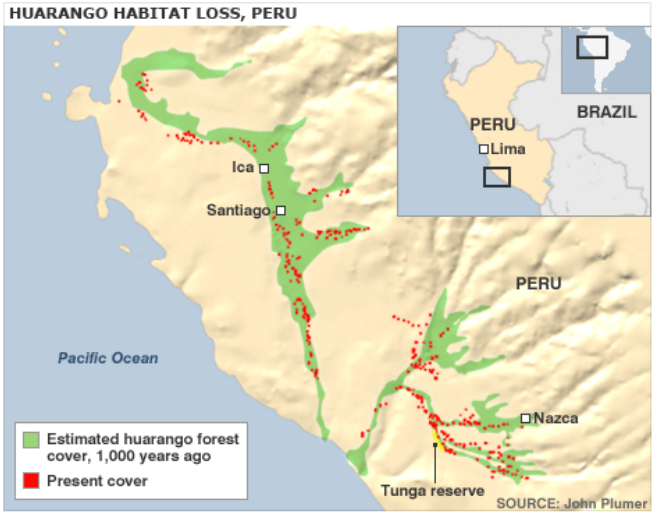
Darwin Initiative – Final Report

Darwin project information

Project Reference	15-016
Project Title	Habitat restoration and sustainable management of southern Peruvian dry forest
Host country(ies)	PERU
UK Contract Holder Institution	Royal Botanic Gardens Kew
UK Partner Institution(s)	
Host Country Partner Institution(s)	Universidad Nacional Agraria, La Molina Lima Peru, Universidad Nacional Luis Gonzaga Ica (UNICA), ANIA Bosques de los Niños
Darwin Grant Value	£198,214
Start/End dates of Project	May 2006 – April 2009
Project Leader Name	William Milliken
Project Website	www.huarango.org
Report Author(s) and date	William Milliken & Oliver Whaley 29th July 2009

1 Project Background



The desert coast of Peru is undergoing rapid environmental deterioration, desertification and biodiversity loss. On the south coast the situation is particularly critical. In close collaboration with local people the project aimed to develop and apply techniques for habitat restoration and sustainable use of native dry forest to combat desertification and conserve forest relics in the region. Planned outputs included baseline biodiversity information, tree propagation methodologies, habitat restoration trials, training, biodiversity awareness, dissemination and sustainable natural resource use. The project has been particularly successful in engaging a cross-section of society in habitat restoration and biodiversity conservation activities, building local capacity for biodiversity research and environmental education.

2 Project support to the Convention on Biological Diversity (CBD)

The project assisted Peru in meeting cross-cutting CBD themes including Forest Biodiversity, Sustainable Use of Biodiversity, Protected Areas, Public Education and Awareness, and Traditional Knowledge Practices. Direct contributions were made to Peru's capacity to implement the CBD by the project's strong, applied focus on in situ conservation and monitoring of fragmented dry forest habitats (Article and Article 7) and sustainable use (Article 10). The collaborative research and training programme, including integration of traditional knowledge into applied project activities (Article 8j) helped develop understanding of threatened Peruvian biodiversity whilst building capacity for further research in the country (Article 12 Article 5 and Article 18). The inclusion of a substantial local and national

dissemination and outreach component, including schools programmes, community workshops and engagement of children in forest restoration, made a significant impact on public education and awareness (Article 13), both within Peru and internationally (Article 17).

The project built the capacity of ANIA and UNICA to meet CBD commitments and worked directly with INRENA, focal point for United Nations Convention to Combat Desertification (UNCCD and CBD), on provision of advice for biodiversity conservation in the region.

3 Project Partnerships

The partnership between RBG Kew and the lead host country partner, Universidad Nacional Agraria, has been a fruitful one. Students were trained through their engagement in project research and joint decisions were made over the structure of the research component of the project. During the course of the project it became clear that there was greater demand and opportunity for significant capacity building in the local university UNICA, and roles in project activities were adjusted in order to reflect this. Grupo los Aves provided valuable ornithological input to the research and has been an important ally in the establishment of protected areas. Engagement of local communities and schools became a more significant element than originally envisaged, consolidating and building ANIA's role into the project to the point that it took on a key part in the exit strategy. All partners played roles in decision-making over relevant areas of project activity, and relationships were consolidated and formalised through the establishment of a number of MOUs with all key partners. The partnerships have been strongest where the relationship was based on local demand. Distance from the project site provided challenges for Lima-based partners, addressed where possible by allocation of additional resources for travel and subsistence.

In the UK, the project has collaborated with the University of Cambridge on archaeobotanical research in the Ica and Nasca regions, with Newcastle University on baseline biodiversity research (engagement of student expedition in fieldwork) and with the BBC over dissemination of project findings via the Internet.

4 Project Achievements

4.1 Impact: achievement of positive impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

The project has had a specific impact on biodiversity through its restoration and conservation activities and recording and promoting a number of rare, new and threatened species through detailed study and inventories. Much of the focus has been on developing methods and approaches to habitat restoration and sustainable use in tandem with awareness building and education: a strategy that should reap future rewards in terms of tangible benefits for biodiversity but is hard to measure at present. However, alongside this the project has been working successfully with local partners to secure small protected areas with more immediate impact. At present the level of actual protection offered by these reserves is limited, but by helping to secure follow-on funding for the development of management plans by local partners (including trained project staff) and restoration activities within the reserves, the project has helped to secure their future and to instigate the establishment of other protected areas in the region.

4.2 Outcomes: achievement of the project purpose and outcomes

Changes in human behaviour towards biodiversity are hard to measure but the project has certainly had an impact in the region. It was clear at the outset of the project that there was little recognition of the difference between cultivated and exotic and invasive plants and native species and likewise little understanding of the importance of native plants and vegetation in the provision of ecosystem services and support. By involving local government, schools, agricultural enterprises and local communities and by communicating a strong educational message through all strands of the project, attitudes can be seen to have shifted in a number of ways. Examples of indicators include the incorporation of native plant information into the local curriculum, the establishment of an official 'Huarango day' in the local calendar, incorporation of environmental messages into local arts (especially poetry and music surrounding the annual

Festival), and investment in native vegetation in industrial farms (e.g. Fundo Chapi, where a 'demonstration area' of restored native vegetation is now used as a community educational resource by the company in association with local schools). Visits to the project by Trees for Cities and biologists from UK and USA, as well as integration of ANIA (www.mundoania.org) has provided access to social networks and resources important for supporting continuing efforts of the Darwin team in Ica. Broader, ongoing UK engagement in the region has been stimulated by the project: in January 2010, 20 Welsh cadets will visit the project and work with the ANIA team on a tree planting campaign.

Further reporting on outcomes, including knowledge (of local biodiversity, management and restoration techniques), physical resources (e.g. published information, local herbarium, tree nurseries), money (follow-on funding for tree planting and reserve management) and social networks (e.g. Miskyhuaranga) is provided in Annex 4.

4.3 Outputs (and activities)

The project achieved its outputs and activities, in many cases exceeding them. There have been delays in producing some of the printed outputs, partly due to the challenges of the achieving meaningful restoration results in less than 3 years, but these are now reaching completion. See Annexes 1 and 4 for details of output achievement.

There were a number of problems encountered during the lifetime of the project. Delays over establishment of MOUs and acquisition of botanical collecting permits due to bureaucratic procedures resulted in delayed commencement of research activities, with a knock-on impact on results and outputs. This was made more critical by the relatively long-term nature of the research, involving monitoring success in the establishment of habitat restoration trials within a tight schedule. Engaging local communities in the research process was a deliberate strategy but this brought its own challenges and setbacks that demanded pragmatic and collaborative solutions and a high level of flexibility. Local estimates of the time taken for saplings to become self-sustaining with regard to water supply proved overly optimistic. An earthquake (the largest in 400 years) provided another challenge, seriously disrupting local infrastructure and diverting project staff from key activities including watering, resulting in the disruption of some trials. Furthermore productivity of Huarango fruit, which was intended as the mainstay of the sustainable plant use component, was severely diminished by insect plagues towards the beginning of the project. In all cases we have drawn lessons from these setbacks which themselves are an important contribution to project outcomes: restoring native vegetation and conserving biodiversity in a degraded desert habitat is an intrinsically challenging process.

4.4 Project standard measures and publications

See Annexes 4 and 5.

4.5 Technical and Scientific achievements and co-operation

The project has undertaken the first significant survey and inventory of the vegetation of the Ica and Nasca regions. This was achieved by a team of students from UNICA and La Molina, San Marcos with coordination and training and specialist input provided by staff from Kew and La Molina (see Annex 4). Local students also gathered information on common names and traditional uses of the plants. Specimen identifications have been verified in the herbaria of Kew and Las Molina drawing on the expertise of a range of taxonomic specialists. A new herbarium has been established in UNICA with equipment purchased by the project and specimens accumulated through its research: the first such reference collection for the region. Over 560 species have been recorded including at least 5 new to science. The principal vegetation types of the region have been characterised, establishing an important baseline for conservation management and planning as well as for habitat restoration.

Habitat restoration trials were conducted in five sites testing different approaches. At two sites these were managed partly by local communities, one on the edge of Huarango dune forest and the other in a dry river valley. The other three sites were established in industrial farms applying three approaches: adaptive restoration along a seasonal stream bed; systematic comparative trial plots using different management, planting techniques and native species combinations; and experimental periodic flood irrigation of planted and unplanted land with

waste water. Restoration studies include trials of: bird perches for plant recruitment, artificial nesting sites, germination of bird droppings and fox dropping as well as innovative irrigation methods including fog capture. At all sites standard monitoring procedures were employed during the life of the project recording growth, mortality and plant health. Monitoring was undertaken by trainee students who trained others with supervision from the Project Manager. The technical findings are in the final stages of analysis and will be presented at a conference at Kew in October 2009. In the meantime, practical findings are being finalised in the habitat restoration manual. Significant results indicate a number of appropriate techniques for arid land restoration including: subsoil watering mulches and regulated planting density as well as identification of local species tolerant of extreme conditions and thus offering climate change adaptation potential.

Systematic research on plant propagation has been conducted in the project nursery by a team of UNICA staff and students, with specialist orientation from staff of Kew's Millennium Seed Bank Project and from its horticultural division (orientation from a horticulturist visiting the project on a travel scholarship). Germination and propagation protocols have been developed for 48 of the most important ecosystem and livelihoods plants in the region, providing a vital knowledge resource for habitat restoration. Most of these species continue to be propagated in the tree nurseries and are used in the education tree planting programme now run by ANIA with funding brokered with Trees for Cities UK.

The project has been keenly aware that effective restoration (and conservation) requires a detailed knowledge of the ecology of plant establishment including pollination, dispersal and species population dynamics - natural regeneration and succession being fundamental to long-term success. Thus the project has worked closely with student and professional biologists to record bird and mammal diversity, habitat requirements and species responsible for specific seed dispersal and pollination. These studies not only provide important ecological information on poorly studied species but also furnish a vital component of the restoration guide.

The project also characterised avian diversity and recorded relationships between bird and plant phenology on a systematic basis. Notable autecological bird studies included the declining Peru-Chile endemic Slender-Billed finch (*Xenospingus concolor*) and Peru endemic Black-necked woodpecker (*Colaptes atricollis*) with novel observations in press. The project has also made studies of insects with special emphasis on plague species of *Prosopis*. A forthcoming paper identifies the species and its devastating effects, perhaps related to locally recorded rises in humidity and average minimum temperatures. In the reserve concession a large, unusual and apparently new species of Cerambycid beetle (8 cm long) is being studied by the Natural History Museums in Lima and London. The project also recorded new distributions for a number of threatened endemic reptiles including the gecko *Phyllodactylus angustidigitatus*.

Additional research activities include case study evaluation of all known *Prosopis* plantings established in the region prior to the project, with interviews of relevant individuals for historical background and systematic evaluation of plant mortality, growth and form (including root structure). Quantitative studies of the fruit yield of Huarango trees were conducted as part of the sustainable plant use component. Studies of vegetation change in the region were undertaken with collaboration from Kew's GIS unit, comparing aerial photographs from the 1950s with up-to-date satellite imagery. An example of the findings, presented as an interactive web page, can be seen here: http://news.bbc.co.uk/1/hi/sci/tech/7981650.stm.

4.6 Capacity building

Capacity building of host partner organisations has largely been through training and human resources development. Training has played a major part in this project, with a particular focus on the local university UNICA but also Grupo Los Aves and ANIA. Details are provided in Annex 4. Personnel now working with these three organisations have received substantial orientation and work experience in research, data management and project management through the course of the project, leaving those organisations in a stronger position to operate successfully in this field. Sustainable financial support secured for ANIA (though the Trees for Cities agreement) and Grupo Los Aves (through a funding agreement brokered with A Rocha) has also helped to build the capacity of these organisations.

As an indicator of the impact of this training, three people trained by the project have since been contracted by other organisations for environmental impact and biodiversity assessments and another eight for plant propagation work. Three have been contracted by ANIA and are continuing to provide training and orientation in tree planting and production of huarango products in schools.

4.7 Sustainability and Legacy

The most enduring achievements of the project are likely to be the following:

Education and awareness: the combination of a strong educational component to the project, engagement of schools and teachers in project activities, input into curriculum development (including teachers' workshops), development of educational resources and establishment of public events (e.g. the Huarango Festival, which was held again in 2009 after project funding had finished) has resulted in considerable momentum behind raising awareness of the importance and significance of biodiversity in the region.

Conservation: the formal establishment of two reserves, incorporating one of the largest remaining fragments of riparian dry forest in the region, will provide secured conservation areas where learning outcomes from Darwin restoration trials can be put into practice at whilst providing vital resources of seeds for expanding restoration. The conservation status improves these areas as worthwhile funding investment. They also provide a source of huaranga (fruits) for food products and an educational resource (particularly the San Pedro reserve nearest Ica) for ecological study and engagement with local communities and schools co-ordinated by GAP and ANIA. It is hoped that they will also furnish a source of income from ornithological tourism. In order to further the sustainability of the San Pedro conservation concession a German ANIA volunteer has been recruited for a year, to ensure the integration of the local community into the establishment of the reserve and the school's 'Bosque de Los Niños'.

Tree planting: Until this project a tree planting culture did not exist in Ica. Instilling tree planting as a regular activity is one of the greatest project legacies. Over 4000 children have planted a tree propagated in the UNICA nursery during the project, whilst over 7,000 trees have been handed out for planting at events and festivals. As well as impoverished communities, officials from the regional government and managers of local agro-industries and banks have also planted and helped fund tree planting events. The emphasis on the importance of undertaking tree planting as a way to initiate natural regeneration has been basic to all project publications and educational events. The importance of restoring and/or conserving the habitat of the seed disperser and pollinators in conjunction with tree planting has been highlighted in the forthcoming guides and in all educational activities and festival events.

Practical knowledge and methodologies: the publication of the two manuals *Plantas y Vegetación de Ica – un recurso para restauración y conservación*; (Plants and vegetation of Ica – a resource for restoration and conservation) and *Sembrando un futuro – Restauración y manejo sostenible de bosques y naturaleza de Ica* (Sowing the future – restoration and sustainable management of forest and biodiverisiy of Ica) will provide experience-based tools very much tailored to local needs and knowledge gaps, constituting an enduring legacy for the region. No such information currently exists.

Sustainable plant use: The project has supported the development of a small initiative**,** Miskyhuaranga, producing flour from huarango pods and other pod-derived products as part of an experimental sustainable utilisation programme. Although there are constraints in the development of such products (including the risk that plagues and dieback will continue to have a negative impact on fruit production), this component of the project has helped to deliver a lasting legacy, broadened by the strong focus of the ongoing Huarango Festivals on awareness of sustainable harvesting of food products from native plants. The technical process for production of the Huaranga 'flour' was undertaken by Walter Mick and his team, who undertook laboratory analysis and developed an industrial process in order to reduce humidity and fungal spores, thus achieving phytosanitary permits and the subsequent DIGESA public sale permits. Due to the delays in achieving these permits the trial product marketing in (in the hotels of Ica and Nasca, in shops in Lima, at organic fairs and in corner shops as cake) has only recently been started, but the initiative is continuing independently of the project.

Political will: Considerable engagement by governmental organisations in habitat restoration and conservation has been stimulated by the project. This is an important legacy, helping to consolidate the position of local biodiversity in local policy. This is evidenced by the fact that, as the profile of the project's successes has been raised, increasing number of unsolicited approaches for support have been received. The project members (led by OQW) have been asked to sit on various committees headed by the regional government, INRENA, Ica and Santiago municipalities. Project staff have assisted in three forest fieldwork surveys of INRENA. The project has contributed to a number of government publications and workshops. Of notable success has been the award of Conservation concessions (one in final stages of approval, the other complete). We have contributed to meetings towards establishment of the recently declared government declaration of a large reserve - the Lomas San Fernando with an area of 154,700 ha - home to unique Flora and Peruvian sub species Guanaco (large camelid) (see Darwin Guanaco projects 6126 and 12022 http://darwin.defra.gov.uk/people/1053/) that is of particular conservation significance. The concession attained is contiguous with the reserve and team members have been asked to help develop the management plan.

Trained staff: see 4.6

The project has worked to develop an exit strategy that will help to build on productive local partnerships to ensure continued momentum and provide continuing opportunities for project staff. We have helped to negotiate funding agreements between Trees for Cities and ANIA that should provide continued employment in education/tree planting, and to facilitate the placement of trained students in appropriate local organisations. Equipment has been made over to the core team (now employed through ANIA) to facilitate this work.

5 Lessons learned, dissemination and communication

Among the key lessons learned are the need for taking a long-term approach to this type of activity and the importance of engaging a cross-section of society. It has been very challenging in a zero rainfall area to ensure a continuity of community engagement in watering both in restoration trials and tree planting areas. The project team have learnt in all situations to prioritise people alongside research in order to have any impact.

Although agro-industry is largely an unsustainable activity (falling groundwater and biodiversity loss), engagement has been fruitful, and the importance of ecosystem integration and sustainability has become increasingly recognised by industrial partners as trusting relationships have formed. We now recognise the agricultural environment as an important context for developing biodiversity conservation and habitat restoration in the region [in 2008 an unsuccessful application for a follow-up grant was made to the Darwin Initiative to take this forward].

Information relating to project achievements has been disseminated through a wide range of media and activities with a particular focus on education and local community engagement, particularly focused on the Ica region. Information on project achievements has been disseminated through the Internet (project website with Spanish-language pages), numerous press articles, radio interviews and television shows in Peru, posters, circulation of reports, teachers' workshops, the schools education programme and the annual Huarango Festival. Dissemination is continuing through BBC Espagnol (to be launched simultaneously with the flora manual, including quotations and perspectives from local individuals involved in the project), through the ongoing education and tree planting work of ANIA and through the Huarango Festivals.

5.1 Darwin identity

The Darwin Initiative has been publicised by the use of its name and logo on all project outputs including leaflets, posters, books, product trials (jars), etc. Specific reference to the Darwin Initiative was made in all media articles, interviews etc. This was clearly identified as a Darwin project and commonly referred to as such ("Proyecto Darwin") in communications. As a result, the profile of the Darwin Initiative has not only been elevated in the Ica and Nasca regions (where it was previously unknown), across a wide cross-section of the population from

government to community, but also within Peru as a whole, where a number of other Darwin Initiative projects have already been successfully undertaken.

6 Monitoring and evaluation

No changes were made to the project logframe. The development of logframe-based indicators was effective in monitoring project progress at output level, both as part of the annual Darwin Initiative reporting and M&E process and for internal six-monthly reviews. At purpose level this has proved more challenging for some of the indicators, partly due to the long-term nature of the expected impacts. Thus, for example, in terms of long-term impact on habitat restoration activities and success in the region, baseline data have been gathered from GIS analysis and ground survey but it is too early to monitor change. Likewise baseline reviews were conducted of the use of huarango products in the region. One of the more valuable M&E processes developed during the project was structured reporting by the local students responsible for many of the research activities. In addition to regular activity and output reports, participating students were required to work as a team to develop annual reviews of activities and achievements in their areas of work, in the course of which they developed important data organisation and presentation skills. The feedback from the Darwin Initiative review process was well considered and helpful. The only external evaluation of the project was undertaken by staff from Trees for Cities, who visited the project in 2008 in order to assess the tree planting component they had partially supported. The result was favourable, leading to agreements for future funding through ANIA.

6.1 Actions taken in response to annual report reviews

All issues have been responded to in subsequent reports. Reviews have been shared with collaborators.

7 Finance and administration

7.1 Project expenditure

Costs	**Grant**	**Claimed**	
Staff costs			
Rent, rates, heating, lighting, cleaning			
Postage, telephone, stationery			Costs higher than expected due to heavy demand for mobile phone use
Travel and subsistence			Costs higher than expected due to delays purchasing vehicle, enlarged project team requiring public transport, increased amount of time spent in-country by Project Manager and fall in value of Sterling against the Sol.
Printing			Publication of manuals delayed; printing will be funded from matching funds.
Conferences, seminars etc			
Capital items			Camera, computer, pickup truck, water pump and other miscellaneous computing and office equipment. Breakdown of gear raised cost beyond expected level.
Others			This was an approved category at the time of application and included nursery construction, specialist technical fees (legal/accounting), workshops and Huarango Festival costs.
TOTAL			

7.2 Additional funds or in-kind contributions secured

Additional funding generated during the project lifetime included £2,000 from the Sandra Foundation, £8,000 from Yorkshire Tea and £2,000 from the Bentham Moxon Trust. Additional in-kind contributions were provided for the annual Huarango Festival ($2,000 from Buenaventura Mining) and for the establishment and management of restoration trials in agricultural land (watering, manpower etc.). One of the project's agricultural partners (Agrokasa) has committed $3,000 to support the publication of the forthcoming vegetation guide.

7.3 Value of DI funding

RBG Kew has no operational funds for projects of this nature. This is also the case for the host country partners, particularly UNICA. Without Darwin Initiative funds it would have been impossible to achieve anything significant in the region.

Annex 1 Report of progress and achievements against final project logframe for the life of the project

Project summary	Measurable Indicators	Progress and Achievements	
Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve • The conservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources		Biodiversity conservation areas and initiatives established, local engagement in biodiversity conservation and sustainable plant use increased, scientific information in support of biodiversity conservation generated and disseminated	
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	5 restoration trials established, learnings disseminated through staff training, workshops, events and manuals* Awareness raised through education, public events, publicity, community engagement and integration with curriculum and local government Partners fully engaged throughout project Dissemination through festivals, marketing trials of products, baseline plant use surveys Conservation areas established. 3 years is not long enough to be sure that specific relics are 'buffered' but within the ecosystem of Ica habitat continuity has been enhanced. * for production 2009	
Outputs			
Baseline information on biodiversity of forest fragments and degraded vegetation; use of forest resources	Research undertaken; reports and papers produced (habitat mapping, bird survey, plant survey)	Full reports produced for research programme each year by local students (see section 6). See Annex 5 for papers.	
Tree nursery and seed handling/ propagation methodologies	Minimum of 8,000 seedlings of 3 major tree species & *Prosopis* land races established yr1 & 2	11,000 trees planted or handed out but with very variable survival rates from 15% - 95%. About 2500 plants have been monitored in restoration sites. About 2500 *Prosopis* and *Inga* land races have been established in schools. The UNICA tree nursery has produced over 23,000 seedlings. Indicator of establishment can only be confirmed after 3 years.	
Habitat restoration trials buffering forest relics, using native species	Land use agreements and designation (ACP)signed; restoration areas established (2 yr1, 2 yr2)	MOUs and land use agreements established with 3 large agro-industries and 2 communities prior to setting up five 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)	15 local students from UNICA and students from La Molina Lima engaged for over 6 months each.	

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)	After initial regional socio-economic survey (Huarango utilization) and Piura capacity building visit a Huarango producers' group [Miskyhuaranga] was set-up; industrial process developed to make Huarango flour; company registered; phyto-sanitary permits obtained; product in shops for marketing trials whilst education activities taking place monthly. Syrup production not taken up due to high fuel consumption of process.
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)	2 schools (Huarangal and San Pedro) working on restoration around forest relicts. 12 Schools involved in educational tree planting programme. Ecological brigades formed within schools and orphanage (80 children) training students to train others. ANIA placement staff due to begin in San Pedro for I year.
Information network developed for SE Peru dry forest conservation, included in CHM	Education and dissemination available online and via partners	Contribution to Darwin-Net website
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	Stakeholder meeting and workshops held annually; Huarango Festival held twice (and once pre-project); press and radio releases, posters, leaflets, project website etc (see Annex 4 for quantities and details).
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)	Illustrated manuals in production – due to be distributed in Peru in 2009 following official launch. The publication of these outputs was held back by delays with the research programme and time required for full illustration (see Section 4.3) but is now in process.
Activities		
Fieldwork and baseline research/ monitoring	Fieldwork and research/monitoring programme completed (see Section 4.5). Voucher specimens databased and lodged in herbaria. Image database established.	
Establishment and management of tree nursery	Three tree nurseries established and staff trained; saplings produced for restoration trials and tree planting programmes; research undertaken for propagation and germination protocols.	
Habitat regeneration research & dissemination	Regular monitoring programme of five restoration trial sites carried out; all data amalgamated in Excel pivot charts (50,000 data points) for analysis. Biodiversity and ecological monitoring programme (including birds) maintained on trial sites.	
Local education and capacity building	Schools education/planting programme; student training and work experience; establishment of botanical garden in local museum; engagement with local teachers and curriculum development	
National and international education and dissemination	Establishment of project websites and liaison with news agencies and other media for development of articles and sites.	
Pod processing and sustainability research; market development	Baseline research including interviews and socio-economic studies; product development; compliance with food standards regulations; productivity research; market research and testing; information exchange and awareness programme; packaging and marketing programme development.	

Annex 2 Project's final logframe, including criteria and indicators

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:** • **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	Research undertaken; reports and papers produced (habitat mapping, bird survey, plant survey)	Research data and reporting; annual monitoring outputs; publication records,	Permits for plant collection granted
Tree nursery and seed handling/ propagation methodologies	Minimum of 8,000 seedlings of 3 major tree species & *Prosopis* land races established yr1 & 2	Tree nursery inventory and provenance records; herbarium vouchers	Seeds available for planting
Habitat restoration trials buffering forest relics, using native species	Land use agreements and designation (ACP)signed; restoration areas esta-blished (2 yr1, 2 yr2)	Planting records & maps, 2-monthly seedling monitoring; biodiversity surveys; ratification of ACP	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	Employment and participation records; University reports and supervision	Local families remain committed to active role in project and support its aims

	research (yr1)		
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 & *Prosopis* 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 Prosopis 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 Project contribution to Articles under the CBD

Project Contribution to Articles under the Convention on Biological Diversity

Article No./Title	Project %	Article Description
7. Identification and Monitoring	30	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	20	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
13. Public Education and Awareness	30	Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
Other Contribution	20	Smaller contributions (eg of 5%) or less should be summed and included here.
Total %	100%	Check % = total 100

Annex 4 Standard Measures

Code No.	Description	ProjectTotal
2	2 Masters students graduate from La MOL. Two additional UNICA students begin Masters through project.	2 (4)
4A	14 Students UNICA; training/experience in nursery and seed management, germination techniques, landrace conservation, average 24 weeks each; 17 students UNICA; monthly monitoring of restoration; ecology and biodiversity inventories, average 3 wks each	31
4B		387
4C	Postgraduate students Universidad La Agraria; training/experience in habitat restoration techniques & biodiversity research	6
4D	Average 31 wks each	186
6A	Six landowners/employees receive training in habitat restoration with productive *Prosopis* and Dry forest plant management (2 days); 6 GAP members trained in Avian biodiversity monitoring and botanical collecting and identification (2 days); 17 nursery staff receive training/experience & trained staff train other UNICA students (1 month average); 1 teacher from project area to train with ANIA (1 week) contracted and trained by ANIA; 600 school children trained in tree planting, ecology & cultural use education (2 days); 6 local families trained in *Prosopis* pod flour production (3 weeks each); exchange/training visit of 6 product stakeholders to Algarrobita project in Piura N. Peru (1 week).	766

6B		338
7	Project poster and site signs (Spanish and Quechua), leaflets for Huarango exhibition Museo de Ica (not yet in Quechua); Training video; edited from filmed activities over project, film being made by Delia Ackerman; Educational poster for school classrooms and 1 leaflet; Vegetation and Plants of Ica in Spanish (Guide to Conservation, Biodiversity and Habitats guide for restoration and ecology) (In Final draft see attached PDF); Habitat restoration and sustainable use manual in Spanish Ica, Peru (in prep.)	4
8	4 UK project staff in Peru: Oliver Whaley 96 weeks, Tiziana Ulian 2 wk, William Milliken 4 wk, Sandra King 3 weeks	105
9	Conservation concession proposals – San Pedro and Tunga Usaca	4
10	2x report of biodiversity assessments of restoration sites, (plant collection, bird mist nesting), 2x annual report of biodiversity monitoring data from restoration sites, 2x manuals - Habitat restoration and sustainable use manual in Spanish Ica, Peru (in Prep.), Plants and vegetation – a resource for restoration and Conservation.	6
11A	Black-necked woodpecker *Cotinga* , The role of Prosopis *Latin American antiquity* (see Annex 5)	2
11B	Chile workshop proceedings, RBG Kew 250th Conference (forthcoming)	2
12A	Botanical database handed over to INRENA, UNICA and MOL	1
13A	Dry forest herbarium reference collections established for new Herbarium at UNICA	1
13B	Dry forest herbarium reference collections enhanced at LA MOL and Kew	2
14A	Huarango Festival and exhibition (products, culture and ecology show) 2, Teachers workshop	3
14B	Papers and posters presented at 5 conferences, public lecture and talks presenting project and results: OQW x8, UNICA x9, La MOL students x1	23
15A	El Comercio article 2007	1
15B	Various local press articles	9
15C	National press release Kew UK, BBC Online, and Geographical Magazine	3
15D	Two articles in Kew Magazine	2
18A	Rey del Desierto – Short film boradcast in Peru and available via Utube	1
18C	Local TV reports on project and festival	4
19A	Australian ABC Science program (http://www.abc.net.au/rn/scienceshow/stories/2008/2432894.htm)	1
19C	Local radio interviews/profiles (Radio Huacachina, Radio Luren)	11
20	Herbarium equipment and cabinets, computer, printer, agricultural equipment, microscope, office furniture	Approx. £3,000
21	Tree nurseries established: main at UNICA (8 x 30m); small at Pueblo Huarangal (4 x 6m), fundo Chapi (8 x 15m); new Herbarium at faculty of Science UNICA	4
22	Habitat restoration areas established with designations, San Pedro Hernandez, Huarangal Anchante, Fundo Chanca, Fundo Chapi, AgroKasa SA (May 2008) Agrokasa (Sept 2008)	5
23	Including £8,000 secured for ANIA tree planting project	£20,000

Annex 5 Publications

NB – Most publications and outputs from this project are written in Spanish and therefore are not submitted with the report. In addition to the publications below, a number of scientific articles are in development. The two manuals on the vegetation of Ica and habitat restoration are in production. In spite of the fact that it is not yet completed and that it is written in Spanish, an early proof of the former is submitted in order to give an idea of the nature of this manual.

Type * **(eg journals, manual, CDs)**	**Detail** **(title, author, year)**	**Publishers** **(name, city)**	**Available from** **(eg contact address, website)**	**Cost** **£**
Journal*	The role of Prosopis in ecological and landscape change in the Samaca basin, Lower Ica valley, South Coast Peru from the early horizon to the late intermediate period David G. Beresford- Jones, Susana Arce T., Oliver Q. Whaley, and Alex J. Chepstow- Lusty (2009)	Latin American Antiquity 20(2), 2009, pp. 303–332 (the Society for American Archaeology)	http://www.saa.org o.whaley@kew.org	
Book	Habitat restoration and sustainable use manual in Spanish Ica, Peru (in prep – due for production 2009)	Royal Botanic Gardens Kew	o.whaley@kew.org	
Book*	The Plants and Vegetation of Ica [in Spanish]. (Guide to Conservation, Biodiversity and Habitats guide for restoration and ecology). Whaley O.Q., Orellana, A et al, Edit. Milliken W, Luthi C. * proof copy submitted with report – due for production 2009	Royal Botanic Gardens Kew	o.whaley@kew.org	
Magazine	Getting to the Root of the Problem, Peru's Huarango Forest. UK Pages 32-36 June 2008 Edwards O. (interview Whaley O. Q.) 2008	*Geographical Magazine*, Royal Geographical Society	http://www.geographical.co.uk/Magazine/Kew_in_Peru_-_June_08.html	
Conference Paper	Avances en la Restauración de hábitat y uso sostenible de los Bosques Secos del sur de Perú-Ica. 2007 IV Congreso Peruano de Ecología. Orellana A., Muchaypiña J., Tenorio M., Pérez E., Pecho O., Quinteros F., Salvatierra F., Gómez C., Borda C., González O., Reynel C., Whaley. O.Q., 2007 Arequipa-Perú. Edición Especial Nov. 2007-5(1)	Revista *Dilloniana* - Universidad Nacional San Agustín.		
Conference Paper	Caracterización ornitológica de tres hábitats para su restauración en la costa sur del Perú, Región Ica. 2007 IV. Tenorio, M., Pérez E., Pecho O., Whaley O., 2007	Revista *Dilloniana* - Universidad Nacional San Agustín Congreso Peruano de Ecología. Arequipa-Perú		
Conference Paper	Flora desértica en el distrito de Yauca del Rosario, Ica-Perú. IV Congreso Peruano de Ecología. Arequipa-Perú. Pecho O., Whaley O. Q., Ormeño. M., Alfonso Orellana A., 2007	Revista *Dilloniana* - Universidad Nacional San Agustín. Edición Especial Nov. 2007-5(1)		
Website	Tree planting in the driest place on Earth, John Walton 2009	*BBC*	http://news.bbc.co.uk/1/hi/magazine/7934406.stm	

Magazine	Messages from the Past (*Neoraimondia arequipensis* cacti) Ecology section Pages 36-39 Whaley O. Q. winter 2007	*Kew Magazine*	Royal Botanic Gardens Kew (winner of **Environmental writing award Gardening Media Guild award**)	
Conference paper	Habitat restoration of Dry forest Southern Peru, Vicuña, Chile Workshop Propagación de Plantas Nativas para Conservación, Reintroducción y Restauración de hábitat publication, Whaley O. Q. Tenorio 2008	Centro Regional e Investigación Intihuasi, INIA and MSB Chile.	http://www.inia.cl/link.cgi/	
Journal	The Endemic Black-necked Woodpecker (*Colaptes atricollis*) in Traditional Agriculture of the Ica region, Peru: first observations of nesting and chick development. [in Spanish] Pecho J. O., Evelyn Pérez E., Tenorio M., Oscar Gonzalez O., Whaley O. Q. 2008.	Submitted *Cotinga* 2008	Oscar Gonzalez	
Conference Paper	Biodiversidad Aviar y Habitat Asociados de Desierto Costero del Pacifico en la Region de Ica - sur de Perú., Maturín-Venezuela. Tenorio M., Pérez E., Whaley O. Q., 2007	VIII Congreso de Ornitología Neotropical		
Magazine	Reviving the Trees of Life, Whaley O. Q., 2006 Conservation section, Pages 30-34 winter 2006	*Kew Magazine*, Royal Botanic Gardens, Kew, UK.		
Conference Paper	Flora asociada a Ecosistemas de Bosques de Prosopis "Huarango" para la restauración de hábitats en el desierto costero del sur, Ica-Perú. Orellana A., Muchaypiña J., Whaley O.Q., 2006	XI Congreso Nacional de Botánica, UNA Puno-Perú.		
Conference Poster	Flora Magnoliophyta 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.fciencias-unica.pe.kz	
Presentation of paper at conference	Inventario Florístico del Distrito de Ocucaje, Ica. 2006. Carlos Carbajo, Marco Mendoza, Juan Muchaypiña & Alfonso Orellana. 25 al 30 de Septiembre 2006.	VII Congreso Nacional de Estudiantes de Biología. UNSCH Ayacucho-Perú	Published in Conference abstracts and CD given to participants botan_ica@hotmail.com	

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/	
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/	
Annual report	Informe Anual de Botánica 2006-2007. Alfonso Orellana, Juan Muchaypiña y Marco Mendoza.	Ica-Perú	http://www.huarango.org/	
Annual reports	Estudio y monitoreo de aves de las zones de la restoracon ecologica. 2006, 2007. Mario Tenorio, Evelyn Pérez y Octavio Pecho.	Ica-Perú	http://www.huarango.org/	

Annex 6 Darwin Contacts

Ref No	1516
Project Title	Habitat restoration and sustainable management of southern Peruvian dry forest
UK Leader Details	
Name	William Milliken
Role within Darwin Project	Project Director
Address	Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB
Phone	
Fax	
Email	
Partner 1	
Name	Carlos Reynel
Organisation	Universidad Nacional Agraria, La Molina Lima Peru
Role within Darwin Project	Scientific partner
Address	Universidad Nacional Agraria, La Molina, Lima Peru
Fax	
Email	
Partner 2	
Name	Joaquin Leguia
Organisation	ANIA
Role within Darwin Project	Education/conservation partner
Address	Asoc. para la Niñez y su Ambiente-ANIA Jr. Dos de Mayo 237 - Barranco www.mundodeania.org
Fax	
Email	