

# DARWIN INITIATIVE FOR THE SURVIVAL OF SPECIES : APPLICATION FOR GRANT FOR ROUND 9 COMPETITION

Please read the accompanying Guidance Note before completing this form. Give a full answer to each section; applications will be considered on the basis of information submitted on this form. Applicants are asked not to use the form supplied to cross refer to information in separate documents except where this is invited on the form. The space provided indicates the level of detail required but you may provide additional information on a separate sheet if necessary. Copies of this form are available on disk or by e-mail on request. You are asked also to complete the summary sheet attached at the end of this form. Although you may reproduce this sheet in a reasonable font, you should not expand it beyond an A4 sheet (leaving the allocated space for DETR comments to be made) as additional information will not be taken into account.

## 1. Name and address of organisation

Seed Science Laboratory, Department of Agriculture, The University of Reading, PO Box 236, Earley Gate, Reading RG6 6AT

## 2. Principals in project

Details	Project leader	Other UK personnel (if working more than 50% on project)	Main project partner or co-ordinator in host country
Surname	ELLIS	HONG	TUYEN
Forename(s)	RICHARD HAROLD	TRAN-DANG	BUI CACH
Post held	Head, Dept of Agriculture; Professor of Crop Physiology; Director, Seed Sci. Lab.	Scientific Officer	Rector
Institution (if different to the above)			University of Agriculture and Forestry, HoChiMinh City, Vietnam
Department			
Telephone			
Fax			
Email			

Please provide a one page CV for each of these named individuals.

## 3. Project title (not exceeding 10 words)

TRAINING OF VIETNAMESE SCIENTISTS IN TREE SEED SCIENCE AND TECHNOLOGY

## 4. Abstract of study (in no more than 750 characters)

SEEDS ARE VITAL FOR NATURAL FOREST CONSERVATION & REGENERATION. A TWO YEAR PROJECT (1 APRIL 2001 - 31 MARCH 2003) WILL DEVELOP VIETNAMESE STAFF'S UNDERSTANDING AND SKILL IN TREE SEED ECOLOGY/PHYSIOLOGY FOR BIODIVERSITY CONSERVATION. TWENTY FIVE VIETNAMESE SCIENTISTS SELECTED FROM FOUR UNIVERSITIES AND FOUR RESEARCH INSTITUTES WILL BE TRAINED IN VIETNAM FOR TWO WEEKS IN MAY 2001. FOUR SCIENTISTS SELECTED FROM THOSE TRAINEES WILL BE TRAINED FURTHER AT THE SEED SCIENCE LABORATORY, READING, IN TREE SEED SCIENCE FOR FOUR MONTHS (JULY - NOVEMBER 2001). ON RETURN HOME, THESE TRAINEES WILL SET UP (I) A NEW SEED SCIENCE COURSE IN THEIR UNIVERSITY FOR UNDERGRADUATES AND POSTGRADUATES, AND (II) A SEED RESEARCH LABORATORY. THE LABORATORY AT READING WILL CONTINUE THE COLLABORATION TO SOLVE PRACTICAL PROBLEMS IN BIODIVERSITY CONSERVATION IN THE REGION.

5. Timing. Give the proposed starting date and duration of the project.

01 APRIL 2001, TWO YEARS TO 31 MARCH 2003

6. Describe briefly the aims, activities and achievements of your organisation. (Please note that this should describe your unit, institute or department within a university.)

**Aims:** The Seed Science Laboratory (SSL), in the Department of Agriculture, was established in 1969 to pursue excellence in university teaching and research in applied seed science. Very recently the Centre for Agri-Environmental Research (CAER) has been established in the Department of Agriculture under the Directorship of Professor Valerie K. Brown. CAER is working closely with the SSL to increase the environmental focus of the Department, with a section dedicated to the conservation of biodiversity.

**Activities:** The SSL is concerned with three main topics: (i) *Ex situ* biodiversity conservation, especially seed storage and problems associated with long-term storage in genebanks; (ii) Seed development, physiological quality of seeds and its effects on establishment, growth and yield; and (iii) Seed dormancy, factors affecting its release and their implications for field establishment, tree nurseries, weed control, seed ecology and habitat regeneration and maintenance. Seed physiology research expertise covers all species, not only crop species, with recent emphasis on trees, shrubs and herbs of endemic flora at risk from genetic erosion. The SSL has had an international outlook from its inception, with over half the research students trained from outside the EU. Plant genetic resources conservation research and training has been a consistent theme of the Laboratory since 1972. Research on forest tree seeds of temperate and tropical species from four continents (Africa, America, Asia and Europe) for biodiversity conservation began in the mid-1980s. Research is disseminated via publications in refereed international scientific journals and in other media aimed directly at practising conservationists.

**Achievements**

- (1) Ultra-dry seed storage Following innovative research begun in the mid-late 1980s, a ten-year international collaborative development programme with genebanks in Europe (co-ordinated by the SSL) has shown that this low technology (environmentally benign) and inexpensive approach to *ex situ* plant biodiversity conservation is safe and reliable.
- (2) Seed collection Research on seed quality development in crop species has been extended to the problems facing collectors of other species. In particular, simple practical methods for post-harvest seed treatments have been developed, and now tested successfully in Europe and South America, to ensure that maximum viability and longevity are obtained from tree seeds collected while immature (a common problem with collections from forest regions).
- (3) Anhydrous biology of other plant propagules We have recently shown that our mathematical model of the response of seed survival to air-dry environment applies also in pollen and in fungal spores. This knowledge has the potential to enhance *ex situ* biodiversity conservation by long-term storage of these propagules.
- (4) International outreach via CGIAR Since 1974, the Directors of the SSL have developed for the International Board for Plant Genetic Resources (IBPGR, presently IPGRI) and FAO Commission on Plant Genetic Resources most of the protocols for the design and management of long-term seed stores which are now applied in more than 300 centres world-wide. Six handbooks and technical bulletins of seed technology for plant genetic resources conservation were written for publication by IPGRI (see Dr Hong's CV).
- (5) Training courses overseas provided to Chile, China, Mexico and Brazil.

7. Has your organisation received funding under the Initiative before? If so, please give details.

No, although Professor Valerie K. Brown who joined the Department recently has been involved in 3 D.I. projects.

8. Which overseas institutions, if any, will be involved in the project? Please explain the responsibilities of these institutions.

The lead institution is the University of Agriculture and Forestry of Ho Chi Minh City (UAF), Vietnam. The Rector, Dr Bui Cach Tuyen, who is also the Director of the Environmental Protection Centre there, has overall authority for the programme (see letter dated 11 October 2000). Dr Le Quang Hung, Vice Dean of the Faculty of Agronomy, who is presently attached to the SSL at Reading for one year (01 February 2000 to 31 January 2001, funded by The Royal Society), will be the principal collaborator in Vietnam. That institution will select the trainees, and coordinate the programme within Vietnam, provide local facilities for the training course, and develop the research programme.

## PROJECT DETAILS

9. Define the purpose (main objective) of the project in line with the logical framework.

Knowledge of tree seed ecology and physiology is pivotal to the regeneration of tree species after selective logging, whether in the natural environment or in nurseries. For many species, seed dynamics / ecology / physiology are unknown. Moreover, they are not appreciated locally throughout most of SE Asia.

The overall objective of the project is to train Vietnamese scientists, who by their past training are principally agriculturalists and foresters - and who have been isolated internationally for the past 25 years or more, in Tree Seed Science for *Ex situ* and *In Situ* Biodiversity Conservation. The specific objectives are as follows:

1. To train a cadre of Vietnamese scientists in Tree Seed Science for *Ex situ* and *In Situ* Biodiversity Conservation to a sufficient level of practical competence and scientific understanding in order that they can themselves train future generations of conservationists. Thus the University of Agriculture and Forestry of Ho Chi Minh City (UAF) will become self sufficient in this regard by the end of the Darwin project.
2. To help Vietnamese scientists to carry out research on tree seeds, particularly to determine (a) successful seed collection strategies, (b) successful dormancy-breaking treatments for the promotion of seed germination, and (c) suitable methods of seed storage for short-, medium- and long-term periods for several forest tree species endemic to Vietnam in order to develop the practical competence and confidence of the UAF staff in research applied to solve problems in seed science for biodiversity conservation.

10. Is this a new project or the continuation of an existing one?

This is an entirely new project beginning from a negligible knowledge base of these topics in Vietnam. In advance of the project, however, Royal Society funding is being used to develop key skills in the Vietnamese project leader.

11. What is the evidence for a demand or need for the work? How is the project related to conservation priorities in the host country(ies)? How would the project assist the host country with its obligations under the Biodiversity Convention?

How was the work identified?

Dr Hong has a lifetime of links with Vietnam. The project evolved from an initial visit to Vietnam in 1996 by Dr Hong (funded by The University of Reading) to assess training needs, subsequent visits to provide seminars on Seed Science at the UAF, subsequent correspondence, and visits by several UAF staff to Reading. The SSL at Reading is providing training to Dr Le Quang Hung of the UAF for one year (funded by The Royal Society). In 1943, Vietnam had about 20 million hectares of forest, covering 44% of the country but this was reduced to 23% by 1983. Decades of war, intensive exploitation, fire, and conversion to agriculture have now destroyed two thirds of Vietnam's natural forests. The actual total area of good quality forest is about 7 million hectares (1994), and a total of 13 million hectares (or 40% of the country) is currently classed as bare land (World Conservation Monitoring Centre, 1994, <http://www.wcmc.org.uk/infoserv/country/vietnam>).

How is the project related to conservation priorities in the host country?

Vietnam is engaged in a struggle to restore forest: there is also a programme of protection from degradation for the remaining 7 million hectares of existing forests, and reforestation of 5 million hectares on marginal land (Degree CT-327, 1992) in order to make full use of wood and other agro-forestry products (Decisions 525-TTg, 1993 and 164-TTg, 1995). Vietnam has established a new ambitious forest planting project aimed at raising the forest cover to 40% by 2010. The results of the reforestation programme for the past ten years in Vietnam are, however, mostly disappointing. The current plantation strategy has led to cutting and burning of naturally regenerating areas in order to plant fast-growing exotic timber species. These are not suited to biodiversity conservation and habitat protection and in any case are not well-adapted locally. The Vietnamese authority is now attempting to re-green the country with local species. However, the seeds of most indigenous species used for reforestation germinate poorly because of lack of knowledge in tree seed physiology (in the areas of regeneration, seed collection, storage behaviour, storage practices, dormancy, and germination).

How will the project assist the host country meet its obligations under the Biodiversity Convention?

In order to implement the national policy, improved nursery and plantation techniques are required, especially in seed collection, processing, storage and germination in order to ensure that the open areas are planted to indigenous (rather than exotic) species. The Darwin project will provide a cadre of trained staff to implement this policy.

This proposal is compatible with the national strategy and the legal instruments. Vietnam is a member of the United Mekong Commission (Man and Biosphere Programme), Ramsar convention on wetlands, IUCN (World Conservation Union), Earth Summit in Rio de Janeiro in 1992 and Vietnam signed the Convention on Biological Diversity in 1992.

See <http://www.wcmc.org.uk/infoserv/country/vietnam/>

for information on Vietnam's policy, legal instruments on biodiversity conservation and reforestation programmes.

12 In what ways can this project be considered a Darwin project? How does the project relate to the Darwin principles? How would the project be advertised as a Darwin project and in what ways would the Darwin name and logo be used?

In a recent assessment, Vietnam was rated as the 16<sup>th</sup> most biologically diverse country in the world with about 12,000 species of higher plants of which only 7,000 have been identified, and about 5,000 are endemic and found only in Vietnam (WCMC, 1994). In that survey 1, 7, 25 and 316 among 983 plant species were reported to be extinct, endangered, vulnerable to extinction or rare species, respectively (WCMC, 1994). An end to both degradation of natural forests and introduction of exotic species is therefore central to Darwin Project objectives. Despite the importance of providing good planting materials of indigenous tree species, at present there is no institution or proper seed laboratory in Vietnam to deal with training and research on seed germination, dormancy and storage. Seed science has not been taught in any university in Vietnam. No publications in Vietnamese, French or English carried out by Vietnamese nationals in their own country on these topics have been found. This project will therefore draw on UK expertise in seed science for *ex situ* plant biodiversity conservation to train Vietnamese nationals not only in the basic science, but also through collaboration to the particular application (i.e. in support of *in situ* and *ex situ* conservation programmes in forest regions). The project will act as a catalyst to strengthen the skills base of the staff of UAF, who will then themselves train subsequent generations of conservationists. This staff and the training materials provided, will therefore provide a lasting impact and will thus support practically the implementation of the Biodiversity Convention of 1992 by Vietnam. That implementation will be sustainable: the output of wood and other forest materials from regenerated forest will help to eliminate poverty in the poorest of the 58 million Vietnamese who live in the rural environment, as justified by the Decisions of 525-TTg (1993) and 164-TTg (1995) of the Government of Vietnam. The training courses will be advertised as Darwin Courses, and all teaching materials will bear the Darwin name and logo. Students will be provided with a certificate of attendance and feed back invited. Local and national media coverage is guaranteed and the lead scientists will commit to publicizing the Darwin Initiative more widely. The work will be innovative because an infrastructure of knowledge and experience will be developed locally from a base that is currently inadequate to deliver Government (and Convention) objectives. The project will feed into real action in Vietnam by plugging the knowledge gap between stated national priorities for conservation and sustainable development and an eager but inexperienced (in this particular subject area) team of scientists, trainers and practical foresters.

13. Set out the proposed timetable for the work, including the programme's measurable outputs using the attached list of output measures.

#### **Year 1**

##### **Time table:**

April 2001: Prepare teaching materials (using power point and hand outs) (Dr Hong).

May 2001: Deliver a two-week training course to 25 Vietnamese scientists at the UAF, Vietnam (Dr Hong + 25).

July, August, September, October 2001: Train four selected Vietnamese scientists at the Seed Science Laboratory, The University of Reading for 4 months (Professor Ellis and Dr Hong + 4).

From November 2001 to 31 March 2002: Tree seed research begins after the four trainees return home with the assistance of Dr Hong (via e-mail and two visits on November (in order to help to design experiments) and February 2002 (in order to assist to collect seeds and begin experiments). Supplementary research with more sophisticated instruments and equipment carried out at the SSL, Reading, by Dr Hong.

##### **Measurable outputs:**

at UAF: 4B= 2 weeks; 4C= 25 persons; 4D= 50 person weeks; 8= 8 person weeks; 10= 1 manual; 15A= 2; 17A= 1

at SSL, Reading: 4B= 16 weeks; 4C= 4 persons; 4D= 64 person weeks

#### **Year 2**

##### **Time table**

Continuation of tree seed research in Vietnam and at SSL, Reading.

June 2002: Dr Hong and Professor Ellis visit Vietnam in order to monitor research and advice.

December 2002: Dr Hong visits Vietnam in order to help, analyse the results and prepare for publication.

**Measurable outputs:** 8= 10 person weeks; 15A= 2; 17A= 1; 20= £2,000

14. Do you know of any other individual/organisation carrying out similar work? Give the details of the work, explaining the similarities and differences.

SAREC-Sida and SKOG-FORSK (Sweden), CSIRO, ACIAR and AusAid (Australia), DANIDA (Denmark), Oji Forestry Institute (Japan), IPGRI have been engaged in cooperative research programmes with the Research Centre for Forest Tree Improvement (RCFTI) of Vietnam at Hanoi in selection, hybridization, vegetative propagation, seed orchard establishment, seed storage and *in situ* conservation of forest genetic resources, but no organization provides training in appropriate seed research. DANIDA has begun several storage experiments of forest tree seeds in collaboration with RCFTI of Vietnam. Although their research protocol was based on the IPGRI Technical Bulletin prepared by SSL, The University of Reading (*A protocol to determine seed storage behaviour* edited by T.D. Hong and R.H. Ellis, 1996) their results to date appear to be misleading because of a lack of basic knowledge of seed storage physiology. Adequate training of Vietnamese scientists with basic, sound knowledge of tree seed physiology is therefore urgently required. We will teach and train university lecturers and forest researchers to a sufficient level of practical competence and scientific understanding in order that they can themselves research efficiently and appropriately and train future generations of conservationists. This training in techniques is vital.

15. Will the project include training and development? Please indicate how many trainees will be involved, from which countries and what will be the criteria for selection. How will you measure the effectiveness of the training and will those trained then be able to train others? Where appropriate give the length of any training course.

This proposal is built around training, and especially training the trainers. In Year 1, 25 trainees selected from four Universities (UAF of HoChiMinh City (HCMC), University of Natural Science of HCMC, University of Hue and University of Can Tho) and several research institutions (e.g. Research institute of Forestry of HCMC, National Research Institute of Fruit Tree at Long Dinh, Research Institute of Industrial Trees of HCMC) will attend a two-week course organized at the UAF. Of the 25 participants, 15 will be from HCMC, two from University of Hue (about 900 km from HCMC), two from University of Cantho (180 km from HCMC) and six from several research institutes situated outside HCMC within 100 km. On the completion of the course, four people selected (two from UAF (for the Department of Sylviculture Plantation and Urban Forestry and Department of Fruit Tree and Horticulture), one from Forestry institutes of HCMC and one from the University of Natural Sciences of HCMC) from that cohort will each receive four months' practical laboratory training at The University of Reading. These four Vietnamese scientists, together with Dr Le Quang Hung, Vice Dean of the Faculty of Agronomy and Head of the Department of Industrial Crops of the UAF, who will complete in February 2001 his one-year attachment at the SSL at Reading, will be the core lecturers and researchers in Seed Science for their universities/institutes. A seed science laboratory will be established at the UAF after their return home, and a new Seed Science course (undergraduate and MSc, PhD) will be introduced in the University prospectus.

Training course participants will be selected by the UAF.

16. How will trainee outcomes/destinations be monitored after the end of the training?

Since all trainees are selected from in-post academic or research staff from the selected universities/research institutes, trainee destinations will be known at the beginning of each course at the UAF Vietnam and SSL at Reading. The selection will be biased towards those already committed to seed-related technology in order to ensure that after the training they continue their careers in seed science, biodiversity conservation, and habitat restoration. The courses should avoid attrition of staff in this important area of biodiversity conservation.

17. How is the work of the project expected to continue after the end of grant period? A clear exit strategy must be included.

Dr Le Quang Hung, Vice Dean of The Faculty of Agronomy of the UAF, presently attached to SSL at Reading, is committed to seed science research when he returns home. Several manuscripts (in Vietnamese and English) are being prepared for publication already. A Seed Science Laboratory will be established at the UAF, and seed science and technology will be included in the prospectus of the UAF. He, together with the two further staff members of the UAF to be trained at the SSL at Reading under the Darwin Project, will be the key lecturers and researchers in seed science and technology in the UAF. After this two-year programme, UAF would be able to contribute effectively and fully to the IPGRI/DANIDA international networked research programme (see below).

## MONITORING AND EVALUATION

18. Describe how progress on the project would be monitored and evaluated in terms of achieving its aims and objectives, both during the lifetime of the project and at its conclusion. How would you ensure that it achieves value for money? What arrangements will be made for disseminating results? If applicable, how would you seek the views of clients/customers?

Training course participants will be required to assess the training they have received: evaluation questionnaires will be completed by participants at regular intervals. Overall monitoring of the progress and guidance to the direction of the project will be provided by Professor R.H. Ellis, Director of the SSL and Head of the Department of Agriculture of The University of Reading and Dr Bui Cach Tuyen, Rector of the UAF. Both have extensive experience of Quality Assurance procedures. Progress will be reviewed: at the end of the training course at the UAF and at the end of the UK training period. The interim results of the research begun during the Darwin project (at the SSL during the training, and at UAF after the training) will be fed into the IPGRI/DANIDA programme of Newsletters, and the participants of that programme will therefore evaluate the research. Value for money will be achieved by maintaining a tight focus on the overall objective of regaining natural forest cover. Principal dissemination will be by widespread use of local media and the “seeding” of the relevant institutions with trained, well-motivated staff. Dissemination through SE Asia will be through refereed journal publications (and the rigour that entails) and through the ASEAN and IPGRI networks.

19. Logical framework. Please enter the details of your project onto the matrix using the note at Annex B of the Guidance Note.

Project summary	Measurable indicators	Means of verification	Important assumptions
<p>Goal: To assist Vietnam with the conservation of biological diversity and implementation of the Biodiversity Convention.</p>	<p>(i) Increase in forest cover to 40% by 2010, by enhancement and recruitment of endemic and economically important species. (ii) Avoidance of further planting of exotic species.</p>	<p>National Statistics on Land Use. The Forest Inventory and Planning Institute of Vietnam monitors annually the situation of forests using satellite imagery collected from over 5,000 grid points at 8km intervals.</p>	<p>Financial support towards Legal Agreements [Decisions 525-TTg (1993) and 164-TTg (1995)] maintained by Government.</p>
<p>Purpose To train and support Vietnamese scientists in tree seed science and technology for biodiversity conservation to a level of practical competence and scientific understanding in order that they can themselves train future generations of conservationists and determine how to solve practical problems in biodiversity conservation.</p>	<p>Number of seeds of indigenous species collected each year, number of seedlings produced and transplanted, areas of forest regenerated “naturally” each year.</p>	<p>UAF and institute records and annual reports.</p>	<p>(i) Financial support to UAF by the Vietnamese Ministry of Education and Training, MOET, maintained. (ii) Expertise from SSL, The University of Reading</p>
<p>Outputs: (i) 25 Vietnamese scientists trained in Vietnam, and four scientists at the SSL at Reading. (ii) Seed science taught at the UAF (iii) Publications (iv) New technology applied in seed collection, handling and storage. (v) Effective methods of promoting seed germination in nursery sowings developed.</p>	<p>(i) Basic knowledge in Tree Seed Physiology tested for each trainee before and at the end of the training at UAF. (ii) Seed science laboratory established at UAF. (iii) Seed science taught at UAF. (iv) Number and range of publications</p>	<p>(i) Test results. (ii) Number of publications (in English and Vietnamese). (iii) Contents of publications (in English and Vietnamese with acknowledgement to the Darwin Project)</p>	<p>The continuation of the in-post trainees in teaching/research/forestry in tree seed science and technology.</p>
<p>Activities The two-week training course given in Vietnam by Dr Hong to 25 scientists selected from several universities/research institutes. Further training in tree seed research at the SSL Reading to four key researchers. Subsequent support from Dr Hong and Professor Ellis via the four key researchers to the National Programme in Vietnam.</p>	<p>Funding by the Darwin Initiative (£69,362), financial support from The University of Reading towards Professor Ellis’s salary, 58.4% and 75% of Dr Hong’s salary for 2001 and 2002, respectively, and the UAF (up to £3,000) to the Project are required.</p>	<p>Regular interim reports to Professor Ellis, Dr Tuyen and the Darwin Initiative.</p>	<p>Political and social stability in Vietnam and UK including support to HE in both countries.</p>