

Darwin Initiative Annual Report

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Project Title	Habitat restoration and sustainable management of southern Peruvian dry forest
Country(ies)	PERU
UK Contract Holder Institution	Royal Botanic Gardens Kew
UK Partner Institution(s)	
Host country Partner Institution(s)	Universidad Nacional la Agraria, La Molina Lima Peru Universidad San Luis Gonzaga de Ica Grupo Aves del Peru Asociación para la Niñez y su Ambiente Instituto Nacional de Recursos Naturales
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Project Leader Name	William Milliken
Project website	www.huarango.org
Author(s), date	Oliver Q. Whaley, William Milliken. 30 April 2007.

1. Project Background

The project is located in the hyper-arid desert region of south-western Peru. The virtually rainless environment results in dry forest vegetation highly susceptible to degradation and desertification, with very infrequent natural regeneration. The region (Department of Ica) is home to over 600,000 people with few economic resources and a rapidly expanding agro-industry. These driving forces, in combination with lack of locally targeted environmental education, have had a devastating impact on native biodiversity.

Huarango (*Prosopis pallida*), originally the dominant tree species in the region, provides many food and forage products that potentially offer lucrative sustainable livelihoods. During the last 30 years there has been an estimated loss of 50,000 hectares of Huarango forest in the Ica region, with less than 1000 ha remaining (of which the majority is secondary forest). Huarango forest is an ecosystem on the edge of extinction; a situation reflected by its national classification as threatened, and the increasing levels of concern among the regional government for its conservation.

The remaining natural vegetation is characterised by several unusual, highly threatened ecotypes, all of which are now poorly represented. These include riparian oasis *Prosopis* dry forests, Andean outwash fan dry-forest, cactus-rich scrub *bajadas*, marginal *Prosopis* coppice dunes, ephemeral streams or wadis and coastal lomas. Within these small relic habitats a number of endemic species, across a range of taxa, are still extant.

The project is addressing these issues through a combined programme of applied activities including: developing and disseminating technology for habitat restoration to protect biodiversity and combat desertification; increasing understanding of dry forest ecosystem dynamics and biodiversity; evaluating the capacity for increased production of native forest products (*Prosopis* pod flour and syrup) as sustainable economic options for forest use; protecting biodiversity of remaining native forest relics by buffering with restored habitats; raising awareness of the importance of south coast dry forests and associated biodiversity, resource values, threats and management strategies; and supporting the establishment of protected areas in remaining fragments of native dry forest ecosystems

2. Project Partnerships

A strong working relationship has been established between Kew and **Universidad Agraria La Molina** that has benefited from the legacy of a previous Darwin project in which Kew was involved. An MOU has now been signed between Kew and the University in order to strengthen this relationship further and facilitate financial management. Four students are working on the project and receiving training and orientation. We have already provided a collection of 200 species for the La Molina herbarium, from an area that was previously poorly represented in the collection.

Our relationship with the **Universidad San Luis Gonzaga de Ica** has developed beyond our original expectations. As well as providing a site for the establishment of the project nursery, 9 UNICA students are now engaged in project research and training activities. Some of these students are also affiliated to **Grupos Aves del Peru** (GAP), which is helping to coordinate the project's expanding ornithological research programme. We are now working with GAP to develop the Concessions for Conservation and associated management plans.

INRENA (**Instituto Nacional de Recursos Naturales**) and CONAM (**Consejo Nacional de Medio Ambiente**) have both been subject to change following the installation of the new Peruvian government, in the process of which some of our established personal relationships were lost. However, we have continued to work closely with INRENA on our proposals for Concessions for Conservation (for one of which we have now received official notification), and maintain communication with the CBD focal points. INRENA's local office has been very supportive of the project and has provided students for study of insect infestation of *Prosopis*. On request from INRENA, the project provided a map of the remaining forest resources in the region. The new administration has taken on a radical restructuring of INRENA that may ultimately lead to the unification of CONAM and INRENA. This restructuring is focused on decentralisation, devolving power to local INRENA offices, and furthermore aims to amalgamate the organisation within regional government. Although subject to criticism, this is proving to be a very timely for the project, as finally the regional government has dedicated resources and a team to forest conservation. We have been invited to join the team and are advising the government on a range of issues (see below).

CONAM is also undergoing a reputedly debilitating restructuring that has seen management resignations. However, on a local level CONAM is now part of Comisión Ambiental Región – Ica (CAR) and has again been highly supportive, especially as the objectives of the project follow very closely the new regional objectives set out in *Estrategia de Gobernabilidad para la Gestión Ambiental en La Región Ica* Agenda Ambiental Regional 2007-2009. The project represents progress towards CBD objectives outlined from the CAR log table (no.3.1-6). These are: 1. *Evaluation of biological resources* – we are now providing the lists of flora, birds and reptiles and their habitats and conservation status/habitats; 2. *Recuperation of threatened species* – our habitat restoration areas include various threatened varieties whilst buffering several important habitats; 3. *Reforestation with native species* - we have propagated over 9000 plants for educational and community planting; 4. *Develop projects for regional products* – the project Huaranga product and honey provide an impetus for the festival; 5. *Sustainable management of water resources* – use of native plants will reduce water demand and evaporation; 6. *Establishment of Areas of Conservation* – the project is stimulating establishment of the only protected areas in the Ica region.

An MOU has been established with ANIA (**Asociación para la Niñez y su Ambiente**) that will facilitate a long term education legacy alongside site designation through their Tierra de Los Niños programme. This relationship is mutually beneficial - for example the project has encouraged ANIA to focus on

native reforestation towards conservation of threatened species (not previously a priority at ANIA), whilst their education experience provides capacity building for the project education team. ANIA has also provided free office space for the project in Lima, and is administering payments to local project staff.

The SPDA (**Sociedad Peruana de Derecho Ambiental**) has been very helpful in supporting the legal processes that have allowed us to progress more rapidly towards achievement of the project goals of conservation designation. The partnership with **DarwinNet** is now becoming fruitful through information dissemination on its web pages. **Samaca Products**, a small local organisation specialising in sustainable products, provided training and demonstrations of syrup and ice cream production and other plant uses at the recent Huarango Festival.

Other Collaborations:

We have established a good relationship with the **Instituto Nacional de Cultura (INC)** which, as well as hosting the Huarango Festival, has provided free auditorium space in which we have conducted two seminars and two musical events where Huarango seeds and plants were distributed. The project has initiated technical information exchange with **SER (Society for Ecological Restoration)**, based in the USA. Kew's Millennium Seed Bank staff provided contacts in Chile for the government-funded **Banco de Semillas Vicuña**, Arica, who plan to visit the project later in 2007.

Both **Climate Stewards** and **A Rocca UK** are now collaborating over their proposed reforestation project for carbon sequestration, which involves nursery building and reforestation through the Catholic Church. The Church is highly influential in Ica and provides a good focal point for disseminating native plants and demonstrating the importance of the ecosystem services that can be provided by reforestation of Church lands (see Annex 4).

The project has developed collaboration with the **British Museum, Cambridge University** and Peruvian researchers, aimed at facilitating biodiversity identification for a planned Nazca Culture exhibition at the British Museum, a higher resolution of historical ecology through bio-archaeology of riparian Oasis (Dr Beresford-Jones), and an ongoing study of Lomas vegetation (Dr Fanny Moutarde).

The project is completing an MOU with a large agro-industrial company based in Ica, **Fundo Chapi**. This MOU will facilitate development of a habitat restoration trial and tree nursery in 7 ha of their private land. This will be designated as an Área de Conservación Privado under the national network, and will provide the project with a site for detailed study of habitat restoration techniques under homogenous conditions. The MOU also outlines the use of the tree nursery to provide native plants for its 200-strong workforce and for use within the Fundo after project exit. This relationship is seen as a key step towards mainstreaming biodiversity in production landscapes in the region.

The project has begun statistical analysis of the first six months of restoration trials, facilitated by Ana Smyk, an exceptionally skilled analyst and communicator working for Hewlett Packard UK. Ana has been giving free advice on data input and data cleaning for analysis, demonstrating techniques for multivariate analysis that is allowing us to evaluate progress more effectively. Ana may be on holiday in Peru next year and has agreed to run a capacity building course for students in statistical analysis.

3. Project progress

3.1 Progress in carrying out project activities

Fieldwork and baseline research/ monitoring

The project began with baseline plant surveys and, since work started towards the latter half of the flowering season, the collecting continues. Training in plant collection and habitat survey was provided to the students during a visit to the project by Dr William Milliken in November 2006. The project has now collected, annotated and databased 800 specimens of over 200 species (previous inventories for the zone registered only 128 species). Specimens are sent to UNICA, MOL, Kew and US herbaria. This is the first detailed survey of the flora of the area, providing baseline plant diversity data for the restoration and sustainable use programme. We have databased over 1800 plant photographs, cross-referenced to collections, which provide phonological data as well as providing source material project outputs (manuals, posters, education tools, website etc.).

Highlights have included several new species from Lomas ecosystems and an extremely rare species of large tree in a disjunctive population (*Maytenus* aff. *octogona*). A *Capparis* species thought to be extinct from the region has been found. Several important south coast endemic species have been collected, such as *Tecoma fulva* subsp. *guarume* and *Philoglossa* sp. Over 50 grass species have been collected and published in a thesis (Octavio Pecho).

The bird group (Mario Tenorio, Evelyn Perez, Octavio Pecho UNICA students and Oscar Gonzalez GAP) have recorded 70 species from the sites. As the areas were in a state of severe degradation and desertification, this reflects the proximity of vegetation relics. In support of this work, a generous donation of 15 pairs of second-hand binoculars was secured for the local GAP group from RSPB. Octavio Pecho has completed a study that will be submitted with Oscar Gonzalez to *Cotinga* and the *Boletín de Lima*: the first ever study of the breeding cycle of the endemic and declining Black Necked woodpecker, with detailed photos within the nest. This bird is emblematic to the project region and its rapid decline can be attributed to forest loss.

In June we undertook extensive seed collection in order to begin propagation of 50 key species, especially focusing on the perennial and threatened species, successional annuals and *Prosopis* landraces. GAP students have now registered over 221 bird species for the region including 10 new records, with 70 species observed in the habitat restoration areas. The key endemics species for conservation measures are the Cactus canastero, Slender-billed finch, Black Necked woodpecker, Coaster miner and Thick-billed miner (see Annex 5). Together with the GAP biologists we have also registered four species of ants in *Prosopis* and eight species of lizards, publishing a poster of the four threatened lizard species found in one habitat restoration area (see Annex 6).

Monitoring of the established habitat restoration areas (see Annex 7) is undertaken monthly. This requires 10 days of fieldwork for seven UNICA students to monitor growth of 1800 plant in four sites. Each area has been mapped with a 5m grid. Plant recruitment is also noted within the grid squares, as are birds and ecological observations. Through training, the student botanical and bird groups are now capable of undertaking the monthly monitoring independently. All plant and bird data are collated on the office computer and backed up on disc and email servers.

Establishment and management of tree nursery

A large (30 x 9 m) native plant nursery is now fully established on the campus of the UNICA Agronomy Department. This has provided plants of 24 key native species for habitat restoration trial sites (1,800 plants), the education programme (1,200), community planting activities (900) and the Huarango Festival (2,600), as well as a further 2,000 for independent fundos. The nursery students (Felix, Julio, Danny, Andrea and Richard, supervised by Elisa Laura) have been conducting concurrent germination and propagation treatment and substrate trials with native species (see Annex 8).

In March 2007 the tree nursery experienced a setback when the campus well collapsed and water had to be purchased. This coincided with a break in direct supervision and personnel problems, as a result of which 5% of the plants died. A workshop was organised and the problem was resolved with one staff substitution and temporary financial assistance for the campus water supply. As we now are starting to build more nurseries, we are presently interviewing an experienced technical nursery supervisor to oversee these and encourage others to be built in schools.

We are now in the process of constructing three more on-site native plant nurseries (Fundo Chapi, Fundo Santa Cruz and Huarangal) for a number of pressing reasons that include: damage to seedlings through transport on very poor roads; wider dissemination and education. Half the plant nursery in Huarangal will house Cactaceae. This overgrazed and threatened ecotype also supports endemic plant rarities with excellent potential for fruit production and horticulture as well as high conservation value. Furthermore the cactus habitat supports two endemic Peruvian birds: cactus canastero and an unidentified subspecies of streaked tit-spinetail. As a result Sandra King, a Kew horticultural student who has won a scholarship to visit the project, will help establish a cactus nursery in the school in the Andean bajada village of Huarangal. She will also produce a small manual in Spanish on the propagation and economic potential of native Cactaceae, emphasising the importance of in situ conservation.

Habitat regeneration research & dissemination

In June and July 2006 seed collection from the relic vegetation was undertaken before the end of the season in order to have a sufficient and representative selection of perennial and annual plants for both our habitat restoration and education planting programme and events. During these collections we were able to complete the tree nursery ready for the ongoing germination and propagation trials. Training in seed collection and management was provided to project participants by Dr Tiziana Ulian from the Seed Conservation Department at Kew. The project has been given use of a seed laboratory, and although the lab is poorly equipped we have been able to record some essential seed extraction and processing data and now have a temporary seed bank of over 30,000 seeds from more than 50 species.

As of December 2006 we have established four habitat restoration trials in degraded and contrasting sites, for which we have agreements with the landowners and communities. These areas form the main sites for source data from which to derive effective habitat restoration techniques in a degraded declining habitat context. Monitored monthly by UNICA and GAP students, they are already showing some positive results. 2,000 plants in the four sites are dual-coded for seed provenance and individual denominator. Growth and ecological observations are noted; plant height, stem width, canopy area (formula for an oval), health (1-10), mortality and other observations.

The avian biodiversity, activity and numbers are recorded as indicators of ecological change whilst pollination and seed dispersal roles are taken into account for adaptive management (see Annex 9). Furthermore, reptile species and ants are monitored for ecological observations, as both groups are known to play key roles in arid land soil, seed and succession ecology.

One of the initial restoration sites (Fundo Chanca) is situated within an asparagus farm. The ephemeral stream habitat of Chanca is proving to be the key migration corridor and habitat for wildlife moving east-west between the Andes and the riparian habitats of the Rio Ica. A number of rare and endemic species of plants and birds as well as reptiles have been recorded in this habitat. The MOU with Fundo Chapi, the largest agro-industrial farm in the area, will provide seven hectares for 5,000 trees and shrubs. This area will provide an ideal location for rigorous comparative evaluation of habitat restoration techniques. Watering will be undertaken by workers from the farm, representing substantial added value for the project. The data from this homogeneous large area of protected land will complement the other four restoration sites, from which hard scientific comparative data are less easy to derive due to the heterogeneity of the conditions.

The management of both farms have shown a developing appreciation of the importance of native biodiversity and their capacity to understand biodiversity to align their production objectives under such agreements as SGS Eurep GAP. This is particularly significant as these are among the largest asparagus producers exporting to US and European markets. The large workforce (over 500) on the two farms is

allowing wider dissemination of project objectives, for which we are providing information leaflets and posters.

Local education and capacity building

The project has endeavoured to integrate education and capacity building into all aspects of the project. We have now set up an education programme in 8 schools (12 by the end of June). The large number of children in schools in Ica (over 50,000) means we can introduce many children (3-18) and students (up to 26) to a range of environmental education messages. These are centred on tree planting and aimed to highlight and address environmental problems and the importance of native biodiversity and ecosystem services.

The large and often empty or abandoned parts of the walled school grounds provide a protective environment and forum for nurturing threatened trees to maturity and for environmental education. We have developed a programme with two paid assistants (Ciro Gomez-Chavez and Flor Salvatierra-Villafuerte) together with several volunteers. The programme includes planting days, during which we give slide talks, provide hand-outs about Huarango and native plants (see Annex 6), and put up posters (Annex 10). Seedlings are provided by the project nursery but we are now planning to help build small tree nurseries in the individual schools. The children are encouraged to pair up and 'adopt' a tree as a friend, and then commit to looking after it with a signed certificate of responsibility. This April during the Festival we were able to award 35 prizes (baskets with books, T-shirt, Huarango products) with certificates (with Darwin logo) signed by the mayor of Ica and OQW, to the winners of the best cared-for tree, best poems and drawings of Huarango (see website www.huarango.org).

As part of these activities, we have developed an interactive media programme of theatre and music that highlight native and local species of plants and birds and their ecology. We focus on the importance of native forests for conservation and production of soil and protection of water resources, and increasingly are able to highlight the global issues of climate change. We have organised a number of small workshops aimed at teachers for updating the curriculum.

The educational component of the project has been particularly successful, as we have been able to introduce over 3,000 children to our planting education programme. Of these children, 1,200 have planted a tree. We have generated more than 15 small articles in the local papers about our programme, most of which mention the Darwin initiative. The education programme has now been expanded and includes the national network umbrella of the highly successful NGO ANIA and its programme Tierra de los Niños. This will ensure nationwide dissemination and exchange of information. We have also provided advice on native planting and the importance of threatened biodiversity, increasing capacity of schools and children to play a key role in conservation. In May 2007 the education programme will resume by replanting mortalities (15%) in the eight established schools, and will begin a further education and planting programme in four more schools and two fundos (Chapi and Santa Cruz).

The Huarango festival/fair

In April 2006, drawing on some of the matching funds (prior to the start of Darwin funding), the first Huarango Festival was organised in Ica. This was considered an important step in raising local awareness in advance of the main project. The second Festival, held between 13 and 15 April 2007, was attended by over 3,500 people. Over 2,500 Huarango seedlings from threatened productive landrace varieties were distributed during this event. The regional government has since been very supportive and enthusiastic, declaring (after consultation with the project) that the 7th of April (a date that coincides with optimum Huarango harvest) will be nominated *Dia del Huarango*, for official inclusion in the municipal regional calendar.

Themes addressed by the festival included Huarango foods and sustainable use, educational talks, exhibitions around local ecology and biodiversity, competitions and prizes, cultural and environmental-focused music, theatre and story telling. The Darwin logo was widely used. Various food products made from the project's Huarango harvest were demonstrated for tasting, including ice cream, empanadas, cakes, biscuits, flours, coffee, marmalade, chicha (fermented brew) and duck stew. The harvest was purchased from our small group of project producers at 80 centavos per kilo and limited sales allowed us

to cover the costs. This market research will be handled and integrated to the project outputs through the sustainable production group Miskyhuaranga (see below): five hard-working third-year economics students from UNICA who took part in the sale of Huarango products during the Festival.

Educational activities (reflected in the press reports) focused on native plants with a demonstration of 15 native species grown for exhibition in the project tree nursery, and a planned botanical garden at INC. There was an exhibition of 30 types of seeds from local plants and 25 key types of Huarango pods from varieties known in the region, to highlight the importance of seed conservation (see website photos). Ten large banners on local biodiversity were displayed, and project students conducted a series of biodiversity and ecology lectures to over 800 children. The talks focused on the native plants, birds and lizards of the region, as well as flow chart banners demonstrating ecological problems. Competitions were held for poetry (270 entries) and Huarango drawing (120 entries). Other entertainment was provided by a merry-go-round and bouncy castle. The Festival hosted two well known music groups (Daniel F and Leusemia) for the younger generation, and Manuelcha Prado provided Andean folkloric music that was received to an adoring crowd and traditional dancing. Eight other local musicians, acts and dances were involved.

National and international education and dissemination

Press in PERU: 16 local press articles, one national press article, five live TV shows, three long radio interviews; ten mentions of the Darwin Initiative on local radio and one on national radio with OQW, Ciro Gomez, Alberto Benavides and others. **See Annex 11 for selected articles.**

Press in UK: Kew press release; Kew Magazine 'Returning the shade' Autumn edition 2007

- Article 'Conservación y reforestación de Huarangos en las Instituciones Educativas' La Opinión 9/10/2006
- Article 'Sobre el Huarango disertan hoy en San Juan Bautista, La Voz de Ica 24/9/2006
- Article 'Enseñan a Escolares a preservar el Huarango' La Voz de Ica 15/9/2006
- Article 'Conservación y reforestación de Huarangos en las Instituciones Educativas' La Opinión, 11/11/2006
- Photo Article 'Contribuyendo a la Ecología' La Voz de Ica, 11 /11/2006
- Article: 'Conservación y Reforestación de Huarangos' La Opinión 13/10/2006
- Article 'Impulsan proyecto De Plantación de Huarangos', La Voz de Ica 13/10/2006
- Article 'Tema del Huarango exponen Hoy en el INC', La Voz de Ica, 26/10/2006
- Article 'Biodiversidad y Habitats Asociados al Desierto Costero en Ica' La Opinión 23/10/2006
- Article 'Conservación y Reforestación de Huarangos en Esuelas' La Opinión 29/8/2006
- Article 'El Defensor del Huarango' Cover and full colour page, website El Comercio 30/10/2006
- Article 'Evento – Festival del Huarango en Ica' and cover, La Opinion 12 /4/2006
- Article 'Se Inicio el II festival del Huarango en el Museo INC de Ica' la Opinión 14 /4/2007
- Article 'Arbolito del arenal, cuidate para que no te vayan a talar' Correo domingo 15/4/2007
- Article 'Con alegría culmino ayer II festival del Huarango' La Voz de Ica, 16/4/2007
- Article 'Mas de 3 mil visitantes acogio II festival del huarango' Correo 16/4/2007
- Radio interview, radio Huacachina 88.33 FM, 1 hr Abello interview OQW 7/11/06
- Radio interview, radio Huacachina 88.33 FM, 1 hr Cesar Panduro interview OQW 10/4/07
- Radio interview, radio Cielo 50 mins 'Dia del Tierra' Alberto Benavides 22/04/07
- TV live, Catalina TV, 15 mins Pedro Falcon-Guerra ' El Poder de la Gente' interview OQW 10/4/07
- TV live, Canal 41 'Desertification and deforestation' interview by the Inga. Nacimiento 8/12/2007
- TV live, Catalina TV, 'Emilio Charapa' interview OQW 13/4/07
- TV live Canal 35, con el Directora Irma Legua 13/4/07
- TV documentary films festival tour by OQW for Lima, Delia Ackerman Films 14/4/2007

Dissemination

- Botanical Congress in Puno, Project presentation gains first prize 18-21 Sept 2006
- Biology conference in Huamanga, Avian paper wins second prize nationally 25-30 Sept 2006
- Earth Expo UK (Haselmere Educational Museum). Dry forest conservation and restoration – a Darwin Project in Peru 10/7/2006 (Annex 12)
- GAP bird survey – Monitoreo de Aves en las Zonas de reforestacion y influencia; Oasis de San Pedro, fundo Chanca y Quebrada Tingue (Dec- Jan 2006/07)
- Publication on plants with horticultural potential, Octavio Pecho, UNICA, 22/11/2006
- Thesis: Graminaceae del Ica Octavio Pecho, UNICA, May 2006
- Report of A Rocha for Climate Stewards on the involvement and potential of the Church and its lands to replant forest with the aim of Carbon emissions offsetting and conservation.
- Assist Natalie Boucherie - Pre-columbian plant dyes CIHAM 5/8/2006
- Conference and planting: ‘Conservación y reforestación a base de Huarangos’ 24/10/2006
- Conference and planting: Colegio Genero Huaman Acuache’ 24/10/2006
- Conference and planting: Colegio Antonia Moreno de Caceres 22533; 15 /9/2006
- Conference and planting: ‘S.P.P. Juan XXIII’ – (teacher training school) 13 /10/2006
- Conference and workshop: Instituto Nacional de Cultura ‘ Tema del Huarango; ‘Biodiversidad y Habitats Asociados al Desierto Costero en Ica’ 26/10/2006

Workshops

- Conference/workshop and planting: I. E. Genaro Huaman Acuache, San Bautista. 29/9/2006
- Fundo CHAPI workshop and lecture to senior management and director stimulates agreement for habitat restoration site 5/11/2006
- Two half-day workshops with Dr Tiziana Ulian; monitoring, and vegetation description UNICA students 10/9/06, and seed collection and management 11/9/06
- Student half day workshop 20/10/06 to confirm monitoring methodology, CR and UNICA students
- Two half-day workshops with Dr William Milliken: plant collection techniques 5/11/06 and vegetation mapping techniques 9/11/06.
- Student half-day workshop to resolve Publication, thesis, methodology, logistics and interpersonal tensions, Ica 10/4/2007
- Conference and half-day workshop, ‘Bosques Secos de Ica’, OQW, Universidad Alas Peruanas, Ica 21/4/07

Websites

- www.huarango.org
- www.kew.org/scihort/tropamerica/peru/
- Information on DarwinNet website
- Information on Trees for Cities website
- Information on Trees for Life website

Pod processing and sustainability research; market development

The project has now completed market research reports for Lima (see Annex 13) and for local marketing in Ica (Miskyhuaranga). These have demonstrated promising markets: eight suitable outlets in Lima are willing to sell *Prosopis* products generated by the project. There have also been discussions with RBG Kew about plans to highlight Darwin Project products through sale of *Prosopis* syrup in the UK.

We now have developed our sustainable management programme to cope with the severe problems of forest die-back and consequent low production now facing the southern part of the project region. We have divided the programme between three integrated groups, all of which are receiving ongoing training and capacity building. The groups are: 1. Producer families; 2. Processing product development; 3. Marketing and small business development.

Producer families

There is an expanding group of Huarango suppliers in the habitat restoration sites and also within the Conservation Concessions (state land) that we are in the process of obtaining from INRENA (see below). The project funding allows four key families to form the nucleus of this co-operative; familia Alarcon (Nazca), familia Anchante (Huarangal), familia Hernandez (Ica), and the workers of San Jorge Fundo. We also have purchased fruit from two other small producers for the Festival and for production trials (about 2,000 kg of fruit). The group is receiving sustainable management training and three families are assisting us with irrigation of Huarango forest reforestation trials. Nine have attended training for processing prior to and during the Festival. Between 10 and 16 of May three family members (Beatriz Hernandez, Reno Cortez [Samaca products], Pedro Anchante and/or Jose Alarcon) will accompany the Miskyhuaranga project group on a visit to El CITEagroindustrial Piura (see below).

Processing product development

Miskyhuaranga is a group of five students at UNICA that have been encouraged to undertake local market research and investigate Huarango production and supply as a University project. Their report won first prize, and they will now develop a product under the name Miskihuaranga (Miski means sweet in Quechua). Since then they have researched the establishment of a small registered business. Miskihuaranga have started a census of Huarango production and ethnobotany that will provide vital baseline data for the sustainable management manual.

Miskyhuaranga will visit and receive training from the Algarrobita and Locuita project hosted by the University of Piura and El CITEagroindustrial Piura: an important capacity building experience. The aims of the trip are to: 1. Learn the techniques of *Prosopis* (Huarango in south Peru and Algarrobo in the north) fruit management to prevent bruchid infestation; 2. Note and take photographs of production techniques; 3. Interview the communities; 4. Complete the training video for workshops, website and dissemination of CD with the manual.

As a result of the progress made, it was decided to advance on a larger scale than anticipated towards demonstrating a sustainable product, both in order to foster a more lucrative and sustainable return over the short project time scale, and also be able to process the pods in Ica. This is partly due to the collapsed forest fruit production in the south (where the original focus of this part of the project lay), and partly because we have been offered the use of two excellent electric mills. The hammer mill and spice mill are brand new (valued at over \$4,000) and were donated by the Ministry of Agriculture some years ago to the Instituto Superior Tecnológico Leon de Vivero, in the Tinguíña suburb of Ica. We are in the final stages of an agreement with the Instituto that would allow the project product to be produced seasonally, and the Institute to develop its own products whilst training students to use Huarango flour in its adjacent bakery. Furthermore the Institute has its own production sanitary permits and RUC registration that allows us to put a product on the market with less investment.

In May 2007 we will start construction of a small building to house the mills next to the bakery, mount and connect the three-phase supply and overhaul the machinery. We now are in the process of bottling the sweet meal from the harvest that was milled by Julio Perales in Palpa, in order to trial marketing. Profits made from the sale will be reinvested in the sustainable management programme and finance the group.

A honey production trial was set-up in December 2006, when 12 hives were brought to the San Pedro trial site by a local producer from Asociación de Apicultores, to test production and provide apicultural training to the community. It was also hoped that the bees would clear up the leaf sugars produced by insect attack and thus prevent sooty fungus from further damaging the saplings. This year due to unknown, perhaps climate- and drought-related stress, there was very little nectar flow. Unfortunately there are now very few areas where dry forest occurs in sufficient quantity to support honey production exclusively from forest. However, the project has been able to exchange information about nectar-producing native species with the Association, and we are including appropriate species in our trial habitat restoration areas. The project will continue to pursue experimental apiculture in San Pedro and Huarangal in August 2007. If successful, honey will be sold with Miskihuranga in collaboration with the community trainees.

3.2 Progress towards Project Outputs

Overall progress towards outputs is solid, and the project is on track towards achieving them by its close. All output-level indicators hold true, although there were concerns about the viability of the Huarango pod harvest due to insect infestation. However, the 2007 harvest proved sufficient for the purposes of the production trials (as detailed above). Output indicators are proving workable and measurable; the only relevant indicator for which we do not yet have a measure is website hits, but given that the site has only recently been widely advertised through the Huarango Festival and associated posters, detailed evaluation at this stage would be premature.

We have been delayed in publication of species data for the flora of Ica, partly because permits have been held up during the restructuring in INRENA. We expect these permits to be approved soon. Tree nursery production has been on track (almost 10,000 plants), supplying the necessary resources for project activities whilst providing a platform for experimental seed management. Germination, propagation and introduction trials have been completed for the 24 key species, including nine varieties of Huarango. Over 20,000 Huarango seeds have been extracted and stored.

The four restoration sites have been mapped (see Annex 3) and characterisation of reference ecosystems made. One ephemeral stream site (Fundo Chanca 2) was severely affected by a large flood/mudslide that removed all of the restored plants. However the area gives us an excellent opportunity to study natural succession. The four areas now have land use agreements signed by the owners: Vieljeux, (Fundo Chanca), Anchante (Huarangal), and Hernandez (San Pedro). We are now completing land-use agreements for Fundo Chapi and Fundo Santa Cruz, to begin planting in June. Additionally, and outside the habitat restoration trials, we have planted trees and shrubs in three community areas to combat desertification (Victoria San Joaquin, FONAVI Pueblo Joven, La Banda Palpa).

Due to the urgent demand for the project and other funds garnered, the project has recruited 14 students to build local research capacity. The core students Alfonso Orellana and Juan Muchaypiña, both final-year UNICA undergraduates, are now working their theses and undertaking collections and monitoring. They have been joined by Marco Mendoza, whom they are training. Also from UNICA are the ornithologist graduates Mario Tenorio and Evelyn Perez, who are undertaking the monitoring. They are assisted by Octavio Pecho: an excellent field biologist who has been able to complete his graduate thesis this month through the project, and will not go on to set up a cactus propagation nursery with Sandra King, a horticulture student from Kew.

From La Molina we have three core students: Gabriel Gabelo (a Colombian national), who is characterising the reference ecosystems; Pamela Caceres, an undergraduate gathering phenological information; and Elisa Laura, an experienced masters student from San Marco University who is undertaking and supervising the germination and propagation trials (see Annex 14). The nursery students include Danny Jacobo (labelling and databasing), Richard Garayar (germination trials), Julio Quinteros (nursery management) and Andrea Padilla (seed management), supervised by Felix Quinteros who is also in charge of Huarango landrace production. We also have five other students from Miskyhuranga (see above), who work as a team to produce the Huarango products and are correlating census data after completing the market research.

All aspects of the dissemination, education and awareness raising programmes have exceeded expectations. This is considered to be a vital component of the project, and the recruitment of a dedicated, experienced team with diplomas in education - Flor Salvaterra and Ciro Gomez - has greatly facilitated the success of this work.

3.3 Standard Output Measures

Table 1 Project Standard Output Measures

Code No.	Description	Year 1 Total	Total
9/11A	Report of biodiversity assessments of restoration sites	Report of plant, bird and reptile diversity supervised by OQW and produced by the project student groups.	2

4A/B	2 Students UNICA; training/experience in nursery and seed management, germination techniques, landrace conservation - 24 wks each	4 students Julio Quinteros , Richard Garayar, Andrea Padilla and Danny Jacobo receive training (26, 20, 26, 18 weeks; documentation available) from FQ, OQW, TU and Elisa Laura La Molina	90
4C/D	2 Postgraduate students Universidad La Agraria; training/experience in habitat restoration techniques & biodiversity research – 24 wks each	<i>Elisa Laura, La MOL students masters thesis: Diversity and composition of the woody flora of the dp. of Ica, Peru, Gabriel Arango Silvicultural attributes of woody plant communities of the dp. of Ica</i> Are now receiving local species training by UNICA students and OQW supervised by Dr Carlos Reynel	2
6A	6 Landowners/employees receive training in habitat restoration with productive <i>Prosopis</i>	Pedro Anchante, Marcelo Anchante (Huarangal), José Alarcón (Nazca), José Hernandez, Eduardo Hernandez, Everaldo Hernandez, Beatriz Hernandez, (San Pedro) Miguel Bailetti, José Mulanovich (Chanca), Xavier de Los Ríos, Sonia Arenas, Liliana Alarcón (Chanca). The training has consisted of PP presentations from OQW, field trips with GAP, and at least 6 visits per site to introduce important biodiversity on their land. Ongoing process involving spontaneous meeting with other staff and community members during monthly monitoring	12
6A/B	4 GAP members trained in Avian biodiversity monitoring	Mario Tenorio, Evelyn Perez, Octavio Pecho, trained by Oscar Gonzalez and OQW (now passing on training with PP presentation in 6 schools)	3 (4)
6A/B	3 Nursery staff receive training/experience visit to Tamarugo project Northern Chile (7 days)	Postponed to June 2007	
6A/B	1 Teacher from project area to train with ANIA (1 week)	Flor Salvatierra will attend a week-long ANIA workshop in June; both she and Ciro Gomez worked with ANIA during Festival. OQW has visited ANIA Bosque de los Niños in Chincha (built over a cleared rubbish dump) to give a talk and exchange ideas.	2
6A/B	Tree planting, ecology & cultural use education with local school (20 pupils, 14 days)	8 schools are participating in the education planting program with planting 1,200 trees, we have be able to introduce 3,000 children to native plants	8, 3000
6A/B	2 Local families trained in <i>Prosopis</i> pod flour production (3 weeks each)	Familia Anchante and familia Hernandez are being trained with 5 economics students (Miskihuaranga) with Julio Perales and Reno Cortez (Samaca) products. Group to join capacity building visit to Algarroba producers of Piura, 16-23 May 2007	2+
6A/B	Exchange/training visit of product stakeholders to Algarrobita project in Piura N. Peru (1 week)	Postponed to May 2007	0 (1)
6A/B	3 Visitors from University of Piura Algarrobita project for demonstration (5 days)	Postponed until 2008 Festival	0 (1)
7	Project poster and roadside signs (Spanish and Quechua), leaflets for Huarango exhibition Museo de Ica; 1 Poster (Spanish and Quechua), for education and festival	Posters printed and distributed to schools: 11 most important woody plants of Ica, threatened lizards, 2 festival posters (see website), 1 flyer. 10 large banner posters were printed for the conferences, workshops, festival school planting days (see photos).	4, 10
7	1 Training video; edited from filmed activities over project	Claudia Luethi – film maker from Lima - has recorded:: huarango flowering and honey production, huaranga collection; flour and syrup production (including the festival). She will complete the video during training in Piura. The video will be used in the	0 (1)

		education programme, and eventually distributed with the sustainable product manual. Claudia has also filmed children asking questions about UK trees and explaining a little of the Huarango, for a 'Blog' at RBG Kew.	
8	3 UK project staff in Peru: OQW 31 wks, KG 2 wk, WM 2 wk	OQW in Peru 35 weeks, Tiziana Ulian (MSB replaced Kate Gold) 2 wks, WM 3 wks	40
10	1 Annual report of biodiversity monitoring data from restoration sites	Two reports: one for avifauna and one for botany	2
11B	1 Paper (minimum) submitted to peer reviewed Peruvian journal (<i>Zonas Aridas</i>)	Several conference papers presented but publication delayed due to incomplete specimen identification (related to permits). Expected to be resolved shortly. <i>Biodiversidad Aviar y Habitats Asociados al Desierto Costero del Pacifico en la Region Ica, Sur del Peru</i> (winner of 2nd prize at national student biology congress) to be submitted to ZA in July. OQW and R. Gagne (ARS) preparing a paper on Cecidomyiidae <i>Prosopis</i> plague.	0 (3)
12A	Employment and participation records database	Copies of letters of project participant in the office, including official University letters of involvement and thesis titles. Participation recorded systematically on activity forms.	1
[12A]	2 Project website; RBG Kew and Peru (Spanish) including research data	www.kew.org/scihort/tropamerica/peru/ www.huarango.org	2
12A	1 Tree nursery inventory, seed provenance (map) and landrace database at UNICA	Database of 104 species of seed collected including 20 key varieties of Huarango with geo-referenced provenance, common names, number of seeds stored, known phenology, seed quality observations, seed cleaning treatments, germination techniques and irrigation trials.	1
14A	Methodology workshop for restoration and multiple stakeholder meeting of project participants	1 day conference / workshop and planting, OQW and UNICA students; I. E. Genaro Huaman Acuache, San Bautista. 29/9/2006 1 day Landowners meeting: Fundo CHAPI and CHANCA, OQW 5/11/2006 2 half day workshops with Dr Tiziana Ulian; monitoring, and vegetation description UNICA students 10/9/06, and seed collection and management 11/9/06 Student half day workshop to confirm monitoring methodology, CR and UNICA students 20/10/06 2 half day workshops with Dr William Milliken; plant collection techniques 5/11/06 and vegetation mapping techniques 9/11/06. Student half day workshop to resolve Publication, thesis, methodology, logistics and interpersonal tensions, Ica 10/4/2007 Conference and half day workshop, 'Bosques Secos de Ica', OQW, Universidad Alas Peruanas, Ica 21/4/07 Festival: over 500 children attend various workshops and talks, UNICA students, ANIA, 13 – 15 April 2007	6
14A/B	Huarango products workshop, families trained by Samaca products	Reno Cortez and Julio Perales provided limited training in Huarango syrup making and huaranga coffee respectively. Complete training week to take place 16-22 May in Piura	0 (1)
14A	1 st Huarango festival in Nazca after pod harvest	Attended by over 3,500 people including 1,200 school children, members of regional government,	1 (2)

		Lima documentary film.	
15A/B/C	First local and national press releases	16 local press, 1 National <i>El Comercio</i> (cover and full page)	17
15C	National press release UK	1 press release from Kew press department; Kew Magazine article winter 2006	1 (2)
17B	Project data included in DarwinNet and CHM (CONAM)	http://www.darwinnet.org/muestranoticia.php?id=22 pending all data inclusion	1
18C	1 Local TV report on project to highlight UNCCD year	TV live, Canal 41 'Desertification and deforestation' OQW interview by the Ing. Nacimiento 8/12/2007	1
19C	6 Local radio interviews/profiles per year	3 long interviews of over 40 mins with OQW and 10 mentions of the Darwin Project on local radio, 1 on national radio.	14
19C	Radio show to promote festival, with interview (Escuela Libre)	Radio interview, radio Huacachina 88.33 FM, 1 hr Cesar Panduro interview to promote festival (Escuela libre) OQW 10/4/07 Radio interview, radio Cielo 50 mins 'Dia del Tierra' Alberto Benavides interviews OQW 22/04/07	2
21	Tree nurseries established: 1 large at UNICA; 2 small at restoration sites	1 large tree nursery at UNICA completed Aug 2006, 1 in Huarangal School in construction for May 2007, 1 in Nazca completed Dec 2006, 2 more planned in Fundo CHAPI and SANTA CRUZ (starting construction June 2007)	2 (5)
22	4 Habitat restoration areas established with designations	See Annex 1	4
23	Sale of Huaranga products (flour and syrup) estimated value equivalent to £1500	Huaranga flour, huaranga coffee and ice creams sold to a value of 970 soles (£170) as marketing trial for Miskihuaranga team. Total sale of Huaranga products at the festival (for the producers we supplied with huaranga) was 3580 soles (£628). As we received \$3000 of extra sponsorship from Buenaventura for the festival we gave 50% of the products out as samples and tasting. We have remaining, for marketing trials, 40 kg of processed flour and huaranga coffee; 200 kg of huaranga pod, that have been sun dried and frozen whilst we put the processing facilities in order and build the team capacity by importing techniques from Piura.	628

Table 2 Publications

Type * (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
Conference Poster	Flora Magnolophyta ribereña de la Cuenca del Río Topará, Ica – Perú. Alfonso Orellana, Juan Muchaypiña y Klaus Bederski. 18 al 25 de Junio 2006.	IX Congreso Latinoamericano de Botánica. Santo Domingo-República Dominicana	http://botanica-alb.org/Congreso06/ www.fcencias-unica.pe.kz	
Presentation of paper at conference	Conocimiento y Conservación de la Fitodiversidad del Valle Topará, Chincha. Ica-Perú. Juan Muchaypiña, Alfonso Orellana y Klaus Bederski L. 18 al 21 Setiembre 2006.	XI Congreso Nacional de Botánica. UNA Puno-Perú.	Published in Conference abstracts and CD given to participants botanica@hotmail.com	
Presentation of paper	Inventario Florístico del	VII Congreso	Published in Conference	

at conference	Distrito de Ocucaje, Ica. 2006. Carlos Carbajo, Marco Mendoza, Juan Muchaypiña & Alfonso Orellana. 25 al 30 de Septiembre 2006.	Nacional de Estudiantes de Biología. UNSCH Ayacucho-Perú	abstracts and CD given to participants botan_ica@hotmail.com	
Article	Returning the Shade. Oliver Q, Whaley 5th October 2006	Kew Magazine	Kew Magazine Autumn 2006	
Poster	11 plantas nativas de Ica. Alfonso Orellana, Juan Muchaypiña y Marco Mendoza. 13, 14 y 15 de Abril 2007.	II Festival del Huarango 2007. Museo Regional de Ica – Perú	http://www.huarango.org/	
Poster	Ficha de 15 Plantas nativas importantes de Ica. Juan Muchaypiña, Alfonso Orellana, Marco Mendoza y Josue Molina. 13, 14 y 15 de Abril 2007.	II Festival del Huarango 2007. Museo Regional de Ica – Perú	http://www.huarango.org/	
Annual report	Informe Anual de Botánica 2006-2007. Alfonso Orellana, Juan Muchaypiña y Marco Mendoza.	Ica-Perú	http://www.huarango.org/	
Poster	Las lagartijas de Ica, Perú. Mario Tenorio, Evelyn Pérez y Octavio. 13, 14 y 15 de Abril 2007.	II Festival del Huarango 2007. Museo Regional de Ica – Perú	http://www.huarango.org/	
Poster	Que pasa con los bosques y aves de Ica?. Mario Tenorio y Evelyn Pérez. 13, 14 y 15 de Abril 2007.	II Festival del Huarango 2007. Museo Regional de Ica – Perú	http://www.huarango.org/	
Paper presented at conference	Biodiversidad Aviar y habitat asociados de desierto costero del pacifico en la region de Ica - sur de Perú. Mario Tenorio, Evelyn Pérez y Oliver Whaley. 13 al 19 de mayo 2007.	VII Congreso Nacional de Estudiantes de Biología. 2006.* Ayacucho-Perú	http://www.huarango.org/	
Thesis	Estudio de las Poaceas Silvestres de la Provincia de Ica. Pecho Quispe, Juan Octavio	UNICA Facultad de Biología	UNICA Facultad de Biología Central library and faculty library	
Annual report	Estudio y monitoreo de aves de las zonas de la restauracion ecologica. 2007. Mario Tenorio, Evelyn Pérez y Octavio Pecho.	Ica-Perú	http://www.huarango.org/	

3.4 Progress towards the project purpose and outcomes

The project is making good progress towards its purpose and proposed outcomes. Namely: habitat restoration trials established (successfully accomplished) and learning outcomes produced (some learning outputs produced - others to follow as research develops and results emerge); increased local awareness of Huarango conservation importance (good progress through education and awareness programmes); engagement in research and project extension (local students and communities effectively engaged); active participation of partner organisations in habitat restoration & prevention of desertification

(national and local authorities participating effectively; new project partners have joined); increased understanding and uptake of sustainable options for Huarango forest use (understanding increased through festival and community participation - uptake will be a longer-term process); areas of restored habitat buffering forest relics (two restoration sited alongside selected sites).

Regarding the purpose-level assumptions, it is too early to say whether the sustainable use options will prove attractive to local communities. Climate change is potentially a significant issue in this hyper-arid region, and it is not known to what extent this is a factor in the insect infestations and die-back observed in some relic patches of Huarango forest. However, to compensate for this possibility, species with economic potential that do not appear to be suffering such problems have been included in the community-based habitat restoration trials.

3.5 Progress towards impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

Aspects of this impact have been referred to above, but the following stand out:

Dissemination

In addition to the more tangible benefits already provided by the project to biodiversity in the region (e.g. the planting of several thousand threatened trees), the indirect impact of dissemination and awareness raising is likely to have a more significant impact in the long term. These are reflected in the increasing numbers of people, schools and communities calling the project office daily for advice on planting, in response to heightened publicity through the festival, radio, TV, conferences and the website. We have taken the approach of aiming to make our reforestation models contagious and replicable with little more resources than enthusiasm. This means providing technical support on seed collection, plant nurseries and techniques of planting and irrigation, using basic, inexpensive technology. Our habitat restoration manual will be a widely used tool and is already in demand.

Government support

It has been reassuring to find strong governmental support for the project. The regional government, with new powers and responsibilities over natural resources, has approached us to guide a working group and advice on all issues concerning the biodiversity of the region. Keen to foster and consolidate this unprecedented step, we will provide 1,000 saplings on request for the forthcoming Day of the Environment on 5th June (Annex 15) and lead a workshop they have organised to address the loss of forest and biodiversity. Furthermore, it is very positive that the regional government and local municipality have asked us to select a date for an official *Dia del Huarango* (see above).

We are noting other moves towards sustainability. The previous regional government developed a project called Ica Verde that planted several hundred thousand non-native *Ficus bejamina* trees (one of the most widely planted street trees worldwide). *Ficus* is inappropriate in such an arid region, consuming much more water than desert-adapted natives. It is relatively very short lived (negating reliable C offset options) and provides little value for local biodiversity. In April 2007 SENATI, the government-funded Programa de Informacion Nacional technology centre, approached us for assistance and requested native plants to replace the *Ficus*. Furthermore it seems that the new government has understood our project message of native species being associated with sustainable forestry, soil fertility and protection of water resources.

Conservation

Although not specified as an output, the project aims to protect biodiversity by helping to establish small community protected areas in remaining fragments of native forest. This is a complex and lengthy process in Peru. We have applied for three small concessions: one in the name of the local community of San Pedro and one with GAP in Usaca and Tunga (Rio Poroma). In October 2006, after 3 months, we received an opposition from a relative of the previous owners of Usaca (although the area had officially reverted to the State following the Agrarian form in 1969). In spite of approval by the head of INRENA Concesiones/Forestales, the legal team decided that they could not uphold it because of the possibility of

a legal case. In December 2006 we split the concession into two, putting in a new Propuesta Técnica for the unopposed area. In January 2007 we received notice from the head Concessions for Conservation informing that the Tunga reserve was approved and would be published. In April, after much correspondence, it seems that this has finally been awarded, and paperwork will be forwarded as soon as it is received. This represents a significant step for biodiversity conservation in the region.

4. Monitoring, evaluation and lessons

Monitoring and evaluation is a constant process undertaken through a range of activities and sources. Students, for example, produce monthly reports with details of progress and activities. We have concluded that whilst some students merit ongoing support by the project, others clearly wish to study outside the region using the skills and qualifications they have gained through the project. Those receiving continued support (Mario Tenorio, Evelyn Perez and Octavio Pecho [ornithology]; Alfonso Orellana and Juan Muchaypina [flora]) have become skilled at various habitat restoration techniques and are experienced in undertaking the regular monitoring processes that we have established for the habitat restoration trials. They have already trained two other students (Marco Mendoza, Josue Molina) who are able to share the monitoring and collecting responsibilities. Alfonso and Juan will go on to build the UNICA herbarium after the publication of their thesis *Analysis floristica de Ica para el desarrollo de tecnicas para restauracion y conservacion de habitat*.

Financial monitoring is undertaken through Kew's internal project and financial monitoring system and the Darwin Initiative's own monitoring procedures.

Two of the most challenging monitoring processes are of the project's impact on public awareness and education, and on policy uptake and conservation impact. In addition to quantitative monitoring measures and procedures (e.g. school participation, public participation in events such as the Huarango Festival etc.), we are also monitoring feedback in a qualitative sense (including requests for collaboration from regional government and national conservation authorities, agro-industries etc.).

Lessons

It is evident that the need for rigorous methodology in botanical survey work, backed up by properly identified voucher specimens, is severely underestimated in the region. In order to go some way towards redressing this we have organised methodological workshops and, in addition (building on the previous Darwin project legacy of cabinets at La Molina), we have agreed to fund the purchase of similar cabinets for a small herbarium at UNICA Facultad de Ciencias, Escuela de Biología. The specimens accumulated through the project will form the initial nucleus for this collection. This was requested by the University and the project students.

One lesson learned from San Pedro and Huarangal is that with seasonal arrival of water, even if pay is offered, the local communities will become fully dedicated to their land and contingency plans must therefore be put in place. Secondly it is important that local people and schools near a reforestation trial are involved in the planting and irrigation, to ensure a long term responsibility of care. Furthermore, the community must be constantly integrated into the decision making process. That is to say, working in the community context the methodology will have to be compromised to accommodate the often eccentric desires of the community.

It is increasingly clear that in a project such as this [which involves a large number of people from a range of strata of society, draws on several disciplines, addresses highly complex, poorly understood and in some cases sensitive issues, focuses on practical outcomes and relates directly to livelihoods and policy measures], requires high levels of methodological, logistical, fiscal and human flexibility.

5. Actions taken in response to previous reviews (if applicable)

n/a

6. Other comments on progress not covered elsewhere

The project has been enhanced in a number of ways. The education programme has been expanded in response to high demand and enthusiasm. Our MOU with ANIA is grounded in this expansion and the need for capacity building among educators, and we are enhancing the exit strategy by attempting to leave Tierra de Los Niños scheme for Ica with UK NGO funding.

Requested by local communities, and with support from additional matching funds, we have undertaken or facilitated a number of small reforestation projects that were not originally part of the programme, and have several more planned for the coming year. These are relatively inexpensive both in terms of time and money, but have a large impact on local engagement and sense of ownership of native biodiversity.

In order to maximise the likelihood of long-term management of restored areas and uptake of restoration techniques, we have modified our trials to match local necessities and priorities (e.g. inclusion of species of economic value, woodlots), and broadened the species composition to maximise the likelihood of survival in what appears to be a changing environment. Our more rigorous restoration trials will be accommodated through our collaboration with Fundo Chapi, where we will be able to undertake experiments in a homogeneous environment without outside pressures.

The only significant project milestones missed were two important capacity building trips. The first, to the Pampa Tamarugal in Chile, will take place in June and will include a visit to the Seed bank in Arica. The second was the trip to the North to the Piura for training in *Prosopis* pod processing. This will take place in the May. These were postponed partly as a result of time constraints and partly due to uncertainties regarding the involvement of community members and other participants in this aspect of the project. Establishing these arrangements was more time-consuming than envisaged, and it was considered important to be certain of long-term involvement before investing in such training activities.

Establishing and maintaining water supplies at the habitat restoration trial sites has been challenging, but vital for success. For example on the San Pedro site, the use of a well required over 10 meetings and one workshop with the community in order to gain the support and trust. Furthermore we had to repair 200m of irrigation canal and build a cement tank of 10 cubic metres capacity. The 700 plants at this site are irrigated by hauling 60 litres at a time in a wheelbarrow that is steered and hauled by two people. The job of doing this was shared by the students and staff. In March the local family participating in the sustainable management project programme were able to take over the weekly watering regime as they had finished cotton harvest.

Risks

In December 2006 the ephemeral stream habitat restoration site of Fundo Chanca suffered from an exceptional year, and water and liquefied sediment flow completely inundated one of our habitat restoration sites. However, this provides a unique opportunity to record the natural succession, as we had already made all the baseline collections. A student is currently undertaking a phenology and succession study.

Over the last five years Huarango trees have been suffering from a twofold defoliating plague culminating in severe impact on pod harvests in the Nazca region (150 tonnes to virtually nil). The first plague is a virulent defoliating moth *Melipotis* aff. *indomita*. This is native to the area and historically causes defoliation until controlled by agents such as wasps, birds or cold weather. SENAMI (Servicio Nacional de Meteorología e Hidrología del Perú) has recorded a three degree increase in minimum average temperature over the last 20 years. The combination of this temperature increase, pesticides and large-scale removal of habitat and bird trapping are likely factors. However, we have found the caterpillar easy to control through the use of traps. The method requires collection of the hundreds of larvae (that serve as excellent chicken feed) for 3-4 days consecutively from rags left at the base of the trunk (where the larvae roost during the day). This method we intend to publicise in collaboration with the regional government.

The second plague is a Cercydomidiid gall midge which has now become a devastating problem. We have identified the species with help from the USDA Agriculture Research Service, and will publish a paper this year. On a positive note, we have identified more resistant varieties of *Prosopis* for

propagation and reintroduction. Furthermore, now we have identified the species we have now devised a method of control.

Agro-industry represents a significant threat to the avian fauna of the region. One table grape producer (Fundo Beta), by trapping with mist nets and paying labourers 20 Soles for 50 birds, kills between 5,000 and 6,000 per campaign. This is a sensitive issue but also a relevant one, as the UK represents an important market for these products. The project does not have the resources to address these problems but has given talks about birds and biodiversity to receptive management groups of agro industry representatives in Ica. The project's emerging MOU with Fundo Chapi, which hosts a social and environmental group, will give us a chance to address these problems. We have also been contacted by Campo Limpio, a Peruvian NGO that seeks to reduce and clean up pesticide containers and use. We hope to work together to disseminate information about the threats to native biodiversity and raise awareness among consumers (in Peru and overseas).

7. Sustainability

Although many of the principal outcomes of the project are focused on development of realistic methodologies for restoration and sustainable use of native biodiversity, we recognise that without a genuine will to pursue these objectives among local communities and authorities, and without the capacity to do so, such methodologies will be of limited value. The project has therefore developed an increasingly strong emphasis on awareness raising and engagement, whilst focusing on enabling a wide range of local organisations and sectors (including, for example, agro-industry) to drive the processes forward with minimal or no requirement for outside financial input. It is believed that this will strengthen the exit strategy significantly.

At the community level, for example, we have taken children from very poor barrios to gather Huarango fruit for production and marketing trials, increasing appreciation of the products in the young generation. We will continue to foster these relationships. All necessary infrastructure developed by the project (e.g. for irrigation, pod processing, nursery production) is established within the context of an existing community or organisation engaged in project activities, again in order to maximise sustainability. In addition, we are actively working to engage a range of NGOs (e.g. ANIA) in a position to continue the initiative after the project ceases, and to develop alternative sources of funding on a long-term basis (e.g. Trees for Cities, Climate Care). In 2007 we will begin to investigate options for commercial production of high-value native plants in the project's nurseries, in order to strengthen the exit strategy further.

The project profile is rising rapidly as we are beginning to demonstrate positive outcomes. The aim is to educate and inspire through a range of media and to instil pride in native desert biodiversity. The national press coverage in *El Comercio*, film documentary, live TV to highlight desertification, live radio and local press (see Annex 11), combined with the events, conferences, and the Huarango Festivals, have all contributed to this process.

8. Dissemination

Dissemination is covered in detail elsewhere in the report. We estimate that project dissemination has reached up to 200,000 people For example:

- *El Comercio* (see <http://www.elcomercioperu.com.pe/EdicionImpresa/Html/2006-10-30/ImEcCronicas0605461.html> for article), has a readership of 120,000 and 37,000 visitors to its website
- 3,500+ people attended the second Huarango Festival.
- TV Catalina has a viewing figure of 15,000 people, Canal 41 about 20,000 people in Ica.

9. .

10. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum). This section may be used for publicity purposes

[I agree for ECTF and the Darwin Secretariat to publish the content of this section](#)

Within a relatively short time this project has begun to have a significant, positive impact on local appreciation of the importance and value of native biodiversity. Seeds have not only been sown in the earth, but also in the mind.

Annex 1

Report of progress and achievements against Logical Framework for Financial Year: 2006/07

Project progress is reported in detail against activities and outputs in Section 3.

Annex 2: Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve: <ul style="list-style-type: none"> • the conservation of biological diversity, • the sustainable use of its components, and • the fair and equitable sharing of benefits arising out of the utilisation of genetic resources 			
Purpose Development and application of techniques for habitat restoration and sustainable use of native dry forest to combat desertification and conserve forest relics in southern Peru	Habitat restoration trials established and learning outcomes produced Increased local awareness of huarango conservation importance, and engagement in research and project extension Active participation of partner organisations in habitat restoration & prevention of desertification Increased understanding and uptake of sustainable options for huarango forest use Areas of restored habitat buffering forest relics	Field survey outputs and experimental monitoring reports Records of local project input/ participation; teaching records, numbers attending Agreements with partner organisations and reports of collaborative activities Local Ministry of Agriculture records; survey of huarango product producers Aerial survey and field data	Project retains support of government agencies and local communities Sustainable use trials prove attractive to local communities Climate change does not exacerbate uncontrollable desertification and drought or prevent successful restoration
Outputs Baseline information on biodiversity of forest fragments and degraded vegetation; use of forest resources Tree nursery and seed handling/ propagation methodologies Habitat restoration trials buffering forest relics, using native species	Research undertaken; reports and papers produced (habitat mapping, bird survey, plant survey) Minimum of 8,000 seedlings of 3 major tree species & <i>Prosopis</i> land races established yr1 & 2 Land use agreements and designation (ACP) signed; restoration areas established (2 yr1, 2 yr2)	Research data and reporting; annual monitoring outputs; publication records, Tree nursery inventory and provenance records; herbarium vouchers Planting records & maps, 2-monthly seedling monitoring; biodiversity surveys; ratification of ACP	<i>Permits for plant collection granted</i> Seeds available for planting Land remains available for habitat restoration trials

Students and local land owners engaged in habitat restoration techniques & research	2 local students & 6 landowners/yr engaged in tree nursery & plots; 2 national postgraduate students in research (yr1)	Employment and participation records; University reports and supervision	Local families remain committed to active role in project and support its aims
Production and processing trials and marketing of sustainable Prosopis pods flour and syrup	2 pod harvest and processing/sustainability trials running (yr1); market research completed (yr2); market trials (yr2-3)	Pod production (kg) monitoring, production records, survey reports	Huarango pod harvests do not fail; market outlets continue to demand Prosopis syrup and flour
Children trained in tree planting, aftercare and habitat regeneration	1 school actively engaged in projects in local forest relic (yr1); 10 children able to train & disseminate (yr3)	School activity records and examination results; Club de Madres feedback, interviews	School and Club de Madres remain open to participation with Bosque de los Niños
Information network developed for SE Peru dry forest conservation, included in CHM	Education and dissemination available online and via partners	Review/monitoring of information portals; hits to website	Existing dissemination networks remain viable
Increased appreciation of forest ecosystem/ livelihood value among local communities and government agencies	Stakeholder meeting and workshops (annual); Huarango Festival (annual); 10 press and radio releases; 1 poster; 1 website	Project activity and output reports; meeting minutes; workshop feedback; media monitoring	Project partners and CONAM (as above) remain committed
Manuals for habitat restoration in dry forests and sustainable production of Prosopis pod products	2 Illustrated manuals produced and distributed (sustainable production yr2, restoration yr3)	Publication and distribution records; independent review of uptake and feedback	N/A

Activities	Milestones
Fieldwork and baseline research/ monitoring	Fieldwork completion & reporting of plant diversity and vegetation mapping of forest relics targeted for buffering with habitat restoration (yr1); report of avian diversity and forest use (yr1). Development of monitoring indicators (yr1); annual biodiversity monitoring (yr1-3).

Establishment and management of tree nursery	Seed storage and germination evaluation (May 2006); seed selection with provenance records mapped and databased, herbarium vouchers lodged with La MOL and SLGI (July 2006 and following yrs); tree nursery constructed & nursery staff contracted (Jul 2006); 8,000 seedlings of 3 major tree species & <i>Prosopis</i> land races established (Dec 2006 and subsequent yrs); nursery commercialisation strategy developed (yr2).
Habitat regeneration research & dissemination	Research plots identified and land use agreements established (Sept 2006); students recruited (May 2006); fencing completed (Nov 2006), planting regimes and experimental plots established (Dec 2006); plots monitored (2-monthly); final research results compiled; research publications submitted (yr3); Dry forest habitat restoration manual produced and distributed (yr3).
Local education and capacity building	Collaborative agreement established with school (Jun 2006); school activities initiated (Nov 2006 and following yrs); educational poster/leaflet produced (Mar 2007); Huarango festival (Apr 2007 and following yrs); teachers workshops held (Feb 2007 & following yrs); schools' planting and education award scheme announced (Jan 2007). Students' visit to <i>Prosopis</i> Tamarugo regeneration scheme in Chile (July 2006).
National and international education and dissemination	Project website and DarwinNet portal established (June 2006); First radio broadcast (May 2006 & min. 6 per year); first press article (May 2006 & min. 3 per year), schools education materials incorporated into CONAM and GAP educational output (Feb 2008); Website integrated to National CHM CONAM (Sept 2008)
Pod processing and sustainability research; market development	Pod processing equipment procured (July 2006); pod processing trials commence in Nasca and Ica (Apr 2007); market research commences (Oct 2006); trials initiated (Oct 2007); Huarango pod product manual produced (Jan 2009).

Annex 3

Habitat restoration sites

sites North to South	Name	Property status	Intended conservation designation	Location	Ecosystem type	Stressors	Area available for restoration	Area ha of active restoration and monitoring	Key tree genera planted
1	San Pedro	State land and private land	Concession for conservation (CFC)	S 14° / 08' / 05" w ° 75 / 44' 37"	Sand dune forest	Dune encroachment, fragmentation, depredation, <i>Prosopis</i> plague, overgrazing	50-80 ha	2-4 ha,	600 plants <i>Prosopis</i> , <i>Acacia</i> , <i>Inga</i>
2	Fundo Chanca	Private Agro-industry and state land Private	Area de conservacio Privada (ACP)	S 14° / 08' / 42" w ° 75 / 38' 42"	Blocked Huaco (ephemeral stream)	Degradation, Intensive agriculture, exotic planting	10-18 ha	3-6 ha	600 plants <i>Prosopis</i> , <i>Cercidium</i> , <i>Capparis</i> <i>Parkinsonia</i> <i>Schinus</i>
3	Fundo Chanca	Private Agro-industry and state land Private	Area de conservacio Privada (ACP)		Open Huaco (ephemeral stream)	Degradation, Intensive agriculture, exotic planting of <i>Tamarix</i>	10-18 ha	3-6 ha	500 plants <i>Prosopis</i> , <i>Cercidium</i> , <i>Capparis</i> , <i>Schinus</i>
4	Pueblo Huarangal	Private land	Area de conservacio Privada (ACP)	S 14° / 12' / 29" w ° 75 / 27' 54"	Cactus rich dry forest	Overgrazing, fragmentation, depredation, <i>Prosopis</i> plague	10-20 ha	3-6 ha	650 plants <i>Prosopis</i> , <i>Acacia</i> , <i>Capparis</i> , <i>Grabowskia</i> , <i>Sapindus</i> , <i>Neoraimondia</i> , <i>Armatocereus</i>
5	Fundo Chapi Tingue	Private Agro-industry and state land	CFC and ACP		Huaco (ephemeral stream); floodplain forest (removed)	Intensive agriculture	10-30 ha	10-15 ha	<i>Prosopis</i> , <i>Acacia</i> , <i>Capparis</i> , <i>Grabowskia</i> , <i>Sapindus</i>
6	Usaca Rio Nazca	State land and private land	CFC and ACP	S 14° / 48' / 21" w ° 75 / 12' 32"	Riparian oasis forest	Depredation for charcoal, <i>Prosopis</i> plague, forest dieback, overgrazing	60 ha	15 ha	<i>Prosopis</i> , <i>Acacia</i> , <i>Vallesia</i> , <i>Parkinsonia</i>
7	Usaca Rio Poroma	State land	Concession for conservation	S 14° / 55' / 00" w ° 75 / 11' 30"	Riparian oasis forest, and riparian and 'Puquio' reeds	Depredation for charcoal, <i>Prosopis</i> plague, forest dieback, overgrazing	25 - 40 ha	4 ha	<i>Prosopis</i> , <i>Acacia</i> , <i>Tessaria</i> , <i>Salix</i> , <i>Vallesia</i> , <i>Parkinsonia</i>

List of Additional Annexes

Annex	Description
4	Report of preliminary trip of A Rocha Peru to Ica and Palpa
5	Paper: Avian biodiversity and habitats associated with the Pacific coastal desert in the Ica region, southern Peru
6	Posters (reduced format)
7	Botany report and example of monitoring data
8	Tree nursery report
9	Bird monitoring report
10	Handouts – important native plants
11	Press and magazine articles
12	Earth Expo flier
13	Miskyhuarango report: Industrialisation of Huarango in Ica 2007
14	Thesis reports, La Molina
15	Letter from Regional Government regarding forthcoming Environment Week