX can in fact help the two Indian NGOs to learn the intricacies of international carbon trading, find more carbon buyers and thus generate additional financial support for their forestry programs. As international carbon rules are still being formulated, these NGOs also have an opportunity to share their own experience of how these rules actually play out in the field and suggest necessary modifications.

### 4.3 Benefits for CCX and its members

Chicago Climate Exchange 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 may outstrip supply in not too distant future. The CCX has therefore started looking for additional suppliers of carbon credits and the two NGOs covered in this study are certainly qualified to fulfill this role.

Striking a relationship with Seva Mandir and FES will thus 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 NGOs, 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 in poor communities.

## 5. Critical challenges and concerns regarding carbon trading

The immediate objective of this study was to assess the feasibility of linking forestry interventions in India with international carbon markets, particularly the CCX. The above discussion shows that carbon trading is not only feasible, it also has several potential gains for the three main stakeholder groups. However, discussions with community representatives, project staff of the local NGOs and senior forest officials also highlighted some important concerns regarding carbon trading.

### 5.1 Transaction costs and need for an aggregator

Transaction costs include the costs of negotiating, contracting, implementing and monitoring any carbon sequestration project. Although the two NGOs already pay for most of these costs from their existing sources of funds, establishing a carbon payment system will impose additional transaction costs on them. Most important among these will be setting up contracts with CCX and paying for third party monitoring and verification.

One way to bring down these transaction costs is to aggregate carbon credits from individual farmers and then sell them in one lot at the CCX. This can help avoid the cost of setting up individual contracts between CCX and the individual farmers in India. The intermediary organization, i.e. the aggregator, can set up a single contract with CCX on behalf of all the local farmers. However, this aggregator will still need to establish some

contracting arrangement with local farmers to ensure that proper protocols are followed. Therefore, the most plausible arrangement at this stage will be for Seva Mandir and FES to form a federation and assume the role of aggregator for their farmers. On its part, CCX will need to impart necessary training to this federation in order to ensure successful carbon trading.

As regards monitoring and verification requirements, both NGOs may need to modify their current system of monitoring through field staff and community representatives. This is not to suggest that this participatory system does not work, but international carbon buyers will desire a more impartial system, such as independent verification. One possible strategy will be to introduce site specific monitoring through hand held GPS (geographical positioning system). These GPS devices are relatively inexpensive, easy to use and can help in more rigorous tracking of carbon plantations[16].

### 5.2 Subsistence farming and food security concerns

Seva Mandir and FES mainly work with small farmers who are only able to meet subsistence needs from their farms. Most poor families derive a substantial proportion of their food requirements from these small farms and by collecting NTFPs from common lands. Long-term carbon plantations with strict guidelines on leakage may thus deprive these poor families from meeting their subsistence needs. Some community representatives even felt that as the population continues to grow, there will be additional demand for agricultural land. However, if most of the land is locked in multi-year carbon commitment, then local communities may be threatened with food insecurity. This is even more pertinent in case of poor communities which may not have secure rights over land. 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). There is thus a need to balance carbon sequestration activities with local needs for immediate livelihood support.

[16] Indeed, the small holder tree plantation project (TIST), based in India and Tanzania already uses hand help GPS to monitor their carbon plantations before selling carbon credits in international markets. For more details see www.tist.org

### 5.3 Carbon sequestration on common lands

A large proportion of the land in rural India is in the form of village common lands. Some of it is owned by the revenue department and a sizeable proportion by the state forest department. These common lands have a significant potential to earn carbon sequestration credits. At present, village communities need approval from the respective authorities to take up plantations on these common lands. Existing laws and policies such as the JFM policy, state that most NTFPs belong to local communities, while timber benefits are shared between the community and the respective authority. Management rights over such common lands are only approved for a fixed time period, after which the community needs to reapply or the management rights get transferred back to the authority. These norms and procedures thus thwart long-term conservation commitments by the local communities. In addition, there are no provisions for sharing of carbon payments.

For example the Nayakheda village (*panchayat* – Ghodach, district – Rajsamand) initiated an integrated watershed program in early 1990s with financial support from Seva Mandir. Under this program, approval was obtained from the local *panchayat* to take up tree plantations on 29 ha of common pastureland. The villagers also planted trees on 100 ha of individually owned lands. Since then, the village community has actively protected these plantations. The present study estimates that the total carbon being sequestered by these plantations is about 236.6 t CO2 per annum, with a financial value of $946.4 on the CCX. However, the lease for the common lands ends in 2009 and the *panchayat* has threatened to take over these common lands. There is thus little motivation for the community to invest in more conservation efforts, leave aside maintaining long-term carbon plantations.

There is thus a need to clarify rules on management rights over common lands for local communities in India. On the other hand, as carbon payments become more significant, there is a possibility that state forest department and local *panchayats* may become much

more rigid in transferring management rights to local communities. This is a potential area for conflict that needs to be resolved at the earliest. A practical way out may be to share carbon payments between local communities and respective authorities, similar to arrangements on sharing of timber benefits.

### 5.4 Necessary modifications in rules

Kyoto rules for carbon sequestration projects are often perceived as too rigid and difficult to follow (IISD, 2006). There has been a move to simplify these rules, especially for small-scale community forestry projects (UNEP, 2004). In comparison, rules for carbon sequestration projects on CCX are relatively simpler 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.

The foremost among these is that trading in carbon credits from forestry projects on CCX is presently restricted to North America and some countries in South America. The present study has shown that NGOs in India not only generate significant carbon sequestration credits, but they also meet most of CCX's requirements. In addition, carbon payments to local communities in India will generate substantial developmental benefits, achieving a possible win-win between environment conservation and economic development. As the CCX continues to grow, it is high time for it to initiate relationships in other regions of the world, particularly in India where forestry projects are already well established.

Secondly, the exchange may need to define sustainability more precisely. The present rules call for long-term commitment to conserve forest plantations, but do not clarify the issue of leakage. This paper has argued that making small provisions for annual harvesting of biomass should not be termed as leakage and in fact, such exemptions may ensure the permanence of carbon stocks. Finally, CCX only allows for trading in aboveground carbon stored in live matter. However, forest plantations often fix substantial amounts of carbon in the soil, which accumulates as organic matter

(Poffenberger *et al.*, 2002). If trading is allowed for belowground carbon, it may provide a still higher economic incentive for local communities to participate in carbon sequestration activities[17].

## 6. Conclusion

Seva Mandir and FES can potentially sell carbon sequestration credits on the CCX and generate additional incomes for their local communities. 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.

On their part, the carbon markets will need to look at integrated role of forests. Carbon payments can provide economic incentives to local communities for conserving forests and other valuable natural resources. However, these communities also depend on the same resources for their immediate sustenance needs. Achieving a balance between these immediate needs and the long-term priorities of the global society can truly promote sustainable solutions to global warming.

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[17] Important to note that CCX already allows for trading in soil carbon, but it is restricted to grasslands and conservation easements in US.

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Annex 1

**Calculation of current annual carbon sequestration from**

**forestry interventions of Seva Mandir and FES, India**

1) All calculations are based on a conservative Mean Annual Increment (green, above ground) of 1 t C/ha for revenue / pasturelands and 2.5 t C/ha for forestlands.

2) Annual carbon sequestration taken as 50% of MAI. Measured in terms of t C/ha.

3) Result from (2) is multiplied with 3.67 to get annual carbon sequestration in terms of t $CO_2$ / ha.

4) Present price on CCX is \$4.40/ t $CO_2$ (Rs200/t $CO_2$)

**Foundation for Ecological Security (FES)**

| | | |
|---|---|---|
| Total area under post-1990 plantations on forestlands | = | 5787 ha |
| Annual carbon sequestration from forestlands | = | 2.5 x 5787 x 0.5 x 3.67 |
| | = | 26,547.9 t CO2 / annum |
| Total area under post-1990 plantations on | | |
| *Panchayat*/revenue lands/watershed development | = | 27,628 ha |
| Annual carbon sequestration | = | 1 x 27628 x 0.5 3.67 |
| | = | 50697.4 t CO2 / annum |
| **Total current carbon sequestration from** | | |
| **Post-1990 FES's forestry initiatives** | **=** | **77,245.3 t CO2/annum** |
| Potential financial value at CCX @ \$4/tCO2 | = | \$308,981 per annum |

**Seva Mandir (SM)**

| | | |
|---|---|---|
| Total area under post-1990 plantations on forestlands | = | 715 ha |
| Annual carbon sequestration from forestlands | = | 2.5 x 715 x 0.5 x 3.67 |

| | | |
|---|---|---|
| | = | 3280.1 t CO2 / annum |
| Total area under post-1990 plantations on | | |
| *Panchayat*/revenue lands/watershed development | = | 7,163 ha |
| Annual carbon sequestration | = | 1 x 7154 x 0.5 3.67 |
| | = | 13,144.1 t CO2 / annum |
| **Total current carbon sequestration from** | | |
| **Post-1990 SM's forestry initiatives** | **=** | **16,424.2 t CO2/annum** |
| Potential financial value at CCX @ $4/tCO2 | = | $65,697 per annum |