BY WORLD AGROFORESTRY CENTRE AND FOREST RESTORATION RESEARCH UNIT

SPONSORED BY THE DARWIN INITIATIVE, U.K. AND WORLD AGROFORESTRY CENTRE

Title   **"International Workshop on Forest Restoration"**

Date: 13 – 15 March 2007

Venue: Sightseeing Hotel, Tengchong, Yunnan

Media: English and Chinese

Sponsored by: World Agroforestry Centre and the Darwin Initiative

Organized by: Yunnan Forestry Technological College,
                             Tengchong Administrative Bureau of Gonligouchang Mountains
                             National Nature Reserve and World Agroforestry Centre

Joint Organization: The Forest Restoration Research Unit (FORRU-CMU)

Introduction

From June 16th to 25th 2005, a workshop entitled "Principles and Practice of Forest Restoration Workshop for Chinese Group" was hosted by FORRU-CMU in Chiang Mai, Thailand. The workshop involved 15 participants from various organizations involved in forest restoration in China. The workshop covered the principles and practices of the framework species method to accelerate biodiversity recovery in planted forests. In addition, a review of FORRU's protocols and results, particularly nursery techniques and logistical planning, was presented. Discussions were held regarding the project outputs, particularly i) organization of the workshop in China, ii) input into the Forest Restoration and Research Project Establishment Manual and iii) adaptation and translation of the Field Guide entitled "How to Plant a Forest". Following this workshop, an in-country workshop was held in Yunnan, China from 13th – 15th March 2007 to fulfill the aims of project outputs listed above. The Yunnan Forestry Technological College, Tengchong Administrative Bureau of Gonligouchang Mountains National Nature Reserve, Yunnan and the World Agroforestry Centre comprised the main organizing committee. Fifty six participants attended the workshop in China, including 3 FORRU-CMU staff.

The participants from China joined the "Principles and Practice of Forest Restoration" workshop in Chiang Mai, 16th-25th June 2005.

The participants of the "International Workshop on Forest Restoration" in Tengchong, Yunnan, 13th-15th March 2007.

Objectives:-

1. To formulate a plan (or plans) for forest restoration research units (FORRUs) in China.
2. To continue information exchange, started at the FORRU-CMU workshop; assess subsequent progress with forest restoration research in China.
3. To explore how to develop the forest restoration research already underway in Yunan and expand it to other areas.
4. Review progress with print project outputs:-
   - o Field guide – **"How to Plant a Forest"** – drafted in Chinese for comments.

- Manual for establishing FORRU(s) in China – **"Research for Restoring Tropical Forest Ecosystems"**

Major Content:

Issues addressed by workshop included:
1. Overview of forestry situation in China.
2. Forest rehabilitation in the past.
3. Role of FORRU in forest restoration
4. The need for FORRU(s) in China
5. FORRU project design in China

The main topics of the workshop include:

1. Inspection of native tree species for forest restoration
2. Native tree seed collection and treatment
3. Native tree seedling propagation experiments
4. Selection of framework tree species for forest restoration
5. Information distribution for improved forest restoration
6. Community-driven forest restoration strategy and combining it with other related activities
7. Teaching and promoting forest restoration concepts and methods.

Participants – a total of 56 participants from both government and non governmental organizations listed below;
1. World Agroforestry Centre
2. WWF, China
3. Forest Restoration Research Unit – Chiang Mai University
4. Yunnan Forestry Vocational College
5. Institute of Ecology and Geobotany, Yunnan University
6. National Forestry Ministry, China
7. Gonligouchang Nature Reserve
8. Baoshan Forestry Bureau
9. Kunming Institution of Botany
10. Jiangxi Agricultural University
11. China Academy of Sciences
12. The Himalayan Environmental Policy Project, National Science Foundation
13. Lujiang Prefecture Forest Bureau
14. National Endanger Species Protection Division
15. Xishuangbanna Wetland Restoration Project
16. Sichuan Forestry and Conservation Division
17. Yunnan Forestry Bureau
18. Tengchong Protection Station
19. ICRAF, Kadoorie Conservation Project
20. Yunnan Broadcasting Station, daily newspaper

Program

Schedule of International Workshop on Forest Restoration

The first day

08:30—09:30 Welcome speech

09:30—10:00 Introduction of workshop's schedule, aim and attendees

10:00—10:15 Tea break

10:15—12:00 Introduction to the forest restoration research project in Tengchong: phenology, seed collect, storage and nursery germination experiments. Experimental plots.

12:00—13:30 Lunch

13:30—16:30 Darwin Project – objectives and progress; strategies for forest restoration; review of activities and outputs from all other participating countries (Thailand, Laos, Cambodia, and Vietnam).

17:00   To Heshun ancient town, welcome dinner

The second day

08:30   From Tengchong County to Qushi Township, visit Tengchong project sites, staff introduction from Gonligouchang Reserve, and visit the reserve

12:00—13:00 Lunch (Qushi)

13:00   Leave from Qushi, to the reserve to see the forest restoration plots and phenology trail.

18:30   Dinner and back to Tengchong

The third day

08:30—10:00 Subject reports of forest restoration research development and policy

10:00—10:15 Tea break

10:15—12:00 Continue presentations

12:00—13:30 Lunch

13:30—17:30 Group discussion of current problems of Tengchong project, options for improvement, combining the strategy with forest restoration and plantation projects, etc.

18:00   Dinner

REPORT ON EVENTS

Tuesday 13rd March 2007
Welcome Remarks and Introduction

Mr. Mou Hang Shen, leader of Tengchong County Government, provided the welcome remarks. He welcomed all participants to The International Workshop on Forest restoration in Tengchong and Gongligouchang Nature Reserve. He then outlined the importance of Techong Country. Tengchong County is close to the Burma border and near India. It is on the route known as the "Silk Road". Tengchong is a new tourism hotspot because it is convenient for river transportation, has hot springs and is an ancient city with Jade industry. Mr Mou Hang Shen then talked about the country's natural assets. Tengchong has an important forest area with many rare animal species. He mentioned that the participating organizations are planning to develop an education center to increase community awareness of the environmental values of the Nature Reserve. Mr Mou Hang Shen wished this workshop success.

National Forestry Ministry Policy - Ms Shee Chen

Ms Shee Chen represented the National Forest Bureau on behalf of National Forest Ministry. She outlined the National Forest Bureau's desire to commence larger forest rehabilitation projects this year. For example, a project to restore mine areas will be started in September this year, with preliminary surveys having been completed. Ms Shee Chen expects that this workshop will help to provide useful theories and concepts for these rehabilitation projects.

Head of Yunnan Forestry College- Mr. Jong

Mr Jong commented that forest restoration is a big forestry topic in China. Many historic references indicate that China has a rich biodiversity and forest area, and that at least 10% of forest has been lost for timber and construction. Forested areas continue to be sought for development and to meet timber demands. Forest restoration projects demonstrate that forests lost to other land uses in China can be restored. The key factor for successfully restoring forest areas is the recognition of the competing demands, and to establish cooperation at all levels and in all sectors where forest restoration is to be undertaken.

Institute of Ecology and Geobotany, Yunnan University- Prof. Zhao-lu Wu

The Director Prof. Zhao-lu Wu outlined the new Forest Restoration Project for former mines. The rehabilitation of these areas is of great importance to local communities. As our ability to mine has increased by new technologies, the impact on the environment has increased. Whereas in the past, nature could recover after disturbance events, now with increased mining, nature cannot recover naturally. For rehabilitation protected areas in

Xishuangbanna, the different concepts of conserving nature and rehabilitating forest come together. We have to think about whole forest rehabilitation. The motivations for forest rehabilitation have changed over time. In the past, the focus has been on just timber: there are now multiple motivations, including a concern for maintaining biodiversity, for protecting wildlife, for NTFP and for the environment. For public forests these emerging concepts influence policy changes that must be adhered to and implemented by all levels of government. Intellectual copyright of achievements of science research needs to be shared, and science needs to be combined with indigenous knowledge.

Gonligouchang Nature Reserve, Baoshan Protection Bureau – Mr. Wang Tiancan

Mr Wang Tiancan extended a warm welcome to all participants. He expressed his hopes that the workshop would obtain wisdom and knowledge from all participants present to help to restore forests.

Goals of the workshop- Mr. Wu Xunfeng

Mr. Wu outlined the agenda for the 3 day workshop. Day one will introduce forest restoration concepts and practices. Day two will involve a site visit to trail plots in Qushi township and Tengchong Project sites. On the last day, proposals and projects will be discussed. In the last ten years, we have done a lot of work in forest rehabilitation but it has not been systematic. We will also discuss problems and challenges. The experts will meet together to combine teaching, defined strategies and function play into nature forestry programs. Concerns for maintaining biodiversity are closely related with those for nature protection.

Introduction of the research at the Tengchong Project Sites
Mr. Li Changlian– Gonligauchang Nature Reserve

Tengchong forest has been destroyed by logging. Replanting was then carried out with exotic species and the input of a single species into the area. The restoration is making slow progress. Gongligauchang Mountain is the biggest Nature Reserve in Yunnan. The population has minorities. Villagers depend on forest reserves and place pressure on conservation and biodiversity.

In 2005 we joined the FORRU workshop in Chiang Mai. After the workshop, the Framework Species concept was applied and each year, the seeds of selected species have been collected, and more than 30 species planted. A research laboratory and herbarium were setup, and specimens were collected. A 100 m^2 nursery was built to implement nursery techniques. A phenology trail was set up, and trees were labeled for monitoring. We had limited knowledge, and so relied on the support of experts we visited in ICRAF, China for education and training programs. Many of the species collected were new and had not been trialed before, so we have been trying to increase the information about them by collecting a lot and undertaking many experiments.

Phenology observation of the mother trees: Mr. Huang Xiangyuan

Mr Huang Xiangyuan discussed the study of important forest species for biodiversity conservation. We still need to inventory all Gonligouchang tree species, record their local names and develop long term phenology studies. The study started in September 2005 at Tengchong station. In the first year, the project established a phenology trail of 91 mother trees of 30 species at Ling Chiou Pou (a 15 yr old plot) with tree labeling and a base inventory to identify trees. We also trained other foresters to do similar surveys. The vegetation type is Evergreen Broad-leaved Forest. We also used GPS readings to record the location of each tree of 30 species. The route of phenology trails made cover 5 Mu (1Mu = 667m^2).

Constraints:
- Needs long-term work
- Lack of staff
- One year is too short to encompass the whole life cycle of some plants.
- The mother trees are scattered and may not be the best representative trees

Discussion:

Q: How did you pick the phenology route?
A: We considered the candidate species, location, and elevation.

Q: Are all trees protected species?
A: Some trees are dominant species or economic species and some are rare and protected species.

Q: How did you decide on mother trees and species?
A: We chose the ones which can provide fruits and are healthy. We need pioneer species and those that attract animals quickly by growing fast and flowering early. We need to talk to local villagers also to gather more indigenous information.

Q: How often is the phenology survey undertaken?

A: Every 15 days.

Q: How many routes and phenology trails are there next to the station?
A: There are 6 station routes near the station.

Q: How do you collect quantitative phenology data? Did you develop a new scoring system or use the FORRU one?
A: We used FORRU's system we learnt from the CMU workshop.

Q: Did you do any remote monitoring?
A: We had limited budget and staff, so we tried to do our best and in the proper way. We welcome any recommendations.

Q; How can you study the forest type?
A: Yunnan University have supported the ecological and environment study.

Gonligouchang's Herbarium Ms. Wang Tiancan

Ms Wang Tiancan reported that a small herbarium had been set up to store tree specimens collected from Gonligouchang Mountain. There are currently 167 specimens from 59 Families; 102 Genera; and 145 species. These are indigenous species and some are rare. The collection started in September 2005 with identification supported by a botanist from the China Academy of Science.

Constraints:
-   Herbarium needs more air ventilation; we only have standard cabinets
-   We need better storage for specimens
-   We need more experts to assist, especially botanists

Discussion

Q: Do you consider the 'proper plant-press' that may need to be used?
A: We tried to start it in a simple way. We need vouchers for identification and collection. If you want us to do vouchers for identification, we need better vouchers. We need to explore simple ways to identify the trees in a short time, because the restoration work needs to start now. We can't identify some seeds that were collected, and sometimes we forgot the vouchers.

Dr Stephen Elliot from FORRU-CMU (Thailand) commented that the research being done is very impressive and good quality. He asked if specimens were collected from mother trees alone, or from seedlings as well? If no, seedling specimens should be collected for identification, because there is no identification book for seedlings. He suggested that fleshy fruits should be preserved in alcohol.

Q: You need participation from local people as well for this work, not only researchers. How do you involve local people?
A: We have only been going for one year, and the restoration process needs the knowledge first before it is applied, and communicated to people. We can provide available techniques to the public, but we need to have knowledge before we can disseminate. At this stage the public could join tree planting events.

Seed collection and Seed treatments: Ms. Ye Jianfang, Tengchong Station.

Ms. Ye has basic experience in seed handling techniques. The area where she works has a poor economy, and the dense population causes a decrease in forest area. By using the Participatory Rural Approach (PRA) method to survey the thinking of the villagers, she found that villagers are interested in forest restoration. They had regulations for community forest but can only plant monocultures. The villagers buy seedlings themselves for planting. They still lack knowledge on trees. We can take advantage of the rich variety of trees species present and collect the seeds without harming the trees. We can try to attract wildlife as well to provide more tree species. We will start with local species then we will share the technique with other people.

To provide seedlings for more than 30 species, we undertook seed pretreatment, seed sowing, seed storing; fungicide application, dry storing, storing with sand and also soaking. We tried to do experiments to explore different mediums; 35 species for each medium with 3-4 replicates. We tried different storage methods. We treated soil and seed with fungicides before sowing. We watered seedlings by hand. The media preparation used 4 kinds of media and we recorded them every 2 days with 4 replicates. We then used ANOVA to analyze the data. Germination curves were produced and photos were taken for recording data. A total of 25 species were successfully germinated. *Cerasus cerasoides* (D. Don) Sekf. was the most successful. These species were subsequently used for a planting experiment in October 2006. The next step will involve collecting seeds from the forest for dormancy testing. We will start from the county level and move up to prefecture and national level. This project is a very important part of Tengchong forestry.

Constraints
-   Question of how to collect data in more appropriate methods for scientific research
-   The need to apply proper treatments
-   The lack of light measurement and soil analysis equipment
-   Seedling techniques need improvement.

Discussion

Q: Did you try seed beds and bare rooting? How about the best media that you have: do we need to do more studies to find something else?
A: We have undertaken new experiments, but we are concerned about the quality of seedlings and the proper species for planting.

Comment: The tray is easier to collect data and do research with. It's not only nursery work but also research. You are not only growing seedlings, you are also growing knowledge.

A: They were trained in Kunming about nursery techniques with LEARNING BY DOING. There is a long history in planting, but we have not yet succeeded and we still lack techniques. So we consider more about the function of the Nature Reserve to save biodiversity. We need to use this Gongligouchang treasure as a learning source as well. It is still not yet assigned a national level of protection. We have the facilities, but we have not integrated all of the knowledge we have.

Q: Most of this species are pioneer species: how about climax species?
A: We need to carry out much more research, such as sun and shade germination experiments. We also need to find more research sites and involve more participation from local people to gather indigenous knowledge. We also lack of funding and need more skills in tree and seedling identification

Dr Stephen Elliot from FORRU-CMU commented that FORRU is very appreciative of the quality of the work being carried out. He mentioned that The Darwin Initiative supported only technology transfer by workshops and publications etc. and that it was interesting to see that other organzations (ICRAF, KIB etc.) had been attracted to provide input into the work going on in Tengchong . We should identify future needs to develop this work further and draft the proposal for submitting to donors in February 2008. It is hoped that Darwin representative(s) will come for that workshop too. We hope for more support from them in the future.

Participation and extension – Curriculum development in Yunnan Forest Vocational College. – Mr.Wu Xunfeng

Mr Wu Xunfeng reported that there is just 16.5% of forest cover, 10 % of which is natural forest comprising of several climate belts both wet and dry. China is the 3rd richest country in biodiversity in the world, and has the most planted forest cover in the world. However, degradation is a serious problem. The Chinese concept is to solve the problem of lost forest by planting. From the 1950's, monocultures were planted of the most fast growing species, but environment regeneration did not increase much, according to a review of the history of plantation and timber production.

The major studies have, until recently, focused on agriculture and business. Now, we must consider environmental regeneration and biodiversity issues more, so a review was undertaken, and education about forest awareness commenced. A curriculum for college students to learn about these issues was established. The ICRAF program commenced in 2004 and a nursery was started in Sept 2004. The goals of the program are to combine the Chinese curriculum and create forest rehabilitation activities, to publish other materials or guidelines about indigenous species, and also to communicate the importance of forests and how much we rely on diverse, functioning, natural forests.

The Chinese version of the Field Guide **"How To Plant A Forest"** will be used as the standard text book in classes. We are keeping the original format and have tried to adapt it to Chinese conditions, especially the last sections. We also have included a lot of revision and reviews from experts. The project should run for the long term and sustainability for 10-15 years to see effects. We also want to develop how to set up FORRU as a model unit and apply it somewhere else.

Discussion

Q: Which group of students is involved and what are their ages?
A: The students are from the Forestry Department. The manual should not only be studied in class: we need more training available for interested people, and include information on forests for provision of habitat for animals, ecotourism procedures, and develop additional courses for forestry study.

Q: How about the concept of restoration and reconstruction?
A: This is a difficult concept; restoration is concerned primarily with function, whereas reconstruction is more concerned about the core or forest body. However, we have not much time for deep theory study, as vocational school concentrates on the operation and the "how to do's". We started with local species and tried to highlight native species over exotic species. We are also trying to get those involved in the timber industry to consider native species. The concepts overlap. Sometimes we need to consider one concept only: we thought that we needed more forest, so we need to plant more trees.

Forest Restoration Concept: Dr. Stephen Elliott, FORRU-CMU

Dr. Elliott presented the concepts and theories of forest restoration. The Framework Species (FWSP) method was explained in detail. This presentation sparked great interest and debate amongst participants. Fruitful discussions came from the participants throughout the workshop.

Discussion

Q: I am quite interesting about the FWSP technique. What's the spacing of the FWSP in the plot?
A: Spacing is about 1.8 meters. If it's too far apart, more money is required for weeding. If it's too close, money is wasted in terms of seedling production and planting.

Q: Do the FWSP have any economic value?
A: "There is no such thing as a NON-economic tree". Some species have tangible value, some have less tangible values. We choose local species and work with local wisdom. Species selection can be adapted to each location and socio-economic needs. You can mix in economic species with higher "monetary" values for more income generation for villagers if necessary.

Q: Do the FWSP include keystone species in local community?
A: Yes, many of them, for example fig trees are flagship/key species in Thailand forest. If you want to try this technique, start with figs species if they are suited to the site and are indigenous species there.

Q: I consider weeds to be one part of biodiversity. How do you differentiate the area for restoration or just protection?
A: Weeds are common plants, they can grow everywhere and they will not go extinct. Most weeds are exotic and come from other countries, and stop forest regeneration. At the landscape level we have a mosaic pattern of different patches of forest and open areas: these provide for more biodiversity than only weeds.

Q: The Chinese version of the FORRU book will be very useful for our work. Will any other information about how to plant a forest in China be published in a book or document?
A: The material in the Field Guide is for anybody who wants to learn how to plant the forest. It can be both a manual and a research book for anyone who wants to plant the trees tomorrow. The second book (Research for Restoring Forest Ecosystems) is about how to set up a FORRU. We need a "third" book which presents your own results from your own China FORRU(s). So, on Thursday we will write proposals together to set up FORRU(s) for China to generate original local information to adapt the FWSP method to China.

FORRU setup in Lao, Cambodia, and China: Ms. Sudarat Sangkam.

Ms. Sudarat presented a summary of all the Darwin workshops that were held in Chiang Mai in the first year of the project, and also the in country workshops in Laos and Cambodia held in the second year of the project. The presentation reported outputs and progress and also explained the future work that needs to be done in coming year.

The Welcome Dinner at Heshun Ancient Town

The welcome dinner was arranged with excellent hospitality. The participants continued discussions their workshop discussions, and it proved to be very fruitful in terms of collaboration and the sharing of experiences.

Fieldtrip to Gonligouchang Nature Reserve, Qushi County on Wednesday 14th March 2007

Brief about Tengchong Station - Mr. Yang Weichuan: Station leader

Mr. Yang Weichuan provided details about the station. The elevation of Tengchong is 1,450 m above sea level, with the dry season being between November – April and temperature ranges from -3 – +32 °C. Tengchong has high biodiversity with hot springs, and ecotourism is being developed. The station has a fire prevention program, with a vegetation rehabilitation program started in 2005 with ICRAF, China. Most staff are local villagers and forestry staff. The forest plantation in Japu covers an area of 31 Mu and is sponsored by the China Academy of Science. The 1st phase plot has 21 species and is being monitored each month. Works are supported by the Forest Conservation Community Development Project (FCCDP).

Nursery Station: Ms. Ye Jianfang

Ms. Ye Jianfang described techniques used at the nursery. The nursery is situated in a local community in Qushi Country, and studies vegetation propagation techniques. The nursery is quite big, with a greenhouse used for germination trays . Beds were laid on top with woven bamboo strips. The data collection was done carefully following the FORRU-CMU format and is being analyzed statisically. Sticks were used to count seedlings that germinated. The research on germination started in August 2005, with trials in different media. Dr. Elliott recommended procedures to improve recording and analyzing germination/dormancy data and explained about median dormancy length to Ms Ye. He also suggested cleaning more weeds and reducing water application because some moss and ferns wereappearing.

The seedling area is concreted and laid with sand 2 inches deep to allow roots to grow but not to penetrate the soil. Seedlings grow in white plastic bag with holes. The major local species were *Machilus yunnanensis, Cerasus cserasoides* (pink flower) and *C. serrulata* (white) that are believed to be good framework species. *Betula alnoides* is another candidate framework species. Seed collection was done with forestry guards and local people. Seed pretreatments applied included acid, water, and scarification. Data analysis was done with simple ANOVA. Staff were trained in taxonomy and identification by Kunming Institute of Botany. More

species are desired for planting out and forest restoration. The restoration site is not far from nursery and the seed collection can be done nearby.

Seed storage room and Herbarium: Ms. Zhao Yingzai

Seed Storage Room

Ms. Zhao explained that they tried to separate recalcitrant and orthodox seeds. Seeds were stored in dry cloth bags, dug in soil, and put in a sealed jar. They also undertook some scientific experiments with normal and electronic scales available. Voucher specimens were stored in a freezer and a cabinet. Germination tests involved several treatments, including soaking, water temperature and cold storage.

Herbarium

The herbarium is full of cabinets with specimens, and lime is used to keep it dry. A voucher specimen of *Rhododendron delvasi*, a rare endemic species is pictured here. They still need more liquid collection of some fruits and flowers.

Rhododendron delvasi – *endemic species in Gongligouchang Mountain.*

Gongigouchang Nature Reserve – Mr. Wang Tiancan

Mr. Wang Tiancan provided details of the reserve. The research site is about 500 ha. They applied phenology trails with 1 – 2 hours walk, 5 km along the mountain ridge. The

major species is *Rhododendron* spp. They found traces of animals e.g. sun bears. The display board (above) at the trail entrance maps the route of the phenology trail and most trees are labeled along the trail.

Reports of Forest restoration Research Development and Policy on Thursday 15th March 2007

Issue of forest restoration in the Xishuangbanna Biodiversity Conservation and Corridor project – Prof. Zhao-lu Wu

Prof. Zhao-lu Wu discussed this project, undertaken in an area next to Lanxang River (Mekong River). The area was a rubber plantation having suffered a lot of forest destruction. Five nature reserves have been set up to protect remnants in the area. However, the nature reserves are scattered and poorly connected. This project, funded by ADB, aims to enhance the connectivity of these nature reserves to bring wildlife back. The project aimed to build vegetation corridors to provide better linkages, and to conserve the good patch of forest that joined three countries – Burma, China and Vietnam. The golden triangle could then be changed to the green triangle. The project aimed to combine forest restoration with other land management activities and the restoration of ecosystems. The project also aimed to assist poverty reduction with capacity building. After the 2nd year, the corridor concept was disseminated to the local community and can be spread further for more participation in all levels. The GIS technique was used to find the patches that need to be restored, and this guided the villagers undertaking the planting.

Discussion

Q: Species selection is very good, but there could be a problem if the species the villagers want to plant are different. They are usually concerned more about economic species. How do you recommend that this problem be solved?
A: The trees are planted by the villagers: we choose the species. Project designs on their land must be settled by mutual agreement. If it is the villager's decision only, they may want their village to look more like a botanical garden. We also have money from National Forest Center to plant trees. We find the benefits for local communities to be involved to be useful to them. They get money from the project and they can use the forest later. However, the project cannot guarantee 100% co-operation from local communities. The National Forest Center once rejected an NGO project that focused on poverty, and as a consequence the villagers cut trees for tea plantations. Some species do have more economic benefit. Forest land is in the villager's hand; if they don't want to do it, a project will fail. I was in an NGO before and know how to work with them and come to mutual agreements. The policy level is different though: I can't cover that and it's out of my hands.

Q: Is there a corridor linking 2 nature reserves? Does it have a core area in the corridor? Was the land part of the village farm land?
A: Yes, the corridor was designed by us. It is considered big by wildlife standards. Mostly the corridor was pre-nature reserve and it's the trail for wildlife. Some are random routes but some were set up if we found traces of animals.

Q: How do you handle the human-animal conflict?
A: If the villagers kill animals, they will go to jail. But if the animal kills people, they get only 10,000 RMB compensation. So no one would like to be in the area and face that problem.

Baoshan Forestry Bureau - Zho Ji mei

Zho Ji Mei provided information from Baoshan. This area has 46.9% forest cover. Timber extraction is the main cause of forest destruction. In 1958 Baoshan had only a low level of forest cover left. Forest plantations started in 1980 and brought back forest cover to 30%. The strategies for forest conservation policy must be run in parallel with the recovery of economy, living standards, and environmental concerns. More tree planting was needed in that area to restore the forest, and parts of the area were "closed" for protection. In 1999 there was limited species selection, due to: the market; low technical information; and a lack of knowledge. Most species were conifers, whereas later plantings involved more broad-leaved trees. In addition, more silviculture techniques (such as fertilizer application), control of the consumption of timber, the limiting of logging and the use of wood saving stoves and alternate solar energy technologies were applied. Forest restoration needed forest classification for zoning management and enforcement with controlled logging, and strong policies for the long-term. Furthermore, they need to stimulate villagers to understand and follow the regulations. Sometimes plantings are in bare areas, but the areas belong to villagers. It can be hard to persuade them to plant trees, because it has no economic benefit. If villagers plant trees, some people may think that they harm development and go backwards. We need to support villagers in planting seedlings, and techniques to encourage them in this should be developed. The land is poor, so we have to choose very good species that can endure the harsh environment and perform better, to demonstrate to the villager how worth while the activity really is. The sustainable development of natural forests can occur alongside plantations of tea, walnut, and bamboo. In the long-term, work needs to apply to all levels of government and local communities.

Discussion
Q: What is the impact of the market?
A: There are so many walnuts in the market. We need to link ecological and economic benefits. Logging is limited and the government insists on that policy, so walnuts amongst rice fields may be a good alternative. Walnut, tobacco and tea have been tried in the field, and villagers want to plant these.

Dr Stephen Elliot from FORRU-CMU commented that economic tree species can be broad-leaves. *Spondias axxilaris* is a top FWSP performer. Why it is not considered as an economic species?
A: *Spondias* provides good timber and edible fruits both raw and dry.

WWF - Panda Corridor Project – Ms. Shao Wen

Ms. Shao Wen discussed the Panda Corridor Project. The area is a scenic area with 2 panda populations. The project aims to establish corridors among panda habitat sites with community involvement. Some human disturbances involve infrastructure. A challenge needing to be researched is a baseline inventory of bamboo shoot collection for eating and selling. The picking of bamboo shoots and firewood collection can disturb pandas, not only reducing their food sources but also causing broader habitat loss, especially in winter. We need good management of forest resources, and capacity building. A tunnel was constructed to prevent disturbance of Pandas. A workshop was run as well as monitoring of biodiversity, focused on enlarging the nature reserve. A demonstration plot (150 Mu) has been established to restore panda habitat.

Discussion
Q: What is the altitude? How long does it take for bamboo to grow for pandas?
A: The Pandas range is about 1000 – 3000 m asl. Only one species is available for growing now.

The Evergreen Broad-leaved Tree Plantation – Jiangxi Province –
Prof. Yangqiu Liu

The project area was under Red Army revolution and has red degraded soil with an area of 2 million Mu. The land here has serious soil erosion issues and is difficult to regenerate. In 1991 they started management for each location: 16 million ha for pastures, bushes, and bare land. The project started in 1994 with a 2000 Mu trial site with 20 species planted randomly. They chose total desert as a pilot area and in 1995 some trees had survived. Some bushes regenerated after 3 years and showed very good recovery after 5-6 years. Another plot had medicinal plants as pioneer species and these were shown to change the environment for better regeneration. Monoculture tree planting was not successful; now more than 10 species survived and showed improvements in soil condition and a change to forest in 10 years. This shows that we need the right species with the right management. In local communities where they need to consider economic and livelihood issues, medicinal herbs are a very good agro forestry technique and they can generate benefits in a short time for improved livelihoods e.g. better nutrition and medicine. Forest restoration with faster growing, high value species mixed with pine and broad-leaved species and with some FWSP (framework species) added, can recover faster than totally man made forest.

Discussion

Q: Dr Elliott – "It looks like you could plant a forest on Mars with your technique! I want to ask you about the natural regeneration you mentioned coming up under the plantations you have established. Where are seeds coming from, by wind or animals?"

A: The natural regeneration was from the old seed bank and from nearby forest areas. I think it's also from animal dispersal but we have no inventory yet.

Q: It seems your systems rely heavily on conifers, which are not particularly good for soil improvement, and yet the main problem in your area is soil degradation. Are you considering including more legumes to improve soil conditions?

A: Some areas have been planted with legumes to improve soil condition. We want to recover the area as rapidly as possible, so now we are considering putting in more species and thinning out older plantations and inter-planting FWSP for greater biodiversity. We did this in degraded virgin forest to add more FWSP.

Q: Horst - I really appreciate this work and I would like to go there. How are you able to do this on such a large scale and how about the funding and support?

A: The work is supported by the provincial bureau, and the university supports the techniques. The planting was done by the forestry bureau and the land rights belong to them. We have the right to plant trees and make test plots. When we get more support from other places we can provide more guidance and techniques.

FINAL SESSION

1. Responses to the workshop

The final discussion session was divided into 3 parts i) feedback about current work and responses to the concepts and techniques which had been presented ii) how to take the work forwards in China and iii) drafting of area-specific ideas for future projects (or extending existing work). Participants were asked to record their comments for i) and ii) on individual cards, which were then reviewed by Mr. He Jun. After that, the participants broke up into 6 smaller groups to work on area-specific project ideas.

Dr. Horst summarized the aims of the workshop to all participants and advised them what we need to benefit from the participants' expertise, and asked for some feedback. Opinions about future needs and extension of existing project or new proposals were discussed. He reminded everyone that the draft Chinese version of the Field Guide is already on CD, and had been distributed to everyone, and that feedback was needed from all participants.

<u>**1.1 Comment cards – feed back on workshop concepts**</u>

- Add to the Framework Species list and match them to "degradation stage" (from 1st day lecture).
- We need a clear international definition of "Forest Restoration". We need a stronger theoretical basis for the work which can be gained from larger trials
- The methods are right, but too specific and difficult to adapt to all degraded lands.
- Forest restoration complements the policy of "Mountain Closure"
- Need training and guidance from experts. We lack experience, and still need more professional guidance
- Participants from Nuchang and Jiangxi wanted the approach extended to their Provinces.
- Analysis of soil in planting plots and we need soil analysis equipment (from Tengchong group)
- We need to adapt the technique and find suitable Framework Species for DRY areas
- Vegetation restoration in Mines is another key issue
- Criteria and evaluation and maintaining system for succession
- We need clearly defined criteria about selection of seed trees and good seed and the timing of seed collection.
- How to combine forest restoration with ecotourism.
- Associations among tree species need to be known
- Regular monitoring of biodiversity

- Tengchong plots are very good. Results from the Tengchong project must be widely disseminated.
- Phenology under different conditions
- Methods suitable for villagers to grow seedlings
- Should include rare or indigenous species.
- Feasibility economic and framework species improvement How to enable villagers to choose their own Framework Species. Should use indigenous knowledge as well.
- More plots to cover wider range of areas

1.2 – Summary of discussion of comment cards:-

1. (Dr Elliott) When we began, FORRU-CMU started with evergreen forest higher than 1000 m because that forest has high biodiversity. Now, FORRU is trying to develop the techniques for lowland condition, and also in rainforest in the South of Thailand. All of these areas have different forest types and vegetation. You can try to do research in different forest types and vegetation cover. And network. We brought people from Yunnan and Sichuan to train in Chiang Mai. But now, you have the facilities here in Tengchong to train the people who want to learn about nursery techniques.
2. All comments and responses are very useful and we can work on them further and make it more practical.
3. Basically most of the work has been done in Southwest China, so we still have to adapt to each location such as Xishuangbanna or other parts of China.
4. The framework species approach is only one way to improve the condition of forest restoration. This workshop is the forum to get information and exchange knowledge. The results will be taken back to Beijing and can be moved up to a higher level and implemented in policy.
5. This involves all levels from local community to prefecture level to national level.
6. Need to replicate FORRU approaches in different areas and condition.
7. Need for more training and more inputs.

2. Future needs and how to move forward.

In this discussion session, participants divided themselves into 2 groups i) those already involved in existing work underway in Tengchong and ii) those who would like to establish new projects in other areas. The second group also began to divide itself into groups for each specific area (Province). Hence the dynamics of the meeting began to move naturally towards the development of area-specific project ideas.

General comments:

1. Set up an interactive mechanism: students in schools – research institution – study site.
2. Get more extensive cooperation internationally and domestically
3. Enhance training unit building (input basic equipments)
4. Enhance capacity building for project institution, improve staff's expertise and office environment especially concerning animal and plant identification to improve project staff's capacity
5. Collaborate with communities on forest restoration.
6. Carry on research on nutritional requirements of different tree species and nutrition of forest restoration sites.
7. Extend forest restoration into areas surrounding nature reserves
8. Should we take "forest landscape restoration" into account?
9. Seedling breeding technology and data processing.
10. Workshops should be held for specific technical issues of forest restoration.
11. There should be a more clear definition for "forest restoration".
12. Local farmers' involvement is very important to forest restoration; we hope to have trainings on how to carry on community participation and forest restoration.
13. Can we collaborate with farmers by combining the forest restoration project with the national projects (like Natural Forest Protection Program and Sloping Land Conversion Program)?
14. Can we combine forest restoration project with environmental education and science popularization activities?

Comments related to work already underway (Yunnan Group)

1. Add the forest restoration concept to public awareness education and extend the technology.
2. Enlarge the nursery and add more equipment to provide enough seedlings for forest restoration (on a large scale). Add equipment and instruments for seed processing, breeding and specimen making.
3. We hope to establish a forest restoration study center in community schools, this is good for technology, research and extension.
4. Add indicators for experimental site monitoring, including dynamic monitoring for vegetation and soil.
5. Forest restoration research should continue.
6. We lack taxonomic training and this is an obstacle to tree species extension.
7. Enhance the project training and raise farmers' awareness of the project.
8. Establish and finance a Yunnan Forest Restoration Study Center in Yunnan Forestry Vocational College.
9. We lack instruments and equipments for light measurement, soil analysis and relevant text books.
10. Hold training on awareness education in buffer zones of the nature reserve to enhance the concept of forest restoration and raise awareness of farmers and students.
11. Add more equipment and tools to enhance monitoring and material collection (high-resolution camera, slide projector, etc.)
12. Keep collecting specimens and record data, which will be used for printing an indigenous tree species manual after three years (with illustrations and text).

Yunnan Forest College Group

1. Establish a Forest Restoration Study Center at a national level.
2. Yunnan has the highest biodiversity, abundant vegetation types and large areas of degraded forest land; it is a good place for vegetation restoration studies. We suggest Yunnan as an ideal place for the center establishment.
3. Select as many experimental sites as possible, including good and bad ones to cover different types of degraded forest land.
4. Set up an animal specimen room and herbarium for regional forest restoration at the Yunnan Forestry Vocational College.
5. Support equipment improvement for Department of Biodiversity Conservation and Utilization, Yunnan Forestry Vocational College.

Other Participants – comment cards:

1. There should be a journal for forest restoration in which to publish papers, share experience and new technologies.
2. Research is needed on the effects of insect diversity change on forest restoration monitoring.
3. Monitoring and experiment equipment, training for staff and information network establishment of FORRU. Hold training (set up a training unit)
4. Integrate the FWSP method into theories and policy of forest restoration on SLCP (Sloping Land Conversion Program) land (technology, cost and benefit).
5. Similar research should be carried in other areas besides nature reserves.

Guangyuan, Sichuan Province Group (Panda conservation):

1. Capacity building (set up institution, training for staff and demand for basic equipments).
2. Baseline survey: socio-economic survey and animal and plant resource.
3. Need more work on plantation design.
4. Forest restoration trials: seed collection, breeding, planting and nursing.
5. Alternative livelihood and alternative energy for communities around trail sites.
6. Monitoring should cover both biodiversity and socio-economic impacts.

Jiangxi – **Prof. Yangqiu Liu**

There are many nature reserves in Jiangxi Province; however, many of them are degraded to different degrees. Forest restoration has great significance for these nature reserves, like Lushan Nature Reserve, Jinggangshan Nature Reserve and Poyang Lake Nature Reserve. Forest restoration in these areas needs financial support and staff training from NGOs.

Salween River Area east of Gaoligong Mountain.

It is also necessary to carry on such work in this area, but we lack the knowledge of plant taxa and all kinds of equipments, the local residents' awareness is weak. We need to do more training.

Discussion

Q: What kind of procedures and costs are needed to set up FORRU?

A: (Dr Elliott) we mentioned in the 1st day of the workshop that there are two published outputs from this project. The Field Guide "How to Plant a Forest" is on your CD and, as Horst has already mentioned, we need your comments back on that. The second text book being produced from this project – a Manual – is all about how to set up a FORRU. It is now being drafted in English and as I mentioned on Day 1 it should be distributed to all participating countries for translation into their own languages by July 2007. All language versions should be ready for presentation at the final workshop in January or February next year [2008]. This book we are calling "Research for the Restoration of Tropical Forest Ecosystems" includes how to set up a FORRU and also discusses costs. This will be a technical manual and also cover administration.

Group Discussion on Developing Area-Specific Project Ideas

**Forest restoration facilitates / forestry development
(Baoshan Forestry Bureau and Forestry Bureaus of the Counties)**

Aims
1. Capacity building:

  (1) Equipment required: tree monitoring, locating and meteorological monitoring. Camera, telescope, laptop and projector.
  (2) Capacity building for staff - support training and study for more technicians (200 people/year).

2. Requirements for sustainable forestry development project:-
    (1) Integration of forestry project and forest restoration project
    (2) Establish forest soil analysis lab
    (3) Extend the achievement of forest restoration project
    (4) Summarize and extend the indigenous forestry technology
    (5) Breeding of selected economic trees
    (6) Farm establishment for indigenous timber tree species of high quality
    (7) Research on NTFP's for efficient planting technology
    (8) Research on community forest protection and development strategies

Forest Restoration Project in Tengchong
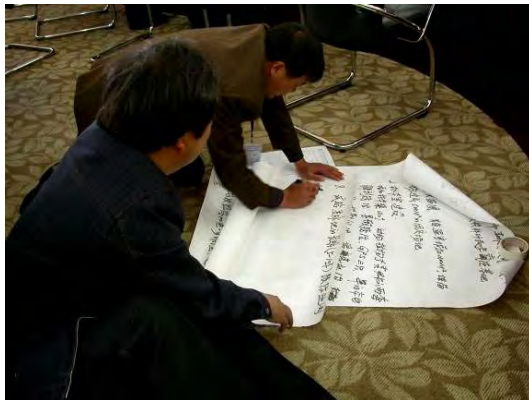
Objectives: To expand and establish new experimental sites in Tengchong for forest restoration and providing a scientific demonstration for forest restoration work.

Activities:
  1. Enlarge the existing nursery by 200 m^2; establish a 500 m^2 seedling planting field.
  2. Improve the herbarium: buy 20 specimen cabinets, two sets of animal and plant taxa books, 1 dissecting microscope, 1 microscope, 3 GPS, 2 laptops, 1 projector, 1 photoelectric analytical balance and 4 cameras.
  3. Community survey and training: training on forest restoration
  4. Capacity building for project staff (4 international staff and 10 domestic staff)
  5. Enlarge community forest restoration of forest restoration (50 ha).
  6. Print relevant books and materials
  7. Further survey for original plant community and degraded areas
  8. Long-term (5-10 years) monitoring for experimental forest restoration area.
  9. Meteorological information collection for experimental sites.

Yunnan Forest Restoration Study Center and Teaching
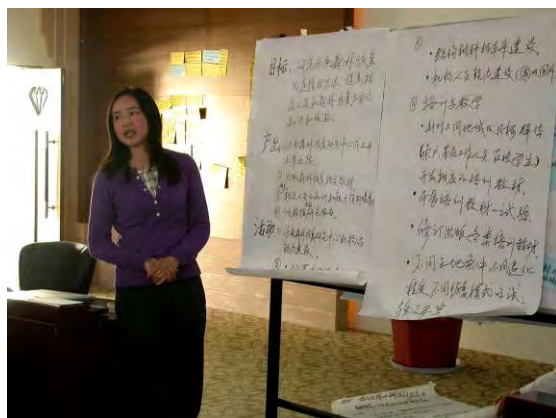
Objective: To study forest restoration in Yunnan, improve staff knowledge and improve techniques on forest restoration.

Outputs:
1. Establish Yunnan forest restoration study centre.
2. Publish forest restoration books.
3. Improve staff knowledge and capacity
4. Experimental research reports

Activities:

1. Establish Yunnan Forest Restoration Study Centre and capacity building
   - buy office equipment
   - establish framework tree species herbarium
   - capacity building for staff (international and domestic)

2. Training and teaching
   - develop training materials for different regions and groups (farmers, staff and students)
   - trials for training materials
   - edit and publish training materials
   - conduct experiments for different land and different restoration models.

Forest Restoration and Monitoring in Central Subtropical Area in Jiangxi Province

Objectives: conduct research on central subtropical forest restoration and ecological processes and functioning in degraded red soil areas of Jiangxi Province.

Content:

1 Adjust forest composition for different degraded re-established forest, select and apply framework tree species.
2 Adjust forest landscape to improve forest function.
3 Conduct monitoring of forest restoration, reconstructed ecological process and functioning (including biodiversity).
4 Capacity building for forest restoration.
5 Duration: 3 years, with intention of continuing beyond this time.

Forest Restoration in Giant Panda Corridor Zones in Yaodu, Guangyuan, Sichuan Province

Objectives:

1. Promote forest restoration in corridor zones in Yaodu
2. Raise farmers' awareness of ecological and biodiversity conservation
3. Alleviate poverty.

Methods:

1. Use indigenous framework tree species for forest restoration
2. Promote natural regeneration with artificial method
3. Participatory planning and implementation

Activities:

1. Baseline survey: land resource and ownership; social and economic aspects; animal and plant resources
2. Community training: seed collection, breeding, planting, nursing and alternative livelihoods.
3. Capacity building, staff, facilities, equipment and training
4. Community nursery: facilities, land and workers
5. Experimental forest restoration: planning, design, site preparation, planting and nursing for 5 years
6. Alternative livelihood for surrounding communities: cultivation, animal husbandry and other.
7. Result monitoring: quality control and technology application.
8. Effect monitoring: social-economic and biodiversity
9. Alternative energy for surrounding communities: biogas, fuel wood-saving stove and energy-saving stove duration: phase 1: 2007-2013, phase 2: 2014 and beyond (enlarge experimental area and community extent)

Dr Elliott commented that the training and capacity building components of this project should be combined with those of the similar project explained by Ms Shao Wen in the morning.

Experimental Study on Forest Restoration in Dry-hot Valleys in Mekong River Watershed

Objectives: study locally adapted forest species in Mekong River watershed and conduct forest restoration experiments.

Contents:
1. Investigate land situation and forest community involvement in the Mekong River watershed.
2. Select suitable indigenous tree species
3. Establish experimental sites for forest restoration
4. Involve the mass in forest restoration

Duration: 5 years

Forest for Environmental Education in Lanxiang Community, Laojunshan, Lijiang, Yunnan

Objectives: raise environmental awareness and set up the base for environmental education.

Method: Use experience from Tengchong as a reference, use more indigenous tree species.

Area: about 0.1 ha and located in Shitou Township, Yulong County
Fund demand: about 150,000 Yuan/year
Duration: 3 years (2007-2010)
Support units: international units
Implementing institution: AGA, etc.
Partners: from Chiang Mai, Kunming, Tengchong, Japan, etc.

Closing
Dr Elliott presented a summary and thanked all of participants, and all of the organizing committee. FORRU-CMU learned a great deal from the presentations and fieldtrip, and has received very good comments from participants, as well as the draft proposals.

Visit to Yunnan Forestry Vocational College –Meeting the Director

Back in Kunming on Saturday March 17th a small group of workshop participants (mostly ICRAF and FORRU-CMU) visited the Yunnan Forestry Vocational College (YFVC) to follow up on the ideas expressed in the work concerning establishment of a forest restoration training and capacity-building centre there, and incorporating forest restoration in to the curriculum.

We were hosted by Mr Wu and the Director. The YFVC has 6 departments with 2300 students; major departments include forestry technology, biodiversity conservation, timber industry, forest economy, basic sciences with natural science and ecotourism. The college also provides a training center for adults to study about forestry conservation areas. The FORRU team met the Director for dinner and had very good discussions about future collaboration.