HINIDUMA BIO-LINK PROJECT

Reforesting traditional home gardens using analog forestry concept in tropical wet zone of Sri Lanka

CARBON CONSULTING COMPANY (PVT) LTD, SRI LANKA

Summery of the project

‘Hiniduma Biolink Project, Sri Lanka’ - Reforesting traditional home gardens using “analog forestry” concept in wet zone of Sri Lanka’ is an effort of Carbon Carbon Company (CCC) with the help of Rainforest Rescue International (RRI) to establish a biodiversity corridor in between the two large remnant rainforest patches in South Western region of Sri Lanka and to conserve buffer zones around the forest edges. The total land area of this proposed biodiversity corridor is approximately 20, 000 ha which started with 10 ha pilot project.

This system involves the reforesting of traditional famers’ home-gardens with analog forestry in the low land wet zone region, that currently have land use practices of traditional tea planting, small rubber plantations, and coffee and paddy cultivation. Furthermore as these areas are near to the buffer of the forest most parts of the land include remnant forest patches and riverine forest

Valuing the farmer community involvement to improve the eco system services through sequestrated carbon quantities is the second objective and this was introduced due to the financial stability of the project. Promote the eco-friendly livelihood options such as organic farming, analog forestry also kept under objectives while without disturbing their existing livelihood practices.

Objectives of the project

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- Main objective of the project is to minimize the threats from the communities adjacent to the pristine forest and to restore a forest corridor with native trees between the two forest patches by improving the know-how of eco system values through participatory approach while promoting the eco-friendly livelihood options such as organic farming, analog forestry without disturbing their existing livelihood practices.

- Second objective is to develop a financial mechanism through voluntary carbon market to sustain the project by valuing the farmer community involvement to improve the eco system services through sequestrated carbon quantities.

Background of Hiniduma Bio-Link Project

Hiniduma, in the southwest of Sri Lanka, is a mixed agricultural community surrounded by one the island's last remaining rainforest ecosystems. The World Heritage Forests of Singharaja and Kanneliya, along with numerous related forest fragments, all lie within 10km of this small village.
'Hiniduma Biolink Project of - Reforesting traditional home gardens using "analog forestry" concept in wet zone of Sri Lanka' is an effort of Carbon Consulting Company (CCC) along with Rainforest Rescue International (RRI) to establish a biodiversity corridor in between the two large remnant rainforest patches in South Western region of Sri Lanka and to conserve buffer zones around the forest edges.

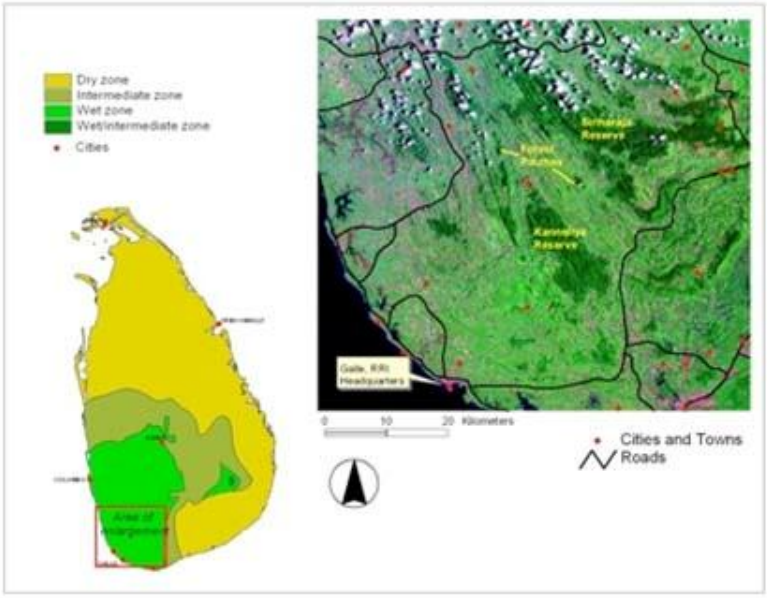


Figure 1: Forest cover and the project area.

Vector layers are overlaid on Landsat ETM+ image acquired in 2000. Dark green represents primary forest, light green represents degraded forest, white represents cloud, and pink represents areas with high soil reflectance. The forest blocks shown here represent nearly all of the remaining lowland moist tropical forest in Sri Lanka.

The Hiniduma biolink project was initiated in February 2010 with 15 poor rural Teagrowers that surround segments of the remnant Rainforest Patches in the South of SriLanka. The establishment of the Biolink aims to join together two of the largest forestpatches by forming a forest canopy corridor with local community support. Expectedcommunity benefit from this project are the enhanced access to natural resources andthe diversification of the cropping base of the local communities. Other expected resultsbrought about by the establishment of this Bio link are enhanced biodiversity migrationand enhanced biodiversity resilience through strengthened

ecosystems. The total land area of this proposed biodiversity corridor is approximately 20, 000 ha which started with 10 ha pilot project (phase 1).

The mechanism for initiating the Bio Link program has been through an innovativeCarbon offsetting process developed by Carbon ConsultingCompany.

1. Physical activities

Community awareness
The importance of securing the correct level of community awareness on the importance of natural forests and the essential role they play in maintaining the quality of local resources such as water and soil resources. The Action has had three community awareness programs over the initial 6 months of the project implementation.

The awareness program covered the following subjects.
1. Project objectives and aims.
2. Basic organic and plantation management knowledge.
3. Restoration forestry principles (Analog forestry).

Distributing reading material to the farmers

Planting
All planting was carried out in the three-months period from February 2010 to April 2011 where the local community involved themselves in the setting up of forest plantations on their home gardens. The geographical location of the plantations was selected by project staff to help develop a biolink-biodiversity corridor between the Kanneliya strict nature reserve and the Polgahakanda nature reserve. The plantations were set up using restoration forestry (Analog forestry) methods with advice from field staff.


Maintenance

The farmers will continue the responsibility of maintenance of plants for 20 years. The conditions are outlined in the farmer contracts. Correct plantation maintenance will include timely weeding, mulching, watering and protecting from disasters both natural and manmade. Plantations were carried out with minimum disturbance to the existing vegetation to enhance water retention for the new seedlings.

Protective covers have been provided by the project partners however the establishment of protective covers has been low due to the concept of plant protection being new to the farmer communities. Up to June 2011 only about 20% of plants are have had protection established.

Community payments

Payments to farmers are based on the plant amount that has planted in their lands. Farmers will be paid a stipend for looking after the plants. Payments will be provided at agreed dates by partner organizations to keep the farmer interest high.

Mr. Subramaniam making the farmer payments

Training

Agricultural training including organic farming, Forest Garden Product training, analogue forestry etc. will provide to beneficiary farmers to train them to increase the income level through farming while maintaining the native plants in their agricultural lands. This will be done regularly identifying their needs. Trainings are expected to be begun in the month of July 2011.

Ongoing monitoring and researches

Regular ongoing monitoring programs are must to monitor the plant maintenance status and to identify the needs of the project. CCC visits supposed to do ongoing monitoring programs once a month.

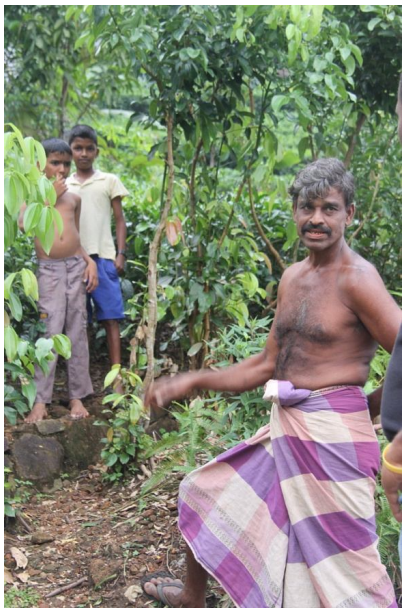
Monitoring procedure by the project coordinators

2. Results achieved

Physical

In the first phase of this project, 7178 native trees were distributed covering 90+ species belong to 45 families. The local community to successfully complete the planting provided all labor. Ongoing plantation maintenance and security will be provided by the local community.

Ecological Service of the project



This project will provide a number of ecosystem services mainly through the protection of wildlife habitat and increased biodiversity, but also through the protection of the watershed. The tree plantation is designed to help develop a canopy structure that will increase animal movements and improve genetic diversity. Moreover this project will also enhance the physical aspects of the surrounding environment. Some of the benefits observed are; the improvement of the soil quality and soil conservation particularly by the prevention of soil erosion associated with heavy rainfall. This will also lead to the prevention siltation of surrounding water sources. The hydrological benefits of this project include the harvesting of incidental moisture and improved water flows which will help to reduce flooding. Planting suitable trees species near the riverine, will helps to protect the river basins and it also helps to protect the watershed in the area and improve the water quality.

Economic Services of the project

The Economic benefit of the project is a win-win situation for both land owners and the project developers. Hence projects will only succeed if land-use practices are viable over the long-term and provide sustainable economic benefits to communities over and above carbon payments. Attractive financial benefits are available to drive landowners towards the conservation of planted trees for the project duration.

Livelihood of the famers will be enhanced in several ways. Improving woodlots will provide a local and sustainable source of firewood and poles, and reduced pressure other forest resources. Income diversification through non timber forest products (NTFP's) as– medicines, fruits, shading materials, livestock feeding, etc, provision of potential bee keeping habitat as beehives can be hung on trees, shading for humans and livestock and pruning material may be used as firewood

Social Services of the project

CCC has created a carbon credit program which attempts to address environmental, social and economic issues that are affecting the area at present. RRI has launched a number of initiatives in the area including a community-based ecotourism project, an environmental education program in 5 schools, the establishment of a nursery for endangered plants rescued from construction sites, and a forest restoration program on 15 acres of purchased land.

Children in the school awareness programme in the project area

Financial structure of the project

The Hiniduma Bio- Link was established using funding from CCC. Future funding is designed to predominantly come from the sale of Plan Vivo Certificates and private investments towards the delivery of future Plan Vivo Certificates.

Long term financial responsibility will be taken by the Carbon Consulting Company and the payments held on behalf of farmers over the long term are carefully handled through a separate account.

The use of funds acquired from the sale of Plan Vivo Certificates will be divided into two broad categories. 44% will go to the first category for project operations and development expenses, tree protection and for monitoring and the certification cost whereas the remaining 56% will directly be provided to the community involved in the project inaddition the cost of provision of seedlings).

Baseline condition of the project before implementation and after

Existing moist forest occurs only in scattered remnants in the southwest region of the nation. Singharaja and Kanneliya Reserves located in Galle, Matara and Ratnapura Districts, Southern Province, about 100 km southeast from Colombo, are the largest and most significant patches of primary rainforest remaining (Figure 1).

Description of project area

Currently, the project area is defined as the area between Singharaja and Kanneliya Forest Reserves. The yellow polygons in Figure 2 represent 5 likely corridor candidates of which a total of 23,473Ha is assumed to be area which will selected based on current knowledge of forest patches, waterways, human population, and land use.

Figure 2: Biological corridor candidates. The yellow lines represent potential corridor areas based on current knowledge.

The project area contains portions of 3 forest reserves: (Singharaja, Kanneliya and Polgahakanda) and 2 proposed forest reserves (Hiniduma and Dellawa) (Figure 2).

Biodiversity and endemism of these reserves is exceptional: they harbor 90% of endemic woody species and 75% of endemic mammals. The Kanneliya Reserve (10,140 ha) is renowned for supporting the highest percentage (60%) of woody species of any single wet zone forest. In 1989, the Singharaja Forest Reserve (8800 ha) was declared a World Heritage Site by UNESCO because of its high proportion of rare and endangered flora and fauna.

The reserve holds 65% of Sri Lanka's endemic trees and woody climbers and is home to the Ceylon Leopard, Sambar Deer, Purple Faced Leaf Monkey, Slender Loris, Blue Oak Leaf Butterfly, Rough Horned Lizard (see photo), and hundreds of other endemic flora and fauna species. Table 1 summarizes diversity and endemism in Sri Lanka as of 1990.

Table 1: Endemism of Singharaja (Zoysa and Raheem,1990)

	No. species in Singharaja	Total species in Sri Lanka	% Species found in Singharaja	Endemic species in Sri Lanka	Percentage endemic species in Singharaja
Birds	141	384	36.71	26	95.00
Mammals	40	85	47.5	12	58.33
Reptiles	14	73	19.17	34	20.58
Snakes	29	90	32.22	39	35.89
Amphibians	19	38	50.00	19	42.10
Fish	10	64	15.62	17	41.17
Butterflies	65	242	26.85	41	51.21

Past ecological research has focused primarily on the larger reserves. Thus, less is known about Hiniduma, Delwalla, and other forest patches. However, preliminary observations by RRI scientists indicate that these under-protected areas are critical habitat for a number of endemic and endangered species. For instance, RRI has already confirmed the presence of 6 endemic and endangered amphibians in a small portion of Hiniduma Forest.

The forests within the study area are located mainly on steep slopes and/or on hilltops where access is more difficult. However, there are small and highly disturbed forest patches remaining on some tea estates in lowland areas that act as windbreaks. Local resources users benefit from forests in the area through the extraction of both timber and non-timber forest products (NTFPs) such as medicine, food (kithul palm syrup for Juggery, a popular sugar substitute), building materials (rattan and bamboo) and other useful products (i.e., *Shorea* species for varnish and incense).

Socio-economic overview

Commercial agriculture and silviculture is the mainstay for the economy in the project area. The government manages vast plantations of pine and eucalyptus while private organizations own and manage plantations of tea, rubber, palm, and other cash crops. The local population is primarily rural although small towns dot the landscape, primarily along the Gin River. The majority of the local population is composed of Sinhalese (Buddhist) smallholders, many of whom grow cash crops – mostly tea – on their land to supplement income. Labor on smallholder tea plots is family based while the larger tea estates hire laborers.

The area is considered to be one of the poorest Sri Lanka; the World Food Program recently labeled the area as nutritionally vulnerable. This can be attributed at least partially to decades of unsustainable agricultural practices that have rendered large portions of land unproductive.

Threats to biodiversity

The dominant proximate threat to biodiversity in the project area is agricultural and silvicultural expansion. The majority of land between and adjacent to the reserves has already been converted to smallholder plots, rice paddies, tea, rubber, oil palm, and cinnamon plantation. These plantations are either privately owned, under government lease to plantations or administered by the Forest Department. Forested crown land is frequently allocated to private estates holders leading to rapid forest conversion. Unfortunately, it can be seen in recent history that plantation managers have little commitment toward environmentally responsible land practices. In addition to agricultural expansion, anthropogenic threats include gem mining, illegal timber extraction and hunting. Anthropogenic threats in the project area are expected to increase substantially following the construction of a new highway linking Matara (southeast of Galle) and Colombo, which will pass as close as 10 km south Kanneliya.

One of the primary underlying causes of deforestation in the area is the Land Development Ordinance, which was established to encourage agricultural production. Under this ordinance smallholders are required to clear land for cultivation in order to claim property rights. Not surprisingly, this land tenure system leads to rapid deforestation and greatly inhibits community based forest conservation initiatives. Another underlying cause is the misuse of agro-chemicals. In response to land degradation, farmers turn to chemical fertilizers. However, improper use of these inputs results in gross imbalances of soil nutrients, which leads to further decreases in soil productivity. The end result is that farmers need more land, often at the cost of natural forest, to maintain productivity.

A number of policies exist that, if enforced, hold potential for effective ecosystem conservation. However, enforcement is inconsistent and weak, particularly outside protected areas. For instance, regulations of the Soil Conservation Actprohibit the clearing of vegetation along fresh waterways. In 2003 RRI estimated that 90% of plantations along the Gin River in the region were violating this rule.

The costs associated with unsustainable land and forest management are already being felt in the project area and decrease in soil productivity is a fundamental concern among smallholders in the project area. Moreover, the low forest cover has made the area prone to flash floods and landslides. In 2003 a flash flood and landslide resulted in the loss of crops, lands, housing and even lives

Ecosystem impact mitigation through new planting

This project aims to provide many ecosystem services other than creating a biolink in between two forest patches. Some of them are listed below,

- Establishment of mixed species forest trees on underutilized lands with minimal biodiversity.
- Emphasis is placed on collecting tree species seeds with the community to maintain a seed bank and a nursery.
- By increasing the forest cover, increase the wildlife habitat and improve the arboreal movements of animals using the bio-link when canopy structure developed.
- Increase the watershed by protecting the riverine areas.

Positive impacts on biodiversity will be evaluated by performing 'Flora and fauna ecological surveys'. RRI survey team has been conducting a faunal survey of threatened species (Eg. Slender loris) and endangered species in the project area.

Soil Quality

With the new planting soil quality and soil conservation will be increased particularly by the prevention of soil erosion associated with heavy rainfall and siltation of water courses. (Climate change adaptation benefit.). The soils quality will be measured by comparing of soil depth humidity level and nutrient content in different sampling frequencies. Setting up Key Performance Index (KPI) and practical targets is identified as a future activity after monitoring and analyzing the soil for at least two years.

Watershed Protection

Hydrological benefits, such as harvesting of incidental moisture and improving water flows which to reduce flooding are some of the identified key watershed protection activities result from this project. Planting suitable trees species near the riverine, will help protect the river basins and also helps to protect the watershed in the area. Some identified factors which enhances the water quality is as below,

- Increase in forest cover (increased water retention and decreased evaporation)
- Planting within the vicinity rivers and streams
- Planting within strategic watersheds

Routine water monitoring analysis will ensure the improvements in the watershed protection and water quality enhancing activities.

Social benefits

Small holder farmers

Land tenure of the project area either solely owned by the farmers or Swarnabhoomi or Jayabhoomi deeds for farmers. (Swarnabhoomi and Jayabhoomi is a long term land lease scheme which awarded to small scale traditional farmer community from Sri Lankan government). Government of Sri Lanka has provided the farmers a perpetual lease facility to the farmers do not have the ownership of the land thus giving complete rights to farm on the lands and generate income.

Commercial agriculture and silviculture is the mainstay for the economy in the project area. Land used of this area and the main income of the farmers is mainly traditional tea planting, small rubber plantations, Coconut, coffee and paddy cultivation. Average monthly household income of the farmers in the project area varies between Rs.3500 to Rs. 10000.

Livelihood of the famers will enhance in several ways, by improving woodlots will provide a local and sustainable source of firewood and poles, reduced pressure other forest resources. Income diversification through non timber forest products (NTFP's) as– medicines, fruits, shading materials, livestock feeding, etc, Provision of potential bee keeping habitat as beehives could be hung in the trees, Shading for humans and livestock and Pruning material may be used as firewood .

The Economic benefit of the project is win-win situation for both land owners and the project developers. Hence projects will only succeed if land-use practices are viable over the long-term and provide sustainable economic benefits to communities over and above carbon payments. Attractive financial benefits driving them onwards conservation of planted trees for project duration. On the other hand project developers will be benefited by selling the carbon credits and the benefit will be partially shared to famers. Sequestrated CO_2 from newly planted trees are eligible to sell as Voluntary carbon credits for local and international markets after going through the project development, validation and verification processors.

By implementing this project it will reduced pressure on forest resources (potentially resulting in reduction of positive leakage.

- Income diversification through and non timber forest products (NTFP's) as– medicines, fruits, shading materials, livestock feeding, etc
- Provision of potential bee keeping habitat as beehives could be hung in the trees
- Shading for humans and livestock.

Additional incomes by making compost and selling and by practicing organic farming can acquire benefits.

Environmental indicators

Biodiversity impacts	**Water availability/watershed impacts**	**Soil productivity/conservation impacts**	**Other (Social impacts)**
Establishment and protection of wildlife habitat for diverse flora and fauna. General improvement in Microclimate associated with trees including shade provision	Reduction of runoff through stem and root effects on soils. Planting suitable trees species near the riverine, will helps to protect the river basins and it also helps to protect the watershed in the area. Improvement of ground water recharges systems through enhanced water infiltration due to increased residence time.	Reduced soil erosion through binding effect of tree roots. Reduced soil erosion through improved structure due to increased organic matter content. Improved soil fertility through biological nitrogen fixation and addition of nitrogen-rich organic residues and through nutrient cycling.	• Woodlots will provide a local and sustainable source of firewood, poles and it will reduce pressure other forest resources. • Income diversification through timber and non timber forest products (NTFP's) as– medicines, fruits, shading materials, livestock feeding, etc • Provision of potential bee keeping habitat as beehives could be hung in the trees • Shading for humans and livestock. • Pruning material may be used as firewood.

Initial assessment of the land use, water quality and biodiversity was conducted

Continues assessments will be carried out in every five year times

Socio-economic impact areas and assessment indicators

Income generation	• All the precautions were made to improve the farmer livelihood activities. • According to the contractual arrangement, farmers can enjoy the harvesting benefits of the plants • A monthly allowance was agreed with the farmers as per the plant care taking and KPI's were agreed. • Addressing the issues of small scale farmers facing problems on applying loans or other financial benefits through free plant distribution (part of the plants are short term cash crops)
Strengthening social cohesion	• Forming the famer organizations and enhance the unity of the farmers • Improve the interaction between individuals, • Improve the social acceptance through state stakeholders, as more responsible farmers towards ecological conservation • Intensified communication among them and supporting networks for social and productive services, especially for the ethnic minorities.
Improve the agro-technical developments	• Providing high quality seedlings and for successful tree planting • Training for local communities to assist them in understanding and evaluating the issues of hosting the proposed Plan Vivo project activity, • Other livelihood benefit training – organic farming, green fertilizer usage etc

- **Govt./community**

The project was initially developed during a community consultation workshop held in 2008 with the presence of Divisional Secretariat, Grama Niladhari (village headman), Land Officers, Forest Conservation Department officers and the public health inspector. The cooperative ministry, tea board and the local police have been made aware of the corridor/bio-link concept. Regional and local level stakeholder engagement is coordinated by CCC.

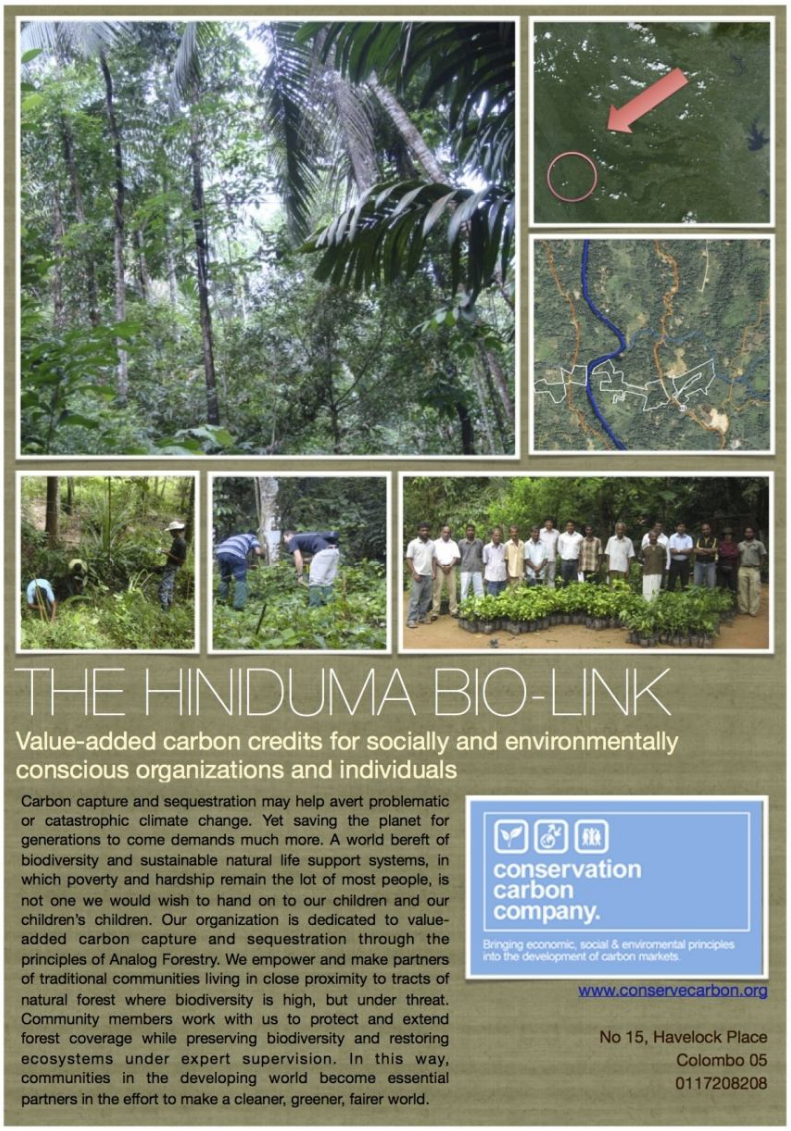
- **Technical assistance**

Project coordinators encourage the farmers take care of the plants. Apart from the self monitoring plan given to the famers, CCC's technical consultants will be fully responsible to monitor the success of the post planting process. Immediate actions will be taken where famers fail to achieve their targets by providing them the necessary technical support and advice from the CCC technical team.

As a long term activity it was identified to tie up with a local research institutions (University of Ruhuna or Sri Lanka University of Sabaragamuwa) in project monitoring activities, which will enhance the social engagement and visibility of the project and gain more recognition.

Publications

- Article to be published in a “CYNOSURE: magazine published by Environmental Conservation and Management Society, University of Kelaniya, Sri Lanka.
  (http://www.encmuok.com/)



- Senadheera, D.K.L.K., Fernando, C. & Wahala, W.M.P.S.B., 2011. Potential for voluntary carbon market in Sri Lanka - **A success story of Hiniduma - Kanneliya Biolink project.** In *Annual International Forestry and Environmet Symposium 2011*. Nugegoda, Colombo, Sri Lanka, 2011. Department of Forestry and Envioronmetal Science, University of Sri Jayewardenepura.

Mr. *Subramaniam Eassuwaren* talk on Lanka Business Report

http://vanguard1.vanguardlk.com/mmg/lbr_video.php?vt=LBR&vn=LBR/carbon21112011.flv&vid=1928

Photo Gallery

1, Project Activities

Plan Distribution

Helping to plant

Planted trees Covered with polythene bags

Plant Tagging

Educational Awareness programme for the university students held at the research center near the project area


Research being carried out with university students

Working group of the Hiniduma Bio-Link

2. Biodiversity in the area



Green vine snake(*A.nasuta*)*Ceratophora asperaScribbled Gobi*

Black ruby barb*Hylarana temporalis*

Beddomea albizonatus

Moth spp

Slender loris

More photos can be found in http://www.flickr.com/photos/conservecarbon/