



Darwin Initiative for the Survival of Species

Final Report

**Preservation, rehabilitation and utilisation of Vietnamese
montane forests**

Project Reference number : 162/10/017

Project Leaders : M.F. Gardner and Dr Nguyen Duong Tai

Authors : P Thomas, N.D.T. Luu, October 2004

1. Darwin Project Information

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Author(s), date	P.Thomas, N.D.T. Luu, M.Gardner, J.Dick, K.Ingleby, N.D. Canh, V.T.X. Thanh

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Appendix	Title	Format
I	Project Contribution to Articles under the Convention on Biological Diversity (CBD)	Within report
II	Outputs	Within report
III	Publications	Within report
IV	Darwin Contacts	Within report
V	Conifers of Vietnam: an illustrated field guide for the most important trees.	original
VI	Manual for the collection, identification and use of edible mycorrhizal mushrooms associated with forest trees	original
VII	Vegetative Propagation of Tropical Trees: Leafy stem cuttings and grafting.	original
VIII	Farjon, A., Thomas, P. & Luu, N.D.T. (2004) Conifer Conservation in Vietnam: three potential flagship species. <i>Oryx</i> 38(3) 257-266	reprint
IX	Thomas, P., Luu, N.D.T. & Nghia, N.H. (2004) <i>Glyptostrobus pensilis</i> (Staunton) K. Koch in Vietnam: a conservation assessment for the IUCN Conifer Specialist Group	On CD
X	Thomas, P. and Nguyen Duc To Luu 2004. <i>Current Status of Taxus species in Vietnam</i> . Unpublished report prepared in response to a request from the IUCN/SSC Wildlife Trade Programme (Hard copy)	On CD
XI	Thomas, P. and Nguyen Duc To Luu 2004: Conservation status of Vietnamese conifers: a report for the IUCN Conifer Specialist Group 47pp	On CD
XII	An Van Bay. 2003 Report on Forest- based incense in Cao Bang. Commissioned 8 June. 2003 for EU project, Cao Bang –Bac Can Rural Development Project ALA/97/17 and Darwin Initiative Project 162/10/017, Preservation, rehabilitation and utilisation of Vietnamese montane forests 39 pp	On CD
XIII	Luu, N.D.T. & Thanh, V.X. (2002) Preservation, rehabilitation and utilisation of Vietnamese montane forests. Visit to UK, 22 April – 20 May 2002. Training report for RBG, Edinburgh	On CD
XIV	Thanh, V.X. (2003). Preservation, rehabilitation and utilisation of Vietnamese montane forests. Visit to UK, 4 March - 2 April 2003. Training report for RBG, Edinburgh. 10pp	On CD
XV	Final seminar Presentations Hanoi 28 th February 2004; Luu, N.D.T. Overall report for the Central Forest Seed Company; Thanh, V.X.– Mycology section. Canh, N.D. Final seminar – Propagation; Taiwania fieldwork section. Hanoi 28 th February 2004	On CD
XVI	Ingleby, KI (2004) Review of mycorrhizal and edible mushroom work as a contribution to final report to be produced by RBGE for Darwin Initiative 'Preservation, rehabilitation and utilisation of Vietnamese montane forests'	On CD

XVII	Dick, J (2002) Preservation, rehabilitation and utilization of the Vietnamese Montane forests Consultancy Visit Report for RBG, Edinburgh: 8-28 January 2002 CEH Project C01741	On CD
XVIII	Dick, J (2003) Preservation, rehabilitation and utilization of the Vietnamese Montane forests Consultancy Visit Report for RBG, Edinburgh: 16 February – 1 March 2003 CEH Project C01741	On CD
XIX	To Quang Thao, Nguyen Duc To Luu & Nguyen Tien Hiep (2004) Conservation Assessment and vegetative propagation of <i>Xanthocypris vietnamensis</i> Farjon & Hiep in Hagiang. <i>Science and Technology Journal of Agriculture and Rural Development</i> 1 (37) 116-119 [In Vietnamese; English abstract]	On CD
XX	Gardner, M.F. & Thomas, P. (2002) Preservation, Rehabilitation and Utilisation of Vietnamese Montane Forests; National Workshop on Conservation of Forest Genetic Resources, 8 November 2002, Sun City Hotel, Hanoi (<i>in prep</i>)	On CD
XXI	Distribution List for Darwin Manuals up to September 2004	On CD
XXII	Luu, N.D.T, Tuan, H.A. & Qui, N.N. (2004) Field report: Visit to Ky Son - Nghe An: March/April 2004 Training report for RBG, Edinburgh. 7 pp.	On CD
XXIII	Evaluation questionnaire for propagation training.	On CD
XXIV	Project Logframe – Revised March 04	Within report
XXV	Proposals - ENVIRO-CENTER Taxol development proposal; Concept note INCO-Vietnam; Mushrooms concept note	On CD
XXVI	Vietnam Conifers: Conservation Status Review (2004) Nguyen Tien Hiep, Phan Ke Loc, <u>Nguyen Duc To Luu</u> , Philip Ian Thomas, Aljos Farjon, Leonid Averyanov, Paul Mathew, Jacinto Regalado Jr., and Sara Oldfield. DRAFT – Part 1 (as at October 11, 2004)	On CD
XXVII	ETFRN articles	On CD
XXVIII	IUCN CSG newsletter articles (<i>Fitzroya</i>)	original

Acronyms Used in this Report

CEH	Center for Ecology and Hydrology (Scotland)
CFSC	Central Forest Seed Company
DANIDA	Danish International Development Agency
FFI (Vietnam)	Flora and Fauna International (Vietnam programme)
FDD	Forest Development Department
FIPI	Forest Inventory and Planning Department
FPD	Forest Protection Department
FSIV	Forest Science Institute of Vietnam
IEBR	Institute of Ecology and Biological Resources
IUCN	World Conservation Union
IUCN CSG	World Conservation Union Conifer Specialist Group
NEFSE	North East Forest Seed Enterprise
RBGE	Royal Botanic Garden Edinburgh
VTSP	Vietnam Tree Seed Programme (part of DANIDA Indo China Tree Seed Program)
WHFSE	Western highlands Forest Seed Enterprise

1. Project Background

Viet Nam is among the most biologically diverse countries in the world. However, the forested areas with the highest biodiversity have been destroyed through conflict and overexploitation so that only 28% survive. These are mainly concentrated in the montane areas of the southern highlands, centered around Dalat, and in the north and northwest. The Vietnamese government recognised the problems caused by deforestation and the threats to biodiversity. In 1995 it approved a Biodiversity Action Plan and subsequently initiated a major reforestation scheme (the 5 million ha. reforestation programme - decision no. 661/QD-TTg). The government also recognised the difficulties of implementing reforestation and conservation programmes due to the lack of the training and resources.

This Darwin Initiative evolved from contacts between Dr Jan Dick (Center of Ecology and Hydrology - CEH), Dr Nguyen Duong Tai (Director of Central Forest Seed Company (CFSC) and his regional associates. These were initially established during an EU funded restoration project for the Nam Cat Tien National Park in southern Vietnam. The CFSC is a state owned enterprise responsible for the national dissemination of plant material to reforestation, rehabilitation and enrichment programmes throughout the country. It has six regional offices (Forest Seed Enterprises – FSE) throughout Viet Nam (See Fig 1).

Following the completion of the EU project, Dr Dick made a study visit to Vietnam during which the need and the basic design of the Darwin project were formulated. Other key Vietnamese government organisations were consulted, along with major NGOs such as the Vietnam-Finland Forestry Sector Co-operation Programme and Social Forestry Support Programme and DANIDA's Indo-China Tree Seed Project.

The aim of this project was to provide Vietnamese with knowledge and skills which would equip them to contribute positively to the sustainable management of the montane forests. Conifers are an important part of these forests; many species have a high economic value and are consequently heavily exploited. However, their taxonomy and overall conservation status were (at the time) quite poorly known. To address this aspect, Dr Dick approached the conifer conservation specialists at the RBGE. The mycorrhizal section of the project was included at the request of the Vietnamese partners due to the potential for sustainable exploitation of mushrooms within the conifer forests and its consequent enhancement of wider conservation strategies.

2. Project Summary

2.1 Purpose and Objectives

Project purpose : To provide Vietnamese researchers and field staff with the knowledge and skills to enable them to undertake the sustainable management of the remaining montane forests through an integrated programme of training in theoretical and practical aspects of biodiversity assessment and utilisation.

Project objectives : This will be achieved by: 1) training in the accurate identification of threatened conifer taxa and 2) their associated mycorrhizae; 3) assessment of the conservation status according to the current IUCN guidelines and in line with the recommendations of the recently published Conifer Action Plan (IUCN, 1999); 4) assessment of potentially economically useful threatened conifer taxa and their associated mycorrhizae and development of appropriate methods for their propagation and utilisation within reforestation and rehabilitation projects in montane forests

Figure 1 Central Forest Seed Company and Forest Seed Enterprises



2.2 Modifications to original objectives or operational plan.

The original objectives of the project were not modified during the course of the project. Variations to yearly work plans and management systems were made in response to changing circumstances.

Co-ordination within Vietnam for each section of the project (conifer, mycorrhizal and propagation) was delegated to individual staff with overall responsibility resting with Nguyen Duc To Luu. He was responsible to Dr Tai (Director of CFSC) until his untimely death in mid 2003. After this Mr Hung assumed overall responsibility with daily responsibility remaining with Mr Luu.

Specific modifications to operational plans are detailed below.

In Year 1, visits by the mycologists and the conifer specialists ran concurrently to provide an opportunity for as many members of the project to meet each other and develop an understanding of the requirements of each section. This was particularly important as the Darwin project represented the first major involvement in Vietnam for the RBGE. At the end of the first year, Dr Philip Mason retired from CEH and was replaced by Mr Kevin Ingleby for the remainder of the project.

In Year 2, the construction of the web-site was deferred to the final year. The operational plan was modified slightly so that one of the UK experts could take advantage of an opportunity to make an extra visit to southern Vietnam as part of her consultancy for the monitoring of another Darwin project based in Vietnam. The second visit to the UK by Vietnamese staff for training in conifer taxonomy and conservation was delayed until the start of the third year, partly in response to the SARS outbreak and the pre-existing commitments of RBGE and Vietnamese staff. Relevant budget changes were made in consultation with the Darwin Secretariat.

In Year 3, the main change to the operational plans involved extra visits to Vietnam by the UK mycology and conifer specialists. These were necessary to complete field work schedules and to allow UK staff to participate in the final workshop at the end of February 2004. These changes did not require alterations to the budget as external finance was used to support the conifer work and savings were made in other budget sections.

2.3 Convention on Biological Diversity Articles (Appendix I.)

The project was originally designed to address the following articles:

- i) Articles 6/7/10 and Annex 1 emphasising cultivated/domesticated species and relatives); through capacity building of key institutions undertaking research into the sustainable management of threatened ecosystems and the planting of 'special use' forests
- ii) Articles 6/7/8/9; assistance for the development of conservation and sustainable use strategies by government agencies and NGOs for threatened species as well as for threatened ecosystems
- iii) Articles 7/8/9; surveys of threatened taxa
- iv) Articles 12/18; training of local personnel through scientific and technical collaboration

The project maintained its focus on the above mentioned Articles. In Appendix 1 of this report, the approximate percentages for Articles 12 and 18 are combined.

2.4 Success in meeting objectives.

The project had 4 principal objectives. Success in meeting each of these objectives is described below.

2.4.1. Objective 1 - training in the accurate identification of threatened conifer taxa

At the start of the conifer work, it was apparent that the majority of the staff of the CFSC and trainees/participants from other organisations (see Section on partnerships for details) had a good or reasonable knowledge of their more common local conifers, especially plantation species such as *Pinus kesiya* and *P. merkusii*. However, their knowledge of conifers in other parts of Vietnam or beyond was limited. Additionally there was almost no understanding of the importance of taxonomy or the methods used for determining conservation status. The project team decided on a strategy of mixing short formal workshop/ seminars with extensive field work in natural forests in different areas. Workshop/seminars concentrated on raising awareness of the diversity, importance and conservation issues of conifers in a global context as well as using locally collected specimens to demonstrate identification techniques.

Field training consisted of specimen collecting, surveying and on the spot training in identification in key areas (See page 11, Appendix V). It also included setting tasks for trainees e.g. during the first conifer visit trainees were sent to a remote area known for its conifer diversity (BiDoup) with instructions to collect and survey populations the conifers that they encountered. Identifications and surveys were verified on their return. The information generated from this particular exercise was included in the main conifer manual (Appendix V) and the scientific paper submitted to the journal *Oryx* (see Appendix VIII). This approach to training was further vindicated in the planning for the final field visit by the conifer specialists in 2003. Reports from provincial Forest Protection and Forest Inventory staff of unknown and possibly new species in remote areas of the southern highlands had been passed on to CFSC and FSE staff. Previously trained staff visited those areas and carried out the identification of the trees in question, allowing the UK staff to visit other areas. At the end of the project, all trainees and participating organisations received at least one copy of the manual 'Conifers of Vietnam'. This manual includes information generated by the project and represents the most up to date reference for Vietnamese conifers. It was designed to allow technical level staff in the relevant organisations to identify any of the currently known species from Vietnam. It also includes an overview of conifers worldwide and represents a consolidation of the training and the information given during the project. Its production and distribution indicates the project's success in the objective '*training in the accurate identification of threatened conifer taxa*'.

2.4.2. Objective 2: training in the accurate identification of associated mycorrhizae

The accurate identification of mycorrhizae requires a reasonably high level of technical qualifications and access to a reasonably well equipped laboratory. The Darwin project concentrated on training a qualified microbiologist - Ms Vu Xuan Thanh from the Western Highlands Forest Seed Enterprise - in field identification and culturing techniques. The Darwin Initiative also provided funds for the purchase of suitable equipment (microscope, laminar flow cabinet). The effectiveness of her training is evident in her appointment as mycorrhizal coordinator at the end of Year 1 and in her co-authorship of the manual produced at the end of the project – see Appendix VI). Further evidence of the success of the training can be seen in the establishment of a fruitbody herbarium in Dalat.

The mycorrhizal team (K. Ingleby and Ms Thanh) followed a similar approach to training non-specialist staff members as the conifer team. A series of field visits and seminar/ workshops in 4 areas of Vietnam (Lam Dong, Lang Son, Lai Chau/Son La and Quang Binh) were held over the course of the three years. These workshops covered basic concepts

relating to mycorrhizae, their hosts and their relationship with forest health as well as identification techniques. Information gathered from these visits formed the basis of the manual. It also allowed the creation of a kind of dissemination network – when staff from Forest Enterprises and other organisations need identification of fruitbodies that are not covered by the manual, they are able to send them to Ms Thanh.

Part of the objective of this section of the work was training in the accurate identification of mycorrhizae associated with threatened conifers, especially the edible ecto-mycorrhizae associated with the members of the Pinaceae. The majority of threatened Vietnamese Pinaceae are restricted to small populations in very remote areas. Consequently, the amount of actual work done on this specific group was not as great as for the non-threatened members. However, the techniques required for the identification of mycorrhizae on non-threatened conifers are the same as those that are threatened. Additionally, the work carried out in plantations provided valuable pointers about the successful management of those plantations – this is a key factor in reducing pressure on the remaining natural forests.

Overall, the project considers the objective of '*training in the accurate identification of associated mycorrhizae*' to have been successfully met.

2.4.3. Objective 3 conservation assessment of threatened conifers

At the outset of the project the conservation status of Vietnamese conifers was unclear with conflicting reports in the Conifer Action Plan (IUCN, 1999), the World Checklist of Conifers (Farjon 2001), the Vietnamese Red Data Book (Phan 1996) and other Vietnamese sources. In the international references some species were listed as Data deficient, others were not listed either because they were not known from Vietnam at the time of publication, were not regarded as being indigenous or there was a conflict in the taxonomic treatment. The conservation status of many of the remaining species was also unclear; some had been assessed using older criteria or the assessments were based on incomplete information regarding current distribution. Overall there were thought to be between 21 and 35 species indigenous to Vietnam.

At the official end of the project, significant progress had been made. There is a consensus that Vietnam's conifer flora has between 31 and 33 species; 22 of these are of conservation concern globally but 29 are nationally threatened. Vietnam is now recognised by the IUCN-CSG as one of the world's hotspots for threatened conifers. A 121 page manual covering all known species has been produced; this represents the most up-to-date work on Vietnamese conifers. Intensive conservation work was carried out on several species e.g. *Glyptostrobus pensilis* : a critically endangered monotypic genus previously thought to be native only in China. The last 2 remaining populations in Vietnam (Dac Lac) have been established as indigenous to Vietnam. Proposals for conservation work are being prepared (See Appendix IX)

Cupressus tonkinensis – previously misidentified as a Himalayan species but likely may represent an indigenous species (work is still continuing). This taxon probably became extinct in Vietnam in January 2004. It is one of the species that has the highest potential economic value. Propagation and ex-situ conservation of this species has been a major focus for both the conifer and propagation sections of the project

Xanthocyparis vietnamensis: a newly described genus from the remote karst areas of Hagiang; extensive survey work was organised along with propagation and cultivation trials (See Appendix VIII)

Taiwania cryptomerioides: joint survey and initiation of in-situ and ex-situ conservation programmes with FFI Vietnam, IEBR and FPD (See Appendix VIII).

Taxus spp.: a report for the CITES commission on the status of Vietnamese populations of

Taxus has been submitted as part of the process of adding all Asian populations of *Taxus* to Appendix 2 of CITES (See also Appendix X)

A short overall report for the IUCN's Conifer Specialist Group has been prepared (See Appendix XI). This is due to be followed by the publication of the 'Vietnam Conifer Status Review' which will give a much more comprehensive overview of the conservation status of Vietnamese conifers and indirectly, the state of the montane forests. It will be a joint publication involving project partners (CFSC, RBGE, CEH), FFI Vietnam, the Global Trees Campaign, IUCN CSG, IEBC and RBG Kew and will draw heavily on the work of the Darwin Project (see Appendix XXVI).

2.4.4 Objective 4: assessment of potentially economically useful conifer taxa, their associated mycorrhizae, development of appropriate propagation methods and utilisation within reforestation and rehabilitation projects

These objectives were related to the development of ex-situ collections that could provide the basis for the utilisation of valuable or potentially threatened conifer taxa. Prior to the start of the project, our collaborators had initiated programmes for a number of species. These were being hampered by difficulties in establishment and propagation. Some of these problems were related to poor choice and limited availability of propagating material. In the course of the project, the majority of these problems were solved, new trials initiated and the genetic basis of the ex-situ collections considerably expanded. This involved integration of the results from the conifer survey work (identifying new sources of propagating material) with the propagation training. The Darwin project received strong support from the DANIDA VTSP and Cao Bang Rural Development Project in the establishment of field plots.

Propagation trials of other potentially useful species surveyed by the conifer team (e.g. *Xanthocyparis*, *Amentotaxus*, *Taiwania*) were initiated. A market survey was carried out as part of the collaboration with the Cao Bang Rural Development Project to support the utilisation of the *Cupressus* from NE Vietnam (See Appendix XII). Three propagation workshops were conducted in the first 2 years. One of these involved a workshop for the Cao Bang Rural Development Project in which previously trained project staff acted as trainers. In the third year trained project staff undertook consultancy work relating to propagation problems in a restoration project at Tam Dao National Park.

In the first year attempts were made during the project to establish '*joint applications with a commercial company for commercial development of non timber forest products*'.

The first of these involved commercialisation of *Taxus* for taxol production. Meetings were held with potential partners from the EnviroCenter (a consultancy firm based at Glasgow University) and an outline proposal developed (Appendix XXVI). During the development of this proposal it became apparent that this particular NTFP would not produce a sufficiently localised benefit as the main profits are in the finished product rather than in the production of raw materials. The project team decided not to take this proposal any further within the context of the Darwin project.

The market survey carried out for the *Cupressus* established the potential for a localised incense production cottage industry suitable for rural villages. Over the 3 years of the project much of the necessary groundwork has been done in terms of clarifying its taxonomic and conservation status as well as establishing the propagation and cultivation protocols and initiating trial plantations. Applications for extra funding were submitted to the British Embassy in Hanoi but these were unsuccessful (See section 11). This species has the most potential for commercialisation and project staff are currently seeking opportunities to take this further.

The mycorrhizal team developed strategies and methods that could be used to establish or

re-introduce edible fungi associated with conifers into new and existing plantations. Their field surveys identified a wide range of edible fungi – this work was complemented by a limited amount of market survey work aimed at establishing the extent of local demand and possibilities for national and international trade. Their results were presented at the final workshop (Appendix XV) and are also included in the manual. Project staff are still seeking opportunities to take this further

Overall, the project team is satisfied that it has met these objectives. Utilisation within reforestation and rehabilitation projects in montane forests is still at a very early stage but the Vietnamese have '*the knowledge and skills to enable them to undertake the sustainable management of the remaining montane forests*'.

3. Scientific, Training, and Technical Assessment

The scientific, training, and technical assessments in this report are divided into 4 sections

1. mycology,
2. conifer taxonomy and conservation,
3. propagation and
4. integration.

Each of these sections is subdivided into three further sections –

1. research/technical work,
2. training/capacity building and
3. comments section.

At the start of the project, the selection criteria for trainees and the content of the training were agreed after consultation with Dr Tai (project leader) and Mr Luu (general coordinator). In the second and third years, section coordinators were also involved.

3.1 Mycology

3.1.1. Research/technical work

Key staff: UK – Dr Philip Mason (Year 1) Dr Kevin Ingleby (Year 2-3). Vietnam: Ms Vu Xuan Thanh from the Western Highlands Forest Enterprise, Mr Nguyen Duc To Luu, CFSC
General aims: survey and identification of mycorrhizae and their fruitbodies, including those associated with threatened conifer taxa and development of appropriate methods for their propagation and utilisation within reforestation and rehabilitation projects in montane forests

Results

Survey and Identification results:

- 109 species (including 36 edible species) collected and identified – this figure includes specimens sent to Ms Thanh as part of the dissemination network.
- One reference herbarium established (WHFSE main office – Dalat comprising 138 fruitbody collections); 2 herbaria enhanced (CEH comprising over 100 fruitbody collections, 51 reference slides and 15 preserved root samples and RBGE - 14 edible fungi as described in manual)
- Collecting network: Visits by the UK specialist were restricted financially to three 2-week periods over the three years. During the second visit, it was decided that to increase the number of specimens and species covered by the project, and to address the lack of information about which species and quantities of fungi were being collected and sold at the local markets, a network needed to be established. Sub-coordinators at each station were assigned who would then relay information and specimens to Miss Thanh. This

dissemination network is ongoing and Ms Thanh is still providing an identification service to other FSEs.

- Mycology research concentrated on field survey work; identifying the different fungi present in different types of conifer forest that have differing species composition or age classes, establishing host specificity and ecological parameters. Specimen collections included fruitbodies and root and soil samples. Field work was hampered by unseasonal droughts and a consequent lack of fruitbodies during the visits by UK staff.

The main results of the field work showed that the diversity of mycorrhizal fruitbodies increases with plantation age, and that the frequency of occurrence of fruitbodies formed by different mycorrhizal fungi changes with plantation age. Of particular interest were the edible species: *Suillus* spp. dominate in 5-10 year old plantations, *Boletus* spp. dominate in 10-20 year old plantations, and *Russula*, *Lactarius*, *Amanita*, *Cantharellus*, and *Tricholoma* spp. occur most commonly in older plantations and natural forest. The implications of this are that forest management strategies which use mixed age class plantings will promote edible fungi diversity. Even age plantations over wide areas will have reduced diversity. The suppression of broadleaf species, especially members of the Fagaceae, also leads to a reduction in edible fungal diversity. In many parts of Vietnam, plantations have an even age structure and fire control involves regular suppression of broadleaved species. These management practices are detrimental to edible fungi production. The CFSC and associated FSEs have indicated that they will use these results when designing and implementing their forest management plans in the future. Their staff are also in a position to advise State Forest Enterprises who control production forests about management regimes that can enhance edible fungi production.

Pilot experiments in the inoculation of nursery grown seedlings destined for replanting and enrichment programmes in the Dalat area were started in March 2003 by Ms Thanh. Early results showed positive effects of inoculation on survival of *Pinus* spp in the sterilised soils. Experiments were compromised by poor viability of seed used and were discontinued. However, the training in identification, culturing and inoculation that has been given means that the CFSC and FSE staff are in a better position to undertake this type of work than before the project.

The remote locations of the majority of the endangered species and the lack of available time meant that only a few collections were made for these species and that therefore only limited conclusions could be drawn about their mycorrhizal associates. Despite this, the results of field work in pine forests in different parts of Vietnam indicated that fungal specificity for pines is low, so that it is likely similar edible fungi could grow with the threatened pines as with the main plantation species. Furthermore, work undertaken by the conifer section on *Pinus merkusii* (one of the main plantation species) in the closing stages of the project indicates that this species may be more threatened than previously thought. The mycology work in *P. merkusii* plantations should prove to be valuable for the longer term management of this species. Further information is provided in the conifer section of this report.

3.1.2 Review and dissemination

The mycology manual (Appendix VI) covers 14 edible species that can be found in most parts of Vietnam. These species are described in considerable detail. Many other edible species were excluded due to their resemblance to potentially poisonous species. If these had been included then the poisonous species would also have to have been included. The project did not have either the finances or other resources to undertake a more comprehensive review. The manual contains details of collecting methodologies, culturing and inoculation techniques. They were printed in Vietnamese but English versions are

available as *pdf* files on the internet so that the manual is available to non-Vietnamese speaking audiences.

3.1.3 Training/capacity building

Training Aims: training in the accurate identification of mycorrhizae and training in the methodology for their propagation and utilisation within reforestation and rehabilitation projects in montane forests.

Trainee selection: The main trainee was selected on the basis of her previous experience in microbiology and tissue culture and English language skills. Other trainees for field work were selected on the basis of the relevance of the subject to their job – they included mainly nursery workers and forest managers. All staff at each of the FSEs visited during the project participated in seminars so that they received an introduction to the project and to mycorrhizae.

3.1.4 Training format:

UK training: 2 one month placements at CEH - Year 1 and Year 2 for Ms Vu Xuan Thanh. Placements included training in identification and laboratory techniques, visits to natural pine forests, restoration schemes, plantations and commercial and government production nurseries in Scotland as well as visits to the taxonomic herbarium at RBGE.

Vietnam Training: three separate training visits were made by UK specialist (23/8-13/9 2001, 7-21/9/2002 and 7-21/6/2003 – 8 weeks total). Four one day seminars/workshops were held at Forest Seed Enterprises in Da Lat, Lang Son, Dien Bien Phu and Quang Binh during visits to Vietnam by UK staff. The seminars were aimed at introducing the work of the project, the basic biology behind mycorrhizal associations, their relationship to forest health and the potential economic value and production of edible ectomycorrhizal mushrooms. All enterprise staff attended.

Seminars were followed by practical field training involving demonstrations of identification, collection and specimen handling techniques. Numbers of trainees are included in the outputs section of this report. In DaLat field training was supplemented by laboratory training using equipment (microscope and laminar flow cabinet) supplied by the Darwin project. Dr Le Ba Dung from Dalat University provided further support and advice on a monthly basis to Ms Thanh on the identification of specimens during the time that the UK specialist was not in Vietnam. In the second and third year, the schedule for field work in other parts of Vietnam combined with the teaching commitments of Dr Dung meant that there was little direct contact with Dr Dung.

3.1.5 Training Assessment

At the end of the placements at CEH in the UK, the trainee was required to give a presentation to UK project staff and other interested parties at CEH. She also produced a short report for each visit (see Appendix XIII and XIV). In the final workshop, Ms Thanh presented the main results of the project to an audience of senior staff from various institutes (Appendix XV). She also acted as translator and instructor during visits to other FSEs. The effectiveness of the training given to other participants was assessed through the effective implementation of a dissemination network created during the project (see below).

Dissemination Networks: A major problem faced by the mycology section of the project was the lack of information about the species and quantities of fungi being collected and sold at the local markets. In Year 2, after discussions with Dr Tai, Ms Thanh and Mr Luu it was decided that, after training, sub-coordinators at each station would be assigned. They would be responsible for organising collections and then relaying specimens and information to Ms Thanh. This proved to be a successful strategy that enabled a more comprehensive

herbarium to be established in Dalat and more comprehensive information to be included in the manual.

3.1.6 Comments

In his final report (Appendix XVI) the UK specialist, Dr K. Ingleby noted that although the main objectives of the project were achieved, the workload was greatly underestimated in the original project document and an extension would be necessary to conduct a full survey of the mycorrhizal populations associated with rare and endangered conifers. This work would require a substantial travel commitment in making repeat visits to remote locations and in laboratory time for the assessment of root collections

3.2 Propagation

3.2.1 Research/technical work

Key staff: UK – Dr Jan McPherson Dick. Vietnam: Mr ND Canh, from Central Forest Seed Company; Mr NV Thang from the North East Forest Seed Enterprise; Mr TT Minh from the Western Highland Forest Seed Enterprise

General aims: development of appropriate methods for their propagation and utilisation within reforestation and rehabilitation projects in montane forests

Results

- 2 training workshops run by UK specialist (Lang Son, Dalat, 4 days each) involving staff from CFSC, FSEs and other organisations involved in propagation work e.g. Forest Science Institute, Tam Dao National Park buffer restoration scheme, Cao Bang – Bac Kan Rural Development Programme, Bai Tu Long Darwin Initiative), Further details can be found in the UK specialist's reports (Appendices XVII and XVIII) and in the outputs section of this report (Appendix II)
- 1 training workshop run by Vietnamese on behalf of the Cao Bang – Bac Kan Rural Development Programme, Cao Bang. Further details can be found in Appendix XVIII
- 4 UK specialist supervised propagation methodology experiments for threatened conifer taxa (*Cupressus* (2), *Taxus*, *Calocedrus*)
3 Vietnamese supervised propagation methodology experiments for threatened conifer taxa (*Cupressus*, *Xanthocyparis* and *Taiwania*)
- 1 MSc with propagation component (To Van Thao – *Xanthocyparis*)
- 1 peer reviewed paper on *Xanthocyparis* conservation and propagation. Draft for 2 other papers in preparation.
- Improved ex-situ collections for conservation and utilisation for 3 species (*Cupressus*, *Taxus*, *Calocedrus*)
- New trial plots for 3 species (*Cupressus*, *Taxus*, *Calocedrus*). Costs for the establishment and continued maintenance of these plots have been met by DANIDA's VTS Programme. The Darwin project's role was twofold – the conifer section contributed through taxonomic work on the *Cupressus* and surveys of new populations of *Taxus* and *Calocedrus* in Lam Dong that could be used to broaden the genetic base; the propagation section solved pre-existing problems with plagiotrophic versus oligotrophic growth, statistical analyses and experimental management.
- 1 propagation manual produced (Appendix VII).

3.2.2 Review/dissemination

The propagation manual is bilingual and the content reflects the theoretical aspects of the training workshops – all participants and their organisations have received copies. At the final workshop the main trainees presented the major results to an audience of senior staff

from various institutes (Appendix XV). The manual is available on the internet.

3.2.3 Training/capacity building

General comments: the CFSC and the 8 associated FSEs are responsible for the supply of plant materials for forestry throughout Vietnam. The CFSC provides central administration and specialist services such as seed testing. The FSEs are responsible for seed and clonal orchards, trial plantations for provenance testing and the introduction of new species as well as management of seed stands in natural forests. These enterprises control significant areas of forestry land which include remnant natural forests. In each region they are closely involved with the planning and management of production forests and watershed and other Special Use forests. The propagation section of the project concentrated its training activities on two FSEs – WHFSE in Dalat in the southern highlands and NEFSE in Lang Son in the montane area of northeast Vietnam. These enterprises carry out the greatest range of propagation work in terms of techniques and the range of species used. They are centers of expertise within Vietnam and have very close links with the central CFSC office. This was a factor in the selection of trainees for this part of the project.

Training Aims: provide training in theoretical and practical aspects of vegetative propagation with particular emphasis on conifers with economic or potential economic value and to develop methodology for their utilisation within reforestation and rehabilitation projects in montane forests. Within this broad aim, resolution of existing specific propagation problems for key species (e.g. *Cupressus*, *Taxus* and *Calocedrus*) was also a priority.

Trainee selection criteria

The main selection criteria for trainees was their direct involvement in propagation work, either at a supervisory level or practical level. Vietnamese colleagues invited organisations to attend workshops and the representative was chosen by the director of the invited organisation.

3.2.4 Training format

Training by the UK specialist involved 3 separate 2-week visits in the first two years of the project. Each visit was centered around 4 day workshops held either in Dalat or in Lang Son. Participatory workshops involved informal lectures covering theoretical aspects of vegetative propagation, group discussions and practical sessions. A summation of these lectures formed the basis of the manual produced at the end of the visit. An assessment of experimental methodologies currently being used by the participants in the course of their work and identification of the major problems that they were encountering was also made. As a result of this, experiments to be carried out prior to the second visit by UK staff were initiated. These were designed to solve the problems for the species that the Vietnamese had particular interests in e.g. *Cupressus*, *Taxus* and *Calocedrus*. At the request of the Vietnamese staff, a lecture on scientific paper writing was given during the second visit to Dalat (Appendix XVIII)

The conifer section's work in the second half of the project generated opportunities for the Vietnamese to undertake propagation work to demonstrate their training e.g. while surveying *Xanthocyparis vietnamensis* in Hagiang and *Taiwania* in Lao Cai, sufficient cuttings were collected for the Vietnamese to set up propagation trials. The results of the *Xanthocyparis* trials were published in a Vietnamese journal (Appendix XIX)

3.2.5 Training Assessment

The value of the initial workshops was assessed by using questionnaires designed by the Vietnamese (Appendix XXIII). Results were used to fine tune subsequent workshops in terms of their subject matter and format. Practical training was assessed by setting up

experiments using targeted species and then monitoring the results at the start of subsequent visits. During the third visit, trainees organised and ran a 2 day workshop in Cao Bang for the Cao Bang-Bac Kan Rural Development Project. Results from independent propagation work on *Xanthocyparis* were published in a Vietnamese journal. Other propagation results were presented at the final workshop by the Vietnamese trainees. Several trainees are currently undertaking MSc courses in Forestry – their theses will incorporate the training received during the project (see Table 1)

3.2.6 General Comments

The propagation section of the project was very successful with over 50 staff from governmental and non-governmental organisations trained in propagation methodologies. CFSC and associated Forest Enterprises are now viewed nationally in Vietnam as centres of excellence for practical vegetative propagation of indigenous and exotic tree species. This is reflected in the invitations they have received to assist other national (Tam Dao National Park) and international projects (Cao Bang – Bac Kan Rural Development Project) in overcoming vegetative propagation problems. In addition the recognition of the value of these technologies for the utilisation of indigenous tree species is reflected in the number of trainees who are currently undertaking MSc level studies and who intend to include a large propagation element in their theses (Table 1). Many of the original problems were related to poor choice of propagating material but in most cases this was the result of over-exploitation of the remaining natural stands. The ability of the Vietnamese students (and organisations) to design and implement experimental work that is capable of producing results that could be published in international journals is an aspect that requires further work. Projects aiming to address this issue should focus on the forestry college curriculum.

Advanced techniques such as flower induction were introduced to the Vietnamese; experiments were limited due to time and financial constraints. Flower and cone induction is recognised as a potentially important research topic by the Vietnamese propagation coordinator who is currently engaged in his Masters theses (Table 1).

3.3 Conifer Taxonomy and Conservation

3.3.1. Research and Technical work – key staff, general aims and results

Key staff: MF Gardner and P Thomas (RBGE – project leader and UK coordinator), NDT Luu – CFSC Vietnam senior coordinator, NV Chi – WHFSE, southern Vietnam fieldwork coordinator, NV Thang, NEFSE, northeast Vietnam fieldwork coordinator.

General aims: survey and identification of threatened conifers; conservation status assessment according to recent IUCN categories (2001) and in line with recommendations of the IUCN's Conifer Action Plan (1999)

Results

- RBGE specialists visited Vietnam four times over the three years resulting in a total of 34 weeks in country. Each of these visits included some time for general project and management work.
- Over the course of the visits, conifer rich areas in 15 provinces were visited. Over 260 specimens representing all currently known species were collected – these have been lodged with IEBR in Hanoi and at RBGE. Three small reference collections have also been established at the FSE station HQ in Dalat, the FSE HQ in Lang Son and at the central CFSC office in Hanoi. Vietnamese staff at each of these locations were trained in collection, identification and curation of specimens and they continue to supplement their collections.

- Detailed surveys were carried out on the following key species
 - *Taiwania cryptomerioides* – a recently discovered population in Lao Cai in northern Vietnam – project staff undertook population surveys followed by seed collecting activities in 2002 and 2003. The aim of this work was to support in-situ conservation work of another Darwin Initiative (Community Based Conservation in the Hoang Lien Mountains – FFI Vietnam) and to establish ex-situ plantations for future utilisation. This work has continued since the end of the project
 - *Xanthocyparis vietnamensis* – a recently discovered species restricted to one small area in northern Vietnam; project staff undertook extensive population surveys to establish its conservation status, followed by collection of propagation material for research, ex-situ work conservation and to provide material for community based replanting programmes organised by IEHR and Hagiang Forest Protection Department. The results from this work were published in Vietnam.
 - *Cupressus tonkinensis* – the most endangered and heavily exploited conifer in Vietnam. It is also one of the most controversial species due to problems in its identification. This species formed the major focus for the conifer work and the propagation work in the second half of the project. Genetic analysis has also been undertaken to clarify its taxonomic position.
- Four Vietnamese CFSC and FSE staff were given intensive training – two of these visited the RBGE. Twenty staff from related organisations (e.g. FPD, FDD, FIPI) were also given field training in identification and collecting techniques. These staff have remained in contact with each other and continue to collaborate.
- One identification manual, 2 peer reviewed papers and various reports were also produced.
- Four specialist assessments for the IUCN Conifer Specialist Group were produced along with a summary of conservation status of each species (Appendix XI).
- A major collaborative conservation status review is nearing completion. This involves CFSC, IEHR, FFI Vietnam, the Global Trees Campaign, RBG Kew and RBGE. It is due for publication in December 2004 (Appendix XXVI).

3.3.2. Review and Dissemination

The bi-lingual conifer manual includes descriptions of 32 species; the key characters, distribution within and outside of Vietnam, ecology, uses, propagation and conservation status are described. It also includes general comments about conifers in Vietnam, taxonomy and conservation. 500 copies were printed. All participants in the project have received copies. Additionally, within Vietnam, copies have been sent to major institutes, most provincial FPD and FDD departments and NGO resource centres (e.g. WWF library in Hanoi). A distribution list for all project manuals is attached as Appendix XXI. All project manuals are available as individual chapters from the project website in either English or Vietnamese. Results from the conifer work were also disseminated through major international conservation journals and Vietnamese scientific journals.

3.3.3. Training and Capacity Building

Training Aims

Training in the accurate identification of conifers and assessment according to IUCN categories.

Trainee selection

Three core trainees from the CFSC (Mr Luu) and FSE (Mr Chi – Lam Dong and Mr Thang – Lang Son) were initially identified by the Vietnamese project leader, Dr Tai. All had degrees in forestry, were employed as technical staff and had good local knowledge and contacts

with other forestry type departments. They were also responsible for the development of ex-situ conservation collections and the utilisation of native species. Mr Luu and Mr Thang were selected for further training in Scotland.

Other trainees were drawn from various provincial departments, particularly Forest Development or Forest Protection Departments (Lao Cai, Hagiang, Son La, Cao Bang, Nghe An), as they were locally responsible for the protection, development and sustainable use of local forest resources. These trainees were chosen by the Vietnamese coordinators; they participated in field work in the different provinces that the conifer team visited. They also participated in workshops in Hanoi and Dalat. The rationale for this was the aim of increasing collaboration between CFSC/FSE and provincial departments.

3.3.4 Training format

UK training. Two one month placements at RBGE for Mr Luu and Mr Thang. Taxonomic training was mainly herbarium based and involved the identification of non-Vietnamese and Vietnamese conifer specimens through the use of keys and literature. Training also involved visits to botanic gardens, private nurseries, private landowners and government agencies involved in restoration of Scottish pinewoods and the establishment ex-situ collections for Scottish species. A significant amount of the time was also spent developing species profiles for the conifer manual. The aim of the training was to broaden their knowledge of the global conifer flora and increase their understanding of the relationships of Vietnamese conifers in that context. The aim of the visits was to introduce them to alternative conservation models and partnerships that could be applicable to their organisations.

Vietnam Training The majority of the training in Vietnam was field based and involved travelling to different areas and making collections. In some areas, UK staff were unable to obtain permits due to political sensitivities. Vietnamese staff were sent on their own to make collections and surveys and report the results back to the UK staff. Trainees were also requested to make collections during the time that the UK staff were not in Vietnam – these were checked during the following visits by the UK staff. In the second and third year the 3 main staff undertook independent surveys at the request of other organisations to investigate reports of unknown species in different provinces (e.g. Lang Son and Lam Dong/Khanh Hoa). Project staff successfully identified the trees in question. This methodology allowed the project to visit more areas than would have otherwise been. Formal workshops were held during the visits by the UK staff in Year 1 and 2. Workshops concentrated on presenting a global perspective of conifer diversity and conservation. They also involved formal sessions on identification techniques using locally collected specimens. The information presented during the workshops was consolidated into the Conifer Manual which was given to all participants at the end of the project.

3.3.5. Training Assessment

Trainees prepared reports on their visits to the UK as well as on the independent field work undertaken– these are included in Appendices XIII and XXII. Trainees also actively participated in the production of the manuals and papers for publication as well as other reports for organisations such as CITES and the IUCN Conifer Specialist Group. The quality of their contributions to that work was taken as a measure of the effectiveness of the training.

3.3.6 Comments

The conifer taxonomy and conservation aspects of the project were highly successful overall. However, as with the mycology section, the amount of work required was underestimated at the beginning of the project. This is partly a reflection of how poorly known the Vietnamese conifer flora was at the start of the project. During the project a

completely new genus and species was described (*Xanthocyparis vietnamensis*) and an isolated population of the monotypic conifer *Taiwania cryptomerioides* was discovered. New taxa in *Pinus* and *Calocedrus* have also been discovered and many new distributions for several taxa have been recorded. Each of these provided opportunities for collaboration with other organisations that were not anticipated at the beginning of the project.

4. Project Impacts

The main project purpose was to provide knowledge and skills relevant to biodiversity assessment and utilisation in montane forests by focussing on conifers and mycorrhizae. This would enhance the sustainable management of the remaining montane forests. A key part of this was training in identification. The mycorrhizal and conifer manuals are the most visible evidence of the success of this aspect. The propagation manual is evidence of the project's contribution to the provision of knowledge and skills for biodiversity utilisation. The improvement of existing ex-situ collections, the establishment of new ex-situ collections for *Cupressus*, *Calocedrus*, *Keteleeria*, *Taxus*, *Xanthocyparis* and the discovery of a new provenance of *Pinus merkusii* (one of the most important forestry species) are further evidence that the Vietnamese are in a better position to sustainably manage and utilise the remaining montane forests than at the beginning of the project. This is also reflected in the positive outcomes for the main trainees as detailed in Table 1. The manuals, scientific papers and miscellaneous reports were all jointly written with the Vietnamese trainees. For most of the trainees, they represent their first publications. Trainees also played a major role in the final workshop (Appendix XV)

The extensive travelling involved in the project has also improved local capacity for biodiversity work by creating informal networks amongst the Vietnamese and improving the collaboration between different organisations that were not previously as closely linked. Perhaps the best example of this is the involvement of the main coordinator in the multi-national and multi-institutional Conservation Status review. In the future there should be additional projects for the utilisation/conservation of selected conifers. These should involve other Asian countries as well as the UK, enabling the Vietnamese to further utilise the skills and knowledge gained from this project and take a more prominent regional role in biodiversity conservation and utilisation.

Name	Organisation	Position during project/ Role in project	Current Status
Coordinators and key project personnel			
Mr NDT Luu	CFSC	CFSC Vice Head of Technical Services; Senior coordinator; conifer coordinator	CFSC Head of Technical Services
Mr ND Canh	CFSC	Propagation coordinator	MSc Forestry; Forestry University, Ha Tay (dissertation on cone induction/propagation)
Ms VTX Thanh	WHFSE ¹	WHFSC technical officer; Mycology coordinator	WHFSE Senior Technical Officer (Mycology and Microbiology)
Main Trainees/students			
Mr NV Thang	NEFSE ²	NEFSE Vice Head of Technical Services; assistant propagation coordinator; northern Vietnam conifer work	MSc Forestry; Forestry University, Ha Tay

Mr NV Chi	WHFSE	WHFSE Vice Head of Technical Services; conifer field coordinator, southern Highlands	WHFSE Head of Technical Section;
Ms NLD Oanh	WHFSE	WHFSC technical officer; Mycology assistant	MSc Forestry (dissertation subject : <i>Pinus merkusii</i> provenances in Vietnam)
Mr TT Minh	WHFSE	WHFSE Technical Officer	WHFSE Vice Head of Technical Services (Bachelor degree – thesis <i>Pinus merkusii</i> grafting)
Mr NDT Huan		Freelance consultant on Vietnamese indigenous plants	Consultant for Darwin Project Bai Tu Long
Mr TQ Thao	IEBR	Xanthocyparis conservation work (MSc student)	Field assistant , Forest Inventory and Planning Institute
Mr NV Dinh	SCFSE ³	Head propagator, Qui Nhon	Technical Officer, CFSC; consultant for World Bank plantation project in Central Region
Mr Nguyen Huu Hieu	CFSC	CFSC Technical Officer	Technical Officer, CFSC; consultant for World Bank plantation project in Central Region
Ms Nguyen Viet Anh	CFSC	CFSC Seed Officer; assistant to NDT Luu	MSc Forestry ; Forestry University, Ha Tay (dissertation theme – pine phenology and seed biology)

WHFSE¹ Western Highland Forest Seed Enterprise; NEFSE² North East Forest Seed Enterprise
SCFSE³ South Central Forest Seed Enterprise

Table 1: Details of coordinators, main students and trainees. The majority are still in the same departments as when they were involved in the project.

4.1 Project Impact on collaboration between UK and local partner.

The Darwin project represented an extension of previous collaboration between CEH and CFSC and the first formal collaboration between the RBGE and Vietnam - previous contacts had been limited taxonomic collaboration with individual Vietnamese botanists relating to the regional Flore du Cambodge du Laos et du Vietnam. There is a strong possibility that all three partners will be involved in future projects

4.2 Project Impact on local collaboration

The extensive field work involved in the conifer and mycology sections of project necessitated an increase in the contact between the Vietnamese project staff and many different organisations at national, provincial and commune level. The successful implementation of the fieldwork programme is proof of good cooperation (i.e. improved links and collaboration)

The project provided opportunities for many Vietnamese (and UK) staff to visit and work in parts of Vietnam for the first time and opportunities to widen their circle of professional and personal contacts. The 'centralised' nature of the propagation workshops also provided similar opportunities. The creation of these networks represents impacts which should benefit future work undertaken by project staff.

A major impact of the project was the increase in awareness and respect for the work of the CFSC and its associated regional FSEs in local communities, provincial government departments. CFSC is now recognised by national and international organisations as a centre of excellence for all aspects of tree propagation. This aspect is reflected in the final evaluation of the project by the CFSC (Appendix XV)

4.3 Social impact.

The immediate local social impacts of this project are difficult to measure or quantify. The project's work on recently discovered and critically endangered species such as *Xanthocyparis vietnamensis*, *Taiwania cryptomerioides* and *Cupressus tonkinensis* relied heavily on local participation and collaboration. By explaining the reasons for the presence of foreigners and project staff from distant parts of Vietnam, the project raised awareness of the importance and uniqueness of 'their' conifers. It also raises awareness of national and global level conservation issues.

The longer term social impact can only be predicted at this stage. The project was mainly targeted at the CFSC and its associated regional FSEs due to their nation-wide role in reforestation, rehabilitation and enrichment programmes; an increase in their skills and capacity should have a marked long term impact through improvements in montane forest management, conservation and utilisation.

One specific example is the work that has been initiated on *Pinus merkusii*. This is one of the principal forestry species which has been widely planted as part of the 5 million hectare reforestation programme, a central part of the Vietnamese government's response to the problems of deforestation and the long term demands to timber. There have been significant problems in the establishment of plantations of this species, mainly due to the unsuitability of the provenances used. In the course of fieldwork in the third year, a new provenance (it may represent a distinct variety or subspecies) was discovered in Nghe An. This has the potential to provide an important alternative to other unsuccessful provenances and enable the success of the reforestation programme. CFSC staff are involved in the conservation of the natural stands and in their utilisation as a seed source. If this is successful, then the social impact will be enormous.

5. Project Outputs

Project outputs are quantified in Appendix II. Publications are detailed in Appendix III. All project outputs listed in the Agreed Schedule were achieved – in most cases at a higher level than anticipated.

The core target audience for the main outputs of the project (the manuals) included government forest managers and workers at national and provincial levels (FPD, FDD, DARD, FIPI, FSIV) as well people involved in protected area management (both government and NGO). Academic institutions were also targeted. Copies of manuals were posted to all people and organisations that had come into contact with the project. Copies are also available on the internet and the UK staff have been distributing copies in the UK on request. All manuals have been distributed free of charge; the CFSC have given an undertaking to continue this until the print run is exhausted. RBGE staff will be responsible for providing updates for the web-based version of the conifer manual when new species are described – 2 new taxa have been identified by collaborating organisations but have not yet been formally published. Appendix XXI gives details of recipients up to September 2004.

6. Project Expenditure

Item	Budget	Actual	£ DIFF	+/- % DIFF
Salaries	99,094	95,748.65	3,345.35	3%
Rent ,rates heating lighting etc	0	0	0	0%
Postage, telephone, stationery	0	0	0	0%
Capital items/equipment	7,750	9,611.69	-1,861.69	24%
Travel & Subsistence	36,665	40,463.29	-3,798.29	10%
Conferences, Seminars	1,100	885.65	214.35	19%
Printing	4,500	3,840.05	659.95	15%
Others	12,790	11,420.21	1,369.79	11%
Total	161,899	161,969.54	-70.54	0%

Original budget amended with approval of Darwin as per above budget (see attached amended Table B).

Additional capital items required for completion of publication, National Conservation Status Review of Vietnamese Conifers. Virement of funds from others heading to capital with approval of Darwin.

Travel & Subsistence increased costs due to additional visits from UK to Vietnam and additional fieldwork by Vietnamese collaborators. Virement of funds from salaries, conferences and printing with approval of Darwin.

PROJECT COST (£)				
Total Darwin Grant : £161,899				
<i>Annual Darwin Grant:</i>				
2001/2002 £64,185				
2002/2003 £55,503				
2003/2004 £42,211				
DARWIN GRANT : EXPENDITURE DETAILS				
Expenditure details	2001/02	2002/03	2003/04	Total
<i>Rent, rates, heating, lighting, cleaning & overheads</i>	0	0	0	0
<i>Postage, telephone, stationery</i>	0	0	0	0
<i>Travel & Subsistence</i>	14,860	14,860	6,945	36,665
<i>Printing (Literature for workshop production of 3 manuals)</i>	500	500	3,500	4,500
<i>Conferences, seminars etc (four technical training workshops and final year seminar)</i>	300	300	500	1,100
<i>Capital Items: computer and printer for dtp; microscopes – stereo and high power; GPS equipment x 2</i>	7,750	0	0	7,750
<i>Other: Herbarium equipment; field accessories; propagation equipment; equipment for mycorrhizal activities; film processing; permits and posting of specimens; vehicle hire; website costs</i>	4,820	3,320	4,650	12,790
<i>Salaries</i>	35,955	36,523	26,616	99,094
Total	64,185	55,503	42,211	161,899

7. Project Operation and Partnerships

7.1 Project Operation 7.2 Project Partnerships

Overall in-country activities were coordinated by Mr Nguyen Duc To Luu from the Central Forest Seed Company (CFSC). Initially he was under the supervision of Dr Tai, the project leader in Vietnam. Due to Dr Tai's ill health during the second and third year of the project Mr Luu assumed an increasing responsibility. To ensure the smooth running of the project additional coordinators for the propagation and mycorrhizal sections of the project were appointed to assist Mr Luu. P Thomas (RBGE) was delegated to act as Mr Luu's counterpart in the UK at the start of the second year. The CFSC was originally intended to be the main partner as this state owned enterprise is responsible for the national dissemination of plant material to reforestation, rehabilitation and enrichment programmes throughout the country. It has six regional offices (Forest Seed Enterprises – FSE) throughout Viet Nam (see Figure 1) including the key montane areas that the project targeted. Collaboration with the Central Forest Seed Company aimed to ensure that all benefits and techniques developed would be available across the whole country rather than to one institute or in one province.

Staff from the CFSC and selected FSEs played a key role in project planning and implementation throughout the three years. Field work schedules, workshop themes and contents as well as the final manuals were designed by the coordinators in consultation with UK staff. The benefit of working with the CFSC and its associated regional offices is reflected in the wide range of other organisations that became involved in the project.

7.2 Project Partnerships

The local organisations involved with each section of the project are listed below. Brief notes of their role in the project are also included.

7.2.1 Conifer work – partnerships

Coordinator – Nguyen Duc To Luu. This part of the project visited many different montane areas in the course of the project and had the widest contact.

Central and provincial government department local partners		
	Name / Location	Project Role
<u>Forest Seed Enterprises (FSE)</u>	North East FSE – Lang Son Western Highland FSE – Lam Dong.	trainees, joint and independent field surveys on threatened conifers, information collation for conifer manual, status reports and scientific papers
<u>Forest Protection Departments (FPD)</u>	Lam Dong, Dac Lac, Nghe An, Cao Bang, Lang Son, Lao Cai	trainees for field work; logistical support for field work
<u>Forest Development Departments (FDD)</u>	Lam Dong, Hagiang, Son La	trainees for field work
<u>State Forest Enterprises</u>	Tam Hiep, Lam Dong; Ky Son, Nghe An	Logistical support for field work
NGOs		
<u>FFI Vietnam Darwin Initiative Community Based Conservation of Hoang Lien Mountain Ecosystem</u>	Lao Cai	field work support, Lao Cai; collaboration on scientific papers and reports
<u>Cao Bang – Bac Kan Rural Development Project</u>	Cao Bang	Project role: support for <i>Cupressus</i> work
National Institutes/ Universities		
<u>Institute for Ecology and Biological Resources (IEBR) and Hanoi Uni.</u>	Dr Hiep and Prof Loc (Hanoi)	Project role: taxonomic advice, field work support, collaboration on scientific papers and reports
<u>Forest Science Institute of Vietnam</u>	(Prof. Nghia) Hanoi, Son La, Dalat	collaboration on scientific papers and reports; logistical support for field work in Son La
<u>Forest Inventory and Planning Institute</u>	Prof. V.V. Dung (Hanoi)	support for field work on <i>Cupressus</i>
<u>College of Natural Sciences, Ho Chi Minh City</u>	Professor Kiet	Taxonomy and distribution of Podocarpaceae
Other collaborators		
	Name / Location	Project Role
<u>Center for Agriculture and Forestry Research</u>	Nghe An.	Logistical support for field work in Nghe An and development of <i>Pinus merkusii</i> work
<u>Tam Dao National Park</u>	Vinh Phuc	trainees and support for field work

<u>DANIDA – Vietnam Tree Seed Programme (part of the IndoChina Tree Seed Project)</u>	Hanoi	General logistical support, integration of conifer taxonomy and conservation status work into gene conservation and forest species utilisation strategies
<u>Hanoi Association for Decorative Organisms</u>	Hanoi	trainees and support for field work
<u>Viet Nam Botanical Conservation Program, Missouri BG, IEBR</u>	Hanoi	taxonomic advice, field work support, collaboration on scientific papers and reports
<u>Global Trees Campaign</u>	Cambridge, UK	collaboration on scientific papers and reports
<u>Royal Botanic Garden Kew/ Conifer Specialist Group</u>	London, UK	taxonomic advice, collaboration on scientific papers and reports

7.2.2 Propagation work – partnerships

Coordinator – Mr Nguyen Duc Canh, CFSC and Mr NV Thang, North East FSE. This part of the project concentrated its work at the Western Highlands FSE, Lam Dong, the North East FSE, Lang Son and the main offices of the CFSC. Project work had two elements (i) workshop based with one field trip to Huu Lien Reserve for in-situ cone induction work on *Cupressus* and (ii) practical propagation studies of a range of rare conifers. Much of this work was organised and implemented by Vietnamese staff.

Central and provincial government department local partners		
	Name / Location	Project Role
<u>Forest Seed Enterprises (FSE)</u>	North East FSE – Lang Son, Western Highland FSE – Lam Dong and Hanoi Forest Seed Enterprise.	trainees for workshops; collection of propagation material from threatened conifers, information collation for propagation manual, reports and scientific papers
<u>Forest Protection Departments (FPD)</u>	Lam Dong, Dac Lac, Nghe An, Cao Bang, Lang Son, Lao Cai	trainees for workshops; logistical support for field work
<u>Forest Development Departments (FDD)</u>	Son La, Hagiang..	trainees for workshops;
NGOs		
<u>Cao Bang – Bac Kan Rural Development Project</u>	Cao Bang	trainees for workshops; support for <i>Cupressus</i> field trials
National Institutes/ Universities		
<u>Hanoi University.</u>	Prof. Dr. Vu Van Vu, Director of the Biological Faculty	propagation consultant for coordinators
<u>Forest Science Institute of Vietnam</u>	(Prof. Nghia) Hanoi, Son La, Dalat	trainees (Lam Dong)
Other collaborators		
<u>DANIDA – Vietnam Tree Seed Programme (part of the IndoChina Tree Seed Project)</u>	Hanoi	General logistical support, integration of propagation work into gene conservation and forest species utilisation strategies
<u>Hanoi Association for Decorative Organisms</u>	Hanoi	trainees

7.2.3 Mycology work - partnerships

Coordinator – Ms Nguyen Xuan Thanh, Western Highland FSE, Lam Dong. This part of the project concentrated its work in areas of Lam Dong, Lai Chau, Quang Binh and Lang Son. Project work was primarily field based with laboratory training sessions and workshops

Central and provincial government department local partners		
	Name / Location	Project Role
<u>Forest Seed Enterprises (FSE)</u>	North East FSE – Lang Son, Western Highland FSE – Lam Dong, Hanoi Forest Seed Enterprise, Dien Bien Phu FSE	trainees for workshops; collection of fruitbodies for identification
<u>Forest Protection Departments (FPD)</u>	Lam Dong, Lang Son, Lai Chau.	trainees for workshops; logistical support for field work
<u>Forest Development Departments (FDD)</u>	Lam Dong, Lai Chau	trainees for workshops;
<u>Department of Agriculture and Development (DARD)</u>	Lai Chau	trainees for workshops
National Institutes/ Universities		
Dalat University	Dr. Le Ba Dung, Biological Faculty.	taxonomic consultant for mycorrhizal coordinator
Institute for Tropical Biology	Dalat, Dr Nhut and Ms Chau;	taxonomic and fruitbody herbarium establishment advice
Other collaborators		
<u>DANIDA – Vietnam Tree Seed Programme (part of the IndoChina Tree Seed Project)</u>	Hanoi	General logistical support, integration of mycology work into gene conservation and forest species utilisation strategies

7.3 Contact with Biodiversity Strategy Office

During the lifetime of the project, there was no direct contact with the Biodiversity Strategy Office. However, several of the collaborating organisations (e.g. VTSP, IEBR, FPD) are closely linked to this office and involved in the revision of the current BAP. Results from the project will be fed into this process.

7.4 Participating International Partners – Project Involvement

International Partners: 7

FFI – through Darwin Project Community Based Conservation of Hoang Lien Mountain Ecosystem

Global Trees Campaign – Vietnam Conifer Status Review

RBG Kew –conifer taxonomy and Vietnam Conifer Status Review

IUCN-CSG –Conservation status and Vietnam Conifer Status Review

European Union –through the Vietnam-Finland Forestry Sector Co-operation Programme's

Cao Bang – Bac Kan Rural Development Project

DANIDA – through VTSP

Royal Society – Chinese Academy of Science (Joint RBGE/Kunming Institute of Botany project *Species delimitation and conservation status of Taxus in China (Yunnan)*): samples

and specimens from Vietnamese populations (See page 102, Appendix V)

8. Monitoring and Evaluation

8.1 Monitoring and Evaluation Strategy

Regular visits by the UK staff, frequent email contact between UK and Vietnam and joint production of reports for Darwin Initiative ensured that project progress was closely monitored. The completion of the manuals (the major output from the project) in time for the final workshop and the publication of two peer reviewed scientific papers indicates the success of that strategy. The effectiveness of training was mainly monitored and evaluated by setting tasks, experiments or mini-projects for Vietnamese staff to undertake prior to the next visit of the UK staff. Results from these were discussed and evaluated with project staff during those visits. The propagation section also used questionnaires to obtain feedback from trainees and to refine workshop presentations (Appendix XVII & XXIII). The culmination of this process was the presentation by the Vietnamese coordinators at the final project workshop in Hanoi in February 2004 (Appendix XV)

Specific examples include the work undertaken with seed collection from *Taiwania* as part of the joint work with another Darwin project. In September 2002, UK and Vietnamese staff visited the site for the first time in order to collect propagating material for ex-situ and restoration work as well as undertaking conservation assessment work. Collection of propagation material was restricted to vegetative material as the timing of the visit was too early for seed. This threatened species was unknown in Vietnam prior to the project and there was no phenological information available. The cuttings were used for a propagation experiment at Lang Son FSE. 90% of these died – this result was a reflection of the poor state of the trees rather than the skills of the trainees. In November 2003, a Vietnamese team organised a return visit which resulted in the successful collection of seed. Good germination has been achieved and some of the seedlings are due to be returned to the site as part of the community conservation plan with the FFI project. A similar exercise was carried out with *Xanthocyparis*, another recently discovered threatened conifer. In this case, vegetative propagation was successful and the resulting plants have also been used to initiate a community based replanting programme in Hagiang. These two examples are good indicators of the success of the project in meeting the purpose and goal of the project.

The main problems in the first year, and the steps taken to overcome them, are detailed in the first annual report. In the second year, no significant difficulties occurred apart from minor technical difficulties such as the loss of fruitbody collections at the end of second visit due to poor drying facilities. Taxonomic problems involving the identification of the *Cupressus* species from Lang Son and a pine from Nghe An (*Pinus cf merkusii*) took up a considerable amount of time.

In the third year, the conifer section received numerous requests to investigate reports of unknown conifers in remote parts of Lao Cai, Son La, Nghe An, Khanh Hoa and Lam Dong. This was in addition to critical field work that was already planned e.g, seed collection from the recently discovered, critically endangered population of *Taiwania* that formed part of the wider collaborative work for the project and verification of localities of other critically endangered conifers. In Khanh Hoa and Lam Dong, staff from WHFSE were able verify the reports. Schedules were changed to allow project staff to investigate the reports from the other provinces. Seed collection for the *Taiwania* work was delegated to other members of the Darwin project as a training exercise. The results of this work were presented at the final seminar in the propagation section (Appendix XV).

From one perspective, the sudden increase in workload was encouraging as the reports were passed to trained staff, indicating the creation of an unintended dissemination network in which other organisations acknowledged the Darwin project staff's specialist skills.

In the second part of the third year, project staff were deeply saddened by the death of Dr

Tai after a short illness. Dr Tai was a dedicated and charismatic leader who had played a significant role in increasing the overall capacity of Vietnam's forestry sector, especially its ability to meet the demands for development and for conservation. It is a tribute to his management and organisational skills that this project was able to continue. Mr NDT Luu also deserves credit for his capable and responsible handling of the project.

8.2 Internal and external evaluation of the project.

In the course of the project, external reviews were carried out by the Darwin monitors. The CFSC conducted annual internal reviews; the results of the final review were presented at the final workshop and are included as Appendix XXIII. In the UK, RBGE and CEH staff maintained a continuous evaluation through regular email, phone calls and short meetings. In addition, CEH staff provided consultancy reports after each visit to Vietnam. Half year and annual reports were prepared by RBGE staff and circulated to all project members for comment prior to submission. Progress meetings were held by relevant UK staff during each visit to Vietnam. Mr Luu, as senior coordinator, attended all meetings. An evaluation meeting was held for all project staff during the final workshop in Hanoi in February 2004. This was also attended by senior CFSC management staff. Reviewer's comments on this report will be circulated to all members and a joint response will be compiled.

8.3 Key lessons

The experiences gained during the course of this project underlines lessons learnt from other projects – the importance of previous or existing relationships between partners (in this case CEH and the CFSC), the value of regular communication, particularly email and the abilities of all participants to understand, tolerate and work with a different culture. With respect to the Darwin Initiative, the presence of another Darwin project with complementary aims enabled collaboration and increased the value of both.

9. Response to annual report reviews

The reviewer of the first annual report suggested increased partnerships with government and local institutions involved in the planning and management of protected areas. The second and third years saw a marked increase in collaboration with staff from IEBR (the main institution involved in botanical surveying) and strong collaboration with NGO's involved in community conservation on conifer rich areas e.g. *Taiwania*. Project staff were also involved in consultancy with national parks such as Tam Dao. Additionally the manuals have been widely distributed to many different organisations and work on a Conservation Status Review (Appendix XXVI) is near completion. This document will make a major contribution to policy.

The reviewer of the second annual report requested that information about training and NTFP be attached to the final report – this information is included in the various project documents attached. A revised logframe was also requested. This is attached as Appendix XXIV. The original logframe was produced to accompany the original application. At the time, logical frameworks were a new addition to the application procedure and the guidelines that were issued at that time were inadequate. In the last two years better guidance has been issued and the benefits of the logical framework are more apparent.

10. Darwin Identity

The Darwin Initiative was appropriately credited in all publications produced by the project. Cover designs of the different manuals were harmonised to increase their impact and reinforce the identity of the Darwin Initiative. Copies of the manuals have been distributed to a range of government departments and all collaborating organisations throughout Vietnam.

Copies are also available in NGO resource centers and libraries such as the one in WWF office in Hanoi. Each manual is available on the internet, either as single downloadable pdf files or in easily managed sections to take into account the slow download speeds in many parts of Vietnam. Internet versions have the Darwin logo on each page so that the documents are always recognisable.

The main scientific paper that was produced by this project was published as the lead article in *Oryx, the International Journal of Conservation* one of the premier conservation journals. This paper also credited the work of other Vietnam based Darwin Initiatives.

During the course of this project, three other Darwin projects were active in Vietnam; Community based Conservation in the Hoang Lien Mountains (Flora and Fauna International; Project 10/011); Training of Vietnamese scientists in tree seed science and technology (University of Reading Project 10/029) and Bai Tu Long Bay awareness project, Vietnam (The Society for Environmental Exploration Project 10/022). A collaborative project with FFI for the conservation of *Taiwania* in the Hoang Lien Mountains was developed during the second year. This work is continuing. Staff from that project are also playing a key role in the production of Conifer Conservation Status Review. Contact with the Reading University initiative was limited to the first year when Dr Jan Dick undertook an evaluation of their work. The Bai Tu Long project is currently employing staff who were involved in the conifer and propagation work as consultant for the development of a botanic garden.

11. Leverage

In April 2002 (end of Year 1) the project submitted a bid for £42 000 to the Foreign and Commonwealth Office Environment Fund for a project entitled 'Conifer conservation and wealth generation in the mountains of Vietnam'. The partners were CFSC and FSEs, CEH, ICCP and the Natural Research Group (NPRG), at Strathclyde University. The specific objective of the project was 'to determine the feasibility of enabling the residents of the poor communes in Lang Son province to conserve and utilize sustainably the rare and endangered conifers, especially *Cupressus*, *Calocedrus macrolepis*, and the recently discovered Golden Cypress, *Xanthocypans vietnamensis*, by generating supplementary income from harvesting parts of the trees for essential oils used in incense production. The NPRG team were involved to provide expertise on the identification of high yielding clones that could be bulked up for plantation programmes. The bid was supported by the Hanoi office of the British Embassy. Unfortunately it was unsuccessful.

In response to this setback, the project team negotiated with the EU funded Cao Bang-Bac Kan Rural Development Project to undertake a market survey – this is included as appendix XII. The work was estimated to be worth US\$ 2 000. The Cao Bang project has also established small trial plantations of *Cupressus* and is still working with the Lang Son FSE and CFSC. The development of the utilization programmes for selected threatened conifers still presents opportunities for collaborative projects.

In April 2003, the mycology section of the project submitted another bid entitled 'Sustainable use of edible mushrooms in montane forests of Vietnam' to the Foreign and Commonwealth Office Environment Fund (£25 000). The main aim of this bid was to finance a socio-economic survey of edible mushroom use throughout Vietnam. It was also unsuccessful. This aspect of the Darwin project is still proceeding in a limited way through the network established in Year 2 (See section 3.1.1).

Throughout the course of the project, the Vietnam Tree Seed Project (DANIDA) provided considerable logistical and financial support for activities resulting from the work of the Darwin project. Examples include finance for the collection of propagating materials from *Taxus* and *Calocedrus* populations identified in the first year of the project. These were used to diversify the genetic representation of the ex-situ collections in Dalat. VTSP also provided financial and logistical support for the second visit by the Vietnamese to the remote *Taiwania* site as part of the training programme and conservation and utilisation work (see Section 3.3.1.). VTSP have also provided finance and support for the

development of the *Pinus merkusii* work that developed in the third year. The total value of their contribution is estimated to be around US \$20 000 (ca £15 000).

At the request of Vietnamese staff, UK members also supported applications to the Ford Motor Company's Vietnam Conservation and Environmental Grants Program for field work on specific species. These were unsuccessful. A proposal for the Peter Scott Fund and the BP Conservation Awards for further conservation work on *Glyptostrobus pensilis* is being prepared.

The RBGE's molecular laboratory made additional in kind contributions estimated at ca £1500 for genetic analysis in relation to the taxonomic work on *Cupressus tonkinensis* in Years 2 and 3. The RBGE also made in kind contributions of £5 000 for the line drawings for the conifer manual and £1 500 for mounting duplicate herbarium specimens on behalf of the Hanoi herbarium.

CEH staff devoted considerably more time than was originally estimated. A total of 155 days were costed; 204.14 staff days were spent on this project. CEH therefore made an additional in-kind financial contribution valued at £16,204. This extra time is a reflection of the overly ambitious aims of the project.

Since the end of the project, UK staff from RBGE and CEH have been liaising with consultants from LTS about possible projects involving further development of NTFPs through donors such as GTZ, the Trust Fund for Forestry and the IUCN.

12. Sustainability and Legacy

The three manuals produced by the project represent a significant legacy. Copies have been distributed throughout Vietnam and are also available to an international audience from the internet. The forthcoming multi-institutional and multi-national report on the conservation status of the Vietnamese conifers should help to inform policy across a wide range of government organisations in Vietnam. The work of the project has already resulted in the recognition by the IUCN's Conifer Specialist Group of Vietnam as a critical conifer hotspot. This will help to catalyse further conservation work. The work of the propagation and mycology sections of the project has created the basis the development of utilisation programmes. The propagation and utilisation work with *Cupressus* is being continued by the EU project, Cao Bang–Bac Can Rural Development Project ALA/97/17. Programmes for the utilisation of edible mushrooms are being taken forward by other UK organisations (e.g. LTS).

The main Vietnamese staff involved in the project have all either been promoted within their organisations or have gone on to MSc level. The physical resources (e.g. microscopes and other mycology equipment) provided by the project will remain with those organisations to underpin their capacity to continue biodiversity and sustainable utilisation programmes. Both UK and Vietnamese project staff are maintaining contact and are likely to work together again in the future.

13. Post-Project Follow up Activities (max. 300 words)

This Darwin project has made a significant contribution to understanding the taxonomy, distribution and national conservation status of conifers in many parts of Vietnam. It has also provided knowledge and skills to enable sustainable utilisation of individual species and NTFPs such as edible mushrooms. Dissemination of information at national and provincial levels has led to an increased awareness, not only of the problems facing conservation and sustainable utilisation conifers and their associated montane forests, but also of the potential answers to those problems. There is now an opportunity to consolidate the legacy of the project through the creation of a series of provincial and regional action plans for flagship species such as *Taiwania*, and *Cunninghamia* or economically important threatened species such as *Fokienia* and *Pinus merkusii*. This would involve a series of workshops, led by Vietnamese and supported by UK expertise. A wide range of stakeholders including staff from Forest Development Departments, Forest Protection Departments, Forest Science Institutes, Forest Enterprises, Forest Seed Enterprises and protected area workers and managers would contribute. This is one of the key recommendations in the forthcoming National Conservation Status Review (App. XXVI). Good contacts with these organisations have been established during this project. Action plans would also involve contributions from similar organisations in adjoining provinces of Lao PDR, where many of these species occur and face similar conservation problems. Participation by Laotian counterparts could be catalysed through the current Darwin project in Lao PDR run by the RBGE (Taxonomic training in a neglected biodiversity hotspot in Lao PDR). This project concentrates on training Laotians in tropical identification rather than conservation and sustainable utilisation. Relations between Lao PDR and Vietnam are very strong – both CFSC and IEBR have good relationships with their counterparts in Lao. Both of these organisations also have expertise that is lacking in Lao PDR and have expressed a strong interest in cross border working.

14. Value for money

The total budgeted cost of the project was around £228K; the Darwin Initiative provided about 70% of this funding while the remaining money represented in kind contributions from the RBGE. Another £26 500 was contributed by the RBGE and VTSP as in kind funding. The outputs from the project provide evidence that biodiversity conservation work has been enhanced within Vietnam – over the longer term this should be reflected in improved management of the remaining montane forests and a decrease in the risk of extinction for the threatened species over the next generation. In this sense the project does represent value for money.

Appendix I: Project Contribution to Articles under the Convention on Biological Diversity (CBD)

Project Contribution to Articles under the Convention on Biological Diversity		
Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use	10	Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring	10	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	10	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation	15	Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity	15	Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.
11. Incentive Measures	5	Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.
12. Research and Training (includes Article 18 Technical and Scientific cooperation component)	15	Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness	5	Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.

14. Impact Assessment and Minimizing Adverse Impacts	0	Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources	5	Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.
16. Access to and Transfer of Technology	5	Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies.
17. Exchange of Information	5	Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol	0	Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Total %	100%	Check % = total 100

Appendix II Outputs

Code	Total to date	Detail
Training Outputs		
1a	Number of people to submit PhD thesis	
1b	Number of PhD qualifications obtained	
2	Number of Masters qualifications obtained	1 (Mr To Quang Thao – MSc Forestry); 4 others due to graduate 2004/2005
3	Number of other qualifications obtained	
4a	Number of undergraduate students receiving training	52 (propagation trainees)
4b	Number of training weeks provided to undergraduate students	156 (3 per student; propagation training)
4c	Number of postgraduate students receiving training (not 1-3 above)	36 (4 postgraduate students received training throughout the project)
4d	Number of training weeks for postgraduate students	55 (4 postgraduates received intensive training for periods of up to 8 weeks in each year of the project e.g. In Year 1 mycology coordinator trained 4 weeks in UK + 3 in Vietnam, In Year 1 Conifer coordinator – 4 weeks in UK + 4 in Vietnam).
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(i.e not categories 1-4 above)	
6a	Number of people receiving other forms of short-term education/training (i.e not categories 1-5 above)	
6b	Number of training weeks not leading to formal qualification	
7	Number of types of training materials produced for use by host country(s)	Training materials included in manuals
Research Outputs		
8	Number of weeks spent by UK project staff on project work in host country(s)	36
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	9 (Taxus, Cupressus, Glypto, 4 assessments, Luu's P merkusii work (x2)
10	Number of formal documents produced to assist work related to species identification, classification and recording.	3 manuals
11a	Number of papers published or accepted for publication in peer reviewed journals	2
11b	Number of papers published or accepted for publication elsewhere	3 (14 unpublished reports also completed and publicly available on request)
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	

Code	Total to date	Detail
13a	Number of species reference collections established and handed over to host country(s)	4 (mycorrhizae/fruitbody in Dalat and conifers in Dalat and CFSC Hanoi and FSE Lang Son)
13b	Number of species reference collections enhanced and handed over to host country(s)	1 Hanoi herbarium - conifers
Dissemination Outputs		
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	7 (workshops - 2 propagation, 2 mycology, 2 conifer + 1 final joint seminar
14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.	3 Presentation to Ecological Society of University of Edinburgh, Cao Bang Workshop and National Workshop on Conservation of Forest Genetic Resources, Hanoi
15a	Number of national press releases or publicity articles in host country(s)	
15b	Number of local press releases or publicity articles in host country(s)	
15c	Number of national press releases or publicity articles in UK	3 (ETFRN newsletter, RBGE Botanic magazine x 2)
15d	Number of local press releases or publicity articles in UK	
16a	Number of issues of newsletters produced in the host country(s)	
16b	Estimated circulation of each newsletter in the host country(s)	
16c	Estimated circulation of each newsletter in the UK	
17a	Number of dissemination networks established	3 (Viet staff from each section of project exchange and receive information and collections from contacts in other parts of Vietnam as well as their own organisation)
17b	Number of dissemination networks enhanced or extended	
18a	Number of national TV programmes/features in host country(s)	
18b	Number of national TV programme/features in the UK	
18c	Number of local TV programme/features in host country	
18d	Number of local TV programme features in the UK	
19a	Number of national radio interviews/features in host country(s)	
19b	Number of national radio interviews/features in the UK	
19c	Number of local radio interviews/features in host country (s)	
19d	Number of local radio interviews/features in the UK	
Physical Outputs		
20	Estimated value (£s) of physical assets handed over to host country(s)	£6 000 (microscopes, field equipment)

Code	Total to date	Detail
21	Number of permanent educational/training/research facilities or organisation established	
22	Number of permanent field plots established	3 (Taxus, Calocedrus, Cupressus) 2 others in preparation – Xanthocyparis and Taiwania
23	Value of additional resources raised for project	£39 204

Appendix III: Publications

All publications are available free of charge from the RBGE contact
P.Thomas@rbge.org.uk; M.Gardner@rbge.org.uk

* included with this report

*1. Manuals

1. Luu, N.D.T. & Thomas, P.T. 2004 Conifers of Vietnam: an illustrated field guide for the most important trees. World Publishing House. Hanoi. 121pp (In English and Vietnamese) ISBN 1 872291 64 3 <http://www.edinburgh.ceh.ac.uk/tropical/Vietnamontane.htm> (App. V)
2. Dick, J.McP, Luu, N.D.T & Canh, N.D. 2004 Vegetative Propagation of Tropical Trees: Leafy stem cuttings and grafting. World Publishing House. Hanoi. 51pp (In English and Vietnamese) ISBN 1 872291 69 4
<http://www.edinburgh.ceh.ac.uk/tropical/Vietnamontane.htm> (App. VI)
3. Ingleby, K. Thanh, V.T.X. & Mason, P. 2004 Manual for the collection, identification and use of edible mycorrhizal mushrooms associated with forest trees. World Publishing House. Hanoi. 63pp (In Vietnamese) ISBN 1 872291 74 0
<http://www.edinburgh.ceh.ac.uk/tropical/Vietnamontane.htm> (App. VII)

2. Peer reviewed papers

* Farjon, A., Thomas, P. & Luu, N.D.T. (2004) Conifer Conservation in Vietnam: three potential flagship species. *Oryx* 38(3) 257-266 (App. VIII)

* To Quang Thao, Nguyen Duc To Luu & Nguyen Tien Hiep (2004) Conservation Assessment and vegetative propagation of *Xanthocyparis vietnamensis* Farjon & Hiep in Hagiang. *Science and Technology Journal of Agriculture and Rural Development* 1 (37) 116-119 [In Vietnamese; English abstract] (App. XIX)

* Hiep, N.T., Loc, P.K., Luu, N.D.T, Thomas, P., Farjon, A., Averyanov, L., Regalado, J., Matthews, P. & Oldfield, S. & (in prep – due December 2004) Vietnam Conifers: Conservation Status Review. 2004. FFI Vietnam. Hanoi. (App. XXVI)

Authors of this report represent the following institutions: Institute of Ecology and Biological Resources (Hiep), Hanoi National University (Loc), Komarov Institute, St Petersburg (Averyanov), Missouri Botanic Garden – Vietnam Botanical Exploration and Conservation Programme (Regalado), RBGE (Thomas), CFSC (Luu), FFI – Vietnam (Swan), IUCN Conifer Specialist Group – RBG Kew (Farjon), IUCN Temperate Trees Specialist Group/FFI (Oldfield) and Global Trees Campaign (Matthews). The report is due to be published in December 2004 and will be available on the internet. It is based on the conifer manual produced by this project - the Darwin Initiative is credited as a sponsor.

2a. Other publications

* Dick, J. (2002) Thirty years of vegetative propagation research on tropical trees in Scotland.

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Newsletter *European Tropical Forestry Research Network* (ETFRN) [available from <http://www.etfrn.org/etfrn/newsletter/news34/index.html>] (App. XXVII) on CD

* Luu, NDT & Thomas, P. (2002) Conifer Conservation in Vietnam – an overview. *Fitzroya*. 1(5) 2-3 (App. XXVIII)

* Luu, NDT & Thomas, P. (2002) Utilisation and Conservation of *Xanthocyparis vietnamensis*. . *Fitzroya*. 1(5) 2 (App. XXVIII)

* Luu, NDT Thomas, P. Dick, JMcP 2003 Preservation, restoration and utilisation of Vietnamses montain forests ETFRN NEWS 38: Mountain Forests 36-37 [available from <http://www.etfrn.org/etfrn/newsletter/pdf/etfrnnews38.pdf>] (App. XXVII)_on CD

3. Unpublished Reports

An Van Bay. 2003 Report on Forest- based incense in Cao Bang. Commissioned 8 June. 2003 for EU project, Cao Bang –Bac Can Rural Development Project ALA/97/17 and Darwin Initiative Project 162/10/017, Preservation, rehabilitation and utilisation of Vietnamese montane forests 39 pp (App. XII)

*Thomas, P. and Nguyen Duc To Luu 2004. *Current Status of Taxus species in Vietnam*. Unpublished report prepared in response to a request from the IUCN/SSC Wildlife Trade Programme. (App. X)

Thomas, P., Gardner, M.F. and Nguyen Duc To Luu 2002. *Threatened conifers of the Dalat Plateau*. Unpublished report for the Darwin Initiative Project 162/10/017 Preservation, Rehabilitation and Utilisation of Vietnamese Montane Forests. RBGE

Thomas, P., Gardner, M.F. and Nguyen Duc To Luu 2003. *Threatened conifers in northern Vietnam*. Unpublished report for the Darwin Initiative Project 162/10/017 'Preservation, Rehabilitation and Utilisation of Vietnamese Montane Forests. RBGE

*Thomas, P., Luu, N.D.T. & Nghia, N.H. (2004) *Glyptostrobus pensilis* (Staunton) K. Koch in Vietnam: a conservation assessment for the IUCN Conifer Specialist Group (App. IX)

Thomas, P. & Luu, N.D.T. (2004) *Cupressus* in north eastern Vietnam. A report for Darwin Initiative Project 162/10/017 'Preservation, Rehabilitation and Utilisation of Vietnamese Montane Forests
Two Annual, 3 half year and one final report for the Darwin Initiative also produced.

4. Specialist Assessments for IUCN Conifer Specialist Group

Abies delavayi Franchet subsp. *fansipanensis* (Q. P Xiang) Rushforth
Amentotaxus hatuyenensis N. T. Hiep [T. H. Nguyen
Amentotaxus poilanei (Ferré et Rouane) D. K. Ferguson
Glyptostrobus pensilis (Staunton) K. Koch

Thomas, P. & Nguyen Duc To Luu 2004: Conservation status of Vietnamese conifers: a report for the IUCN Conifer Specialillist Group 47pp. (App. XI)

5. Conferences and Conference Papers

Dick, J. (2002) Preservation, Rehabilitation and Utilisation of Vietnamese Montane Forests; presentation to the University of Edinburgh Ecological Society

Gardner, M.F. & Thomas, P. (2002) Preservation, Rehabilitation and Utilisation of Vietnamese Montane Forests; National Workshop on Conservation of Forest Genetic Resources, 8 November 2002, Sun City Hotel, Hanoi (*in prep*) (App. XX)

26-28th February 2004 Final Project Workshop (Hanoi) – various formal presentations of key aspects of project work from all project members. (Available on CD) Delegates included senior Ministry Officials, senior staff from Forest Inventory and Planning Institute, Forest Science Institute, Institute of Biological and Environmental Resources, Missouri Botanic Gardens, FFI. (App. XV)

6. Consultancy Reports from Centre for Ecology and Hydrology

Dick, J (2002) Preservation, rehabilitation and utilization of the Vietnamese Montane forests Consultancy Visit Report for RBG, Edinburgh: 8-28 January 2002 27pp CEH Project C01741. (App. XVII)

Dick, J (2002) Preservation, rehabilitation and utilization of the Vietnamese Montane forests Consultancy Visit Report for RBG, Edinburgh: 27-30 Oct 2002 23pp CEH Project C01741.

Dick, J (2003) Preservation, rehabilitation and utilization of the Vietnamese Montane forests Consultancy Visit Report for RBG, Edinburgh: 16 February – 1 March 2003 CEH Project C01741 (App.XVIII)

Ingleby, K. (2002). Preservation, rehabilitation and utilisation of Vietnamese montane forests. Visit to Vietnam, 7-21 September 2002. Consultancy report for RBG, Edinburgh. 11pp. CEH Project C01741 (App. XVI)

Ingleby, K. (2003). Preservation, rehabilitation and utilisation of vietnamese montane forests Consultancy Visit Report for RBG, Edinburgh 7-21 june 2003 9pp CEH Project C01741.

Mason, P.A. (2001). Preservation, rehabilitation and utilisation of Vietnamese montane forests. Visit to Vietnam, 23 August – 13 September 2001. Consultancy report for RBG, Edinburgh. 10pp CEH Project C01741.

7. Training Reports

* Luu, N.D.T. & Thanh, V.X. (2002) Preservation, rehabilitation and utilisation of Vietnamese montane forests. Visit to UK, 22 April – 20 May 2002. Training report for RBG, Edinburgh. (App. XIII)

* Thanh, V.X. (2003). Preservation, rehabilitation and utilisation of Vietnamese montane forests. Visit to UK, 4 March - 2 April 2003. Training report for RBG, Edinburgh. 10pp. (App. XIV)

* Luu, N.D.T. (2004) Overall report for the Central Forest Seed Company: Preservation, restoration and utilisation of Vietnam montane forests. Hanoi. 6pp.

* Luu, N.D.T, Tuan, H.A. & Qui, N.N. (2004) Field report: Visit to Ky Son - Nghe An: March/April 2004 Training report for RBG, Edinburgh. 7pp. (App. XXII)

Nguyen Duc Canh, Nguyen Van Thang, Nguyen Duc To Luu & Jan Dick (2003). Propagation protocols for threatened Vietnamese conifers. Report for Preservation, rehabilitation and utilisation of Vietnamese montane forests. Hanoi. 10pp

Appendix IV: Darwin Contacts

To assist us with future evaluation work and feedback on your report, please provide contact details below.

Project Title	Preservation, rehabilitation and utilization of the Vietnamese Montane forests
Ref. No.	162/10/017
UK Leader Details	
Name	Martin Gardner
Role within Darwin Project	UK Project Leader
Address	c/o Royal Botanic Garden Edinburgh
Phone	44 131 248 2963
Fax	44 131 248 2901
Email	M.Gardner@rbge.org.uk
Other UK Contact (if relevant)	
Name	Philip Thomas
Role within Darwin Project	UK co-ordinator; gymnosperm specialist
Address	c/o Royal Botanic Garden Edinburgh
Phone	44 131 248 2878
Fax	44 131 248 2901
Email	P.Thomas@rbge.org.uk
Partner 1	
Name	Jan McPherson-Dick ¹ , Kevin Ingleby ² , Philip Mason ² (retired)
Organisation	Center for Ecology and Hydrology
Role within Darwin Project	Propagation ¹ and Mycorrhizal ² consultants
Address	Bush Estate, Penicuik, EH 26 0QB
Fax	
Email	jand@ceh.ac.uk; ki@ceh.ac.uk
Partner 2 (if relevant)	
Name	Nguyen Duong Tai (deceased), Nguyen Duc To Luu
Organisation	Central Forest Seed Company
Role within Darwin Project	Vietnam Project Leader (2001-2003) Vietnam project coordinator
Address	62 Cau Diem, Tu Liem, Hanoi
Fax	
Email	ndtluu@fpt.vn

Appendix XXIV
REVISED LOGICAL FRAMEWORK March 04

Project Summary	Measurable indicators	Means of Verification	Assumptions
Goal:			
To work with local partners in countries rich in biodiversity but poor in resources to achieve the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.			
Purpose:			
To provide Vietnamese researchers and field staff with knowledge and skills to enable them to undertake the sustainable management of the remaining montane forests through an integrated programme of training in theoretical and practical aspects of biodiversity assessment and utilisation focussing on conifers and mycorrhizae	Conifers, mycorrhizae, and propagation manuals published by Year 3 Conservation status reports for conifers completed by Year 3 Evidence of sustainable utilisation of threatened species from/within montane forests	Manuals on conifers, mycorrhizae, and propagation techniques produced jointly Reports on conservation status of conifers produced jointly Field plots established for selected species	Government policies and programmes remain supportive of sustainable utilisation Access to montane areas will be possible; Suitable climatic conditions for general plant growth and production of appropriate material e.g. Fruitbodies formed by mycorrhizal fungi during life of project
Outputs:			
Sustainable management of remaining montane forests improved	Up to twenty seven Vietnamese scientists, foresters, nurserymen trained in and able to display the knowledge and skills necessary to rehabilitate and sustainably manage the threatened conifer component of the montane forests of Viet Nam	Contribution by Vietnamese staff to manuals, scientific papers, unpublished reports Participation by Vietnamese staff in workshops and presentation by those staff in final workshop.	Trained staff remain in relevant institutions and positions to use the skills and knowledge provided.
Utilisation programme for selected species developed; joint applications for commercialisation for NTFP (e.g. Taxol, incense, edible mushrooms,) submitted	Suitable species identified, surveyed and reports produced; propagation problems solved; protocols available	Field plots with targeted species, established; market surveys produced; copies of surveys and applications available	Propagation problems overcome; NTFPs will be commercially desirable
Manuals (3) Scientific papers (2), reports on conservation status	Manual and papers peer reviewed; Publishers and publication date, print run established; distributed by yr 3	Copies of all publications and recordings sent to Darwin Initiative Relevant publications/reports sent to IUCN and to project participants and other organisations	

Activities	Activity Milestones (Summary of Project Implementation Timetable)
Workshops/ Seminars	<p>Yr 1: Project planning visit and workshops/field training for mycology and conifers (Aug-Oct 2001). Dalat mushroom herbarium established. Propagation workshop to identify main problems, establish priorities, and training programme (Jan 2002)</p> <p>Yr 2: Northern Vietnam: Workshops/field training for mycology and conifers (June-Nov 2002); Dalat mushroom herbarium enhanced. Propagation workshop to initiate identify main problems in northern Vietnam; initiate research work with selected species; review Y1 work, establish priorities, and training programme (Jan 2003)</p> <p>Yr 3: Northern and southern Vietnam Final workshops/field training for mycology and conifers (Aug-Nov 2003); Dalat mushroom herbarium enhanced; Final seminar (Feb-March 2004)</p>
UK Training	<p>April-May 2002 - 2 Vietnamese trainees to UK for 1 month training in conifer taxonomy and conservation and mycology taxonomy and culturing</p> <p>April-May 2003 - 2 Vietnamese trainees to UK for 1 month for further training in conifer and mycology work and for manual preparation</p>
Field research programme	<p>Y1 Y2 and Y3 - conifer surveys in 4 main areas undertaken; data for conservation assessment collated, specimens collected, herbaria enhanced. New populations for ex-situ work /utilisation identified. Integrated in-situ/ex-situ programmes for conservation of priority species established.</p> <p>Y1 Y2 and Y3 - mycology surveys in 4 main areas undertaken; data for edible mushrooms collated, specimens collected and Dalat herbarium established and enhanced annually</p> <p>Y1 Y2 and Y3 - propagation - experiments with new taxa and new methodologies undertaken; information from conifer surveys integrated; field plots established.</p>
Manual development (conifer, mycology and propagation)	<p>Y1 Information from surveys, workshops from southern Vietnam collated in reports. Y2 and Y3 Information from surveys, workshops from northern Vietnam collated in reports. Draft versions by December 2003, published for Final seminar Feb-March 2004.</p>
Dissemination	<p>Manuals distributed to all project participants; manuals available on internet by May 2004. Scientific papers (2) published by May 04 depending on research results. Report for IUCN produced (May 04) Project information in newspapers/journals</p>