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Asia-Pacific Network for Sustainable Forest Management and Rehabilitation

COMPLETION REPORT

[Demonstration on Sustainable Forest Management and Restoration in Hilly and Low Mountain Area of Southern China (2016P2-CAF)]

(January 2017 to December 2020)

Research Institute of Forestry, Chinese Academy of Forestry
Forestry Bureau of Qingyang County, Anhui Province
Forestry Bureau of Lin'an District, Zhejiang Province

January 20, 2021

Basic Information

Project Title (ID)	Demonstration on Sustainable Forest Management and Restoration in Hilly and Low Mountain Area of Southern China (2016P2-CAF)		
Executing Agency	Research Institute of Forestry, Chinese Academy of Forestry		
Implementing Agency	Forestry Bureau of Lin'an County, Zhejiang Province, Forestry Bureau of Qingyang County, Anhui Province		
Date of Project Agreement: [15/11/2016]			
Duration of implementation: [01/2017-12/2020], 48 months			
Total project budget (in USD)	$ 1,410,207	APFNet assured Grant (in USD)	$ 695,207
Actual project cost (in USD)	$ 1,443,494	APFNet disbursed Grant (in USD)	$ 685,207

Disbursement Status	Date of disbursement	Amount (in USD)
Initial disbursement	[04/2017]	15,610
The second disbursement	[06/2017]	123,025
The third disbursement	[07/2018]	149,427
The fourth disbursement	[06/2019]	246,973
The fifth disbursement	[06/2020]	150,172
Balance to be disbursed		

Reporting Status	Schedule [1]implementation	Project progress status[2]
1st reporting (period covered: 01/2017-12/2017)	on track of schedule	satisfactory
2nd reporting (period covered: 01/2018-12/2018)	on track of schedule	satisfactory
3rd reporting (period covered: 01/2019-12/2019)	on track of schedule	satisfactory
4th reporting (period covered: 01/2020-12/2020)	on track of schedule	satisfactory

[1] Schedule [1]implementation status could be on track/behind/ahead of schedule

[2] Project progress status could be ranked as satisfactory, dissatisfactory, moderately satisfactory, moderately dissatisfactory

Project Steering Committee

Chair

Name	Title/Position	Organization
CHU Fuxiang	Vice President	Chinese Academy of Forestry

Members

DING Wen	Deputy Director	Forestry Bureau of Chizhou City
CAO Yanchuan	Director	Afforestation Station of Forestry Department of Anhui Province
HAN Lin	Director	Forestry Bureau of Qingyang County
HE Zhiming	Director	Division of Forest Resources, Forestry Department of Zhejiang Province
ZHU Yongjun	Deputy Director	Forestry Bureau of Lin'an District
JIANG Chunqian	Professor	Research Institute of Forestry, Chinese Academy of Forestry

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Abstract

Funded by Asia-Pacific Network for Sustainable Forest Management and Rehabilitation (APFNet), the project of *Demonstration of Sustainable Forest Management and Restoration in Hilly and Low Mountain Area of Southern China* (2016P2-CAF) has fulfilled the activities and works defined by the project through the four years' implementation since the launch of the project in January 2017, attaining the project expected targets and engendering an effective demonstration effect.

In order to tackle the problems confronted by the forests in the hilly and low mountain areas of Southern China, the project selected the typical forests in Qingyang County and Lin'an District as the targets, worked out the Operation Plan in Qingyang County, Anhui Province, and the Operation and Implementation Plan for Demonstration Plots in Lin'an, Zhejiang in accordance with the people-oriented concept and in the light of different site conditions and status quo of forest resources, and set up seven demonstration models for forest restoration and sustainable management of which the demonstration area is 160 ha. (4 models in Qingyang totaling 100 ha. and 3 models in Lin'an totaling 60 ha.), producing a good demonstration effect.

Compared with the control, the demonstration models have enhanced the carbon sequestration ability of the forests in the project plots and their biodiversity. (1) Qingyang County: ① In demonstration of degraded forest restoration in rocky mountainous area of Youhua Stated-owned Forest Farm, the soil carbon in model plots was 8% higher than that in the control area; ②In Large-diameter-oriented cultivation of Chinese fir in Yaoxi Forest Farm, the biomass of each organ was the model > control and the total carbon storage of forest vegetation was 6% higher than that of the control. ③ In intensive sustainable management of low-yield *moso* bamboo plantation, the net income per unit area was 20100 yuan/ha, among which the income of bamboo shoots was 8550 yuan/ha; and it improved the biodiversity of *moso* bamboo forest. (2) Lin'an County: ① In the demonstration of restoration and

sustainable management of *Cunninghamia lanceolata* (Chinese fir), the order of soil carbon storage in the model plots was as follows: Chinese fir - evergreen broad-leaved forest > Chinese fir - deciduous broad-leaved forest > Chinese fir spruce forest. The carbon storage of the forest ecosystem with the model of *Cunninghamia lanceolata* - evergreen broad-leaved forest was 5% higher than that of *Cunninghamia lanceolata* spruce forest ecosystem. ② In ecological management of *Hickory* forest, due to introducing evergreen broad-leaved tree species into Hickory forest, soil carbon storage per unit area increased by 12.13 tons/ha, and soil carbon storage increased by 5.95 tons/ha under *Hickory* plantation. The output value after interplanting yellow essence is 1.6 times of original. ③ In the demonstration of intensive management based on Chinese torreya professional cooperative, the soil carbon storage of *Torreya grandis* with ecological management measures was 9% higher than that of traditional management.

Based on the investigation on and interview with government departments, forest farms, large contractors, forest farmers and others, and in combination with future development of forest resources and social economy, the *Report on the Strategy on Forest Restoration and Sustainable Management in APFNet Project Areas in Anhui and Zhejiang* has been worked out. At the same time, the *Carbon Accounting Methodology for Forest Restoration Projects* has been formulated for hilly and low mountain areas of Southern China.

The Project Area Monitoring Report has been completed, which was deemed excellent in the interim assessment conducted by APFNet. The ecological management models adopted by the project for *Carya cathayensis* plantation and *Torreya grandis* plantations have greatly reduced the use of herbicides, reduced the risk of soil erosion, and protected the local ecological environment.

The project hada Project Steering Committee meeting 4 times; 6 training courses were held, with a total enrollment of nearly 600 trainees; andexchange studie tours to Wangyedian Forest Farm, Chifeng, Inner Mongolia, Wangzhangshan Forest Farm, Pu'er, Yunnan, and to the Experimental Center of Tropical Forestry, Chinese Academy

of Forestry, Guanxi were held. Specialists have been engaged to solve, on spot, technical problems met in the project implementation process, which has drastically improved the capacity of the local stakeholders.

The project important activities and their progresses have been disseminated and covered by networks, newspapers, television and other media, 300 copies of brochures have been printed for project publicity, 7 research papers have been published on national scientific journals, and 1 doctor has been trained. The project experience has been shared with people of other areas, expanding the impact of the project.

During the implementation process, Mr. ZHAO Shucong, Chairman of the APFNet board of directors, paid two visits to the project sites, who gave praise and affirmation of the demonstration project. The project has attained the expected targets and played a positive demonstration effect. A local forest farmer says delightedly, "The APFNet project has brought us a new concept and techniques of forest management, which are very down to earth!"

CONTENTS

1. BACKGROUND AND INTRODUCTION

1.1 Project Background

Forests are a principal part of terrestrial ecosystems. Theyplay an irreplaceable role in addressing climate change and developing a low carbon economy. According to the 8th National Forest Resource Inventory (2013), forest area and volume are both growing in China. Forest area has increased from 195 million hectares to 208 million hectares, the forest coverage rate from 20.36% to 21.63%, and the forest volume from 13.721 billion m^3 to 15.137 billion m^3, with a net increase of 1.416 billion m^3. However, forest coverage in China is much lower than the world's average of 31%, the forest area per capita is only 1/4 the world average, and the forest volume per capita is merely 1/7.

Hilly and low mountain areas of Southern China enjoy favorable humid and thermal conditions and therefore great potential in productivity. However, one universal question facing on sustainable forest management is how to reduce forest degradation, and enhance capacities in forest management and carbon sequestration potential from perspectives of technology and policy by taking the resource superiority and hydrothermal conditions.

Qingyang County and Lin'an County (Map and detailed information in Annex A) represent different economic development levels of key forest zones in hilly areas of Southern China. Forestry holds an emphasized position in construction of national economy and ecological civilization in two Counties. Lin'an County, situated in the northwest of Zhejiang Province and densely populated, has a limited environmental capacity and thus its resources and the environment have weak carrying capacities. Its pursuit of economic growth has led to wide range forest degradation and obviously increased greenhouse gas emission, which has backfired as a bottleneck impeding sustainable economic and social development and living quality. For Qingyang County of Anhui Province, hills cover more of the area while waters cover a smaller

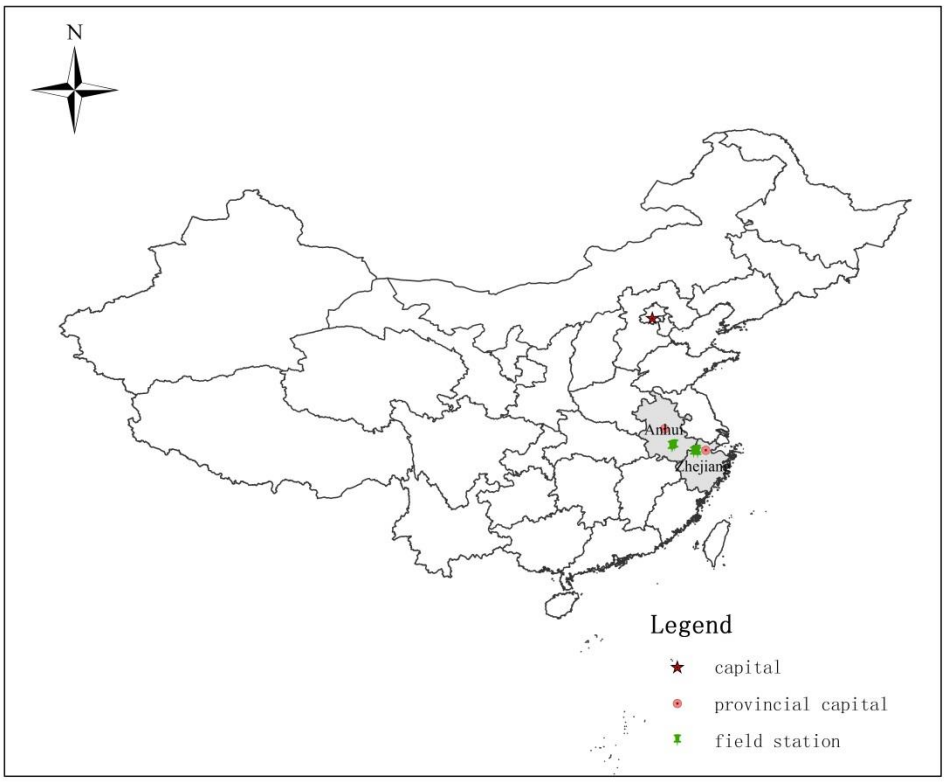
area. The county is one of the key typical collective forestry zones in Southern China, but given the ecological red line, it still faces challenges of barren soil and low forest coverage (less than 0.3) in some areas. The two counties still face severe challenges in how to rehabilitate degraded forests, improve sustainable forest management and find a solution to improve low forest quality by policy and technological means.

In addition, China has initiated National Carbon Trade Program since 2017. Lack of guidance and methodology in determining forest reference levels affects carbon sink accounting. Determination of forest reference levels is prerequisite to research on carbon sink. So, how to determine forest reference levels is the precondition of carbon sink accounting, and scientific basis for carbon sink trade. The two places lack enough understanding about carbon sink and the accounting methods in forest restoration and management, which will hinder the locals' right to benefit from future carbon trade market. The stakeholders in Lin'an and Qingyang urgently need knowledge and skills in the field of carbon sink.

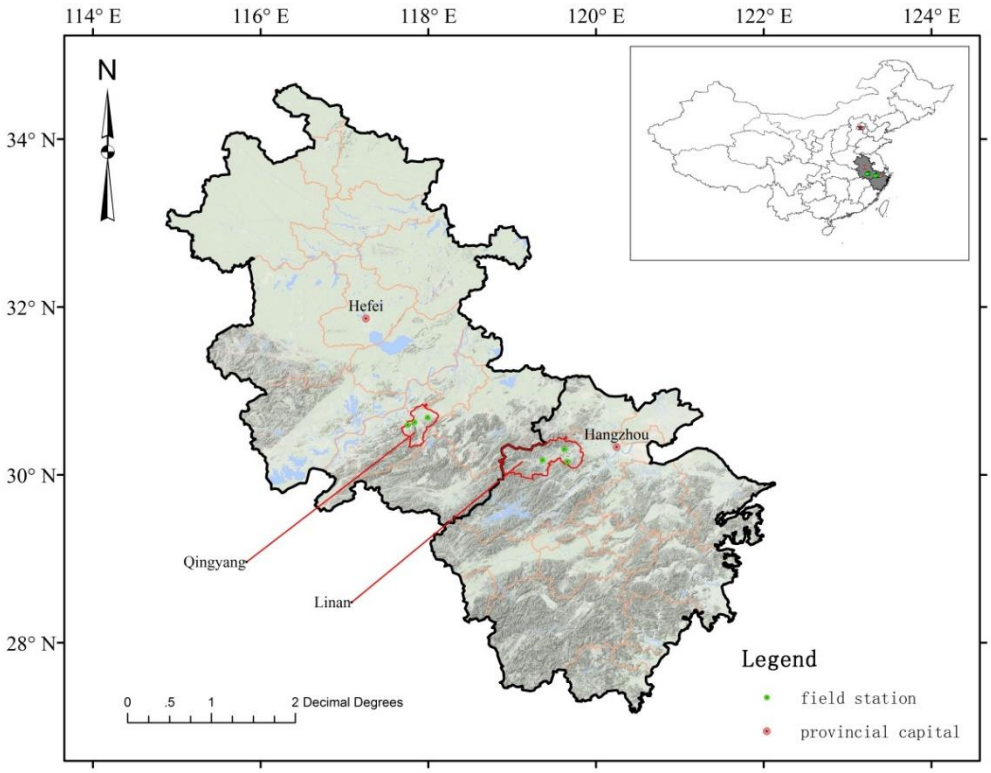
Thus, it is a wise choice for Qinagyang County and Lin'an County to raise the productivity of local forests, increase carbon sinks, improve living standards of local people in the forest zone and intensify capacity building of forest restoration through conducting study on degraded forest restoration, demonstrating sustainable forest management, and promoting capacity building activities.

1.2 General Information about the Research Area

Qingyang County in Anhui Province and Lin 'an District in Zhejiang Province are mainly managed by state-owned forest farms, collective forests, as well as large afforestation contractors and companies, which are typical in China, especially in the hilly and low mountain areas of Southern China. Therefore, the county and district wereselected as demonstration areas of forest restoration and sustainable management in the southern hilly and low mountain areas. The project area overview and location map are attached below.



Sketch Map of the Location of the Research Area in China



Sketch Map of the Location of the Project Sites in Anhui and Zhejiang

1.3 Existing Problems

Qingyang County of Anhui Province and Lin'an District of Hangzhou City of Zhejiang Province are typical representatives of different levels of economic development in the important forest areas in the southern hilly and low mountain areas, and forestry occupies a vital position in the national economy and ecological civilization construction in these two areas. Lin 'an District of Zhejiang Province is located in the northwest of Zhejiang Province, with a dense population, small environmental capacity and weak carrying capacity of resources and environment. In the pursuit of economic development, it has also brought about a great deal of forest degradation and resulted in a significant increase in greenhouse gas emission, which has become the bottleneck restricting the sustainable economic and social development or the upgrading of people's living quality. Although Qingyang County is a key forest area in the southern hilly and low mountain region, forest restoration in Qingyang County is as well confronted with severe challenges such as poor soil quality and low local forest coverage (less than 0.3) in the battle to safeguard the ecological red line.

Qingyang County of Anhui and Lin'an District of Zhejiang are endowed with rich forest resources, but there exist various forest resource management patterns in the southern hilly and low mountain areas. Qingyang County and Lin'an District still face severe challenges such as how to restore degraded forest and improve the level of sustainable forest management in the perspective of policy and technology, so as to transform the situation that the forests there are of poor quality. In addition, with the full launch of the national carbon trading market, forest carbon sequestration will bring great economic benefits to forest farmers and forest owners. However, there is still a lack of understanding of the importance of forest carbon sinks and a lack of carbon sink accounting methods in the field of forest restoration and forest management in the southern hilly and low mountain areas, which seriously affects the benefits of forest farmers and enterprises in the southern hilly and low mountain areas from the trade of forest carbon sink.

Therefore, research on ways to set up a demonstration on the restoration of degraded forests and models on sustainable forest management, and to strengthen capacity-building activities, can boost forest productivity and forest carbon sequestration. That will be a wise choice to improve people's living standards and the capacity building in forest restoration in Qingyang County, Anhui Province and Lin'an District, Zhejiang Province.

1.4 Project Beneficiaries

1.4.1 Government Institutions

Forestry Bureau of Qingyang County, Anhui Province, Youhua State Forest Farm and Forestry Bureau of Lin'an District, Zhejiang Province.

The implementation of the APFNet project will facilitate the government to improve its own management level and public service level, and to recognize and clarify the government's responsibility in mitigating climate change. The project implementation will constantly upgrade the quality of forest resources in the southern hilly and low mountain areas, and reduce soil erosion, promote the technology and methods of forest restoration as well as disseminate carbon sink knowledge in the areas; At the same time, it will provide outstanding local examples and demonstrations for the Asia-Pacific Network for Sustainable Forest Management and Rehabilitation.

1.4.2 Forest Farmers

Forest farmers are located in the experimental demonstration areas and in their peripheries.

The implementation of the APFNet project heightened the income level of forest farmers and forest restoration and sustainable management technical ability, helped forest farmers to master the new forest restoration techniques and carbon sink, and new information about carbon trading; It will raise the awareness of forest farmers to restore the forest and protect the ecological environment.

1.4.3 Education and Research Institutions

Anhui Provincial Forestry Academy and Zhejiang University of Agriculture and

Forestry.

Through the APFNet project, the major institutions of higher learning and other research institutions received project funding support, pushed international exchanges, innovated forest restoration techniques, carbon sink theories and related policies, and improved overall the level of scientific research. To obtain the support from the local practice base needed for the implementation of scientific research projects. It also provides technical and policy advice on forest restoration and carbon sequestration for the Asia-Pacific Network for Sustainable Forest Management and Rehabilitation.

1.4.4 Enterprises

By implementing the APFNet project, local forest-related enterprises received policy, technical and financial support for forest restoration. The implementation facilitated enterprise leaders and employees in enhancing the knowledge and competence on forest restoration and carbon sink. It alsohelped enterprises in exploring new ways to reduce greenhouse gas emissions. The enterprises expanded actual economic and social benefits. Meanwhile, it provides examples of outstanding enterprises for the Asia Pacific Network on Sustainable Forest Management and Rehabilitation and made publicity among similar enterprises about the significance of forest restoration and sustainable management, and energy conservation and emission reduction.

1.5 Project Objectives

The general objective of the project is to promote restoration and sustainable management of forest which focus on the improvement of forest ecosystem productivity and forest carbon storage in hilly and low mountain area of Southern China. It is anticipated to bring forward forest restoration technologies and organizational management models. The results are expected to enhance both technological and management capacities of hilly areas of Southern China in SFM and restoration, improve the quality of forest, increase forest carbon storage, improve living standards of local residents in the forest zone and thus set an example for its

kind in the Asia-Pacific region in future. The objectives are as follows:

(1) Testing and demonstrating effective technological methods on SFM and restoration;

(2) Establishing carbon sink accounting methodology for SFM and restoration at the project level; and

(3) Promoting knowledge and experience exchange in SFM and restoration among Asian-Pacific region.

1.6 Expected Outputs and Key Activities

Output 1 Demonstration on SFM and Restoration

Activity 1.1 Set up sample plots and controls (100 ha. in Qingyang of Anhui, and 60 ha. in Lin'an of Zhejiang)

Activity 1.2 Surveying background data in project sites

Activity 1.3 Designing operation plan on forest restoration and management for demonstration sites

Activity 1.4 Implementing the operation design plan

Activity 1.5 Developing strategies of SFM and restoration

Activity 1.6 Monitoring and evaluating the effect of restoration

Output 2 Accounted Forest Carbon Storage and Sinks in Target Areas

Activity 2.1 Analyzing baseline data of carbon pools of project activity areas

Activity 2.2 Making dynamic study on forest carbon storage in target areas

Activity 2.3 Making FRLs and accounting of carbon sinks in project areas

Activity 2.4 Developing the carbon accounting methodology fit for the hilly area of Southern China at project level

Output 3 Enhanced Capacity Building and Information Sharing among the Stakeholders

Activity 3.1 Holding project initiation meetings and 1st expert steering committee for program implementation

Activity 3.2 Building capacity via training on relevant knowledge and technique

Activity 3.3 Exchanging regularly and attending international conferences

Activity 3.4 Publishing project results

2. PROJECT IMPLEMENTATION

2.1 Project schedule and implementation arrangements

2.1.1 General Overview

The project of *Demonstration on Sustainable Forest Management and Restoration in Hilly and Low Mountain Area of Southern China* was started up in January, 2017. Till December, 2020, as requested by the project PD, 7 demonstration models have been established, the Demonstration Plan for forest Restoration and Sustainable Management has been formulated, the Report of Strategy for Forest Restoration in the Southern Hilly and Low Mountain Area has been worked out; The Carbon Accounting Methodology for Forest Restoration has been set forth; The impact of the project has been expanded by means of training, propagandizing and popularizing, and exchange studies, so that the expected objectives have been fulfilled.

(1) In consideration of characteristics of the degraded forests in the project areas of Qingyang County, Anhui, and Lin'an District of Zhejiang, a total of 160 ha. of demonstration plots has been set up by means of forest restoration on a landscape scale, of which 100 ha. for demonstration is in Qingyang and 60 ha. for demonstration in Lin'an. The implementation programs of operation plans for the project areas have been drawn up.

(2) The carbon storage and its changes in the project plots has been estimated, the Carbon Accounting Methodology for Forest Restoration has been compiled, and the carbon sink in the demonstration plots has been accounted.

(3) The technical capacity of the project staff and participants for forest restoration and sustainable management has been augmented through training courses, and exchange studies to other APFNet project sites. The project has

totally trained approximately 580 man/time, exceeding the anticipated number of trainees.

(4) The project demonstration effect and progress have been publicized and covered by local websites and television stations of the Forestry Department of Anhui Province, Forestry Department of Zhejiang Province, Chinese Academy of Forestry, Forestry Bureaus of Chizhou City, Qingyang County, and lin'an District. The project has published 7 research theses, and printed 300 copies of publicity brochures.

(5) The project demonstration has turned out a good effect. Since the implementation of the project, local farmers say, "the APFNet project has brought us a new concept of forest restoration." Under the influence of the project, local forest farmers have started growing economic plants as undergrowth all by themselves. For example, Yaoxi Forest Farm in Qingyang County have started growing *Polygonatum cyrtonema* under *moso* bamboo groves.

2.1.2 Implementation Status of Project Activities

Output 1 Demonstration on SFM and Restoration

Activity 1.1 Set up sample plots and controls

With the technical support from Zhejiang Agriculture and Forestry University (ZAFU) and Anhui Academy of Forestry (AHAF), the setting up of sample plots, the collection and measurements of above-ground biomass (arbor trees, shrubs and grass), vegetation biodiversity and litter, and soil sample in the project areas have been accomplished in 2017 by the Forestry Bureau of Lin'an District and Forestry Bureau of Qingyang County. A total of 63 sample plots has been set up in the project areas, of which 27 are in Lin'an District, 36 in Qingyang. For the purpose of surveying data of the shrub layer, herb layer and litter layer, 261 shrub samples, 261 herb samples and 26 litter samples have been set up in Lin'an District and Qingyang County. Regarding base data of arbor trees, shrubs, grass and soil, Forestry Bureau of Lin'an District and

Forestry Bureau of Qingyang County have completed the survey report of base data (see Attachment D2).

Setting up sample plots

Activity1.2 Surveying background data in project sites

During August to October, 2017, the report of survey of base data was finished by Forestry Bureau of Lin'an District and Forestry Bureau of Qingyang County (see Attachment D2). With the technical support of ZAFU and AHAF, the Forestry Bureau of Lin'an District and the Forestry Bureau of Qingyang County conducted the survey of base data of arbor trees, shrubs, grass, and soil. The above-ground biomass (arbor trees, shrubs and grass), vegetation biodiversity, litter and soil samples of the project sample plots were collected while soil physical and chemical properties were tested.

In August, 2017, soil density was measured in Qingyang

In October, 2017, biomass was measured in Lin'an

Activity1.3 Designing an operation plan on forest restoration and management for demonstration sites

In September, 2017, the Project Management Office commissioned the technical specialists of ZAFU and AHAF to draw up, respectively, the operation design schemes for the demonstration sample plots in Lin'an District and Qingyang County (see Attachment D3), which were evaluated, in December, by the specialists engaged by the Project Management Office. The specialists held that the schemes could not only tackle the problems faced in the local forest development, but also could realize the expected objectives of the project.

In December, 2017, evaluation specialists were discussing the operation design scheme

Activity1.4 Implementing the operation design plan

Activities in Qingyang, Anhui:

In the project process, Forestry Bureau of Qingyang County has accomplished the establishment of 4 demonstration models in accordance with the operation design scheme, of which the total area is 100 ha.

(1) Demonstration of Degraded Forest Restoration in Rocky Mountainous Area

The demonstration of degraded forest restoration on rocky hilly land is 50 ha. in Youhua Forest Farm of Youhua Township, which comprises the demonstration model of *Pteroceltis tatarinowii* - *Platycladus orientalis* - *Zanthoxylum ailanthoides* restoration plots and the demonstration model of *Cunninghamia lanceolata* - *Liquidambar formosana* restoration plots.

① Demonstration of *Pteroceltis tatarinowii* - *Platycladus orientalis* - *Zanthoxylum ailanthoides* (30 ha.): The model is set in the work area of the farm headquarters. During the project process, a total of 14,900 stems of

Pteroceltis tatarinowii have been complementarily planted; Clearing up shrubs and weed and shape pruning took place twice a year so that the productivity of *Pteroceltis tatarinowii* has been increased. Moreover, to help the implementation of the project, the forest road has been repairedby the Forestry Bureau of Qingyang County with the counterpart fund.

Before clearing up shrubs and weed (2017)

After clearing up shrubs and weed (2018)

② Demonstration model of *Cunninghamia lanceolata* - *Liquidambar formosana* (20 ha.): The model is set in the work area of Caoxieling, Youxi Forest Farm. During the process, a total of 6,000 stems of *Liquidambar formosana* has been complementarily planted with the intention of transformation of stand structure. Clearing up shrubs and weed has taken place twice a year, and 800 m forest road has been constructed.

Before clearing up shrubs and weed (2017)

After clearing up shrubs and weed (2018)

After the project implementation (2019)

(2) Demonstration of Large-diameter-oriented cultivation of Chinese fir in Yaoxi Forest Farm

The model is set in Miaoqianzhen, Yaoxi Forest Farm (15 ha.). It has taken the technique of oriented cultivation, complementarily planted *Phoebe chekiangensis* and *Sassafras tzumu* (225 stems/*ha*), resulting in a multiple layered mixed forest of coniferous and deciduous tree species with *Cunninghamia lanceolata* as the dominant species. A total of 2,300 stems of *Phoebe chekiangensis* and 3,450 stems of *Sassafras tzumu* has been replanted in the plantation of *Cunninghamia lanceolata*. For the convenience of the implementation, 800 m forest road has been constructed, 1,000 m fencing has been erected to prevent the destruction to forest by livestock.

Clearing up shrubs and weed in 2018 in Chinese fir plantation　　Marking the trees to be thinned


Erecting fencing in Miaoqianzhen in 2019 (prevention against livestock destruction to the sample plot)

(3) Demonstration of Intensive sustainable management of low-yield *moso* bamboo plantation

The model is set in Yangchong Village, Rogncheng Township (25 ha.). In December, 2017, thinning was carried out in the *moso (Phyllostachys pubescens)* bamboo plantation to optimize the plantation structure; In 2018 and 2019, after clearing up shrubs and weed, and fertilization were done, and sticky traps were placed to prevent pests. In 2018, a large contractor for *moso* bamboo plantation started attempting to grow 0.67 ha. of *Polygonatum cyrtonema* after he had returned from a study tour to Lin'an; The *Polygonatum cyrtonema* will be harvested in Autumn 2022, when the best results will be obtained. Based on the current growth, the yield (dry weight) is expected to reach 800-1000kg/*mu*. 3.5 km forest road has been constructed.


Commercial *moso* bamboo plantation before thinning

Comparison of *moso* bamboo plantation before and after thinning (2017)

Moso bamboo plantation intercropped with *Polygonatum cyrtonema* in 2018

Furrow application of fertilizer in *moso* plantation (2018）

Forest road constructed (2018)

(4) Design planning on control of pine wilt disease and protection of migratory birds (migratory bird habitat protection)

The model is set in Baihua Village, Rongcheng Township (10 ha.). In 2018, Masson pines (*Pinus massoniana)*, most of which were infected with pine wilt disease were all cut, and 2,000 *Liquidambar formosana* seedlings were planted in 2019. The "Operation Design Scheme for Demonstration of Transforming the Masson Pine Plantation Infested with Pests and Diseases into Deciduous Forest and Establishment of Migratory Bird Habitat Protection" has been drawn up (Attachment D3).

Lin'an District of Zhejiang Province:

In the period of 2017 to 2020, the project has accomplished demonstration models of 60 ha in Lin'an.

(1) Demonstration of Restoration and sustainable management of plantation *Cunninghamia lanceolata* (Chinese fir)

It is set in Xikou Village, Yuqian Towhsip (20 ha.) and is composed of 3 models:

① Model of mixed forest of *Cunninghamia lanceolata* and evergreen deciduous trees (2.2 ha.): 2018 saw an operation of cutting sprouts in the Chinese fir plantation, and kept 1,200 stems/ha; 264 stems of *Phoebe chekiangensis*, 264 stems of *Cinnamomum chekiangense Nakai* 264 stems of *Phoebe sheareri* and 264 stems of *Liquidambar formosana* were planted. 10 stems of *Osmanthus fragrans* were planted along the forest road. Clearing up shrubs and weed took place respectively in April and November each year.

② Model of mixed forest of *Cunninghamia lanceolata* - deciduous broadleaf trees (9.8 ha.): in 2018 interfering trees were removed, and the stem density became 1,200 stems/ha（the original density was 1980stems/ha, and thinning intensity was 40%）; Then 264 stems of *Liquidambar formosana*, 40 stems of *Acer palmatum* and 4 stems of *Magnolia denudata* were planted; May and October saw a clearing up shrubs and weed, respectively; To facilitate the operations, a 800 m forest road was constructed.

③ Demonstration of cultivation of large diameter *Cunninghamia lanceolata* (18 ha. traditional management): In January and February, 2018, interfering trees were cut and a density of 1,800 /ha. was kept.

The Chinese fir (*Cunninghamia lanceolata*) plantation before and after the project implementation

(2) Demonstration of ecological management of *hickory* forest

The demonstration plot is set in Bainiu Village, Changhua Township (20 ha.), which comprises 4 demonstration models (20 ha.). The target is, on the basis of safeguarding the ecological effect, to ensure the economic effect to promote the sustainable management of *Carya cathayensis* plantation.

① Demonstration model of *Carya cathayensis* plantation intercropped with Chinese medicinal herb (2.93 ha.): The intercropped medicinal herbs: 12,000 stems of *Tetrastigma hemsleyanum*, and 162,000 stems of *Polygonatum cyrtonema*; 3,000 kg special formula fertilizer was applied.

② Demonstration model of ecological management of *Carya cathayensis* plantation (7.07 ha.): Complementarily planted were 596 stems of the landscape tree species of *Phoebe chekiangensis*, 212 stems of *Neocinnamomum chekiangense*, 232 stems of *Cerasus serrulata*, and other species of 491 stems of *Acer palmatum*, 318 stems of *Camellia uraku*, 760 stems of *Myricaceae*, 50 stems of *Osmanthus fragrans*, and 3,000 stems of *Torreya grandis*. 33,000 kg special formula fertilizer, and 22,000 kg lime were applied. The local counterpart fund was spent on the construction of 2,000 m forest road, the surface hardening of 3,000 m forest road, the construction of 2 small reservoirs, and the erection of 4,000 m protective isolation net.

③ Demonstration model of mixed forest of *Cunninghamia lanceolata* and *Carya cathayensis* (9.07 ha.): Planted were 5,000 stems of *Carya cathayensis*, 75,000 stems of *Paris polyphylla*, and 75,000 stems of *Rhizoma bletillae*. Manual weeding took place in July and October, respectively, each year; Lime was applied in July and October, respectively, 4,000 kg fertilizer was applied.

④ Model of traditional management of *Carya cathayensis* (0.93 ha.): Herbicide was sprayed: 4,000 kg lime was applied.

(3) Demonstration of intensive management based on Chinese torreya professional cooperative

The demonstration plot is set in Gaoyuan Village, Linglong Sub-District (10 ha.). By means of ecological restoration and intensive management techniques, it is intended to improve the forest stand structure, reduce soil erosion, increase the income of forest farmers, and realize the sustainable management of *Torreya grandis*. It comprises 3 models (10 ha.):

① Demonstration model of ecological management of *Torreya grandis* plantation (4 ha.): The demonstration plot adopted manual weeding, with no application of herbicide. Planted were 30 stems of *Torreya grandis* grafted seedlings, 170 stems of *Phoebe chekiangensis*, 110 stems of *Acer palmatum*, 120 stems of *Cerasus serrulata*, 480 stems of *Torreya nucifera*, and 10 stems of *Osmanthus fragrans* were planted along forest road. 1,200 organic manure was applied; 300 m operation trail was built.

② Demonstration model of cultivation of newly established *Torreya grandis* plantation (2 ha.): Planted were 761 stems of *Torreya grandis*, 60 stems of *Acer palmatum*, and120 stems of *Torreya nucifera*, as well as 50 stems of *Osmanthus fragrans* were planted along forest road. 300 kg fertilizer was applied to the *Torreya grandis* trees.

③ Demonstration model of traditional management of *Torreya grandis* plantation (4 ha.): A thorough weeding and tending was carried out, and 1,200 kg fertilizer was applied.

Traditional management-*T. grandis* used with herbicide (Gaoyuan Village)

Ecological management of *T.grandis* used with no herbicide (Gaoyuan Village)

Activity1.5 Developing strategies of SFM and restoration

In 2018, acting as the technical support organization, ZAFU conducted a field survey, in a manner of participatory interview, on the needs and strategy for forest restoration in the project areas of Lin'an District and Qingyang County, which accomplished the drawing up of the report of the Strategy on Forest Restoration and Sustainable Management in Hilly and Low Mountain Area of Southern China for the project area, which was based on the survey findings and data analysis of the resources of project demonstration models (see Attachment D11).

ZAFU interviewing forest farmers, 2018

APAF surveying in Qingyang, Jan., 2019

PMO discussing the strategy on forest restoratiion in ZAFU, March, 2019

Activity 1.6 Monitoring and evaluating the effect of restoration

In September and December, 2017, the Project Management Office went to Qingyang and Lin'an successively to inspect the setup of the project sample plots. In 2018 and 2019, PMO went to Qingyang and Lin 'an to verify the implementation status of the demonstration activities and. The demonstration activities in Qingyang and Lin 'an were in line with the project operation design plan, and the survival rate of the planting seedlings both exceeded 95%.

For the purpose of understanding the implementation of project activities, PMO carried out the survey, analysis and assessment about the vegetation carbon sequestration ability, biodiversity, and economic benefit of economic plantation of the different demonstration models of forest restoration and sustainable management, respectively, in Lin'an District, Hangzhou City, Zhejiang (Nov., 2019), and in Qingyang County, Anhui Province (Sept., 2020). The above work provided support to the evaluation of the effects of project implementation, and to the second phase project activities in the future. Details are referred to the monitoring report attached. For the sake of ensuring the project monitoring scheme is scientific and feasible, specialists were engaged by PMO to discuss the scheme and offer recommendations for improvement.

Monitoring Chinese fir stand in Lin'an, Nov. 2019

Monitoring in Youhua Forest Farm in Qingyang, Sept. 202

Specialists discussing the project monitoring schemes, 2019

In January, 2019, evaluation specialists were invited by APFNet to inspect the project progress in the project areas.

Evaluation specialists were listening to the project report in Jan., 2019

Evaluation specialists were conducting on-site inspection in Jan., 2019

Output 2 Accounted Forest Carbon Storage and Sinks in Target Areas

Activity 2.1 Analyzing baseline data of carbon pools of project activity areas and

Activity 2.2 Making dynamic study on forest carbon storage in target areas

The report of the Carbon Storage and Its Changes in the Project Plots was completed in 2018 (see Attachment D4). The forest vegetation carbon storage of the three project sites in Lin'an is 430.570 tC, of which the carbon storage of *Carya cathayensis* plantation in Bainiu Village, Changhua Township is 272.791 tC, the carbon storage of *Torreya grandis* plantation in Gaoyuan Village, Linglong Sub-District is 6.013 tC, and the carbon storage of *Cunninghamia lanceolata* plantation in Xikou Village, Yuqian Towhsip is 151.766 tC. (2) The total amount of carbon storage of the forest ecosystem of the project sites in Qingyang is 17745.617 tC. The carbon storage in Xiyou Forest Farm is 11378.498 tC, with a yearly increment

of 3.300 tC/ha; The carbon storage of *Cunninghamia lanceolata* plantation in Yaoxi Forest Farm, Miaoqian Township is 2595.757 tC, with a yearly increment of 2.994 tC/ha; The carbon storage of *moso* bamboo plantation in Rongcheng Township is 627.640 tC, with a yearly increment of 1.442 tC/ha; And the carbon storage of *Pinus massoniana* plantation in Rongcheng Township is 3143.722 tC. (3) The soil carbon storage occupies a large proportion of that of the forest ecosystem in the project plots in Qingyang, which ranges between 79.5% - 90% of the forest ecosystem.

Activity 2.3 Making FRLs and accounting of carbon sinks in project areas

The estimation of the carbon sink in the project plots was finished in 2020 (see Attachment D4). The carbon sink of the demonstration of degraded forest restoration on rocky mountainous land in Youhua Forest Farm, Qingyang County is 1.50 t/ha; The carbon sink of the demonstration of cultivation of large diameter *Cunninghamia lanceolata* in Yaoxi Forest Farm is increased by 5.65 t/ha.; The carbon sink of the demonstration of intensive management of *moso* bamboo plantation is 18.43 t/ha. Of the models of different management of *Carya cathayensis*, the carbon sinks of the demonstration model of *Carya cathayensis* - *Polygonatum cyrtonema*, and the demonstration model of *Carya cathayensis* - landscape trees are 4.136 t/ha. and11.676 t/ha., respectively; The carbon sinks of the models of *Cunninghamia lanceolata* - evergreen deciduous trees, *Cunninghamia lanceolata* - deciduous broadleaf trees are 3.27 t/ha and 8.78 t/ha, respectively; The carbon sink of the model of ecological management of *Torreya grandis* is increased by 4.59 t/ha.

Activity 2.4 Developing the carbon accounting methodology fit for the hilly area of Southern China at project level

The Research Institute of Forestry, Chinese Academy of Forestry has established the Carbon Accounting Methodology for Forest Restoration (see Attachment D9). The methodology contains the determination of reference levels for forest restoration (FRLs), on the basis of which the carbon sink in the project plots has been estimated. The results show that different models of forest restoration and sustainable management adopted by the project have effectively enhanced the carbon fixation ability of forest, fulfilling the expected objectives of the project.

Output 3 Enhanced Capacity Building and Information Sharing among the Stakeholders

Activity 3.1 Holding project initiation meetings and 1st expert steering committee for program implementation

In April, 2017, the project launch meeting and the first PSC meeting were held by PMO in Lin'an, Zhejiang; In April, 2018 the second PSC meeting was held in Qingyang County; In March, 2019, the third PSC meeting was held in Qingyang County; In May, 2020, the fourth PSC meeting was conducted via Tencent video conference owing to the influence of Covid-19.

the 1st PSC (Lin’an)


the 2nd PSC (Qiangynag)

Activity 3.2 Building capacity via training on relevant knowledge and technique

PMO has, in all, run 4 training courses, while Ling'an PIO has conducted 3 training courses, training a total of over 580 man/time. In December, 2017, the training course on fundamental theory and knowledge of sustainable forest management and landscape restoration, and related techniques was held in Qingyang County, Anhui Province, training over 200 man/time. In April and June, 2018, Qingyang County and Lin'an District held successively the training courses on techniques for accounting and monitoring forest sink, and on cultivation and management of none timber forest products, enrolled over 200 trainees. For the sake of learning techniques for cultivation of winter bamboo shoot, Qingyang County sent more than 30 people to attend the technical training on cultivation of winter bamboo

shoot that was held in Lin'an. In April, 2019, PMO specially conducted a project training course on growing Chinese medicinal herbs as the undergrowth, of which more than 60 trainees of the project technical staff were taught on the operational knowledge by the specialists and professors from ZAFU. In June, 2020, Lin'an PIO ran a training course on the techniques and management of *Carya cathayensis* and *Torreya grandis*, which was attended by forest farmers, over 120 man/time.

3rd Training Course on Accounting Forest Carbon Sink in 2018

Training Course on Undergrowth of Medicinal Herb in Lin'an, 2019

Technical staff from Qingyang were learning cultivation of winter bamboo shoot in Lin'an, 2018

Activity 3.3 Exchanging regularly and attending international conferences

During the project process, PMO, Qingyang PIO, and Lin'an PIO have maintained communication and exchange on the project progress, and on tackling problems derived from the implementation via email, WeChat, QQ and etc. while PMO has regularly reported the project progress to APFNet.

The project has adjusted the international exchange plan to the domestic exchange studies. In July, 2017, the Seminar on Forest Restoration i.e. "Meeting on Exchange of Achievements and Experience of the APFNet Projects in China" was

held under the auspice of APFNet in Chifeng, Inner Mongolia, which also introduced the successful experience of the Demonstration Project on Vegetation Restoration and Forest Resource Management and Utilization in Greater Central Asia -- Chifeng Project Area of China.

In October, 2020, representatives of the project executing agency and implementation agencies went to Wanzhangshan Forest Farm in Pu'er, Yunnan Province, a project site of APFNet, and to the Demonstration Base of Sustainable Forest Management, Experimental Center of Tropical Forest, CAF to conduct exchange study (see the report attached).

Exchange study in Chifeng,

Exchange in the center of tropical forestry, October, 2020

Visit to site of cultivation of large diameter *Michelia macclurei*

Activity 3.4 Publishing project results

The performance and progress of the project demonstrations have been publicized and covered by local websites and TV stations of Forestry Department of Anhui Province, Forestry Department of Zhejiang Province, Chinese Academy of Forestry,

Forestry Bureau of Chizhou City, Qingyang County, and Lin'an District.

The project has, in all, published 7 papers, and printed 300 copies of publicity brochures; The Research Institute of Forestry, CAF has trained 1 doctor.

The titles of the 7 papers are as follows:

① A review of the effects of nitrogen deposition on forest soil chemical properties and greenhouse gas emissions. *Protection Forest Science and Technology*

② Problems and countermeasures in forest restoration in China. *Journal of Northwest Forestry University.*

③ Plant community characteristics of young *Cunninghamia lanceolata* sprout forest *Journal of the Zhejiang Agriculture & Forestry University.*

④ Rural Forest Landscapes and Plant Communities in Hilly Areas of Southern China, *Forestry Research*

⑤ *Zanthoxylum ailanthoides* Sieb. Zucc., new to Anhui Province, *Journal of Biology*

⑥ Plant Community Characteristics of Young *Cunninghamia lanceolata* Sprouted Forest, *Journal of Zhejiang University of Agriculture and Forestry*

⑦ Attempting Discussion on Evaluation of Forest Carbon Sink and Forest Restoration, *Forestry Science and Technology*

2.2 Project resources and costs

2.2.1 Budget and Expenditure of Funds

The total project budget is 1,410,207 USD, of which 695,207 USD is granted by APFNet, and 715,000 USD is the local counterpart fund in kind. Main of the local counterpart fund in kind includes lease of office space, construction of forest road in the demonstration plots, construction of impounding ponds and some labor cost, which is borne by the local forestry bureaus, forest farmers and large contractors.

In 2018, the project budget was adjusted because of the expenditure adjustment of Activity 1.5 Studying and Formulating the Strategy on Forest Restoration, provided that the total project budget remained the same.

In the project period（2017-2020），an amount of 685,207 USD (4673931.58 CNY, based on the rate of 1 USD = 6.8212 CNY) from the 5 allocations of APFNet has

been received. Another 10,000 USD has been received as the evaluation expense of a third party (evaluation experts) hired by APFNet for the project interim assessment and completion acceptance.

The project budgeting and execution has all abided by the state regulations governing the project fund.

By December 31, 2020, the total project expenditure is 1,403,494 USD, of which 631,146 USD (4,305,298 CNY) has been allocated by APFNet, reaching an expenditure rate in place of 92.11%.

Later the expenses of the project completion acceptance and financial audit need to be spent.

2.2.2 Expenditure Statement

(1) Statement of over-expenditure/surplus of funds

The use of the project funds has abided strictly by the state and APFNet administrative regulations. So far, the implementation rate of activities with the funds in place is as high as 92%. Influenced by Covid-19, the project international exchange and expert consulting meeting has been hindered so that the expenses of international exchange, meeting and experts have been delayed in expenditure.

Out of the international exchange expense of 58,270 USD, 12,847 USD are left there. That is some saving from international travel expense since the plan of international exchange has been adjusted to the exchange studies conducted in Guangxi and Yunnan. In addition, the travel expenditure of the personnel from the Research Institute of Forest, CAF for their trip to Guangxi and Yunnan has been categorized into the domestic travel in the financial summary, resulting an over-expenditure of 6,333 USD in domestic travel expenditure.

The proposed seminar on the project acceptance and specialist consulting meeting on forest restoration strategy and carbon accounting methodology for forest restoration has not been held, owing to the influence of Covid-19, and the 2020 PSC meeting was conducted via videoconferencing over the internet, which has also saved the conference costs. As well fees for experts have not been paid.

Furthermore, the cost of office fuel and power for the project period has not yet

paid, resulting a surplus in this cost.

(2) A description of the cost of concluding acceptance

As the project is going to conduct the concluding acceptance, certain cost should be prepared for the acceptance. It is estimated to be 40,000 USD, which covers:

The cost for the project acceptance and evaluation meeting, including meeting expense, travel expense and etc., which is estimated to be 15,000 USD that breaks into the travel expense of 5,000 USD, the acceptance meeting expense of 5,000 USD, and also the specialist fees of 5,000 USD for some project acceptance material assessment.

The forest restoration strategy report of the project will be published, the publication cost of which is estimated to be 12,000 USD.

The project audit fee is estimated to be 4,000 USD, based on the consultation with an audit firm.

The project intends to invite *China Pictorial* to make a publicity brochure, of which the cost is estimated to be 5,000 USD. Besides, the project will pay 2,000 USD for the printing and binding of some project reports

Other unpredictable costs are 2,000 USD.

The remaining project funds will be refunded to the APFNET account.

2.3 Procurement and consultant recruitment

2.3.1 Procurement

(1) The Research Institute of Forestry, CAF

In accordance with the government procurement procedure, purchased were 2 computers: one is a desktop computer, and the other a notebook computer;

1 copying scanner; 1 digital camera; 1 GPS.

(2) Qingyang County, Anhui Province

In accordance with the government procurement procedure, purchased was 1 notebook computer; 1 scanner; 1 digital camera; 1 GPS. I pickup truck was purchased through bidding.

(3) Lin'an District, Zhejiang Province

In accordance with the procurement procedure, purchased was 1 printer; 2 solid state drives and 2 computer memories; 2 notebook computers; (see the explanation attached for the purchase of 2 computers).

See Attachment G for the list of fixed assets.

2.3.2 Consultant recruitment

(1) Associate Prof. JIANG Chunwu of APFA and Prof. YU Shuquan of ZAFU were invited to design the operation design schemes for the forest restoration and sustainable management models of the project plots, respectively, in Qingyang County and Lin'an District (see Attachment D3 of the operation design schemes and the employment contract).

(2) Regarding the interim assessment, Senior Engineer ZHANG Songdan and Senior Engineer LIU Yingchun were hired by APFNet to evaluated the project progress. The evaluation was excellent.

(3) Regarding the concluding acceptance, experts will be hired by APFNet to evaluate the project.

(4) In addition, in order to ensure the project quality, specialists has, in the light of project actual needs, been invited to provide full technical service for guaranteeing the fulfillment of the targets of the project demonstration and training activities, who are from the East China Survey, Plan and Design Institute of SFGA, CAS, CAF, ZAFU, Research Institute of Forestry of Zhangjiajie, Forestry Academy of Hunan Province, APFA and etc.

2.4 Monitoring & evaluation and reporting

In the light of actual needs for project monitoring and evaluation, PMO have engaged specialist from APFA and JUAF to assist PMO in the project monitoring and evaluation so as to guarantee the project quality. According to the project progress, PMO has conducted monitoring on the boundary of the project demonstration plots, the demonstration effect of the demonstration models, and on the changes of carbon storage. The monitoring activities have proven to guarantee the realization of the project expected objectives.

2.4.1 Formulation of Monitoring Report of Setting up the Boundary and Sample Plots of the Project Area

In consideration of the project expected objectives and the need of study on the changes of carbon storage in the project area, and abiding by the Technical Provisions for Continuous Inventory of National Forest Resources, in September 12 to 15 and December 8 to 10, 2017, PMO went to Qingyang County, Anhui and Lin'an District, Zhejiang to inspect whether the boundary of the project area matched the project design, or whether the process of setting up of sample plots and data survey met the requirements.

PMO has been mainly engaged in: (1) inspecting and reviewing of the report on setting up sample plots and base data, specialists' reviewing the finished operation design schemes; (2) field inspecting the boundary of project area, with the use of GPS, and checking with the topographic map; (3) field checking the piles and boundary of fixed sample plots, tree number cards, random inspecting measurement data per tree.

The inspection shows that the setting up of boundary of the project demonstration area and sample plots meet the Technical Provisions for Continuous Inventory of National Forest Resources. The closure error of the fixed sample land perimeter measurement set by the project is less than 0.5% ; The sampling inspection shows that the measurement error of DBH of arbor trees (5-20cm) is less than 0.3cm, the error of DBH (≥20cm) was < 1.5%; The measurement error of tree height (< 10m) is less than 3%, and that of tree height (≥10m) is less than 5%. The project operation design schemes have passed the assessment of the specialists. The Monitoring Report of Setting up the Boundary and Sample Plots of the Project Area is attached.

2.4.2 Formulation of Project Monitoring Report

Under the assistance of the project technical support agencies of ZAFU and APFA, PMO successively went to Lin'an District, Zhejiang and Qingyang County, Anhui in July and August, 2019 and September, to carry out survey on the changes of carbon storage and carbon sink data of the project areas. The survey results show that the demonstration models adopted by the project have apparently enhanced the productivity and soil carbon storage of the forest of the project areas. For example, the

carbon storage of the forest ecosystem of the demonstration model of *Cunninghamia lanceolata* - evergreen deciduous trees is 5% higher than that of the forest ecosystem of sprouted *Cunninghamia lanceolata* forest. The introduction of evergreen deciduous trees into the *Carya cathayensis* plantation has increased soil carbon storage per unit area by 12.13 t/ha., the soil carbon storage of the *Carya cathayensis* plantation with the undergrowth of *Polygonatum cyrtonema* is increased by 5.95 t/ha. The demonstration models in Qingyang County and Lin'an District all display different increases of carbon sink. The Project Monitoring Report is attached as Attachment D4.

2.4.3 Completion of the Analysis Report of Training Courses

In 2017 and 2018, PMO ran altogether 4 training courses, which were trainings entitled as Basic Theory and Knowledge on Forest Sustainable Management and Landscape Restoration, Techniques for Control of Pests and Diseases, Methods, Accounting and Monitoring Techniques of Forest Carbon Sink, Management Techniques for *Moso* Bamboo Shoot Production. In the wake of the training courses, PMO made evaluation of the training activities in the aspects of training course arrangement, training methods and content, organization and management of training sessions and future training needs. The trainees agreed that the teachers were knowledgeable and their lectures were rich in content, the knowledge and technology that they had presented matched the needs of local forest development. At the same time, the trainees expressed that the project should increase the training activities like this, especially add more the content of field practice guidance. Details are referred to the Analysis Report of Training Courses attached as D5.

2.5 Dissemination and knowledge sharing

(1) During the process of the project implementation, all the project activities kept video footage. The events of the project meetings (launch meeting, PSC meetings, training courses and specialists consulting meetings) have all been publicized and covered via websites of Forestry Department of Anhui Province, Chizhou City

Government, Qingyang County, Forestry Department of Zhejiang Province, Lin'an District Government, Chinese Academy of Forestry as well as local newspapers and TV stations.

① Project Launch Meeting

Barren Hills to Turn Green and Forest Farmers to Increase Income -- the APFNet Project of Forest Restoration is landed in Lin'an

http://www.forestry.gov.cn/portal/zlszz/s/4258/content-972733.html

http://hangzhou.zjol.com.cn/system/2017/04/27/021500965.shtml

In April, 2017, Chairmen ZHAO Shucong was inspecting in Lin'an

The Project of Demonstration of Sustainable Forest Management and Restoration in Hilly and Low Mountain Area of Southern China Starts Implementation in Our City

http://www.linan.gov.cn/art/2017/4/27/art_1367620_11440999.html?from=singlemessage

② Inspections by Leaders

In 2017 and 2019, Chairman ZHAO Shucong paid visits respectively to the project sites to inspect, which were covered and reported by Lin'an and Qingyang TV stations.

In December, 2019, Chairman ZHAO Shucong was inspecting in Qingyang

(Qingyang TV Station)

In December, 2019, Chairman ZHAO Shucong was inspecting in Lin'an (Lin'an TV Station)

③ News on the Interim Assessment

In January, 2019, APFNet evaluation specialists were inspecting the project progress in the project sites.

http://www.linan.gov.cn/art/2019/1/28/art_1367555_30111283.html

In Jan., 2019, evaluation specialist were inspecting in Lin'an

④ Project Survey

The survey of project base data was reported by Qingyang County.

https://www.sohu.com/a/190287001_273223

In Aug., 2017, survey on sample plots was going on (Qingyang)

⑤ News About PSC Meetings and Training Courses

During the process of project implementation, PMO and PIOs have made the PSC meetings and training courses covered and reported by medium, e.g. the Second PSC Meeting held in Qingyang and the field guidance in Youhua Forest Farm in April, 2018.

http://lyj.chizhou.gov.cn/News/show/393334.html

http://lyj.chizhou.gov.cn/News/show/393335.html

http://www.caf.ac.cn/info/1254/38777.htm

2nd PSC Meeting held in Qingyang, 2018

PSC offering guide in Youhua Forest Farm, Qingyang

Technical Training, 2018 (Qingyang)

In April, 2018, Lin'an representative was in APFNet PSC meeting i.e. training on methods for accounting carbon sink

http://www.zjly.gov.cn/art/2018/4/13/art_1285504_17306299.html

Project technical training and assessment of operation design schemes were held in Qingyang

http://lyj.chizhou.gov.cn/News/show/396910.html

2018 second technical training was held in Lin'an

http://rif.caf.ac.cn/news.aspx?itemid=3909

⑥ News Coverage about Project Exchange

In May, 2017, Deputy Mayor of Chizhou City XIA Jimiao and his party were exchanging project management experience in Lin'an.

In October, 2020, the project of Demonstration of Sustainable Forest Management and Restoration in Hilly and Low Mountain Area of Southern China made a trip to Yunnan and Guangxi to exchange and study the experience in sustainable forest management and project management.

http://www.caf.ac.cn/info/1254/38777.htmTr

In Oct., 2020, the project was exchanging experience in the Center of Tropical Forestry in Guangxi

（2）Sharing the Effects of Project Demonstrations

The process of the project implementation has witnessed the conduction of 6 training courses or meeting with a total enrollment of nearly 600 trainees; 300 copies of technical and publicity brochures; The formulation of the Strategy on Forest Restoration of the Project Areas, and the Carbon Accounting Methodology for Forest Restoration; Publication of 7 academic theses (Attachment D8), RIF of CAF has trained 1 doctor on ecology.

The project implementation has realized the expected objectives and exhibited its demonstration effect. After the project training and implementation, local farmers said with delight, "APFNet project has brought us a new concept of sustainable forest management". For example, in the early stage of the project, Lin'an District initiated the experiment of *Polygonatum cyrtonema* as undergrowth, which was noticed by Qingyang PIO staff when they were exchanging experience about the project there, who learned that *Polygonatum cyrtonema* had a huge market potential in the future. On returning back, the staff as well started the experiment of cultivation of *Polygonatum cyrtonema* under *moso* bamboo plantation since there was the distribution of wild *Polygonatum cyrtonema* in Qingyang itself. Moreover, Youxi Forest Farm, Miaoqian Township, Qingyang County also found the great potential in

intercropping *Polygonatum cyrtonema* under forest, which intended to grow *Polygonatum cyrtonema* under Chinese fir plantation.

3. PROJECT PARTNERES' PERFORMANCE

3.1 Project Steering Committee Performance (supervision and guidance)

Being jointly composed of leaders and specialists from Forestry Department of Anhui Province, Forestry Bureau of Chizhou City, Forestry Bureau of Qingyang County, Forestry Department of Zhejiang Province, Forestry Bureau of Lin'an District, and Chinese Academy of Forestry, PSC has been endowed with the responsibilities of leadership, coordination, supervision over the implementation of the project, so as to ensure the implementation of project activity plan and solve any major problems encountered in the project execution, and keep supervision of the project implementation. It has reviewed and approved the annual work plan and its completion. For the smooth implementation of the project, PMO has been set up that has been under the leadership of PSC, which has been in charge of the following:

(1) Being responsible to report the project progress to PSC and APFNet;

(2) Active coordination in the implementation of policies and work plans made by PSC;

(3) According to the project progress and technical requirements, coordinating the employment of technical specialists and their technical guidance service;

(4) In line with the project annual work plan, supervising and inspecting the activities of the project implementation agencies, and reporting to PSC;

(5) Regarding any problems derived from the implementation of the annual work plan of the project sites, reporting them to PSC and conveying the comments and suggestions to the project sites, and actively pushing the project implementation.

3.2 Performance of Executing Agency

In accordance with the overall project program and annual plan requirements,

Research Institute of Forestry of Chinese Academy of Forestry (RIF - CAF) has, acting as the executing agency, been in charge of the project organization and management, employment of specialists for guidance, promotion of project demonstration and strengthening the use and management of funds, so as to accomplish soundly the different works defined by the project.

(1) Project organization and management. According to the project plan, PMO was set up in RIF - CAF upon the signing of the project, and PIOs were set up in the project sites of Forestry Bureau of Qingyang County, and Forestry Bureau of Lin'an District. After the project launch, EA has given a full play in project guidance, providing to the project sites with the experience about international project management and regulations of fund use, so that a highly effective communication among the project parties has been maintained. The project annual work plans have been drawn up and project annual progress reports have been prepared. At the same time, EA has done a good job of bridging the communication between APFNet and project sites.

(2) Employment of specialists for guidance. In line with the project expected objectives and the requirements of the annual works, specialists of forest restoration, forest ecology and sustainable management, and other fields have been hired to give guidance on key technical problems met in the project implementation and on technical methods.

(3) Promotion of project demonstration and information sharing. Promotion and training have been lent to the different stakeholders on the technical methods of forest restoration and sustainable management while the demonstration effect has been publicized via internet, new medium, and brochures. Besides, information sharing has also been accomplished by attending the exchange meeting of project achievements and by exchange visit with other projects on project outputs.

(4) Strict management of funds. A special account has been set up for special funds to ensure the safe use of project funds. The use and management of project funds has strictly followed APFNet and national funds management regulations.

3.3 Performance of Implementation Agencies

(1) Forestry Bureau of Qingyang County and Forestry Bureau of Lin'an District are the project implementation agencies (IA). Project Implementation Offices (PIO) are set in the forest bureaus of Qingyang County and Lin'an Distric, which is of the benefit to the project internal coordination. Acting as the director of the Project Implementation Office, the director of the local forestry bureau has been responsible for the activity implementation and coordination in the project sites so that a smooth project implementation has been attained in the project site; A deputy director has been set, in charge of communication and coordination between superiors and subordinates on the one hand, and of preparation of summary materials of project implementation progress according to the project management regulations on the other; At the same time, PIO has been staffed with project publicity, special financial management personnel, responsible for project publicity and the use of funds.

(2) The technical advisors and specialists of the project team are specialists in forest restoration and sustainable management from CAF, CAS, Beijing Forestry University, East China Survey, Plan and Design Institute of SFGA, APFA, ZAFU and International Center for Bamboo and Rattan, who have provided the operation design schemes, project monitoring, technical training and solutions to critical technical problems in the project implementation, and offered comments and suggestions on the implementation so that the attainment of the project expected objectives have been guaranteed.

3.4 Performance of APFNet

(1) The smooth implementation of the project has been strongly supported by APFNet. In the whole process of the project implementation, APFNet has conducted a full coordination and guidance on the project implementation. The annual work plans and annual progress reports have been reviewed and approved.

(2) Funds have been appropriated in time by APFNet according to the project program.

(3) APFNet has designated a person to liaise with PMO personnel, to track the

project progress, who has made many visits to the implementation agencies to offer guidance. Assistance has been lent to the project team in the exchange studies made to Chifeng City of Inner Mongolia, Wanzhangshan Forest Farm, Pu'er City of Yunnan Province. That has enhanced the impact of the project.

4. PROJECT PERFORMANCE

4.1 Project achievements

The project implementation in the 4 years has fulfilled all the project activities, turned outstanding effects, and matched the expected objectives. The project implementation has presented a landscape-level forest restoration to the project areas, has brought the government administrators, forest farmers and large contractors in the project areas a new concept of forest restoration and sustainable management and related techniques. As a consequence, the capacity of the local forest administrators has been strengthened and their past ideas of forest management have been transformed; The forest quality and carbon fixing ability have been improved; As well, the implementation of project demonstrations has upgraded the ecological environment of the areas; The project has provided local forest farmers job opportunities, the growing medicinal herbs as undergrowth and the cultivation techniques for improving forest management by forest farmers, which has raised the productivity and the income of forest farmers. The project has played a promotion and demonstration role in the local economic development, and will display a good demonstration role in the forest restoration and sustainable management in the Asian-Pacific region.

4.1.1 Forest Restoration and Sustainable Management Has Turned a Good Demonstration Effect, Ameliorated the Forestland Environment and Increased the Forest Carbon Storage

With the support of specialists of the technical support institutions of APAF and ZAFU, the Project Implementation Scheme of Qingyang County, Anhui Province, and the Operation Implementation Scheme for the Demonstration Plots in Lin'an District,

Zhejiang (details are referred to the Attachment) have been drawn up based on the status quo of the forest resources and economic development of the project area, and in consideration of the project survey of base data. Acting as the project implementation agencies, Forestry Bureau of Qingyang County and Forestry Bureau of Lin'an District have carried out the activities according to the project implementation schemes. The accomplishment of the project implementation has upgraded the forest quality, ameliorated the ecological environment, and improved the income of local forest farmers. The project has generated benefits to the local forest development, and produced a good demonstration effect (details are referred to the monitoring report).

Qingyang County, Anhui Province:

(1) Experiment Demonstration of Degraded Forest Restoration on Rocky Mountainous Land

After the project implementation, the forest biomass and carbon storage have all been increased and the environment of the forestland has been improved. Of the demonstration forest of degraded forest restoration on rocky mountainous land, the biomass of each organ shows that that of the experiment is greater than that of the check; The total carbon storage of forest vegetation on the experiment site is 58.76 t/ha, greater than 54.48 t/h of the check.

Comparison of Total Carbon Storage on Rocky Mountainous Land Before and After Implementation (t/ha)

Treatment	Arbor Layer	Shrub Layer	Herb Layer	Litter	Soil
CK	9.49	2.693	3.208	8.057	31.03
Experiment	16.66	2.099	2.501	6.282	31.22

Demonstration of Cypress - Tatarinowii - Ailanthoides

Comparison of the check and experiment

Pteroceltis tatarinowii Comparison of branches before and after

Comparison of forest road before and after the construction

(2) Experiment Demonstration of Cultivation of Large Diameter Chinese Fir Plantation

Of the demonstration plantation of cultivation of large diameter *Cunninghamia lanceolata*, the biomass of each organ shows that that of the experiment is greater than that of the check; The total carbon storage of forest vegetation on the experiment site is 114.93 t/ha, greater than 108.54 t/h of the check. In addition, the shrub biodiversity of the experiment plot is greater than that of the check plot.

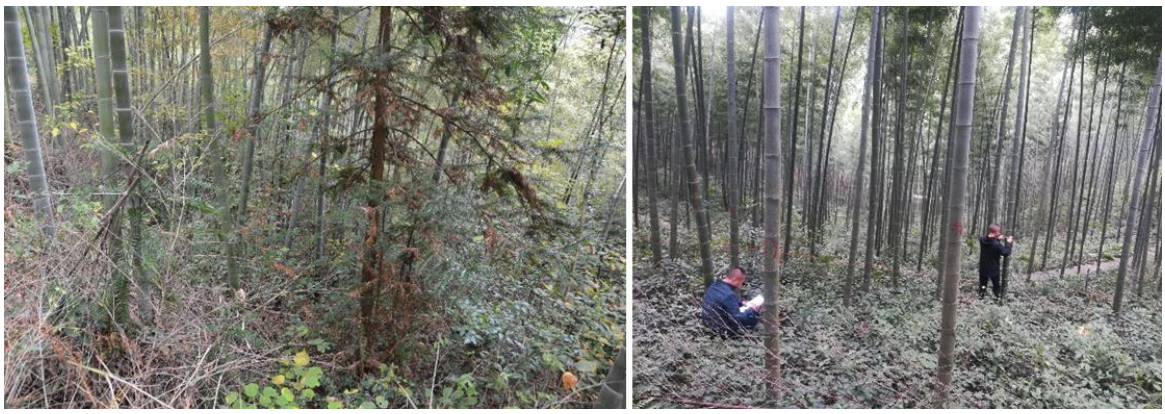
Chinese fir plantation before and after clearing up shrubs and weed

Total Carbon Storage of *Cunninghamia lanceolata* Plantation (t/h)

Treatment	Arbor Layer	Shrub Layer	Herb Layer	Litter	Soil
CK	64.31	0.387	2.570	13.250	28.02

Experiment	72.30	0.413	2.746	14.156	25.31

(3) Experiment Demonstration of Intensive Sustainable Management of Bamboo Plantation



Moso bamboo plantation before and after the project implementation

Through the project implementation, whether the biomass of bamboo pole, above-ground or the whole plant shows that that of the check is greater than that of the experiment; The carbon storage of the demonstration of intensive management of low-yielding *moso* bamboo plantation is 94.23 t/ha, less than 111.09 t/h of the check plot. That mainly derives from the fact that the density of *moso* bamboo plantation in the check plot is higher than that of the experiment plot. As a result, the biodiversity of shrubs and weed in the experiment plot is greater than that of the check plot.

The economic benefit of moso bamboo plantation has been augmented. The net economic income per unit area is 1,340 yuan/mu, of which 570 yuan/mu is from the sale of bamboo shoot, thanks to the improved forest stand structure, expanded productivity of bamboo shoot plus the income from the sale of moso bamboo.

Total Carbon Storage of Bamboo Plantation (t/ha)

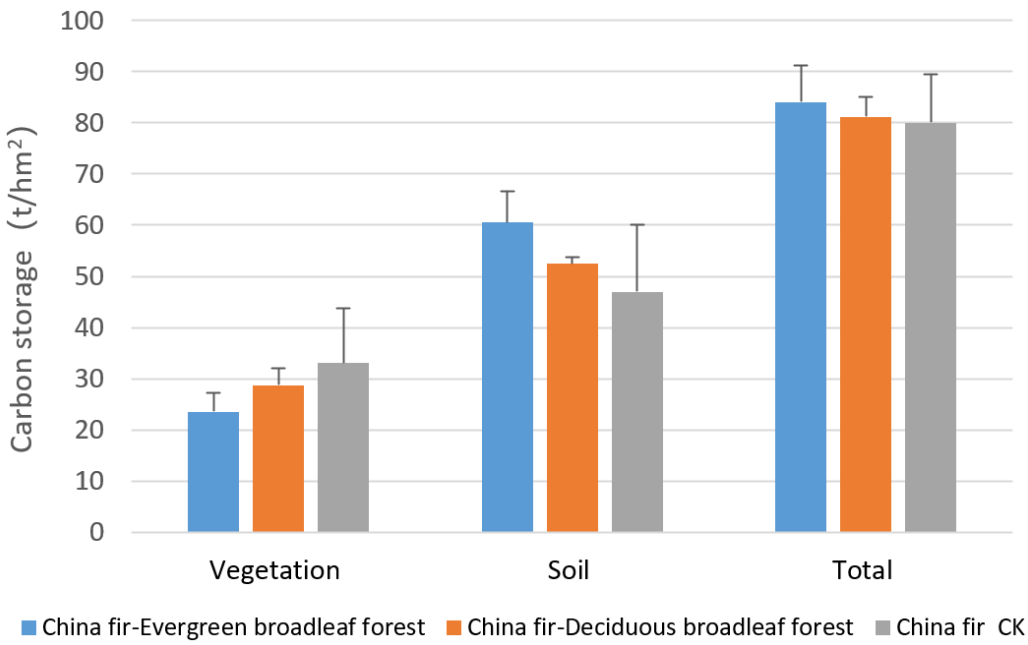
Treatment	**Whole Plant**	**Soil**	**Total Carbon Storage**
CK	69.03	42.06	111.09
Experiment	52.57	41.66	94.23

4.1.1.2 Lin'an District, Zhejiang Province

(1) Demonstration of Restoration and Sustainable Management of Degraded *Cunninghamia lanceolata* Plantation

The demonstration of management of degraded *Cunninghamia lanceolata* plantation consists of 2 models i.e. mixed forest of *Cunninghamia lanceolata* - evergreen deciduous tree species (*Phoebe chekiangensis*, *Neocinnamomum chekiangense*, *Phoebe sheareri* and *Phoebe zhennan*) and mixed forest of *Cunninghamia lanceolata* - deciduous broadleaf tree species (*Liquidambar formosana*). The soil carbon storage of different models is as follows: that of the model of *Cunninghamia lanceolata* - evergreen deciduous tree species is greater than that of the model of *Cunninghamia lanceolata* - deciduous broadleaf tree species, and that of the latter is greater than that of the check plot of *Cunninghamia lanceolata*. That indicates the mixed forest of *Cunninghamia lanceolata* - deciduous trees presents a notable improvement of soil fertility and carbon storage.

Chinese fir plantation in 2017 and 2019（before and after the implementation）



Comparison of Carbon Storage of Different Models of *Cunninghamia lanceolata* Plantation in 2020

(2) Demonstration of Ecological Management of *Carya cathayensis* Plantation

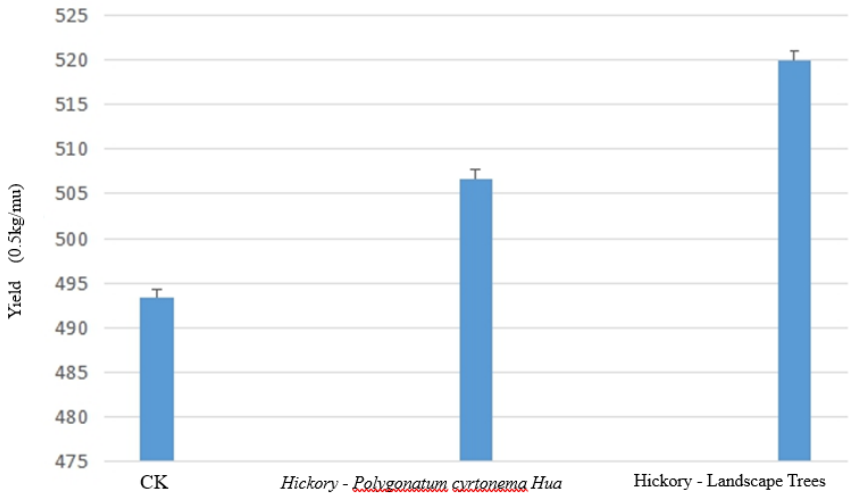
The models of different management of *Carya cathayensis* comprise the mixed forest of *Carya cathayensis* - landscape trees (*Phoebe chekiangensis*, *Neocinnamomum chekiangense*, *Cerasus serrulata*), the mixed forest of *Carya cathayensis* - *Polygonatum cyrtonema* intercropped as the undergrowth. As far as the carbon storage of the models of different management of *Carya cathayensis* is concerned, the carbon storage of the model of *Carya cathayensis* - landscape trees is greater than that of the model of *Carya cathayensis* - *Polygonatum cyrtonema*, and that of the latter is greater than that of the model of the check plot of *Carya cathayensis*. That shows the mixed forest of *Carya cathayensis* - deciduous trees, and the *Carya cathayensis* plantation with the undergrowth of *Polygonatum cyrtonema* have an ameliorating effect on soil.

Carya cathayensis plantation before and after the ecological management

Comparison between *Carya cathayensis* plantation and that with undergrowth of *Polygonatum cyrtonema*

The nut yield of hickory plantation with the undergrowth of *Polygonatum cyrtonema* Hua is 253 kg/*mu*, the nut yield of hickory mixed with landscape trees is 260 kg/*mu*, and the nut yield of hickory check plot is 246.5 kg/*mu*. This shows that the hickory plantation with the undergrowth of *Polygonatum cyrtonema* or mixed with deciduous tree species all could increase notably the nut yield, which plus the earnings from *Polygonatum cyrtonema* Hua and deciduous trees would greatly heighten the income of forest farmers. Taking the intercropped *Polygonatum cyrtonema* for example, the output value of *Polygonatum cyrtonema* Hua is 1,000 *yuan*/*mu*, and the hickory nut is calculated at 6 *yuan* per kg, the output value of hickory nut is 1,500 *yuan*/*mu*, thus the output value of hickory plantation with

intercropped *Polygonatum cyrtonema* Hua is 1.6 times of the previous. Hickory plantation mixed with landscape tree species plays mainly a role of beautifying environment to attract tourists, which will generate a hidden economic benefit by promoting the sale of hickory nut.



Analysis of Hickory Nut Yield of Different Models of Hickory Management

(3) Experiment Demonstration of Forest Restoration and Intensive Management by Specialized Cooperative

Torreya grandis plantation before and after intensive management

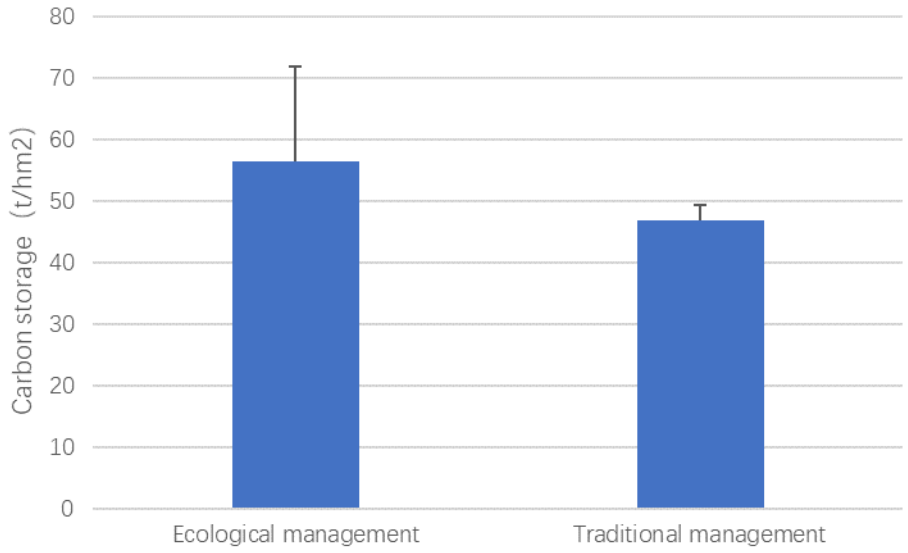
The management of Chinese torreya comprises two models i.e. the traditional management with herbicide application, and the ecological management with no herbicide application. The comparison shows that the model of ecological management has increased the carbon sequestration of soil. So the adoption of the

measure of ecological management could increase more carbon sequestration of soil than the traditional management does.

Regarding the economic benefit, the total yield of 30 *mu* Chinese torreya plantation, by the statistical data of Gaoyuan Village, has been increased year by year. It was 2,500 kg in 2018, 3,500 kg in 2019, and 5,000 kg in 2020. This indicates that the Chinese torreya plantation is still in the period of increasing production. Based on 18 *yuan*/kg, the yearly incomes were respectively 45,000 *yuan*, 63,000 *yuan* and 90,000 *yuan*, which is a steady increase of income.

Soil Carbon Storage of Different Models of *Torreya grandis* Plantation

Treatment	Soil Layer	Carbon Storage
Traditional Management	0-10cm	19.94±6.85
	10-20cm	17.01±0.57
	20-30cm	14.80±0.82
	Total	51.75±8.23
Ecological Management	0-10cm	24.63±9.01
	10-20cm	16.03±2.77
	20-30cm	15.68±4.06
	Total	**56.34±15.83**



Soil Carbon Storage of Different Models of *Torreya grandis* Plantation

4.1.2 Strengthening the Capacity of Stakeholders and Expanding the Project Impact

(1) Strengthening the Capacity of Stakeholders by Technical Training and Exchange Studies

Since the project launch, the project has run 6 training courses or meetings, enrolled about 600 trainees. The training courses have covered concept and techniques of forest restoration and sustainable management, methods of accounting forest carbon sink, control of pests and diseases, cultivation and management techniques for none timber forest products, of which 4 training courses have been conducted by PMO, and 2 training meetings by Lin'an District.

In addition, in July, 2018, the related project personnel were organized by PMO to participate the experience exchange seminar sponsored by APFNet in Chifeng, Inner Mongolia, where the project achievements and experience were shared with other projects. In October, 2020, the project personnel organized by PMO went to Wanzhangshan Forest Farm, Yunnan, and Experimental Center of Tropical Forestry, CAF in Guangxi, to conduct exchange study. While in the project process, technical specialists have been hired to give on-site guidance. All this has enabled the project team and local stakeholders to learn the advanced concept and techniques of forest restoration and sustainable management, tremendously enhancing the capacity of the stakeholders.

Training meetings (left: in Qingyang, 2018; right: in Lin'an, 2019)

(2) Expanding the Project Impact by Information Publicity, Exchange and Publication of Theses

In the process of project implementation, events such as the project signing, project launch as well as the progress of project implementation have been publicized via internet, TV, newspapers and etc.

The exchange and sharing experience on project management and techniques with other projects of APFNet have expanded the project impact.

300 copies of project publicity brochures, the publication of 7 theses on national-level scientific journals such as *Scientia Silvae Sinicae*, and *Journal of Zhejiang University of Agriculture and Forestry* have promoted the share of project achievements and expanded the project impact in a larger scope.

The project signing ceremony in Chizhou, 2016

Project launch ceremony, 2017

Project survey on base data, 2017 (Qingyang) and monitoring, 2020 (Lin'an)

Project publicity brochures

News coverage on the project and project signboard (Lin'an)

Project team exchanging with Experimental Center of Tropical Forestry, CAF in Guangxi, 2020

4.2 Project Impacts

(1) Social Influence of the Project

Based on the theory of landscape restoration, the project design incorporated people's needs into the project plans, which has embodied the concept of "people oriented". From a fresh perspective, the project has been tackling the problems facing the forest restoration and sustainable management on hilly and low mountainous area of Southern China. That has offered an idea to the local forest management departments on the forest policy and management in the future, and will benefit decision-making departments to take into account people's need for forest when they make any forest related policies or regulations. Policies that are made in this way are down to earth, of which the implementation will receive twice the result with half the effort.

The project training activities have brought the local areas a new concept and techniques of forest restoration and sustainable management, upgraded the technical level of local forest operators, ameliorated forest quality, and then raised the confidence and willingness of forest farmers for forest management.

The project implementation has improved the forest stand structure, biodiversity, and forest quality of the project areas, has brought real benefits to forest operators,

thus engendering a change in the way forest farmers in the periphery manage their forests, and displaying the demonstration effect of the project.

As some forest farmer says, "APFNet project has brought us a new concept and new techniques of forest management, which are quite down to earth!"

(2) Economic Influence of the Project

The project demonstration model has brought the local area economic benefits. Anhui is the origin of Chinese art paper, and *Pteroceltis tatarinowii* is one of the raw materials for the art paper production. The demonstration model, designed by the project, of forest restoration on rocky mountainous land has included the model of management aiming at improving the yield of *Pteroceltis tatarinowii*, and the *Pteroceltis tatarinowii* has raised the income of the operators. The winter bamboo shoot cultivation techniques that has been introduced from Lin'an to Qingyang, and *moso* bamboo plantation intercropped with the undergrowth of Polygonatum cyrtonema Hua has increased the income of *moso* bamboo operators.

The transformation of sprouted Chinese fir plantation in Lin'an into a mixed forest of coniferous and deciduous tree species has improved the forest stand structure on the one hand, and the complementary planting of deciduous trees in the Chinese fir plantation could still allow the operators to obtain benefit from the management of deciduous trees after the cutting of Chinese fir on the other, thus ensuring the sustainability of earnings of the operators. The ecological management of *Carya cathayensis* plantation an*d Torreya grandis* plantation in Lin'an has decreased the use of herbicide and prevented soil erosion and natural disasters caused by rainy season, so the economic loss has been reduced. Not only has it protected the environment, but it has also offered more job opportunities and stimulated the economic development.

(3) Environmental Influence of the Project

The project implementation has decreased the use of herbicide, improved the quality of forestland, enlarged forestland coverage, and reduced soil erosion, resulting in an effective protection of the environment.

The introduction of precious deciduous tree species into Chinese fir plantation or growing color leaf tree species along forest roads could not only improve the forest

stand structure, but also enhances the ornamental nature of the forest, and protect the ecological environment as well.

4.3 Project Sustainability

The project demonstration models are the critical technical issues in the forest restoration and sustainable management on hilly and low mountainous area of Southern China. The techniques designed by the project for forest restoration and sustainable management are people oriented, and lend local forest farmers job opportunities. So to speak, the project could protect the local ecological environment, and stimulate the local social and economic development. The demonstration models could yield good social, economic and ecological effects and promote the sustainable development of the local forest resources.

The project implementation has enjoyed an energetic support from Forestry Department of Anhui Province, Forestry Department of Zhejiang Province as well as local governments and departments concerned. In addition, APFNet has signed the Memorandum of Understanding on Forestry Cooperation with Chizhou City, Anhui Province, of which the two parties would conduct cooperation on the establishment of forest demonstration project, promotion of the summary of project achievements and technical models, ecological protection and the protection of biodiversity. Furthermore, CAF has, over the years, maintained scientific cooperation with Forestry Department of Anhui Province and Forestry Department of Zhejiang Province, which has laid a good foundation for the sustainability of the project.

To boom the project impact and establish a long-term demonstration base, the project will apply for the second phase project of forest restoration and sustainable management on the basis of the first phase. The second phase project shall chiefly maintain and monitor the demonstration models of the first phase, and establish a long-term demonstration base for forest restoration and sustainable management, and make further promotion and demonstration in the Asian-Pacific region on the basis of summarizing and refining the advanced achievements and mature experience.

5. CONCLUSION, LESSONS LEARNED AND RECOMMENDATIONS

5.1 Conclusions

In accordance with the project design plans and annual work plans, the project has accomplished all the activities and achieved the expected objectives.

5.1.1 Establishing Demonstration Models of Forest Restoration and Sustainable Management and Yielding a Good Demonstration Effect

(1) After the project launch, a total of 63 fixed sample plots has been set up, of which 27 are set up in Lin'an District, and 36 are set up in Qingyang County. Under the technical assistance of ZAFU and APFA, the forestry bureaus of Lin'an District and Qingyang County have completed the survey and analysis report of base data of the project areas, drawn up the Operation Scheme of Qingyang County, Anhui Province and the Implementation Program of Operation Schemes for the Demonstration Plots in Lin'an, Zhejiang, see Attachment D3.

(2) 7 typical demonstration models have been established, of which 4 are in Qingyang County, Anhui Province, and 3 are in Lin'an District, Zhajiang. The prospect of promotion of the project demonstration models is quite promising.

① Demonstration of degraded forest restoration on rocky mountainous land (50 ha.)

② Demonstration of cultivation of large diameter *Cunninghamia lanceolata* plantation (15 ha.)

③ Demonstration of intensive and sustainable management of bamboo plantation (25 ha.)

④ Demonstration of transformation of *Pinus massoniana* plantation infected with pests and diseases into deciduous tree plantation (10 ha.)

⑤ Demonstration of restoration and sustainable management of degraded *Cunninghamia lanceolata* plantation (30 ha.)

⑥ Demonstration of ecological management of *Carya cathayensis* plantation

(20 ha.)

⑦ Demonstration of forest restoration and intensive management by specialized cooperative (10 ha.)

(3) The Strategy for Forest Restoration in the Project Areas has been drawn up and is going to be published.

(4) Project monitoring has been carried out twice, of which the reports have been finished and passed the interim assessment sponsored by APFNet.

5.1.2 Changes of forest carbon storage and carbon sink of the project areas have been analyzed, and the demonstration models have improved the carbon sequestration ability of the forest stand in the project areas

According to the project base data and monitoring data, the project has analyzed the carbon storage and carbon sink of the different demonstration models, the findings of which indicate the established demonstration models can improve the carbon storage of the project area, and increase the carbon sequestration ability of the forest stand. At the same time, the Methods of Carbon Accounting for Forest Restoration Project has been formulated that is suitable to the hilly and low mountainous areas of Southern China.

5.1.3 Strengthening the Capacity and Information Share of Stakeholders and Booming the Project Impact Effect

(1) The training courses run by the project, exchange studies made to the sites of other projects, and specialists invited to give guidance on the project sites, all this has improved the capacity of the stakeholders.

① The project has held 4 times of PSC meetings; 6 training courses, and nearly 600 people have been trained.

② Exchange study has been made twice to Chifeng, Inner Mongolia; Exchange study has been made once to Wanzhangshan Forest Farm, Pu'er City, Yunnan, and to the Experimental Center of Tropical Forestry, CAF, Guangxi.

③ 30 man/time of specialists has been hired to give guidance on the project sites, which has solved the technical problems encountered in the process of project implementation.

(2) The project experience has been shared and the project impact has been expanded via internet, newspapers, TV, publicity brochures printed and the publication of theses.

① Project meetings (the project launch meeting, training course, PSC meeting) project important events, and project progress have been publicized and reported.

② The project has printed 300 copies of publicity brochures, published 7 theses, and trained 1 doctor (the information of doctoral thesis is attached).

5.2 Lessons Learned and Recommendations

5.2.1 Existing Problems

(1) In the process of project implementation, some activities have been influenced by natural conditions or policies, which have been caused to be postponed or implemented across the year.

The international exchange plan made by the project was not implemented that year. When the plan had been adjusted, the epidemic of Covid-19 occurred, leading to the adjustment of the trip to make exchange study in Yunnan and Guangxi instead of the international exchange study. That is a loss of chance to exchange and study forest techniques and experience with foreign colleagues.

The project monitoring activities has been implemented after a delay caused by the epidemic of Covid-19; In addition, some of the project seminars and specialists consulting meeting have been conducted via web conferencing, resulting in savings in some of the meeting expenses.

(2) In the process of project implementation, it has been found the forest farms of the project areas have lacked the operational long-term forest management plan.

5.2.2 Recommendations

(1) To avoid the influence of natural conditions and policies on the project implementation, it is suggested that PMO strengthen communication with the local implementation agencies so as to understand the local policies. So project activities could be adjusted timely in accordance with the policies. And as far as possible, an adjustment request should be submitted to the PSC meeting in the

current year, so as to reduce the influence of activity change or adjustment on the project. In line with the project management regulations, a request for the change of funds should be submitted timely based on any activity changes.

(2) APFNet is proposed to finance the second phase of the project, which will consolidate and consummate the establishment of demonstration models of the first phase, and monitoring activities and continuously strengthening the capacity building; It is suggested that related content be designed in the phase two of the project in response to the long-term sustainable forest management plan needed by the forest farms.

(3) Besides, the first phase of the project has complementarily planted some juvenile trees in *Cunninghamia lanceolata* plantation on rocky mountainous land in Qingyang and in *Cunninghamia lanceolata* plantation and *Torreya grandis* plantation in Lin'an, the forest stands and their long-term effect need to be monitored continuously. It is suggested the second phase of project be financed.

Annexes

A. Implementation status (scheduled versus actual)

B. Annex B (1) Details of project cost by Activity

Annex B (2) Details of project cost by Category

C. Project Audit Report （to be supplemented）

D. Project Outputs

D1 Annual Progress Reports

D2 Baseline Survey Report

D3 Operations Design Schemes

D4 Monitoring Report (changes of carbon storage and carbon sink of the project areas)

D5 Minutes of Meetings

D6 Introduction of Demonstration Models

D7 Exchange Report

D8 Articles Published

D9 Carbon Accounting Methodology for Forest Restoration

D10 Materials about Changes (change of experiment site in Lin'an and change of Activity 1.5)

E. Project News Report and Video

F. Project Agreement and Text