Carbon sequestration through reforestation projects in China and Argentina: a multiple benefit approach

Lucia Perugini[*]; Riccardo Valentini[∇]; Antonio Lumicisi[+]

[*∇] University of Tuscia, Department of Forest Science and Environment ,Via San Camillo de Lellis snc, 01100 Viterbo, Italy
[+] Ministry for the Environment and Territory, Department for Environmental Research and Development, Via Cristoforo Colombo, 44 - 00147 Rome - Italy

Introduction

Each of the Conferences of the Parties (COP) to the Rio Conventions – the Convention on Biological Diversity (CBD), the United Nations Conventions to Combat Desertification (UNCCD) and the United Nations Framework Convention on Climate Change (UNFCCC) – has underlined the need for enhanced collaboration among the conventions. For example, the UNFCCC COP has affirmed that there is a need for enhanced cooperation between UNFCCC, CBD and UNCCD, with the aim of ensuring the environmental integrity of the conventions and promoting synergies under the common objective of sustainable development. The rationale for collaboration among the conventions stems from the interlinkages between the issues that they address. Climate change can be an important driver of desertification and biodiversity loss. Ecosystem dynamics can impact the earth's carbon, energy and water cycles and therefore affect climate. Further, measures undertaken under one convention to address climate change (including mitigation and adaptation activities), to combat desertification and land degradation, or for the conservation and sustainable use of biodiversity, might have consequences for the objectives of the other conventions. Noting the distinct mandates and independent status of each convention, the need for improved coordination and cooperation among the Rio Conventions has been recognized as a means to capture synergy, reduce areas of potential conflicts between activities taken by Parties to fulfill the provisions under each agreement, avoid duplication of efforts, and use resources more efficiently.
It has been largely recognized that forests are the natural resource where synergistic results under the three Rio Conventions could be achieved. At the workshop on "*Forests and Forest Ecosystems: Promoting synergy in the implementation of the three Rio Conventions*", (Viterbo, Italy, 5-7 April 2004) organized by the UNCCD and CBD secretariats, in cooperation with the UNFCCC secretariat, has been underlined that countries could achieve synergistic effects in afforestation/reforestation activities by formulating projects according to basic principles contained in the objectives of the three Rio Conventions. This would ensure that appropriate attention is paid to the environmental goals of conservation and sustainable use of biodiversity, combating desertification, carbon sequestration and other environmental goals and socio-economic aspects, including fair and equitable benefits sharing and poverty eradication. In this context, the afforestation/reforestation activities under the Kyoto Protocol CDM (Clean Development Mechanism) mechanism can represent an effective tool, if an integrated approach is used.
Recognizing that, the Italian Ministry for Environment and Territory has been funding two pilot afforestation/reforestation CDM projects, namely the "Afforestation for the purpose of combating desertification, mitigating climate change and protecting biodiversity in China: Youth Participation in Plantation Establishment for Combating Desertification in Aohan County, Northeast China" and "Environmental Youth Groups in Santiago del Estero, Argentina".
The projects are aimed to the afforestation of 6,000 ha (3,000 ha in each country) with native species, on degraded land threatened by desertification. Those activities have a multipurpose objective: sequestering carbon dioxide and mitigating climate change, combating desertification, creating job opportunities improving socio-economic conditions, and increasing environmental awareness, particularly among youth.

[*] Author: E-mail: perugini@unitus.it; Tel +39 0761 357251; Fax +39 0761 357 389
[∇] Author: E-mail: rik@unitus.it; Tel +39 0761 357394; Fax +39 0761 357 389
[+] Author: E mail: lumicisi.antonio@minambiente.it; Tel +39 06 57228122; Fax +39 06 57228177

Projects description

China Case: Aohan County	
Project developer	Secretariat of China National Committee for Implementing Programmes for Combating Desertification (CCICCD)
Other participants	Chinese partners: Aohan youth league, County Women Association, Aohan Forestry Bureau, Chifeng, Forestry Division, Aohan county Division Forestry department at provincial level, Chifeng Forestry bureau, Aohan County Forest Bureau, Chinese Forestry Academy, and Chifeng Forest Research Bureau. Italian partners: Ministry for the Environment and Territory and University of Tuscia (Viterbo)
Project location	Aohan County is located in Inner Mongolia province of China, situated between 41°42′-43°02′N and 119°30′-120°53′ E, and stretches 176 km from South to North and 122 km from east to west with a total land area of 800,000 hectares.
Project site description	The County lies in the temperate zone featuring typical continental semiarid climate with decreasing aridity from South to North. The annual mean temperature is around 7,5º C, the extreme maximum and minimum temperatures are 39,7º C and -30º C respectively. The average annual precipitation of the area is 310 to 400 mm, declining from south to north and is mainly obtained from July to September. Over the past few decades, the forested land area in Aohan has reached 352,700 hectares, accounting for 42.5% of the total land area; the grassland established is 68,000 hectares. An ecology system dominated by forestry has been basically established. However, there is still over 200,000 hectares of eroded land; 80,000 hectares of desertified land; 120,000 hectares of degraded grassland that need urgent treatment. The project will take place on agricultural and grazing areas with low productivity and highly prone to wind erosion The ecological rehabilitation task is still huge and pressing. The implementation of afforestation for the purpose of combating desertification will be the central task in the effort to rehabilitate the ecology over a long period of time.
Project benficiaries	The proposed project covers nine state forest farms, with a total population of 2,311 and 705 households, of which the agricultural population is 2,201, accounting for 95.24% of the total; the number of management and technical staff is 110, accounting for 4.76% of the total.
Afforestation description	Indigenous tree species such as Poplar, Hedysarum laeve Maxim, Scotch pine and Apricot are the major species to be planted on the proposed 3000 ha, taking into consideration the site conditions and types, as well as natural conditions of the project areas.
Carbon sequestered by 2012	The related carbon credits (lCERs) are estimated in 238,184 tCO_2-equivalent by 2012

Argentina Case: Santiago del Estero	
Project developer	Fundación del Sur (FS) and Grupo Ambiental para el Desarrollo (GADE)
Other participants	Argentinean partners: Universidad Nacional de Santiago del Estero (UNSE) Italian partners: Ministry for the Environment and Territory and University of Tuscia (Viterbo)
Project location	The Province of Santiago del Estero is located in the North of Argentina, in one of the highest poverty and lowest relative development areas in the country. Its location, in terms of geographic coordinates, is 25º 35´ and 30º 41´20" South latitude, and 61 º 34' and 65º 34´ West longitude with a total surface of 136,351 km².
Project site description	The province is sited in the North part of the big Chaco-Pampean prairie, which ranges from North to South, in the center of the country, known as "Región Chaqueña". The climate of Santiago del Estero is subtropical, with two different seasons: the rainy season, from October to March, and the dry season, from April to September. Especially high in summertime, precipitations decrease from East to West. During the year, they range from 750 mm to 600 mm, with an annual average of 695 mm. The annual average temperature is 21,5º C, with an absolute maximum summer temperature of up to 47º C, and an absolute minimum winter temperature of -5º C. Land degradation is a consequence of intensive agricultural exploitation, overgrazing, and land clearing (the irrational exploitation of the natural forest destroyed 9 million hectares since the beginning of the last century). The increase in farming borders entails -in a context of poor territorial planning- soil degradation and loss of native forests as a result of uncontrolled clearing, without using the products obtained there from (wood, firewood), because of burning. Once farming becomes not viable, lands are set aside or abandoned. Native forests - heavy wood products sources - are degraded by the lack of sustainable management policies since they are not perceived as valuable options to carbon and/or firewood production. The potential for non-wood forest production is very high. This status causes a loss of biodiversity in species protected by CITES such as: yaguareté, panther onca, landau (Rhea americana), so hormiguero (Myrmecophaga tridactyla), tatu carreta (Priodontes maximus), etc. Deforestation highly affect native species: Algarrobo Blanco (Prosopis alba), Brea (Cercidium praecox), Algarrobo Negro (Prosopis nigra), Quebracho Colorado (Schinopsis balanzae), Quebracho Blanco (Aspidosperma spp), Itin (Prosopis kuntzei), etc. The proposed sites are located on abandoned agricultural land affected by salinization processes due to poor water management and lack of maintenance of irrigation and drainage systems. Besides, the inadequate water disposal during overflows lack worsens the overall situation, accelerating the degradation processes occurring in those lands.
Project benficiaries	There will be a total of 200 youth and 40 farmers and/or landowners (and their families) who will benefit from the Project.
Afforestation description	Afforestation/Reforestation of 3,000 hectares with native species for approximately 93% (Algarrobo blanco or *Prosopys alba*, Itin or *Prosopis ruscifolia,* quebracho blanco or *Apidosperma quebracho blanco*), and with exotic species for about the 7% (*Casuarinas* spp.). A number of positive effects are recorded for *Prosopis Alba* plantations: minimization of soil losses and contribution to organic matter and nitrogen, increase of water efficiency for themselves and for other cultures, their growth is less affected by draught, production valuable side-products such as energy, food, wood, gum, etc.
Carbon sequestered by 2012	The related carbon credits (lCERs) are estimated in 321.275 tCO2-equivalent by 2012

Lessons learned

Following synergistic approach, the projects were focused on the following principles: selection of degraded sites, use of indigenous species, and participation of local stakeholders for the project planning.

The projects have been developed in tight collaboration with relevant entities at national level for both conventions UNCCD and UNFCCC, and taking into account the principle of biodiversity conservation. A participatory approach has been used in order to guarantee stakeholder participation under sustainable development principles. Afforestation in the framework of Kyoto Protocol can be viewed as an efficient tool not only for climate mitigation but also for reversing degradation processes on areas threatened by desertification. Poor communities can gain additional benefits from the projects activities increasing their incomes not only related to timber wood production and carbon credit revenues, but also increasing the value of their land, otherwise unproductive.

The involvement of the youth gives an additional value to the project, increasing their environmental awareness.

The social and environmental benefits of such kind of projects are evident, but some compromises have been taken into account. The following table highlights some *pro* and *cons* of the choice taken during the projects planning.

Factor	***Pro***	***Cons***
Plantation on degraded areas	- Desertification processes are reverted - Land use conflicts on degraded areas are lower, decreasing the risk of leakage due to activity shifting. - Additional income can be generated on land otherwise unproductive.	Poor soils decrease the growing velocity and the survival rate of tree species, increasing the risks of failure of the plantation
Use of indigenous species	- The ecological biodiversity of the project sites is increased - The acceptance form the local population can be higher - The environmental impacts of the afforestation are minimal or positive - Traditional use of native trees can be preserved.	- In some cases local populations prefer exotic species for their higher growth rates. (In Argentina, for example, the local people were more favorable to the use of Eucalyptus instead of Algarrobo, since there is not any example of plantation of algarrobo in the area). - Material for afforestation and *know-how* is often difficult to find (tree propagation, seedlings, seeds, etc.)
Fast growing vs. slow growing species	- Fast growing can guarantee an immediate income in terms of wood production and carbon credits in the short term, which is usually better accepted by local stakeholders. - Slow growing species produce an environmental benefit restoring the forest ecosystem, protecting the soil form erosion, developing a well-structured forest soil increasing the soil organic carbon content. Furthermore the quality of wood coming form long rotation plantations is higher than in the short rotations ones, giving higher economical benefits on the long term.	- In the long term, fast growing species do not guarantee a substantial increase of carbon sequestration. This is due to the short rotation (which results in a carbon emission and decrease the soil carbon contents) and the low wood density. - The use of slow growing species can increase the pressure on the surrounding forests for fuel wood collection.

Conclusion

Afforestation activities under CDM can play an important role in reducing GHG, reducing land degradation and increase of biodiversity. However this depends on the local circumstances and the design of the activities. There are opportunities to implement mutually beneficial activities, but the relationship between livelihood requirements and the desired environmental services can be controversial. The final compromise should be built in adequate provisions concerning local environmental and social factors, with relevant local participation.