REQUEST FOR CEO ENDORSEMENT/APPROVAL

PROJECT TYPE: Full-sized Project
THE GEF TRUST FUND

Submission Date: 21 April 2010
Resubmission: 14 June 1010

PART I: PROJECT INFORMATION

GEFSEC PROJECT ID: 3483
GEF AGENCY PROJECT ID: 40684
COUNTRY(IES): People's Republic of China
PROJECT TITLE: Forestry and Ecological Restoration Project in Three Northwest Provinces (formerly Silk Road Ecosystem Restoration Project)
GEF AGENCY(IES): AsDB
OTHER EXECUTING PARTNER(S): State Forestry Administration; Provincial Governments of Gansu, Shaanxi, and Xinjiang
GEF FOCAL AREA(s): Multi-focal areas; LD and CC
GEF-4 STRATEGIC PROGRAM(s): LD (SP1, SP2, & SP3); CC (SP6-bis)
NAME OF PARENT PROGRAM/UMBRELLA PROJECT: PRC-GEF PARTNERSHIP ON LAND DEGRADATION IN DRYLAND ECOSYSTEMS PROGRAM

Expected Calendar (mm/dd/yy)	
Milestones	**Dates**
Work Program (for FSPs only)	Nov 2008
Agency Approval date	June 2010
Implementation Start	October 2010
Mid-term Evaluation (if planned)	June 2013
Project Closing Date	Sept 2015

A. **PROJECT FRAMEWORK** (Expand table as necessary)

Project Objective: To restore forest lands in Gansu, Shaanxi, and Xinjiang provinces and improve incomes and sustainable livelihoods from the use of forest land through the adoption of appropriate technologies and practices.

Project Components	**Indicate whether Investment, TA, or STA[2]**	**Expected Outcomes**	**Expected Outputs**	**GEF Financing[1]**		**Co-Financing[1]**		**Total ($)**
				($) a	%	($) b	%	c=a+ b
Component 1: Mainstreaming of Integrated Ecosystem Management (IEM) principles and approaches into Economic tree crops development	Investment	Increased productivity of forest lands and reduced land degradation in Gansu, Shaanxi, and Xinjiang provinces through appropriate and sustainable land use leading to sequestration of 368,600 tons C in orchards by end of project. Average per capita net income of beneficiary households increased by 15 % by end of project.	• About 38,000 ha of 13 varieties of economic tree crops planted and producing fruit on degraded forest land in the three provinces by 2016. • About 207,000 rural households and workers benefiting directly from the production and processing of economic tree crops by 2016. • At least 20 enterprises operating profitably in financially sound positions by 2016, and confirmed to use environmentally-sustainable farming and industrial technologies	0	0	138,808,687	100	138,808,687

Component 2: Mainstreaming of IEM principles and approaches into Ecological forestry development	Investment /TA	• Degraded forest land in the three provinces reduced by at least 10%. • Forest cover and tree density (stand volume) increased by 3% in Gansu, 2% in Shaanxi, and 1% in Xinjiang, leading to protection of total carbon stocks of 32 million tons C and sequestration of a total of 3.3 mt C by end of project	• GEF financing: (a) about 700 ha of degraded steeply sloping forest land in Gansu restored; (b) about 435 ha of degraded forest land secured in Xinjiang; and (c) improved carbon storage on forest land in about 12 SFFs in Shaanxi and Gansu.	3,250,300	16	17,482,113	84	20,732,413
		• Protection of carbon stocks in **Gansu** amounting to 2.7 mt and sequestration of 2.3 mt C by end of project	▪ Ecological forest planted on about 700 hectares. Yellowhorn planted on about 3,000 hectares (with future opportunities for biofuel production from tree seeds). ▪ State Forest Farms in Gansu Province improve tree cover and density on about 176,613 ha.					
/		▪ Improved retention of soil and water, on severely degraded land, some of which is steep-sloped. ▪ Protection of carbon stocks on 7 SFFs in **Shaanxi** amounting to 28.8 mt C and sequestration of an additional 1 mt C by end of project. ▪ Improved management of sand dunes using minimal water and other inputs and other degraded ecological forestry land ▪ Protection of 6,286 tons C of carbon stocks and sequestration of an additional 5,015 tons C by end of project in **Xinjiang**.	▪ At least 7 State Forest Farms in Shaanxi Province form public-private partnerships with private ecotourism enterprises and improve tree cover and density on about 155,113 ha. ▪ Ecological forests planted on about 495 hectares of sand dunes in 3 townships, protecting 190 homes and 592 hectares of productive land from further sand dune advances, and native poplar on 139 hectares of degraded land in Changji County, Xinjiang.					

Component 3: Strengthening of capacity to implement forest sector reforms using IEM approaches at provincial and county levels	TA	Improved IEM capacity in provincial forestry departments, county forest bureaus and township forest stations Centre of Ecological Forestry established	Minimum 3,000 technical staff in provincial forestry depts and in county institutions trained in IEM Institutional strengthening of 7 SFFs for the transition into effective IEM managers Office premises rented for the Center of Ecological Forestry and capacity established to monitor environmental and socio-economic impacts of forestry development and ecosystem restoration, including carbon sequestration potential and identification of opportunities for accessing the carbon market	1,520,400	15	8,452,000	85	9,972,400
		Enhanced technical capacity of participating households and farms in implementing IEM approaches on-the-ground	207,000 households benefitting from training in IEM, including at least 40% women and representative share of ethnic minorities					
Project management support • PPMOs and CPMOs established and operating in each province and county • Project performance and monitoring system operating effectively • Activities prepared, reviewed, and approved consistent with criteria				348,846	3	11,917,200	97	12,266,046
Total Project Costs				**5,119,546**	**2.8**	**176,660,000**	**97.2**	**181,779,546**

[1] List the $ by project components. The percentage is the share of GEF and Co-financing respectively of the total amount for the component.
[2] TA = Technical Assistance; STA = Scientific & Technical Analysis.

B. SOURCES OF CONFIRMED CO-FINANCING FOR THE PROJECT (expand the table line items as necessary)

Name of Co-financier (source)	*Classification*	*Type*	*Project*	*%**
ADB	Multilat. Agency	Hard Loan	100,000,000	59
Provincial government	Local Gov't	Grant	45,750,000	19
Enterprises	Private Sector	Grant	13,050,000	10
Households	Beneficiaries	Grant	17,860,000	13
Total Co-financing			**176,660,000**	**100**

* Percentage of each co-financier's contribution at CEO endorsement to total co-financing.

C. FINANCING PLAN SUMMARY FOR THE PROJECT ($)

	Project Preparation a	*Project B*	*Total c = a + b*	*Agency Fee*	*For comparison: GEF and Co-financing at PIF*
GEF financing	335,000	5,119,546	5,454,546	545,454	6,000,000
Co-financing	1,200,000	176,660,000	177,860,000		196,400,000
Total	1,535,000	181,779,546	183,314,546	545,454	202,400,000

D. GEF RESOURCES REQUESTED BY AGENCY(IES), FOCAL AREA(S) AND COUNTRY(IES)[1]

GEF Agency	*Focal Area*	*Country Name/ Global*	*(in $)*		
			Project (a)	*Agency Fee (b)*[2]	*Total c=a+b*
AsDB	Land Degradation	PRC	3,636,364	363,636	4,000,000
AsDB	Climate Change	PRC	1,818,182	181,818	2,000,000
Total GEF Resources			5,454,546	545,454	6,000,000

[1] No need to provide information for this table if it is a single focal area, single country and single GEF Agency project.

[2] Relates to the project and any previous project preparation funding that have been provided and for which no Agency fee has been requested from Trustee.

E. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	*Estimated person weeks*	*GEF amount($)*	*Co-financing ($)*	*Project total ($)*
Local consultants*	72	100,800	0	100,800
International consultants*	28	111,076	0	111,076
Total	100	211,876	0	211,876

* Details to be provided in Annex C.

F. PROJECT MANAGEMENT BUDGET/COST

Cost Items	*Total Estimated person weeks/months*	*GEF amount ($)*	*Co-financing ($)*	*Project total ($)*
Local consultants	1,040	0	1,456,000	1,456,000
International consultants		0	0	0
Office equipment		348,846	1,767,800	2,116,600
Vehicles		0	4,255,100	4,255,100
Operating costs		0	4,439,100	4,439,100
Total		**348,846**	**11,918,000**	**12,266,800**

* Details to be provided in Annex C. ** For others, it has to clearly specify what type of expenses here in a footnote.

G. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? yes☐ no X☐

The GEF funded components of the project do not include any non-grant instruments.

H. DESCRIBE THE BUDGETED M &E PLAN:

To monitor the progress of the Project in achieving the planned outcome and outputs, the provincial and county project management offices (PPMOs and CPMOs) will establish and maintain project performance management systems, which will be designed to permit adequate flexibility to adopt remedial action regarding project design, schedules, activities, and development impacts. The PPMOs and CPMOs will monitor the progress of implementing the environmental and social safeguard documents and plans (ethnic minority development plan, and community consultation and participation plan) and follow the monitoring and evaluation sections laid out in these plans. Within the project performance management systems framework, the PPMOs and CPMOs will confirm achievable targets, refine monitoring and recording arrangements, and establish systems and procedures no later than 6 months after the start of the Project. The PPMOs and CPMOs will collect baseline and progress data, and report to the national PMO (NPMO) at the requisite time intervals. The national PMO will be responsible for analyzing and consolidating the reported data through its management information system and reporting the outcome to ADB through quarterly progress reports. Total funding allocated to project monitoring and evaluation amounts to US$4.2 million, which constitutes 2.4% of total project cost. A summary of the M&E activities relevant to GEF is provided below:

Type of M&E activity	Responsible Parties	Project Budget US$ *Excluding project team staff time*	Time frame
Inception Workshop and Report	▪ NPMO, PPMOs ▪ ADB	US$ 30,000	Within first two months of project start up
Measurement of project results.	▪ NPMO in consultation with PPMO and ADB will oversee the identification and measurement of key results indicators related to socio-economic benefits and global environmental benefits (GEBs). Results to be monitored include: changes in land cover and land use, land productivity, water availability, and human well-being,	US$ 50,000	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Project Progress on *output and implementation*	▪ The PPMOs and CPMOs will adopt the following agreed indicators: (i) physical progress of planting, replanting (based on survival rates), sand fixation, and reforestation of degraded and low production forest lands; (ii) allocation of long-term forest-land use rights to households; (iii) changes in uses of organic and chemical fertilizers and other inputs in fruit and nut orchards; (iv) changes in household, enterprise, and SFF productivity and profitability; (v) improvement of water use and quality in orchards; (vi) reduction of poverty in the project area; (vii) carbon sequestration; and (viii) provision of technical services in the project area.	US$ 90,000	Annually prior to PIR and to the definition of annual work plans
PIR	▪ NPMO ▪ ADB	None	Annually
Periodic status/ progress reports	▪ NPMO with PPMOs	None	Quarterly
Mid-term Evaluation	▪ ADB ▪ External Consultants (i.e. evaluation team)	US$ 40,000	At the mid-point of project implementation.
Final Evaluation	▪ ADB ▪ External Consultants (i.e. evaluation team)	US$ 50,000	At least three months before the end of project implementation
Project Terminal Report	▪ NPMO ▪ ADB	None	At least three months before the end of the project
Audit	▪ ADB ▪ State Forestry Administration	None	Yearly

Type of M&E activity	Responsible Parties	Project Budget US$ *Excluding project team staff time*	Time frame
Visits to field sites	▪ ADB ▪ Representatives from State Forestry Administration and Provincial Forestry Departments	Paid from GEF agency fee and operational budget	Yearly
TOTAL indicative COST Excluding project team staff time and ADB staff and travel expenses		US$ 260,000	

PART II: PROJECT JUSTIFICATION:.

A. STATE THE ISSUE, HOW THE PROJECT SEEKS TO ADDRESS IT, AND THE EXPECTED GLOBAL ENVIRONMENTAL BENEFITS TO BE DELIVERED:

Background

The drylands of the western PRC cover about 40% of the country and contain some of the most severely degraded land in the world. The proposed project area covers about 165,000 square kilometers (km^2), incorporating 18 districts and 55 counties selected from some of the worst affected and poorer parts of Gansu, Shaanxi, and Xinjiang. This area includes three distinct ecological zones: the loess plateau, the central mountain region, and the oases in Xinjiang. The ancient Silk Road ran through this area, starting near Xian and running northwestward through Gansu and Xinjiang. The loess plateau in the PRC is characterized by fine, wind-blown soil that is very deep up to about 200 meters in places and highly prone to erosion. This soil is the source of most of the sediment that gives the Yellow River its distinctive color and creates problems of sedimentation. Much of the area of eastern Gansu and Shaanxi lies on the loess plateau. Agriculture is predominantly rainfed, producing relatively low-value and low-yielding annual crops such as wheat and corn. The region's natural environment is being improved with support from the local and central governments. The central mountain region includes the Qian Mountains in Xinjiang, the Qilian Mountains in Gansu, and the Qinling Mountains in Shaanxi. It contains several nature and forest reserves that provide important habitats for endangered and protected species. The third zone, the desert oases in Xinjiang, is home to the majority of rural people and agricultural activities but makes up only 4% of its territory. The oases areas require irrigation for agriculture and their desert climate features harsh winters and summers of extreme heat and high winds. To improve economic prospects and living conditions in this region, the establishment of shelter belts to prevent the shifting of the desert sands, and the construction of water management infrastructure, e.g., canals, wells, and high-efficiency irrigation are vital. Oasis farming of grapes, melons, cotton, and wheat forms the core of the local residents' agricultural activities.

The connection between dryland degradation, poverty, and rapid population growth in the project area is well documented. Between 1980 and 2006, the combined population of Gansu, Shaanxi, and Xinjiang increased from about 60 million to about 84 million, or by about 40%. The population of ethnic minorities therein grew from about 9.2 million to about 15.2 million or by about 65% over the same period. Land degradation is a critical environmental problem in all three project areas, seriously affecting about 274,600 km^2 of land in Gansu (about 65% of its total area); about 30,000 km^2 in Shaanxi (about 14.5% of the province); and about 1.1 million km^2 (about 64% of the total area) of Xinjiang. The economic cost of land degradation is estimated at about CNY3.1 billion in Gansu, and about CNY11.6 billion in Shaanxi (about 15.9% and 3.6% of provincial GDP, respectively). About 64% of the population in the three provinces lives in rural areas. In 2006, the average annual urban income in the project area was CNY9,103 ($1,097 equivalent), while the average annual per capita rural income was only CNY2,377 ($286), less than the poverty line defined as $1.25 per day. While there is greater reliance on agriculture in Xinjiang, the rate of growth in agriculture is lower due to limited access to markets, poorer natural resource endowments (especially water), and a lack of essential infrastructure. Furthermore, Xinjiang has received significantly less investment into the commercialization of agriculture throughout the value chain.

The key problems affecting the project area include (i) low forest land productivity and sustainability, (ii) land degradation and diminishing returns from traditional management practices and inputs, (iii) vulnerability of households

to price fluctuations and natural disasters, and (iv) lack of adequate working capital and long-term financing for households, enterprises, and state forest farms (SFFs). Farming on degraded and barren land and steeply sloping land with low-yielding and unsustainable grain crops has become common due to the combined effect of population expansion and poor regulations. Uneven rainfall and farming on forest land have caused an increase in the scope and intensity of water runoff and soil erosion, and a decline in the capacity to regulate water and hold soil.

Forest land is typically of three types in the PRC: (i) ecological or natural forests, (ii) timber plantations, and (iii) economic trees comprising fruit and nut orchards. In the project area, the focus is on ecological forests and economic trees. Degraded ecological forests are in need of restoration with improved forest density and forest cover. Ecological forests provide important ecosystem services, such as soil and water retention, climate regulation through carbon sequestration, and habitats for threatened biodiversity. Forests also help build resilience to climate change impacts of landscapes important for food production. Forest land currently being cultivated and cropped annually, usually with wheat and maize, degrades through loss of soil qualities such as organic matter and carbon, and water holding capacity. The excessive use of fertilizer leads to water pollution, additional use of agrochemicals results in health and environmental threats, and high levels of irrigation cause depleted water resources. In addition, producers on these lands are increasingly living in below-average socio-economic conditions and lag further behind urban dwellers and more productive rural producers.

The high proportion of forest land in most rural regions combined with inappropriate low-value use is a significant constraint on the Government's rural development objectives. For example, Shaanxi's collective forest land totals about 130 million mu[1] (land measurement in the PRC) and while all this is not cultivated, it represents about 42% of the total provincial land area. Gansu has about 60 million mu of collective forest land, which is about 25% of the total cultivated land area.

Project Strategy

The Project will respond to policy failures related to forest land tenure that have resulted in resources being allocated to low-value, non-sustainable land uses causing a loss of forest and tree crops benefits, and disadvantaged socio-economic conditions. These conditions have resulted in higher poverty and non-viable organizations responsible for managing the high-priority ecological assets in natural forests and critical watersheds for urban water supplies. These policy failures have also created externalities in terms of under–delivery of public goods in the form of soil and water protection.

The Project's strategy is to support the implementation of recent collective forest tenure reforms and assist land contract holders to convert their land and labor resources into higher-value and more sustainable tree crops production systems using Integrated Ecosystem Management (IEM) approaches and principles developed by the PRC-GEF Partnership on Land Degradation in Dryland Ecosystems. The IEM approach offers the PRC a new way to plan and manage the natural resources within its drylands by providing an integrated planning approach within which the government can develop the legal, policy, institutional, and socio-economic systems required to support the sustainable utilization of dryland ecosystem resources.

The project is organized in three components that address the main barriers to SLM and IEM identified above, especially on forest land:

1. Mainstreaming of IEM principles and approaches into economic tree crop development
2. Mainstreaming of IEM into ecological forestry development
3. Strengthening of capacity to implement forest sector reforms using IEM approaches at provincial and county levels.

The project seeks to capture additional ecological benefits from reduced soil degradation, improved soil organic matter, and soil carbon leading to increased water percolation and holding capacity. Economic and social benefits relate to significantly higher returns to land and labor, and reduced agricultural demand for household labor. Land that is ecologically sensitive, degraded, or barren will be secured through tree planting to reduce the risk and scale of erosion, sand intrusion, and off-site effects that arise from these, and institutional strengthening for the transitioning of state forest farms into effective ecological resource management units using public-private partnerships.

[1] 1 mu is about 0.07 hectare or 1 hectare is about 15 mu.

The conversion of annual cropping systems into perennial tree crops systems provides significant changes to the ecology. Tree crops development have a wide range of ecological and productive benefits compared with existing cropping systems. Tree crops in the northwest PRC reduce wind velocity by 20–40% with associated increases in relative air humidity of about 10–20%, and reduced evapo-transpiration rates by about 9–25%. These effects have increased water content of soils by about 6%, improved water holding capacity by about 9%, increased effective soil moisture in the 0–30 cm profile by about 13%, increased soil organic matter by about 20%, increased total nitrogen by about 8%, and increased available phosphorous by about 16%. Crops grown in association with agro-forestry systems reported higher-crop yields ranging from 10–30% for wheat, 10–21% for maize, and 8% for cotton. The role of economic tree crops therefore fits (i) the Government's policy for tree crops development, (ii) the movement of rural production systems into less damaging and more sustainable production models, and (iii) the objective of transforming development assets in the forest sector into tree cropping systems that generate greater returns to the rural economy.

Global Environmental Benefits

Securing land that is ecologically sensitive, degraded or barren will significantly improve the key ecological services of water retention, soil nutrients, and reduced soil erosion. By transitioning state forest farms into ecological resource managers, the Project expects to show that this will lead to protection and improved management of their ecological forests. The future effectiveness of state forest farms is crucial for the protection of ecological forests. Currently the PRC has an estimated 4,000 state forest farms, which manage 42% of forest land, and a significant proportion of the 13 million hectares of ecological forests.

The Project is expected to achieve significant environmental benefits, including (i) water savings, (ii) reduced use of agrochemicals (fertilizers and pesticides), (iii) reduced soil erosion, (iv) increased use of indigenous fruit trees in agricultural systems leading to agrobiodiversity benefits, and (v) increased carbon sequestration both in trees and soils. Carbon sequestration is considered as a significant benefit representative for the overall direct and indirect positive impacts of the Project. The Project will also enable participating farmers and beneficiaries to better adapt to climate change impacts by introducing sustainable land and management policies that enhance the resilience of production systems to droughts and other extreme weather events. It is expected that possible adverse environmental impacts will be prevented or minimized to an acceptable level if adequate environmental management plans are effectively implemented. For example, groundwater usage is a serious concern in the areas where overexploitation of the aquifers already takes place. It was agreed that in those areas no new wells will be drilled for economic tree crops activities. For the start-up of some ecological forestry activities the drilling of some additional new wells has been proposed.

Ecological benefits generated by the project are (i) carbon sequestered over and above the without project situation, and (ii) soil and water retention from the change of forest land use that result in reduced erosion, sedimentation and siltation of water catchments and rivers. The former includes the carbon captured by the ecological reforestation program of Gansu, the predicted incremental benefits of secured management of the seven pilot SFFs in Shaanxi, and the soil carbon benefits from moving away from traditional cropping systems to agroforestry or economic forestry. The project will ensure the protection of existing carbon stocks in SFFs in Shaanxi and Gansu and in land that will be restored in Gansu and Xinjian that amount to approximately 32 million tons of C and have an additional sequestration potential of 3.3 mt by the end of the project. In addition, economic tree crops (orchard) development will lead to sequestration of around 0.4 mt of C by the end of the project giving a total sequestration of 3.7 mt C for all project interventions (for detailed calculations of carbon benefits see Annex F).

The carbon gains are calculated as the annual carbon gain of the ecosystem (mt C/year including above-ground biomass, below-ground biomass, litter, and soil organic carbon) multiplied by the duration of the project (five years). These values are derived from *The FAO EX-ACT carbon balance tool* (FAO 2010) that has been developed within the IPCC carbon assessment framework specifically for project planning and evaluation. The calculations using this tool have been compared with satellite measurements of net primary productivity (carbon fixed by photosynthesis less carbon emitted by respiration) for the project sites over the period 2000- 2006 and proved to be conservative. Under the relatively cool, dry climate of the three NW Provinces, the carbon sink capacity will not fill within the five-years' project period. Although IPPC is using a 10-year period of linear incremental build up of carbon stores through improved management and changed land-use activities[2], the different carbon stores build up at different rates. Equilibrium between accumulation and decomposition may be reached: for tree crops in 10 years; for standing timber in

[2] Intergovernmental Panel on Climate Change. Land Use, Land-Use Change and Forestry, Cambridge University Press, 2000.

ecological forest 25-100 years; for litter 10 years[3]; for soil organic matter, which is about half of all carbon storage, hundreds of years, reaching maximum rates of sequestration in 10-30 years[4].

B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL AND/OR REGIONAL PRIORITIES/PLANS:

Since ratification of the UNCCD, the PRC has progressively increased its land conservation efforts and recognized the need to combat land degradation as a national development priority. The ninth (1996 -2000), tenth (2001–2005) and eleventh (2006-2010) Five-Year Plans show the Government's commitment to sustainable natural resource management, calling for (i) sustainable use of water resources; (ii) protection of land, forest, grassland, marine, and mineral resources; and (iii) improved environmental quality in rural and urban areas. In June 1999, the Government officially launched the Western Development Strategy (WDS) with the objectives of: (i) reducing economic disparities between the western and other regions and (ii) ensuring sustainable natural resource management. Also, this proposal is complementary to and consistent with PRC national priorities as identified in national and regional policies and legislation.

The Government initiated the inception phase of the PRC-GEF Partnership on Land Degradation in Dryland Ecosystems (approved by the GEF Council in October 2002) as an international partnership led by ADB to develop, test, and disseminate more comprehensive resource management approaches that integrate the ecological, economic, and social dimensions of the land degradation problem. It remains committed to the partnership, recognizing that it: (i) provides opportunities to create synergies among land degradation control, carbon sequestration, and biodiversity conservation objectives within the framework of the WDS; (ii) enhances the scope and new opportunities for catalyzing action, replication, and innovation for IEM; (iii) provides greater opportunities for maximizing and scaling up of approaches that yield both local and global environmental benefits; and (iv) helps to create an open and transparent process for interacting with international agencies. A partnership based on the programmatic approach also provides opportunities for coherent planning and predictable financial support that has not been possible under the previous ad hoc project-by-project approach to GEF assistance. The PRC's National Action Plan (NAP) for implementation of the UNCCD recognizes the opportunity provided by projects like the one proposed that was developed out of work of the PRC-GEF Partnership on Land Degradation in Dryland Ecosystems in combating desertification (page 40 of PRC's NAP).

The PRC National Climate Change Program was released in June 2007 and documents current and planned mitigation and adaptation activities. The strategy calls for regional administrative systems to be established to better coordinate climate change mitigation and adaptation efforts, including the promotion of energy efficiency and development of renewable energy sources. A high-level "National Leading Group on Climate Change," headed by Premier Wen Jiabao, guides implementaiton of the program. The PRC has introduced severe restrictions on logging across the country and in recent years supported widespread afforestation and reforestation efforts, partly justified on the grounds of carbon sequestration. This proposal is consistent with the National Climate Change Program and would support its efforts to reduce national greenhouse gas emissions from land use change.

The proposal also complements PRC national priorities as identified in national and regional policies and legislation. It will contribute to the implementation of the IEM Strategies and Action Plans for Land Degradation control that were developed for Gansu, Shaanxi and Xinjiang provinces in 2007 with support from the PRC-GEF Partnership. These plans identifies long-term and mid-term development goals and are comprehensive, multisector and cross-area guideline documents for land restoration.

The proposal also follows CBD guidance to GEF as stipulated in CBD Decisions I/2 and VII/20 referring to CBD Program Priorities. More recently, the so-called "New Socialist Countryside," which was developed through a number of policy statements, has highlighted the importance of restoring degraded ecosystems in western provinces in underpinning broader development efforts in the relatively poor region. The proposed project will also contribute to the results framework of the China Biodiversity Partnership Framework, particularly in the following themes: Improving Biodiversity Governance; Mainstreaming Biodiversity into Socioeconomic Sectors, Plans and Investment Decision Making; Investing and Managing Effectively in Reducing Biodiversity Loss Outside Protected Areas.

[3] JS Olson Energy storage and the balance of producers and decomposers in ecological systems. Ecology 44, 322-331, 1963.
[4] R Lal p56 in Carbon sequestration in soils in Latin America. Food Products Press - Haworth Press, Binghamton NY, 2006.

C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH GEF STRATEGIES AND STRATEGIC PROGRAMS:

The objectives and activities of the proposed program are fully in line with the GEF-4 focal area strategy for land degradation in that they are designed to mitigate the causes and negative impacts of land degradation on the structure and health of the dryland ecosystems of the western PRC, through the promotion of innovative sustainable land management practices for improved agriculture, rangeland and forest management (LD SPs 1,2&3). The core objective of the proposed program capacity building activities is to develop an enabling environment that will place sustainable land management in the mainstream of PRC development policy and practices at national, regional and local levels (LD focal area strategic objective 1) while the proposed program investment activities are aimed at up-scaling sustainable land management investments that generate mutual benefits for the global environment and local livelihoods (LD focal area strategic objective 2).

Improved land use management, including land use changes and forest interventions, has the potential to sequester carbon and reduce greenhouse gases (CC SP 6). The project will contribute to the LULUCF strategic priority of the climate change focal area by identifying innovative approaches to reducing CO2 emissions caused by deforestation, land conversion, and related agro-processing industry emissions, as well as monitoring these changes. Benefits from avoiding deforestation will be tied to emerging methodologies for the reduction of emissions from deforestation and forest degradation (REDD) approach mandated for a pilot period of testing at the UNFCCC COP 13 meeting.

D. JUSTIFY THE TYPE OF FINANCING SUPPORT PROVIDED WITH THE GEF RESOURCES:

This Project is mainly financed by an ADB loan (USD 100 million), counterpart funding from provincial and local governments (USD 31.9 million), funding from participating enterprises (USD 17.6 million), and household equity (USD 22.5 million), in addition to the GEF grant (USD 5.1 million).

The GEF grant will finance public-good outcomes associated with restoration of degraded lands and improving the management of high-value ecological forests. The loan and counterpart funds support the investment into planting of economic trees, which mainly provide a private benefit to households and enterprises - although there is also some public-good benefit (from reducing soil erosion, improving soil quality, and increasing water retention).

E. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES:

The PRC-GEF Partnership on Land Degradation in Dryland Ecosystems was designed as a long term (minimum 10 years) program. Phase 1 of the partnership lasted three years (2003-2005) to the end of the PRC 10th five year plan (FYP) and GEF3, Phase 2 covers the period of the 11th FYP (2006-2010) and GEF4, and Phase 3 the 12th FYP (2011-2015) and GEF5. Experience gained under the initial stage of Partnership activities has already been shared with other GEF pipelined and ongoing projects and programs in Central Asia and Sub-Saharan Africa. These links will be further strengthened. The project will also coordinate closely with the China Biodiversity Partnership Framework (CBPF) during the design and implementation phases, particularly with respect to the contributions of the proposed project to the results framework of CBPF to ensure that its efforts to improve ecosystem management in the arid and semi-arid reaches of western PRC are complementary to biodiversity conservation objectives and projects given in the CBPF.

F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH INCREMENTAL REASONING :

The requested support from GEF will be instrumental in enhancing the environmental benefits of the Project in several ways. First, the demonstrations of ecological restoration in Gansu and Xinjiang that will be supported by GEF financing will enable the development and testing of innovative forest-based approaches to addressing land degradation. Demonstrations will support data collection and technical examination of the impacts of designed interventions on land degradation beyond the development scope of the Project. Environmental benefits will accrue from the establishment of buffer zones, protection of watersheds from land degradation, and other categories of forest management (e.g., orchard crops on marginal lands converted from more deleterious agricultural use) and lead to the restoration of ecosystem services important for downstream areas, such as water regulation and soil retention, provision of habitats for unique biodiversity and enhanced carbon sequestration above and below ground (e.g. 1.3 tonsYr-1Ha-1 in pilot SFFs) . Baseline information compiled and the ecosystem monitoring capacity established during the PRC-GEF Land Degradation Partnership's under GEF 3 support will be key in providing a baseline from which the impact of mitigating measures applied on land degradation will be measured. Lessons learned from the demonstrations and related technical assessments will be applicable to a broad area in PRC and globally (particularly in Central Asia).

Second, the innovative approach in Shaanxi to improve the financial viability and management capacity of state forest farms will provide a robust pilot program to demonstrate how improving state forest farms can improve their management of high-value ecological forests. In this case, GEF's contributions will achieve high leveraging with respect to the baseline project, both in funding and in action. With respect to activities supported, in the absence of the GEF financing, mechanisms for improving the management of carbon stocks and for arranging payments for ecological services for the environmental and cultural services provided by ecological forests would be unlikely to be explored. Efforts at broader environmental planning along the route would be difficult to support. Instead, the Project would have focused on uncoordinated and piecemeal investments in local measures to combat land degradation – especially reforestation of degraded slopes.

The relatively small funding requested from the GEF is considered to be vital in facilitating broader systemic cross-sectoral planning of the Project and ensuring innovative investments are planned that take advantage of the latest scientific understanding of IEM and SLM technology in maximizing the environmental benefits of the proposed Project. An even larger positive incremental effect of GEF-supported activities will take place through the effects of demonstrations and GEF-supported development of capacity to implement forest sector reforms using IEM approaches at provincial and county levels. At an institutional level, the efforts of the GEF-sponsored work hold promise of advancing the State Forest Administration's understanding and approved approaches to reforestation and afforestation efforts in terms of optimizing the protective and carbon sink impact of forestry development in the country by increasing the understanding and application of the latest international technical know-how and technologies.

G. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED AND OUTLINE RISK MANAGEMENT MEASURES:

Risk	Level	Mitigation Measure
Climate change reduces available water resources	Medium	The Project will enable participating farmers and beneficiaries to better adapt to climate change impacts by introducing sustainable land and management policies. For example, groundwater usage is a serious concern in the areas where overexploitation of the aquifers already takes place. It was agreed that in those areas no new wells will be drilled for economic tree crops activities. To mitigate the risk of crop losses due to climate change and other natural disasters, the provincial governments will design and implement agricultural insurance schemes to provide needed compensation to the participating farmers against crop losses.
Quality control standards inadequate to meet domestic and international market standards	Low	To address concerns about food quality and safety, and promote good agricultural practices, the PRC initiated the ChinaGAP program, which will eventually match the standards of certified producers supplying European markets also known as GLOBALGAP. This will complement compliance with international standards already achieved by enterprises through hazard analysis, critical control points, and International Organization for Standardization certification. Access of households to support services is currently limited by low-quality extension services. The proposed project will improve both the quality and outreach of advisory and information services through public–private partnerships in which local and more readily accessible and sustainable private sector-led services are established through linkages to existing public sector systems.
Forest land tenure contracts and rental agreements are not secured	Low	There are three ongoing reforms for the development and implementation of forest land tenure and institutional restructuring, aimed at creating incentives for investment and development in the forest sector. The first is the reform of collective forest land tenure, seeking to allocate forest rights to households and individuals. For areas under the economic forest land category, land will be contracted to the households for a period of 70 years with the right to renew. The second reform will be to accelerate the reform of SFFs through the definition and classification of their forest resources into economic and ecological resources and the linking of ecological resources to public good budgets and secure funding systems. The forest land tenure reforms confirmed rights for a period of 70 years while enabling rights to be rented to operators. For economic forest resources, business units will be reformed to ensure viable operations and balance sheets. The third reform seeks to develop the capacity to support the reformed forestry institutions. The proposed project has been designed to support and accelerate these reforms at provincial and county levels.
Prices change such that local farmers and/or enterprise are no longer competitive	Low	A financial analysis was undertaken to assess the viability and sustainability of the proposed Project. An assessment of the financial internal rates of return (FIRR) for each crop indicates that the expected returns range from 12.1% for ginko to 45.6% for Chinese dates. About 33% of the planted area will be under apples followed by about 29% under walnut. These two crops have estimated FIRRs of 16.6% and 19.8%, respectively. To estimate the financial returns to representative households in the Project, three household models were constructed based on different tree crops. Financial due diligence was conducted for all enterprises that are included in the Project. The results indicate that the nine private enterprises in Gansu have FIRRs ranging from 12.5% to 18.2%, compared to a weighted average cost of capital of 5.2%.

Public-private partnerships fail due to unsound management practices		The inclusion of the private sector, management skills, market access, advertising, and equity are considered essential for SFF reforms and sustainability. There are numerous successful companies in the private sector of Shaanxi that can assist with project implementation.
Insufficient institutional cooperation at provincial and county levels	Low	The PRC-GEF Partnership, of which this project is part, has already introduced a multisectoral approach to combating land degradation. The initial stages of the Partnership showed wide acceptance of the IEM approach. In addition, the proposed project will train and build the capacity of key staff in the three provinces and counties involved.

H. EXPLAIN HOW COST-EFFECTIVENESS IS REFLECTED IN THE PROJECT DESIGN:

To ensure cost-effectiveness, the proposed Project has taken into account lessons and success factors in previous ADB, World Bank, and other international donor projects and has completed due diligence of the orchard crops, enterprises, and farmer interventions selected. The project thus builds on the following lessons: (i) flexibility in design that allows stakeholders to revise planned activities to respond to market demand; (ii) a high level of private sector participation and the ability to operate on a commercial basis; (iii) strong ownership by project stakeholders including private enterprises, farmers, and local government implementing agencies (IAs); (iv) capacity building in advisory and other support services to facilitate the adoption of new technologies and practices, in particular among small-scale and poor farmers; (v) effective project management, monitoring, and evaluation; (vi) participatory strategies such as simple watershed management approaches and solutions to land degradation problems with farmers' involvement; and (vii) promotion of sustainable farming techniques on marginal land.

The economic benefits of the Project are calculated from the financial benefits, discussed in section G, and converting financial prices into economic prices. Additional ecological benefits included in the calculations are (i) carbon sequestered over and above the without project situation, and (ii) soil and water retention from the change of forest land use. The former includes the carbon captured by the ecological reforestation program of Gansu, the predicted incremental benefits of secured management of the seven pilot SFFs in Shaanxi, and the soil carbon benefits from moving away from traditional cropping systems to agroforestry or economic forestry. The economic internal rate of return for the overall Project is estimated at 19.5%, ranging from 18.7% in Shaanxi to 19.8% in Xinjiang, indicating that the project is a viable and cost-effective investment.

PART III: INSTITUTIONAL COORDINATION AND SUPPORT

A. INSTITUTIONAL ARRANGEMENT:

N/A

B. PROJECT IMPLEMENTATION ARRANGEMENT:

The executing agency (EA) at the national level will be the State Forestry Administration (SFA) through its ADB loan project management office, and the forestry departments of the three participating provinces together with the county forestry bureaus will be the implementing agencies (IAs). The national project management office (NPMO) will be under the leadership of a director from the ADB loan project management office. The NPMO will be responsible for overall project management, communication with ADB, consolidation of progress reports once every 6 months, supervision and monitoring, and training and other technical support.

Each province will set up a provincial lead group comprising the Department of Finance, the Forestry Department, and the Provincial Development and Reform Committee (PDRC) and will be chaired by a Vice Governor. Key roles of the leading groups are to ensure coordination between sector agencies and to address project strategic decisions. The Shaanxi leading group will also establish the proposed Center of Ecological Forestry and be responsible for investment and distribution decisions regarding (i) eco-compensation, (ii) carbon trading, and (iii) private sector participation in ecotourism. A PPMO will be established in each provincial IA to organize, manage, and monitor project

implementation activities. The PPMO will be a unit within the provincial forest department. The PPMO will have several full-time staff including (i) a project director, with oversight responsibility for making decisions, monitoring achievements, and resolving issues; (ii) a technical support leader, for technical assessment, technical training, planting monitoring, etc.; (iii) project management staff for the preparation and implementation of annual plans, procurement management, training, reporting to SFA, and the establishment and operation of project monitoring and management systems; (iv) financial staff for the preparation of withdrawal applications, fund mobilization and expenditure summaries, loan repayment schedules and reconciliations, and auditing; and (v) general affairs staff for coordination and liaison with municipality and CPMOs and other related parties, and documentation management.

Each CPMO will operate under the leadership of a county project director and will be a unit within the county forestry bureau (CFB). The CPMO will work closely with the CFB to prepare work plans and arrange operational staff to undertake the project activities. The CPMO will be staffed with necessary staff depending on the scale and complexity of the planting program in the county. These staff may include (i) a project director for leadership and coordination of programs at the county level including the organization of technical training from other sections of the CFB; (ii) technical support staff for site level planning, developing annual plans and designs, identifying technical training, and site monitoring, inspection, and ratification of documentation on field-level performance based on the approved design, coordination, and technical support of forest station programs; (iii) project management staff for data collection, contract management (households, civil works contractors, and private sector), procurement of planting materials for ecological forestry, and documentation management, including reimbursement claims to be provided to the PPMO; and (iv) financial management staff for managing disbursement and reimbursement procedures, reconciling county level expenditures, maintaining repayment registers, and auditing.

Project implementation will basically adopt the implementation model of the two successful World Bank projects in the sector, the completed Forestry Development in Poor Areas Project and the ongoing Sustainable Forestry Development Project. For the economic tree crops component, households will be provided with long-term financing to purchase inputs, prepare land, and plant fruit and nut orchards. The households will be identified by the CPMO through the township forest station, which will work with households to develop a technical site plan. The site plan once approved by the CFB will be used to obtain a loan agreement with the county finance bureau that will be countersigned by the CPMO. The Project will finance the first 3 years of tree crop establishment and replacements. The planting program will be spread over the first 3 years upon recognition that most planting blocks are small. Households will also receive technical support through the CFB technical staff on a continual basis for at least the first 5 years. The support will ensure that fertilizer, pruning, and pest management are completed to a high standard and that technical weaknesses are rectified.

The alternate modality will be undertaken in the Xinjiang economic tree crops planting program where there are fewer local communities and the majority is state forest land as opposed to collective forest lands in Gansu and Shaanxi. In this modality, enterprises will be the subborrowers and they will contract land to households or collectives. These enterprises will follow the same procedures outlined above for the household modality. The Xinjiang enterprises will implement the activities, working with farmers and farmer associations to establish and develop the production areas or bases and processing facilities, and will be responsible for all marketing activities. An agreement will be entered into between each participating enterprise and participating farmers. Many of these contracts are already in place, facilitating early project implementation. The enterprises in Gansu and Xinjiang were selected using agreed selection criteria and all have at least 3 years of experience in their current activities. All provincial and county agencies, and enterprises involved in the Project have received annual training on technological improvements, project management, and financial management. The Project will provide additional training.

For the ecological forestry component, reforestation of degraded forest land will take place in Gansu and Xinjiang, sand fixing with appropriate tree species in Xinjiang (entirely financed by GEF), and promotion of public-private partnerships for the economic and environmental sustainability of SFFs in Shaanxi. For the Gansu and Xinjiang activities, the planting programs will be implemented through the CFBs and their respective forest stations (FS). Each FS will confirm the areas to be planted and, once agreed with the CPMO, will prepare a detailed reforestation plan including a site plan (map), planting layouts and densities, species, quality of planting materials, inputs, and labor requirements. The Shaanxi SFF subcomponent will require a support group within the PPMO. To manage the risks of revenue and enterprise development in the seven Shaanxi SFFs, a Center of Ecological Forestry is proposed to be established. This Center will provide leadership, coordination, and technical assistance to the SFFs.

PART IV: EXPLAIN THE ALIGNMENT OF PROJECT DESIGN WITH THE ORIGINAL PIF:

The original PIF was based on the Project design in place during early 2008. Since that time, an extensive design has been completed and the overall Project design has been comprehensively developed. The rationale of the original PIF is still in place, but the Project structure and design of the GEF-financed sub-components has evolved. Specifically, the provinces requested simplification of the project design to focus on the important aspects of (i) economic tree crop development on barren and degraded forest land; (ii) ecological or natural forestry development through reforestation, quality improvement of the forest stands, public-private partnerships to improve ecotourism and other revenue generating activities for financial sustainability, and the introduction of carbon trading; and (iii) capacity building and project management support to farmers, forestry staff, and PMOs at all levels of project implementation.

The full-size project now has three technical components plus a project management component instead of the four technical components envisaged in the PIF, the reason being that component 4 in the PIF on Project environmental monitoring, etc. has been split between the Capacity Building component and the Project Management component in the final project. In addition, some training activities under Project Management in the PIF have also been moved to the Capacity Building component to ensure that all training and capacity development are using IEM approaches. IEM will continue to be an important feature to project implementation through planting degraded forest land with appropriate tree crops and ecological forestry species, application of environmentally-friendly production and processing technologies, use of integrated pest management, use of water resources (including irrigation and rain water runoff) in watersheds and water-saving technologies, and carbon sequestration in managed and natural ecosystems.

PART V: AGENCY(IES) CERTIFICATION

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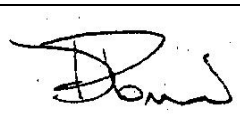
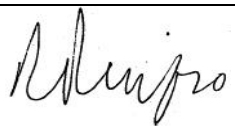
<tr><td> 
Daniele Ponzi
Lead Environment Specialist
GEF Agency Coordinator</td><td> 
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Tel: +(632) 632 6746
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ANNEX A: PROJECT RESULTS FRAMEWORK

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
Impact Improved incomes and sustainable livelihoods from the use of forest land in Gansu, Shaanxi, and Xinjiang provinces.	• Average per capita net income of beneficiary households increased by 30% by 2020. • Economic output from forest land increased by 2.2% by 2020. • Protection of ecologically sensitive areas increased by 130,000 ha by 2020. • Rural employment increased by 48,000 jobs by 2020. • At least 67% of beneficiary households adopt improved economic tree crops cultivation practices, including drip and sprinkler irrigation, tree pruning, and integrated pest management, by 2020.	• 12th Five-Year Plan reported achievements, and future directions and priorities • Provincial and county yearbooks and reports • Project benefit monitoring reports	**Assumption** • Effective monitoring ensures that enterprises, county forestry bureaus, SFFs, and forest stations successfully implement the activities and sustain benefits. **Risks** • Rapid economic growth dominates priorities and pollutes landscape. • Climate change reduces available water resources.
Outcome Increased productivity of forest lands and reduced land degradation in Gansu, Shaanxi, and Xinjiang provinces.	• Degraded forest land in the three provinces reduced by 10% by 2016. • Forest cover and tree density (stand volume) increased by 3% in Gansu, 2% in Shaanxi, and 1% in Xinjiang, leading to protection of total carbon stocks of 32 million tons and sequestration of 3.3 tons by 2016.	• 12th Five-Year Plan reported achievements and future directions and priorities • Provincial and county yearbooks and reports • Forestry department reports	**Assumptions** • Prices encourage viable adoption of sustainable practices. • Access to support services adequate. • Project is implemented as designed. **Risks** • Natural disasters, particularly droughts, and erosion events are not effectively mitigated. • Government's priorities and policies for natural forest protection unchanged.
Outputs 1. Mainstreamed integrated ecosystem management (IEM) approaches applied to economic tree crops development	• About 38,400 ha of 13 varieties of economic tree crops planted and producing fruit on degraded forest land in the three provinces by 2016. • About 210,000 rural households and workers benefiting directly from the production and processing of economic tree crops by 2016. • At least 20 enterprises operating profitably in financially sound positions by 2016, and confirmed to use environmentally	• Provincial and county yearbooks and reports • Forestry department reports • PPMS • Financial statements of enterprises and commercial production bases	**Assumptions** • Market prices and demand for fruit and nuts remain high. • Farmers are able to access required support services from local government agencies. **Risks** • Quality control standards inadequate to meet domestic and international market standards. • Forest land tenure contracts and rental agreements not secured. • Enterprises fail due to

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
	sustainable farming and industrial technologies. • Increased sequestration of about 368,600 tons of carbon in orchards by 2016..		unsound management, illegal corporate practices, and operational neglect or natural disaster. • Prices change such that local farmers and/or enterprise are no longer competitive. • Natural disasters seriously disrupt supply of inputs.
2. Mainstreamed IEM approaches applied to ecological forestry development	• About 3,000 ha of degraded forest land in Gansu restored. Protection of carbon stocks of 2.7 tons and sequestration of 3.3 tons by 2016. • At least seven SFFs in Shaanxi form public–private partnerships with private ecotourism enterprises and improve tree cover and density on about 126,000 ha. Protection of carbon stocks of 28.8 tons and sequestration of additional 1 ton carbon by 2016. • Ecological Forestry Center established and providing support to SFFs in forestry management and carbon trading. Offices rented and capacity established to monitor environmental and socio-economic impacts of forestry and ecosystem restoration including carbon sequestration and accessing the carbon market. • GEF financing: (a) about 700 ha of degraded steeply sloping forest land in Gansu restored, (b) about 435 ha of degraded forest land secured in Xinjiang, and (c) carbon forestry improvements made on about 12 SFFs in Shaanxi and Gansu. Protection of 6,000 tons carbon and sequestration of 5,000 tons in Xinjiang by 2016.	• Provincial and county yearbooks and reports • Forestry department reports • PPMO and CPMO benefit monitoring reports • Reports and audited statements from SFFs	**Assumptions** • Forest trees are established and survive. • Forest tree maintenance is provided by county forest bureaus and financing is made available by county finance bureaus. • Commercial ecotourism revenue is generated for SFFs to operate profitably. **Risks** • Public–private partnerships fail due to unsound management, illegal corporate practices, and operational neglect, or natural disaster. • Insufficient institutional cooperation in the provinces and counties.

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
3. Project management support strengthened to implement forest sector reforms using IEM approaches at provincial, county, township, and household levels	• PPMOs and CPMOs established and operating in each province and county • Capacity building of key institutions in the provinces and counties • Project performance and monitoring system operating effectively • Enhanced capacity of households and implementing agencies in implementing IEM approaches. About 200,000 households received training in IEM.	• Project reports and monitoring • Benefit and impact monitoring • Training records • Procurement records	

Activities with Milestones

Advance Decisions

- Drafting of all project management procedures
- Design and implementation of PPMS
- Update of procurement plan for approval by SFA and ADB
- Preparation of household and enterprise loan agreements
- Identification of economic planting areas and household planting plans
- Ratification of year 1 tree planting plans
- Preparation of project training plan
- Training of project management staff in ADB procedures and systems
- Agreement and joint training with county finance officials on procedures and documentation

Project Year 1

- Procurement plan implemented
- Initiate beneficiary training
- Planting of about 21,000 ha of economic tree crops
- Preparation of year 2 planting plans
- Center of Ecological Forestry establishment approved in Shaanxi
- Monitoring of survival rates on economic tree planted areas
- Preparation of county ecological planting plans starting year 2
- Enterprise development plans approved by PPMO and loans awarded
- Contracting of business planning procedures for each pilot SFF
- Carbon administration system design and training started

Project Year 2

- Continue beneficiary training
- Planting of about 13,900 ha of economic tree crops
- Planting of about 2,640 ha ecological forests
- Planting of replacement economic trees
- Center of Ecological Forestry staffed and operational
- Value chain enterprise loans disbursed
- Planting and survival monitoring
- SFF business plans approved and private sector investors identified
- Carbon database and MIS established
- Social monitoring completed

Project Year 3

- Completion of beneficiary training
- Planting of about 3,500 ha of economic tree crops
- Planting of about 1,250 ha of ecological forest trees

- **Inputs ($ million)**

ADB loan	100.00
GEF grant	5.10
Provincial, Municipal, and County Governments	45.75
Enterprises	13.05
Households	17.86
Total	**181.76**

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
• Monitoring and evaluation of planting program • Carbon trade designed • Payment for ecological services schemes designed • PPP design completed and agreed by all parties • Mid-term monitoring report completed **Project Year 4** • Planting of about 245 ha ecological forest trees • Continued tending of trees • SFF enterprise investments implemented • First carbon trade **Project Year 5** • Monitoring project activities • Training of IA staff completed • Continued tending of trees • Evaluation of project outputs and evaluation survey • Project completion report • Carbon trades concluded			

ADB = Asian Development Bank, CPMO = central project management office, GEF = Global Environment Facility, ha = hectare, IA = implementing agency, MIS = management information system, PPMO = provincial project management office, PPMS = project performance management systems, PPP = private–public partnership, SFA = State Forestry Administration, SFF = state forest farms.

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF)
All comments were addressed in the PIF except for STAP.

A) STAP

STAP comment(1):
1) The proposal should provide further details on how it proposes to achive each of the three components - integrated ecosystem management into investment project development; capacity building for forest-based SLM; and, developing innovative reforestation interventions that embrace IEM to combat land degrdation. In this context, it remains unclear if, and to what extent, farmers' knowledge and perspective will be considered in the three components.

ADB response:
Integrated Ecosystem Management (IEM) principles and approaches will be mainstreamed into the project components on Economic tree crops development and Ecological forest development through training and capacity building in IEM supported under component 3 of technical staff in provincial forestry admin as well as key staff at county level. Agricultural extension staff will also train farmers in new technologies and integrated approaches to the management of land, water and ecosystems building on existing local knowledge in natural resources management in drylands and the use of e.g. local landraces of crops and trees. In addition, capacity will be established at the Center of Ecological Forestry to monitor environmental and socio-economic impacts of forestry development and ecosystem restoration, including carbon sequestration potential and identification of opportunities for accessing the carbon market in order to provide incentives for preservation of ecosystem services.

STAP comment (2):
Also the proposal could detail further what are incentives that will drive a sustained adoption of IEM to address SLM….

ADB response:
As discussed under the risk mitigation section, detailed financial and economic analysis was conducted on management practices and crops the project proposes to introduce. The economic internal rate of return for the overall Project is estimated at 19.5%, ranging from 18.7% in Shaanxi to 19.8% in Xinjiang, indicating that the financial incentives to adopt IEM and implement new SLM practices should be strong among land users. Farm incomes will increase due to (i) the adoption of improved production technologies, including quality seed; shifts in cropping patterns to include high-value crops; judicious use of agrochemicals (fertilizers and pesticides); use of organic fertilizers; increase in irrigation efficiencies; improved water and soil conservation; and reduction of postharvest losses; and (ii) premium prices received from improved quality of outputs. The incremental income flows were derived from the financial analysis of farm investments, which indicated appreciable returns to investment. Based on model farm budgets, the average farm household will have an additional CNY4,125 from economic tree crops.

STAP comment (3):
The proposal does not state what methodology will be used to measure carbon stocks as a result of IEM and reforestation….

ADB response:
Three comprehensive methodologies are available; each has advantages and disadvantages for application at different stages of the project:

1. *Direct estimation of net primary productivity using earth-observation satellite data.* Trends in vegetation productivity since 1981 may be measured at 8km resolution using the NASA GIMMS dataset of normalised difference vegetation index (NDVI) data set (Bai and Dent 2009 de Jong and others 2010). This identifies the long-term trends of land degradation and improvement that should justify the choice of demonstration areas.

   For monitoring of carbon flux, measurements of net primary productivity (NPP) at 1km resolution and 16-day interval may be derived from satellite measurements of the fraction of photosynthetically active radiation (fPAR) absorbed by green vegetation are available from 2000 (MODIS Collection V 2010, Nemani 2010). NPP is the net flux of carbon from the atmosphere to green plants. The output is validated partly by FLUXNET sites (FLUXNET 2010) which may already exist in the region.

   Taken together, these satellite measurements may serve as a baseline for the project and provide area-based surveillance at very low cost.

2. *The GEFSOC model* (Milne and others 2007, Easter and others 2007). This is the best-available predictor of carbon storage under business-as-usual and improved management. The model is currently under further development in the GEF 2009-11 *Carbon Benefits Program* as the standard methodology to be applied to all GEF projects that claim global carbon benefits. The model has not been applied in China for want of the necessary site data but this work needs to be undertaken at the outset of the *Three Provinces Project* proper, for each demonstration area, to establish the case for global carbon benefits and to enter global or regional carbon markets.

3. *The FAO EX-ACT carbon balance tool* (FAO 2010) which has been developed specifically for project planning and evaluation. It is developed within the IPCC carbon assessment framework and includes default values to enable a robust preliminary assessment of carbon-fixing potential with limited data.

To provide the "detailed estimate of the carbon uptake/offset potential" required for GEF CEO endorsement, the FAO EX-ACT tool (FAO 2010) has been applied to available project site data. However, the other two methodologies will be used in the implementation of the project to (a) establish a comprehensive baseline across the entire project area and (b) continuously monitor carbon gains from economic tree crops and ecological forestry development in the three provinces.

STAP comment (4)
The risk analysis (Section F) states that, "The principal risk facing the project is that the innovative measures to be introduced will be beyond local capacities or will find difficulties in their acceptance as deparure from past practices." This is not a normally-acceptable risk, being an issue that needs to be fully internalised in the project…….Additionally, the proposal omits the challenges it could face in yielding carbon stocks from degraded lands.

ADB response:
This is no longer identified as a major risk in the fully developed project result framework, which is based on numerous consultations from provincial to county to farm level. The Project will facilitate farmers' access to markets, to higher income for their agricultural products, and to rural labor opportunities to move into off-farm employment, obtain higher-income opportunities, and build capacity to exit poverty. The key project design features in this respect build on the findings of a recent ADB evaluation of poverty exit

achievements, which highlighted the success of linking rural poor to commercial value-adding enterprises, and the associated off-farm employment opportunities. The project design uses similar contract farming, processing, and alternative livelihoods through links with enterprises, which will provide credit, farming support services, and technical training. The interventions will result in productivity improvements and greater market certainty leading to increased incomes. Adoption of appropriate technologies, land use matched to soil capability, improved water use and nutrient efficiency, strengthened farmer associations, access to rural finance, contract farming agreements linked to processing and market chains, and capacity development will all contribute to improved sustainable livelihoods and resilience for poor rural households.

Detailed caclulations of carbon gains through restoration of ecological forests at 7 degraded SFFs in Shaanxi indicate that there will be a total carbon gain at pilot sites of 196,682 tons/year, ranging from just 2,166 tons/year at the smallest site to 52,625 tons/year at the largest. Using the lower limit for small-scale CDM projects of 50,000 tons/year, indicates that some sites could be eligible for carbon finance on their own, but that the most suitable approach would be the bundling of CERs or VERs. This is however beyond the scope of the project, as it will not directly engage in carbon trading.

B) GEF COUNCIL

1. Australia

   a. Australia supports this as a project particularly useful in relation to environmental challenges in China and reflecting previous GEF work on Land Degradation in Dry-land Ecosystems.

      No response needed.

   b. The project has useful synergies with a proposed Australian-supported program in Qinghai and Australia may be interested in collaborating with the GEF in aspects of this project. For example specific pilot activities could provide useful opportunities for shared learning, as could aspects of policy development, drawing on Australia's experience working in this sector in China.

      ADB Response:
      Information and implementation progress will be shared with this and other projects (such as the World Bank-supported forestry projects) as well as the PRC-GEF partnership on land degradation which will continue to link formally with relevant projects in Qinghai, Gansu, Shaanxi, and Xinjiang.

   c. Australia supports the focus of the project on grasslands, given their importance for carbon stocks.
      No response needed.

   d. Australia recommends taking a realistic approach to what can be undertaken through the project, and welcomes the realistic assessment of risks involved (e.g., capacities of local government, incentives).

      ADB Response:
      In accordance with ADB procedures, an assessment was made of the procurement capacity of SFA and the IAs. The assessment concludes that SFA and the IAs have adequate procurement experience in domestic- and ADB-financed projects, but that SFA and IA staff require training on ADB procurement procedures and requirements to ensure compliance with ADB procurement guidelines. SFA and IA staff will attend ADB-sponsored courses and seminars on procurement and project implementation.

2. Germany

   a. This project can be supported without a need for further comments.

No response needed

C) GEF SECRETARIAT

GEF Sec Comment (1) - Small calculation errors in Table A. Please make sure that after revision the co-financing amounts in Table A and Table C are identical.

ADB Response:

Table A and C have been revised and co-finance amounts are now consistent at $176,660,000. This amount has been confirmed with government at loan appraisal (see below)

GEF Sec Comment (2) Table D needs to be revised to be consistent with the PIF. the Agency Fee comes from the Climate Change Focal Area and should be 10% of the CC project amount.

ADB Response:

The Agency Fees and the Project Amount used in the PIF were rounded-up, with the Agency fee being lower that 10%. From 2009 the GEF Secretariat has indicated that Agency fees must be exactly 10% of the project amount. Agency fees and Project Amounts in Table D have therefore been revised to be consistent with the new procedures for entry into the PIMS. This does not affect the total grant amount under either the BD ($4m) or LD ($2m) focal area allocations. Total Project grant (including PPG) at PIF stage was $5,455,000, with Agency fee of 545,000 for a total $6,000,000 project grant. Correcting for the previous rounding, the new figures become Total Project grant (including PPG) at PIF stage was $5,454,546,000, with Agency fee of 545,454 for a total $6,000,000 project grant.

GEF Sec Comment (3) Provision of co-financing letters

ADB Response:

As part of the loan appraisal process ADB and the Government have signed an MOU, which includes at paragraph 9 (Table 2) reference to the agreed co-financing for the project. ADB considers this equivalent to a co-financing agreement/letter. This document is provided to the GEF with the revised submission of the CEO endorsement.

GEF Sec Comment (4) Provision of web site links for Annexes in PAD document

ADB Response:

We apologize that the web links have not yet been activated for the project. This will be completed prior to ADB Board approval. In the meantime, e-copies of all the Appendices are provided in the attached zip-file.

GEF Sec Comment (5) Elaborate the linkage between the descriptions in section A of Part II and the Annex F

The LD and CC related GEB (reduction of degraded forest land, increase in forest cover, tree density, and carbon stocks) are measurable. Please clarify how to calculate the total carbon benefits described in the last part of the section A of Part II from Annex F. The benefits described in the Annex F is given by annual basis while the total carbon benefits are given as an cumulative number. The carbon stock increase by the

interventions of this project may be saturated in different time scale depending on the nature of each carbon stock and intervention.

ADB Response:

Additional text has been added to Part II, section A to clarify and has been copied below as reference.

The carbon gains are calculated as the annual carbon gain of the ecosystem (mt C/year including above-ground biomass, below-ground biomass, litter, and soil organic carbon) multiplied by the duration of the project (five years). These values are derived from The FAO EX-ACT carbon balance tool (FAO 2010) that has been developed within the IPCC carbon assessment framework specifically for project planning and evaluation. The calculations using this tool have been compared with satellite measurements of net primary productivity (carbon fixed by photosynthesis less carbon emitted by respiration) for the project sites over the period 2000- 2006 and proved to be conservative. Under the relatively cool, dry climate of the three NW Provinces, the carbon sink capacity will not fill within the five-years' project period. Although IPPC is using a 10-year period of linear incremental build up of carbon stores through improved management and changed land-use activities , the different carbon stores build up at different rates. Equilibrium between accumulation and decomposition may be reached: for tree crops in 10 years; for standing timber in ecological forest 25-100 years; for litter 10 years ; for soil organic matter, which is about half of all carbon storage, hundreds of years, reaching maximum rates of sequestration in 10-30 years .

GEF Sec Comment (6) Provision of a cover note in addition to explanation of changes to project design stated in Part IV.

ADB Response:

A cover note has been provided with the resubmission of the CEO Endorsement as requested.

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ANNEX C: CONSULTANTS TO BE HIRED FOR THE PROJECT USING GEF RESOURCES

Position Titles	*$/ person week**	*Estimated person weeks***	*Tasks to be performed*
For Project Management			
Local			
Nil			
International			
Nil			
Justification for Travel, if any: N/A			
For Technical Assistance			
Local			
Enterprise business planning and identification of private investors	1,400	32	Assist state forest farms to develop commercially viable business plans for new business ventures that rely on the ecological forest asset. Develop a range of business sectors and specific business opportunities that could be possible to establish. Design and complete a market analysis and marketing plan for the specific business opportunities. Complete a business strategy for each SFF, including capital and operating plans, pro-forma financial statements, and a financing and capital-raising plan. Develop criteria for selection of companies to partner with each SFF, and identify local companies that meet the criteria and would be willing to invest in a new enterpise with an SFF.

Carbon forestry assessment, auditing, reporting	1,400	40	Assist the state forest farms and PPMO to prepare the ecological forests under their management for entry into an international carbon market. Facilitate the creation of carbon ownership agreement between the Center of Ecological Forestry (CEF) and the SFFs; Design processes for data collection and validation on carbon storage and management of the forest for carbon. Train provincial forestry department and SFF staff on the nationally relevant carbon accounting methodology and framework and on methods for data collection and reporting of carbon stocks and growth. Demonstrate the data collection and storage for the management information system to be used by CEF;
International			
Carbon forestry assessment and audit	3,967	12	Assist the state forest farms and PPMO to prepare the ecological forests under their management for entry into an international carbon market. Facilitate the creation of carbon ownership agreement between the CEF and SFFs. Design processes for data collection and validation on carbon storage and management of the forest for carbon. Coordinate development of the nationally relevant carbon accounting methodology and framework. Coordinate the data collection and storage in the management information system (MIS) to be used by CEF. Provide training to stakeholders. Assist with third party audits.

Enterprise business planning and identification of private investors	3,967	8	Assist state forest farms to develop commercially viable business plans for new business ventures that rely on the ecological forest asset. Review existing business enterprises already based in Shaanxi. With the participating SFFs, develop a range of business sectors and specific business opportunities that could be possible to establish. With each SFF, design and complete a market analysis and marketing plan for the specific business opportunities. For each SFF, complete a business strategy, including capital and operating plans, pro-forma financial statements, and a financing and capital-raising plan. Establish criteria for CDF to review the proposed business strategy of each SFF. Provide recommendations to CEF on providing Project funding to each SFF proposed enterprise investment, including amount, terms, etc.

Payments for ecological services	3,967	8	Assist the PPMO to develop values for ecological services provided by the ecological forests of the State Forest Farms and develop a negotiation strategy for the PPMO to pursue with agencies who beenfit from the service. review existing payments-for-ecological-services schemes already in existence in the PRC. Review the legal and institutional environment in Shaanxi and in the PRC that underpins payments-for-ecological services. Identify the opportunities for payments-for-ecological-services in the 7 Shaanxi SFFs (excluding carbon forestry) and the government agency that would pay for the ecological services provided. Estimate the economic value of each SFF opportunity, from the standpoint of the SFF and from the standpoint of the proposed paying agency. Develop a negotiating strategy for each SFF. In conjunction with CEF, select the highest priority SFFs and work with them as a test case during their negotiations. Analyze lessons learned from the first negotiation and conduct a workshop with all of the SFFs and CEF to present recommendations for future negotiations.
Notes: International consultants' travel costs include $10,500 for international travel, and $3,000 in per diem amounting to a total of $13,500 for the three consultants. Domestic consultants' travel costs include $2,400 for domestic travel, and $4,320 in per diem amounting to $6,720 in total.			

* Provide dollar rate per person week. ** Total person weeks needed to carry out the tasks.

ANNEX D: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS

A. explain if the ppg objective has been achieved through the ppg activities undertaken. Yes

B. describe findings that might affect the project design or any concerns on project implementation, if any: No major concerns

C. provide detailed funding amount of the ppg activities and their implementation status in the table below:

Project Preparation Activities Approved	*Implementation Status*	*GEF Amount ($)*				*Co-financing ($)*
		Amount Approved	*Amount Spent Todate*	*Amount Committed*	*Uncommitted Amount**	
Consultants	Completed. Disbursement being finalized.	335,000	335,000	335,000	0	641,000
Equipment						8,000
Training/Seminar						30,500
Studies/Surveys						15,000
Contract Negotiations						8,000
Miscellaneous TA Administration						20,000
Contingency						77,500
Others (govt counterpart)						400,000
Total		**335,000**	**335,000**	**335,000**	**0**	**1,200,000**

* Any uncommitted amounts should be returned to the GEF Trust Fund. This is not a physical transfer of money, but achieved through reporting and netting out from disbursement request to Trustee. Please indicate expected date of refund transaction to Trustee.

ANNEX E: CALENDAR OF EXPECTED REFLOWS

Provide a calendar of expected reflows to the GEF Trust Fund or to your Agency (and/or revolving fund that will be set up)

N/A

ANNEX F: CARBON ESTIMATIONS

1. Procedures for estimating carbon uptake

Three comprehensive methodologies are available; each has advantages and disadvantages for application at different stages of the project:

a. *Direct estimation of net primary productivity using earth-observation satellite data.* Trends in vegetation productivity since 1981 may be measured at 8km resolution using the NASA GIMMS dataset of normalised difference vegetation index (NDVI) data set (Bai and Dent 2009 de Jong and others 2010). This identifies the long-term trends of land degradation and improvement that should justify the choice of demonstration areas.

   For monitoring of carbon flux, measurements of net primary productivity (NPP) at 1km resolution and 16-day interval may be derived from satellite measurements of the fraction of photosynthetically active radiation (fPAR) absorbed by green vegetation are available from 2000 (MODIS Collection V 2010, Nemani 2010). NPP is the net flux of carbon from the atmosphere to green plants. The output is validated partly by FLUXNET sites (FLUXNET 2010) which may already exist in the region.

   Taken together, these satellite measurements may serve as a baseline for the project and provide area-based surveillance at very low cost.

b. *The GEFSOC model* (Milne and others 2007, Easter and others 2007) is the best predictor of carbon storage under business-as-usual and improved management. The model is currently under further development in the GEF 2009-11 *Carbon Benefits Program* as the standard methodology to be applied to all GEF projects that claim global carbon benefits. The model has not been applied in China for want of the necessary site data but this work needs to be undertaken at the outset of the *Three Provinces Project* proper, for each demonstration area, to establish the case for global carbon benefits and to enter global or regional carbon markets.

c. *The FAO EX-ACT carbon balance tool* (FAO 2010) has been developed within the IPCC carbon assessment framework specifically for project planning and evaluation. It includes default values to enable a robust preliminary assessment of carbon-fixing potential with limited data.

2. Estimation of carbon uptake/offset potential

To provide the detailed estimate of the carbon uptake/offset potential required for GEF CEO endorsement, the FAO EX-ACT tool (FAO 2010) has been applied to available project site data. The data needed for the required estimate of carbon uptake/offset for each of the project areas are:

Location
Area, hectares
Elevation range, metres above sea level
Mean monthly rainfall, temperature and reference evapo-transpiration
Current and proposed land use and management, by landform unit:
Forest type, per cent tree cover, specific vegetation, above-ground biomass (forest inventory data), degradation status
Grassland type, specific vegetation, above-ground biomass, degradation status, frequency of fires
Soil type, thickness to bedrock and erosion status.

The calculations are detailed in Appendix 1 to this Annex. The carbon stocks and annual carbon gain are estimated to be, for Shaanxi:

SSF	Area, ha	Stock, tonC	Gain, tonC/yr
Liping	22 200	4 729 525	31 033
Matoutan	33 677	7 053 372	52 625
Taiping	11 817	2 523 865	17 158
Jinchiyan	6070	1 285 673	8 493
Huangfuzhang	20 029	236 634	2 166
Houzhenzi	36 505	7 707 646	50 652
Xinjiashan	24 815	5 262 255	34 555

Less information is available for participating SSFs and land restoration projects in Gansu and Xinjian. Estimated carbon stocks and gains for these areas are[5]:

	Area, ha	Stock, tonC	Gain, tonC/yr
Gansu SFFs	172 913	2 560 080	446 123
Gansu restoration	700	20 790	2 033
Gansu restoration	3 000	89 100	5 797
Xinjiang stabilisation	495	6 286	1 003

There is insufficient information about the 38 000 ha of degraded forest lands that are earmarked for economic tree crops (orchards) to estimate their present carbon stocks. With-project carbon gains for this area are estimated to be 73 720 tonsC/yr. These figures are calculated using default values in EX-ACT; for comparison, estimates based on MODIS NPP values will be extracted when the exact locations are known. The actual baseline and predicted carbon gains should be established at the outset of the project using the GEF methodology that is at present under development, based on the GEFSOC model. Carbon markets at present only accept carbon gains over and above business as usual. Under the present rules, the minimum size of small-scale CDM projects is 50 000 tons/yr, which indicates that some sites could be eligible for carbon finance, but that bundling of CERs or VERs could be the most suitable approach. However, the project will protect the huge present carbon stock from the losses that will certainly occur if business as usual is applied throughout the project area.

3. Methodology for continued measurement and monitoring of carbon stocks and changes throughout the project

This is required for GEF CEO endorsement and was also highlighted in the STAP Guidance. A rigorous procedure is currently under test in the GEF Carbon Benefits Program (GEF 2007). An outline procedure to satisfy emerging carbon markets will be adapted from the current project design documents; this can be further developed and, even, simplified once results from the GEF Program are available and combined with the other methods discussed under Section 1 above..

4. References

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GEF 2007 *Carbon benefits project (CBP): Modeling, measurement and monitoring.* Project identification form, October 2007

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Milne E, R Al Adamat, NH Batjes and others 2007 National and sub-national assessments of soil organic carbon stocks and changes: The GEFSOC modeling system. *Agriculture Ecosystems and Environment 122*, 3-12

Shepherd KD and MK Walsh 2007 Infrared spectroscopy – enabling an evidence-based diagnostic surveillance approach to agricult7ral and environmental management in developing countries. *J. Near Infrared Spectroscopy* 15, 1-19

[5] The discrepancy in the per-area carbon gains between the Shaanxi and Gansu areas arises from the default values in EX-ACT, which are much higher for Temperate Continental forest (used for Gansu) than for sub-tropical forest (used for most of Shaanxi).

Appendix 1: Calculation of carbon stocks and carbon gain

Liping Forest Farm
Location: Nanzhin County, Shaanxi Province, PRC, Continental Asia
Climate: Warm temperate, humid; mean annual rainfall 1372 mm, mean annual temperature 7.4°C, altitude 1400-2300 m
Dominant soil type: High–activity clay (brown forest soils)
Vegetation: Warm temperate moist forest (2/3 deciduous. 1/3 coniferous) not degraded, mature secondary growth
Land use: forest 21 920 ha, shrub forest 137 ha, plantation 143 ha, non-forest use 246 ha
Carbon stocks
Forest:
Above-ground biomass 84.5 tons C/ha (Table DM2, 180 tons/ha dry matter, coefficient 0.47)
Below-ground biomass 23.69 tons C/ha (Table DM4, coefficient 0.28)
Litter 17.5 tons C/ha (Table DM5)
Soil organic carbon 88.0 ton C/ha (Table 1) [6]
Total 213.79 tons C/ha, for 21,920 ha: 4686 276.8 tons C
Shrub forest:
Above-ground biomass 61.0 tons C/ha (130 tons dry matter/ha)
Below-ground biomass 14.64 tons C/ha
Litter 1.75 tons C/ha (10% of forest value)
Soil organic carbon 66.0 tons C/ha (75% of forest value)
Total 143.4 tons C/ha, for 151.7 ha: 21 752.3 tons C

Plantation:
Above-ground biomass 65.8 tons C/ha (Table DM2 140 tons dry matter/ha)
Below-ground biomass 18.42 tons C/ha
Litter 17.5 tons C/ha
Soil organic carbon 66.0 tons C/ha (75% of mature forest)
Total 150.2 tons C/ha, for 143.1 ha 21 496.7 tons C

Liping carbon stocks for forest land: 4 729 525.8 tons carbon

Carbon gains
Management as ecological forest suggests no change from present land use and management in the mature forest and plantation. Shrub land may be a climatic or edaphic climax or may be degraded forest; calculation assumes that it is degraded and will be restored to mature forest. No change is proposed for the area under non-forest use.
Forest
Above-ground biomass 0.96 tons C/ha/yr (Table A/R1, 2 tons dry matter)
Below-ground biomass 0.26 ton C/ha/yr
Litter and soil organic carbon 0.12 ton C/ha/yr (10% of biomass increment)
Total 1.34 tons C/ha/yr, for 21 920.7 ha 29 372.8 tons C
Plantation
Above-ground biomass 4.23 tons C/ha/yr (Table A/R1, 9 tons dry matter)
Below-ground biomass 1.07 tons/ha/yr
Litter and Soil organic carbon 0.53 ton C/ha/yr
Total 5.83 tons C/ha/yr, for 143 ha 833 tons C/yr

Shrub land, managed recovery, also 5.83 tons C/ha/yr, for 137 ha 798 tons C/yr

Total carbon gain in Liping: 31 003.8 tons C/yr

Matoutan Forestry Bureau
Location: Qinling Mountains, Shaanxi Province, PRC, Continental Asia
Climate: Warm temperate, moist sub-humid; mean annual rainfall 612-900 mm, mean annual temperature 11°C, altitude up to 2500 m
Dominant soil type: High –activity clay (brown forest soils, 30-60cm thick on parent materials of mixed lithology)
Vegetation: Warm temperate moist forest (mixed deciduous and coniferous) alpine meadow at high elevation

[6] Values given for upper 35cm only, for normal soil profile, these may be doubled - but not on shallow soils or for the degraded situation

Land use: forest 31 446 ha, open forest 332 ha, shrub forest 348 ha, plantation 1551, non-forest use 228 ha

Carbon stocks

Forest:

Above-ground biomass	84.5 tons C/ha (Table DM2, 180 tons/ha dry matter, coefficient 0.47)
Below-ground biomass	23.69 tons C/ha (Table DM4, coefficient 0.28)
Litter	17.5 tons C/ha (Table DM5)
Soil organic carbon	88.0 tons C/ha (Table 1) [7]
Total	213.79 tons C/ha, for 31 446 ha: 6 722 840.3 tons C

Open and shrub forest:

Above-ground biomass	61.0 tons C/ha (130 ton dry matter/ha)
Below-ground biomass	14.64 tons C/ha
Litter	1.75 tons C/ha (10% of forest value)
Soil organic carbon	66.0 tons C/ha (75% of forest value)
Total	143.4 tons C/ha, for 680ha: 97 512 tonC

Plantation:

Above-ground biomass	65.8 tons C/ha (Table DM2 140 ton dry matter/ha)
Below-ground biomass	18.42 tons C/ha
Litter	17.5 tons C/ha
Soil organic carbon	66.0 tons C/ha (75% of mature forest)
Total	150.2 tons C/ha, for 1551ha 23 960.2 tons C

Carbon stocks for forest land: 7 053 312.5 tons carbon

Carbon gains

Management as ecological and production forest indicates no change from present land use and management in the mature forest and plantation. It is assumed that the open forest will be regenerated. The shrub land may be a climatic or edaphic climax or may be degraded forest; calculation assumes that it is degraded and will be restored to mature forest. No change is proposed for the area under non-forest use.

Forest

Above-ground biomass	0.96 ton C/ha/yr (Table A/R1, 2 tons dry matter)
Below-ground biomass	0.26 ton C/ha/yr
Litter and soil organic carbon	0.12 ton C/ha/yr (10% of biomass increment)
Total	1.34 tons C/ha/yr, for 31 446 ha 42 137.6 tons C

Plantation

Above-ground biomass	4.23 tons C/ha/yr (Table A/R1, 9ton dry matter)
Below-ground biomass	1.07 tons/ha/yr
Litter and Soil organic carbon	0.53 ton C/ha/yr
Total	5.83 tons C/ha/yr, for 1551ha , 9 042.3 tons C/yr

Shrub land and open forest, managed recovery, also 5.83 tons C/ha/yr, for 248 ha 1445.8 tons C/yr

Total carbon gain in Matoutan: 52 625.7 tons C/yr

Taiping Forest Farm

Location: Qin and Qinling Mountains, Huxian county, Shaanxi Province, PRC, Continental Asia Latitude 33°50' 00" – 33°55' 24" north, longitude 108°35'24"-108°41'06"east

Climate: Warm temperate, moist sub-humid[8]; mean annual rainfall 730mm, mean annual temperature 7-10°C, altitude 1000-3013sm

Dominant soil type: High–activity clay, brown forest soils, 30-60cm on mixed lithology, above 3000 m stony alpine meadow soil 20-50 cm

Vegetation: Warm temperate moist forest (broad-leaved evergreen and mixed deciduous and coniferous) alpine meadow at high elevation

[7] Values given for upper 35cm only, for normal soil profile, these may be doubled - but not on shallow soils or for the degraded situation

[8] Potential evaporation is greater than rainfall, at least at lower elevations so the region is not humid, although so categorized on FAO and IPCC maps. Calculation assumes forest productivity equivalent to the warm temperate moist category

Land use: forest 11 654.8, shrub forest 187.8, un-established forest area 76.5 ha, non-forest use 228 ha

Carbon stocks

Forest:

Above-ground biomass 84.5tons C/ha (Table DM2, 180tons/ha dry matter, coefficient 0.47)
Below-ground biomass 23.69 tons C/ha (Table DM4, coefficient 0.28)
Litter 17.5 tons C/ha (Table DM5)
Soil organic carbon 88.0 tons C/ha (Table 1) [9]
Total 213.79 tons C/ha, for 11 654 ha: 2 491 508.7 tons C

Shrub forest:

Above-ground biomass 61tons C/ha (130 tons dry matter/ha)
Below-ground biomass 14.64 tons C/ha
Litter 1.75 tons C/ha (10% of forest value)
Soil organic carbon 66.0 tons C/ha (75% of forest value)
Total 143.4 tons C/ha, for 187.8 ha: 26 939.5 tons C

Non-established land:

Biomass 5 tons C/ha
Soil organic carbon 66 tons C/ha
Total 71 tons C/ha, for 76.3 ha: 5 417.3 tons C

Carbon stocks for forest land: 2 523 865.5 tons carbon

Carbon gains

Management as ecological and production forest suggests no change from present land use and management. It is assumed that the un-established land will be planted. The shrub land may be a climatic or edaphic climax or may be degraded forest; calculation assumes that it is degraded and will be restored to mature forest. No change is proposed for the area under non-forest use.

Forest

Above-ground biomass 0.96 ton C/ha/yr (Table A/R1, 2 tons dry matter)
Below-ground biomass 0.26 ton C/ha/yr
Litter and soil organic carbon 0.12 ton C/ha/yr (10% of biomass increment)
Total 1.34 tons C/ha/yr, for 11 654.8 ha 15 617.4 tons C

Plantation and regenerated shrub land

Above-ground biomass 4.23 tons C/ha/yr (Table A/R1, 9 tons dry matter)
Below-ground biomass 1.07 tons/ha/yr
Litter and Soil organic carbon 0.53 ton C/ha/yr
Total 5.83 tons C/ha/yr, for 264.3 ha, 1 540.9 tons C/yr

Total carbon gain in Taiping 17 158.3 C/yr

Jinchiyuan Forest Farm

Location: Leyang County, Hanzhang City, Shaanxi Province, PRC, Continental Asia
Climate: Sub-tropical- warm temperate, moist sub-humid[10]; mean annual rainfall 864 mm, potential evapo-transpiration 1345 mm, mean annual temperature 13.2^{o}C, altitude 587-2423 m
Dominant soil type: High –activity clay, soils parent materials include limestone
Vegetation: Sub-tropical-warm temperate moist forest (mixed broadleaved evergreen, deciduous and coniferous)
Land use: forest 5 990.2 ha, shrub forest 28 ha, plantation 38 ha, non-established land 14 ha

Carbon stocks

Forest:

Above-ground biomass 84.5tons C/ha (Table DM2, 180tons/ha dry matter, coefficient 0.47)
Below-ground biomass 23.69 tons C/ha (Table DM4, coefficient 0.28)
Litter 17.5 tons C/ha (Table DM5)
Soil organic carbon 88.0 tons C/ha (Table 1) [11]

[9] Values given for upper 35cm only, for normal soil profile, these may be doubled - but not on shallow soils or for the degraded situation

[10] Potential evaporation is much greater than rainfall, at least at the lower elevations, so the climate is not moist, although so categorized by FAO and IPCC maps. Calculation assumes the productivity of warm temperate moist forest.

Total 213.79 tons C/ha, for 5990.2 ha: 1 27 5 912.7 tons C

Shrub forest:
Above-ground biomass 61.0 tons C/ha (130 ton dry matter/ha)
Below-ground biomass 14.64 tons C/ha
Litter 1.75 tons C/ha (10% of forest value)
Soil organic carbon 66.0 tons C/ha (75% of forest value)
Total 143.4 tons C/ha, for 28ha: 4015.2tonC

Plantation:
Above-ground biomass 65.8 tons C/ha (Table DM2 140 ton dry matter/ha)
Below-ground biomass 18.42 tons C/ha
Litter 17.5 tons C/ha
Soil organic carbon 66.0 tons C/ha (75% of mature forest)
Total 150.2 tons C/ha, for 38 ha 5745.6 tons C

Jinchiyuan carbon stocks for forest land: 1 285 673.5 tons carbon

Carbon gains
Management as ecological forest suggests no change from present land use and management in the mature forest and plantation. Shrub land which may be a climatic or edaphic climax or may be degraded forest; calculation assumes that it is degraded and will be restored to mature forest.
Forest
Above-ground biomass 0.96 ton C/ha/yr (Table A/R1, 2 tons dry matter)
Below-ground biomass 0.26 ton C/ha/yr
Litter and soil organic carbon 0.12 ton C/ha/yr (10% of biomass increment)
Total 1.34 tons C/ha/yr, for 5990.2 ha 8 026.9 tons C

Plantation
Above-ground biomass 4.23 tons C/ha/yr (Table A/R1, 9 tons dry matter)
Below-ground biomass 1.07 tons/ha/yr
Litter and Soil organic carbon 0.53 ton C/ha/yr
Total 5.83 tons C/ha/yr, for 38 ha 221.5 tons C/yr

Managed recovery of *shrub land and plantation of land suitable for forestry* also 5.83 tons C/ha/yr, for 42 ha 244.9 tons C/yr

Total carbon gain in Jinchiyuan: 8 493.3 tons C/yr

Huangfuzhang Forest Farm
Location: Heyang County, Shaanxi Province, PRC, Continental Asia
Climate: Warm temperate, sub-humid; mean annual rainfall 552 mm, mean annual evapo-transpiration 1988 mm, mean annual temperature 12.5^{o}C; elevation 342-1543 m
Dominant soil type: High –activity clay, degraded brown soil on loess
Vegetation: Warm temperate dry forest (Robinia pseudoacacia dominant) in warm temperate grassland zone
Land use: project area 6120 ha of which forest 1988.97 ha, 40.2 ha newly established.

Carbon stocks
Forest:
Above-ground biomass 61.1tons C/ha (Table DM2, 130 tons/ha dry matter, coefficient 0.47)
Below-ground biomass 15.9 tons C/ha (Table DM4, coefficient 0.26)
Litter 24.3 tons C/ha (Table DM5)
Soil organic carbon 19.0 tons C/ha (Table 1, using the sandy-soil value for degraded land)
Total 120.3 tons C/ha/yr for 1948 ha: 234 431 tons C

Plantation:
Above-ground biomass 28.2 tons C/ha (Table DM-2 60 tons dry matter/ha)
Below-ground biomass 7.3 tons C/ha

[11] Values given for upper 35 cm only, for normal soil profile, these may be doubled - but not on shallow soils or for the degraded situation.

Litter 12.3 tons C/ha (new plantations, 50% of established forest)
Soil organic carbon 14.3 tons C/ha (75% of mature forest)
Total 54.8 tons C/ha, for 40.2 ha 2 203.9 tons C

Huangfuzhuang carbon stocks for forest land: 236 634.9 tons carbon

Carbon gains
The project area is three times the present forest area. Management as ecological forest suggests no change from present land use and management in the forest land and no indication is given of future plantation or other expansion of the forest area.
Forest
Above-ground biomass 0.71 ton C/ha/yr (Table A/R1, 1.5 ton dry matter)
Below-ground biomass 0.18 ton C/ha/yr
Litter and soil organic carbon 0.09 ton C/ha/yr (10% of biomass increment)
Total 0.98 ton C/ha/yr, for 1 948 ha 1 907.1 tons C

Plantation
Above-ground biomass 4.7 tons C/ha/yr (Table A/R1, 10 tons dry matter)
Below-ground biomass 1.2 tons/ha/yr
Litter and Soil organic carbon 0.59 ton C/ha/yr
Total 6.49 tons C/ha/yr, for 40 ha 259.6 tons C/yr

Total carbon gain in Huangfuzhuang: 2 166.7 tons C/yr

Houzhenzi Forest Farm
Location: Qinling Mountains, Zhouzhi County, Shaanxi Province, PRC, Continental Asia
Climate: Warm temperate, humid; mean annual rainfall 1000 mm, mean annual temperature 8.4-6.4^{o}C, altitude 800-3082 m
Dominant soil type: High –activity clay, brown forest soils on mixed parent materials
Vegetation: Warm temperate moist forest
Land use: forest 35 460 ha, shrub forest 243.3 ha, thinned forest 294.6 ha, un-established production land 507.4 ha
Carbon stocks
Forest:
Above-ground biomass 84.5 tons C/ha (Table DM2, 180 tons/ha dry matter, coefficient 0.47)
Below-ground biomass 23.69 tons C/ha (Table DM4, coefficient 0.28)
Litter 17.5 tons C/ha (Table DM5)
Soil organic carbon 88.0 tons C/ha (Table 1) [12]
Total 213.79 tons C/ha, for 35 460 ha: 7 580 993.4 tons C

Shrub forest:
Above-ground biomass 61.9 tons C/ha (130 tons dry matter/ha)
Below-ground biomass 14.64 tons C/ha
Litter 1.75 tons C/ha (10% of forest value)
Soil organic carbon 66 .0 tons C/ha (75% of forest value)
Total 143.4 tons C/ha, for 243.3 ha: 34 889.2 tons C

Thinned forest:
Above-ground biomass 65.8 tons C/ha (Table DM2 140 tons dry matter/ha)
Below-ground biomass 18.42 tons C/ha
Litter 17.5 tons C/ha
Soil organic carbon 88.0 tons C/ha
Total 189.2 tons C/ha, for 294.6 ha 55 738.3 tons C

Un-established production land 507.4 ha
Standing biomass 5.0 tons C/ha
Soil organic carbon 66.0 tons C/ha (75% forest value)
Total 71.0 tons C/ha, for 507.4 ha: 36025.4 tons C

Houzhenzi carbon stocks for forest land: 7 707 646.3 tons carbon

[12] Values given for upper 35cm only, for normal soil profile, these may be doubled - but not on shallow soils or for the degraded situation

Carbon gains

Management as ecological forest indicates no change from present land use and management in the mature forest and thinned forest. Shrub land may be a climatic or edaphic climax or may be degraded forest; calculation assumes that it is degraded and will be restored to mature forest. No change is proposed for the area under non-forest use.

Forest

Above-ground biomass 0.96 ton C/ha/yr (Table A/R1, 2 tons dry matter)
Below-ground biomass 0.26 ton C/ha/yr
Litter and soil organic carbon 0.12 ton C/ha/yr (10% of biomass increment)
Total 1.34 tons C/ha/yr, for 35 460 ha: 47 516.4 tons C/yr

Thinned forest

Above-ground biomass 4.23 tons C/ha/yr (Table A/R1, 9ton dry matter)
Below-ground biomass 1.07 tons/ha/yr
Litter and Soil organic carbon 0.53 ton C/ha/yr
Total 5.83 tons C/ha/yr, for 294.6 ha: 1 717.5 tons C/yr

Shrub land, managed recovery, also 5.83 tons C/ha/yr, for 243.3 ha: 1 418.4 tons C/yr

Total carbon gain in Houzhenzi: 50 652.3 tons C/yr

Xinjiashan Forest Bureau

Location: Qinling Mountains, Fengxian County, Shaanxi Province, PRC, Continental Asia
Climate: Warm temperate, humid; mean annual rainfall 600-900 mm, mean annual temperature 11.4^{o}C, altitude 1359-2758 m
Dominant soil type: High –activity clay, brown forest soils on acid igneous and metamorphic parent materials
Vegetation: Warm temperate moist forest
Land use: forest 24 505.8 ha, thinly-stocked forest 16.9 ha, unestablished forest and other suitable land 293.2 ha

Carbon stocks

Forest:

Above-ground biomass 84.5 tons C/ha (Table DM2, 180 tons/ha dry matter, coefficient 0.47)
Below-ground biomass 23.69 tons C/ha (Table DM4, coefficient 0.28)
Litter 17.5 tons C/ha (Table DM5)
Soil organic carbon 88.0 tons C/ha (Table 1) [13]
Total 213.79 tons C/ha, for 24 505.8 ha: 5 241 790.6 tons C

Thinly-stocked forest:

Above-ground biomass 61.9 tons C/ha (130 tons dry matter/ha)
Below-ground biomass 14.64 tons C/ha
Litter 1.75 tons C/ha (10% of forest value)
Soil organic carbon 66 .0 tons C/ha (75% of forest value)
Total 143.4 tons C/ha, for 16.9 ha: 2 423.5 tons C

Un-established production land and other suitable land

Standing biomass 5.0 tons C/ha
Soil organic carbon 66.0 tons C/ha (75% forest value)
Total 71.0 tons C/ha, for 254.1 ha: 18 041.1 tons C

Xinjiashan carbon stocks for forest land: 5 262 255.2 tons carbon

Carbon gains

Management as ecological forest indicates no change from present land use and management in the mature forest. The calculation assumes that the thinly-stocked and other suitable land will be planted.

Forest

Above-ground biomass 0.96 ton C/ha/yr (Table A/R1, 2 tons dry matter)
Below-ground biomass 0.26 ton C/ha/yr
Litter and soil organic carbon 0.12 ton C/ha/yr (10% of biomass increment)

[13] Values given for upper 35cm only, for normal soil profile, these may be doubled - but not on shallow soils or for the degraded situation

Total 1.34 tons C/ha/yr, for 24 505.8 ha: 32 837.8 tons C/yr

Newly planted forest
Above-ground biomass 4.23 tons C/ha/yr (Table A/R1, 9 tons dry matter)
Below-ground biomass 1.07 tons/ha/yr
Litter and Soil organic carbon 0.53 ton C/ha/yr
Total 5.83 tons C/ha/yr, for 254.1 ha: 1 717.5 tons C/yr

Total carbon gain in Xinjiashani: 34 555.3 tons C/yr

Carbon forestry in Gansu Province
The five participating SFFS in Gansu Province, Lizi, Dangchuan, Guanyin, Baihua and Longmen cover 172 913 ha. It is assumed that this is all temperate continental forest on steep land with high-activity-clay soils.
Climate: Continental, sub-humid
Dominant soil type: High–activity clay soils on loess or mixed-mineralogy meta-sediments
Vegetation: T*emperate c*ontinental forest
Land use: Forest 172 913 ha

Carbon stocks
Above-ground biomass 56.4 tons C/ha (Table DM2, 120 tons/ha dry matter, coefficient to convert to C: 0.47)
Below-ground biomass 14.1 tons C/ha (Table DM4, coefficient to convert above-ground to below-ground: 0.25)
Litter 28.0 tons C/ha (Table DM5)
Soil organic carbon 50.0 tons C/ha (Table 1)
Total 148.5 tons C/ha for 1729136 ha: 2 560 080 tons C

Carbon gains
Above-ground biomass 1.88 tons C/ha/yr (Table A/R1, 4 tons dry matter)
Below-ground biomass 0.47 ton C/ha/yr
Litter and soil organic carbon 0.23 ton C/ha/yr (10% of biomass increment)
Total 2.58 tons C/ha/yr, for 172916 ha 446 123 tons C

Restoration of degraded land in Gansu Province
3000 ha of degraded land in the continental forest zone will be restored. To make allowance for the degraded land, estimation of carbon stocks assumes a low starting point of 20 per cent of the default values for temperate continental forest and estimation of carbon gains assumes 75 per cent of the standard forest increment.
Carbon stocks
Above-ground biomass 11.28 tons C/ha (Table DM2, 120 tons/ha dry matter, coefficient 0.47, reduced by 80 % on degraded land)
Below-ground biomass 2.82 tons C/ha (Table DM4, coefficient 0.25)
Litter 5.6 tons C/ha (Table DM5)
Soil organic carbon 10.0 tons C/ha (Table 1, reduced by 80 per cent)
Total 29.7 tons C/ha for 3000 ha: 89 100 tons C

Carbon gains
Above-ground biomass 1.41 tons C/ha/yr (Table A/R1, 4 tons dry matter reduced by 25 per cent)
Below-ground biomass 0.35 ton C/ha/yr
Litter and soil organic carbon 0.17 ton C/ha/yr (10% of biomass increment)
Total 1.93 tons C/ha/yr, for 3000 ha 5 797 tons C/yr

In addition, 700 ha of degraded steep land forest will be replanted. To make allowance for the degraded land, estimation of carbon gains assumes 75 per cent of the growth rate of plantation forest in the region.
Carbon stocks
Above-ground biomass 11.28 tons C/ha (Table DM2, 120 tons/ha dry matter, coefficient 0.47, reduced by 80 % on degraded land)
Below-ground biomass 2.82 tons C/ha (Table DM4, coefficient 0.25)
Litter 5.6 tons C/ha (Table DM5)
Soil organic carbon 10.0 tons C/ha (Table 1, reduced by 80 per cent)
Total 29.7 tons C/ha for 700 ha: 20 790 tons C

Carbon gains
Above-ground biomass 2.12 tons C/ha/yr (Table A/R1, 6 tons dry matter)

Below-ground biomass 0.52 ton C/ha/yr
Litter and soil organic carbon 0.26 ton C/ha/yr (10% of biomass increment)
Total 2.90 tons C/ha/yr, for 700 ha: 2033 tons C/yr

Land stabilization in Xinjiang

435 ha of degraded land will be stabilized: 296 ha planted to dryland shrubs, 139 m ha to poplars. Calculations are based on default values for warm temperate dry forest on sandy soils.

Carbon stocks

Above-ground biomass 5.64 tons C/ha (Table DM2, 60 tons/ha dry matter, coefficient 0.47, reduced by 80 % on degraded land)
Below-ground biomass 1.41 tons C/ha (Table DM4, coefficient 0.25)
Litter 3.6 tons C/ha (Table DM5)
Soil organic carbon 3.8 tons C/ha (Table 1, reduced by 80 per cent)
Total 14.45 tons C/ha for 435 ha: 6285.8 tons C

Carbon gains

Dune stabilization by shrubs

Above-ground biomass 0.7 ton C/ha/yr (Table A/R1, 1.5 tons/ha dry matter) Below-ground biomass 0.17ton C/ha/yr
Litter and soil carbon 0.09 ton C/ha/yr (10% of biomass increment)
Total 0.96 ton C/ha/yr, for 3000 ha: 2 880 tons C/yr

Poplar plantation

Above-ground biomass 3.76 tons C/ha/yr (Table, 8.0 tons dry matter/ha/yr)
Below-ground biomass 0.94 ton C/ha/yr
Litter and soil carbon 0.47 ton C/ha/yr
Total 5.17 tons C/ha/yr, for 139 ha: 719 tons C

Economic tree crops

Economic tree crops (orchards) are to be established on 38,000 ha of degraded forest land in all three provinces. Without knowing the areas concerned, it is hard to justify any estimate of the present carbon stocks. Estimation of carbon gains assumes that the orchards will be rainfed, that biomass production will be one third of forest plantations in the sub-humid region, previously estimated as 5.83 tons C/ha, that is 1.94 tons C/ha/yr. For 38,000 ha:73,720 tons C/yr.