

Darwin Initiative Annual Report

Darwin Project Information

Project Ref Number	15/010
Project Title	Buffer Zone Restoration and Development in Knuckles Forest Reserve, Sri Lanka
Country(ies)	Sri Lanka
UK Contract Holder Institution	University of Aberdeen (UA)
UK Partner Institution(s)	Centre for Ecology and Hydrology, Banchory (CEH)
Host country Partner Institution(s)	University of Peradeniya (UP)
Darwin Grant Value	£225,068 / £82,471 (2006 / 2007)
Start/End dates of Project	1 July 2006 / 30 June 2009
Reporting period and annual report number	1 April 2006 to 31 March 2007 Annual Report Number 1
Project Leader Name	Michelle A Pinard
Project website	www.abdn.ac.uk/~soi637/Knuckles/KnucklesHome
Author, date	M A Pinard, 30 April 2007

1. Project Background

The Knuckles Forest Reserve (KFR), located in the central uplands of Sri Lanka (Annex 3 – location map), is one of South Asia's premier sites for conservation of montane tropical forest habitats. It lies within the biodiversity hotspot that extends from the Western Ghats of India into Southwest Sri Lanka and has been proposed for MAB Reserve and World Heritage Site status. The core zone of KFR contains 6000 ha of natural montane forest within an altitudinal range of 200 -1900 m. The buffer zone (20,000 ha) is a mosaic of anthropogenically derived vegetation types that vary in habitat quality, including degraded grasslands maintained by anthropogenic fire and livestock grazing, plantations of tea and *Pinus caribaea*, and natural forest fragments which have, in many cases, been under-planted with Cardamom. The threats to the sensitive ecosystems in the core zone of the KFR are derived from human-induced changes occurring within the buffer zone, such as encroachment of fire, invasion of *P. caribaea* and other plant species, illegal cardamom cultivation, hunting and firewood collection, and forest clearance for agriculture. Understanding and reversing these drivers of landscape change is an essential prerequisite for conservation of the core zone of the KFR.

The aim of the project is to enhance the sustainable conservation of biological diversity and ecosystem services in the Knuckles Forest Reserve (KFR), Sri Lanka, by addressing the main threats to environmental protection through the development of options for buffer zone management that improve the livelihoods of local communities and the restoration of ecosystem functions.

2. Project Partnerships

Project partnerships: UA and UP are working in partnership as the main implementing agencies of the project. A Research Assistant from the UA, Mr Balram Dhakal, is based at UP and supports Prof Gunatileke with project administration and coordination. Further the two institutions, with support from CEH, supervise the four students that are conducting research for the project; each student has an academic advisor from UP and a UK institution.

Work between UA, UP and CEH during the first year focused on the development of the research component related to invasive plant species and planning for the GIS training course that will be held in the second year of the project. Our main collaborator at CEH, Dr Phil Hulme, moved to New Zealand in January 2007 (Professor of Plant Biosecurity, National Centre for Advanced Bio-Protection Technologies PO Box 84, Lincoln University, Canterbury, New Zealand; We are continuing to work with Dr Hulme on the pine invasion study and the GIS training because he is committed to the project, well-qualified and has relevant local experience. His move to New Zealand should have no budgetary implications as the cost of flights from New Zealand to Sri Lanka are similar to those from the UK to Sri Lanka.

In August 2006, the project team met for the Inauguration workshop and a scoping field trip. All project partners (UA, UP, IUCN, Eco Friends Lanka, Midlands Tea Estate) were present for this workshop, with the exception of Mr. Sarath Fernando, Conservator General of the Forest Department (FD), Colombo.

Subsequent to the workshop, formal and informal meetings were held between members of the project team and officials from the Forest Department. The meetings focused on the project's objectives, FD priorities and concerns, selection of study sites, and FD interest in components of the project. A formal meeting was held in Colombo between Mr Dhakal, Prof Anoja Wickramasinghe and Mr Fernando in February 2007 to discuss project developments, study sites, the teams' interest in supporting community development in the buffer zone and the management plan. Progress in gaining approval to set up restoration experiments on FD land has been slower than expected, in part due to a lack of information about the procedures and protocols for requesting approval. We seem to be on track now and expect to submit proposals to the FD very soon for the cardamom and pine enrichment research, and the participatory research on pine enrichment with communities.

Meetings to follow-up on issues raised at the inaugural workshop were held between UA, UP, Eco Friends and Midlands Tea Estate to consider study sites and to refine research objectives. The enthusiasm and support that Eco Friends and Midlands have shown towards the project has been a strength and helpful for overcoming logistical problems in identifying and evaluating potential study sites. Meetings with other collaborators (IUCN, Eco Friends Lanka) and stakeholders (local administrative bodies, private landholders) have been regular to share information and keep everyone up to date on developments.

Capacity building to date has focused on training the MPhil and PhD students affiliated with UP. The students have attended some courses, defended their proposals to a university committee and initiated field work.

The Forest Department and IUCN Colombo are our links to CBD implementation. We will continue to discuss with them a way forward for a management plan for the buffer zone over the next year. In particular, we need to discuss concerns related to the establishment of benefit-sharing agreements between the FD and communities in areas that are identified for sustainable development initiatives and coordinate efforts to produce a vegetation map.

Other Collaborations: The project has collaborated with additional private land holders. We are in discussion with Finlay's as well as the Midlands Tea Estate in relation to establishing collaboratively restoration experiments on their lands.

3. Project progress

3.1 Progress in carrying out project activities

We have met the key milestones that were included in the proposal for the first year's activities. These were as follows: to 1) appoint project staff and recruit MPhil students; 2) to hold the stakeholder workshop with project team to agree workplan, define tasks and priorities, establish experimental and sampling designs; 3) to conduct PRAs in a minimum of 3 villages; and 4) to collate historical data on *Pinus* plantation planting records. More details of these activities are provided below under the output to which they pertain. The activities have been carried out in the manner and time planned with only minor changes; these changes are explained below.

All Outputs

Balram Dhakal began work as Research Assistant for the project in July 2006, he was based in Aberdeen until 14 August, at which time he moved to Sri Lanka.

On 16 August 2006 a Stakeholder Workshop in Colombo (Annex 4a, 4b – agenda and summary of discussion) where we discussed the conservation, restoration and development issues in Knuckles. We also discussed project objectives and the work plan and received valuable feedback as well as commitments to participate from a variety of participants. There were 28 participants that included delegates from the University of Aberdeen (UK), CEH (UK), University of Peradeniya (Sri Lanka), IUCN Sri Lanka, Open University (Sri Lanka), Finlays (Sri Lanka), Eco-friends (Sri Lanka) and several other local NGOs. The workshop was immediately followed by a field visit (17-20 August 2006) to Knuckles and planning meetings for project team. A general work plan and project objectives were agreed at that time.

During the months of September and October 2006, candidates for the studentships were interviewed and appointments were made. Mr. Wijethunga Wasala Mudiyaansdage Anuradha Madawattae was appointed as an MPhil student in September and Mr. Bandara Ekanayake was appointed as a Research Assistant; both are working on *Pinus* invasion research. In October 2006, Ms. Dona Kaushalya Vajirapani Wijayaweera was appointed as a MPhil student and Anusha Prasangani Indra Kumari Abeyaardana was appointed as a Research Assistant. Both are working on the participatory community-based research projects. Mr. Danushka Warnapura Wickramarathna was appointed as the MPhil student to work on grassland restoration at the Riverston site.

There was some delay in appointing one of the three MPhil students at UP because the original candidate withdrew and we had to recruit a second candidate. In the original proposal, one of the three MPhil students would focus on the *Pinus* enrichment study. Because we were able to recruit a student with training and experience in working with communities, she and a second student will focus on community development and the project coordinator, B Dhakal, will take lead responsibility for the implementation of the pine plantation enrichment work. Initiation of the experimental work in the pine and cardamom sites is likely to be slower than expected as it is proving more difficult than anticipated to locate sites appropriate for the work where current use won't be compromised (more explanation is given below).

Equipment procurement was completed in January 2007. A project vehicle and motorbike have been purchased, along with three computers, a printer, two pair of binoculars, a GPS unit and a digital camera. An office space for the project has been established at U Peradeniya in the Postgraduate Institute for Science.

In addition to the travel by UK-based PIs for the workshop and field visit in August 06, D Burslem travelled to Sri Lanka in Dec 06 and M Pinard in Jan 06. In March 07, Prof Wickramasinghe travelled to Aberdeen.

Output: Risk Assessments for Invasive Species and Impacts of Fire

The research plan for the experimental work was approved in November 2006 (Annex 5) and planting records, thinning history and fire history data have been compiled from district, regional and local Forest Department offices (Annex 6). These data have been examined to explore the distribution of the plantations across the forest reserve in order to select sites that will capture the variation ecological variation within the reserve. This has also required the compilation and preliminary analysis of climate and soils data.

Output: Reports on methods of restoration of Pinus plantations and forest with cardamom underplanted

Work towards these outputs focused on identifying study sites within FD lands, potential private landowner partnerships and potential forest fringe communities with an interest in converting pine plantations to agroforestry systems. Reconnaissance visits were made to many parts of the reserve by B Dhakal. A list of potential sites was prepared from the reconnaissance, and a second round of visits were made by B Dhakal and Prof Gunatilleke, to assess the suitability of the sites. Two important criteria for selection were clarity of ownership and accessibility. Once a list of potential sites was finalized (Annex 7), the concerned authorities were contacted to request permission. Some of the potential sites are on privately held land (e.g., Kallabokka State Plantation, Medulkele, Midlands State Plantation, Rattota, Hare Park State Plantation and the State Plantation Cooperation). These private landholders have agreed to allow the research to be carried out on their sites. Though the lands proposed for the cardamom experiment are on privately held land, they are also within the conservation area or within the buffer zone therefore the FD must allow give their permission. This permission has been requested of the FD but we are awaiting approval.

Some issues arose during the review of potential sites that had not been fully anticipated. The restoration work in the cardamom areas, and the experimental methodology that will be applied excludes the maintenance and collection of cardamom from the study sites. The private landowners were unwilling to free up their land for the studies because of this cost.

For the pine plantation enrichment experiment, site selection was restricted because many of the accessible plantations are under contract with individuals for resin-tapping. Our experimental protocols (including thinning the overstorey and planting within the understorey) are incompatible with resin-tapping, at least during the initial stages of establishment, therefore our choice of sites was very limited. We eventually identified 3 potential sites and have put in a request for permission to proceed with the FD. The three sites are Riverston, Gammaduwa and Udailuka. The third, Udailuka, is particularly important because the local community has identified the plantation as a low value land use and would welcome an opportunity to increase its value to them with an enrichment planting experiment.

Preliminary proposals have been written for the research projects but these are yet to be finalized (Annex 8).

Output: Reports on methods of restoration of degraded grasslands

The research plan for the experimental work was approved in November 2006 (Annex 9) and subsequent work has focused on maintaining plots in Riverston that will allow us to test hypotheses related to constraints on tree establishment in degraded grasslands (Annex 10). A second experimental site is being established now at Deanstone in order to test hypotheses related to nutritional and competitive interactions that constrain tree seedling establishment. A third experimental site has been identified in Madulkele with work planned for May 2007.

Output: Reports on the compatibility of cash crop production with conservation goals in the buffer zone

Two Participatory Rapid Appraisals were conducted with residents from three villages (Kalugala, Kosdanda and Udailuka; see map in Annex 3) in December 06 and February 07 with a main aim of prioritizing development options for the buffer zone. More specifically, these meetings and activities were used to: 1.) To describe broadly the economic profile of the villages, the major problems and issues they face, and possible solutions to these problems and issues; 2.) To increase local awareness of the community's concerns over their situation and their environment; 3) to reinforce the recognition of their collective abilities and responsibility to manage themselves and their environment in a sustainable manner; 4.) To provide an opportunity for men and women to participate in decisions and actions that will affect their lives, thus developing a sense of ownership and collective responsibility for such decisions and actions; 5) To strengthen community capacity to access internal and external funds to support viable and sustainable socio-economic projects; 6) To enable a community to link and form alliances for advocacy and technology sharing; 7) to support the enhancement and sustainability of local institutional and organizational structures for community development. Objectives 3-7 will continue to be addressed during the second year of the project through participatory planning workshops for interventions in fallow enrichment (Udailuka), pine forest (Udailuka) riparian areas (Kalugala), and home gardens (Kosdanda). These four interventions were ranked as the top priorities for the communities during the PRAs.

The PRAs contribute to two project outputs, the recommendations to the management plan and to the report on the compatibility of cash crop production with conservation in the buffer zone. The PRAs served as a formal starting point for the project team to work with the communities in order to prioritize and plan future interventions for development.

The PRAs were conducted by 5-6 members of the project team, lead by Prof Anoja Wickramasinge (UP). The activities with Kalugala and Kosdanda were conducted at the community hall; the activities with Udailuka were conducted at a residence in the village. Efforts were taken to conduct the meeting to bring together representatives of several forest user groups, to include issues as awareness raising, information transfer and extension. The activities included participatory mapping, community income charting and group discussions to identify common problems and issues, potential solutions. Subsequent to the group meeting, transect walks with key informants have been used to identify useful plant species that could be incorporated into the enrichment interventions (see map Annex 11).

The results of the PRA are summarized in Annex 12a (with the project proposal as Annex 12b). The three villages differ in their reliance on forest products for income and their concerns about the environment.

In Kosdanda, villagers are more reliant on treacle and jaggery production than on agriculture. Treacle (brown sugar) is produced from the sap of the palm, *Caryota urens* (locally known as kitul); jaggery is a fermented drink produced from the sap. Palms in the forest are tapped but legal access requires a permit from the FD; these annual permits have been issued as a short-term measure to allow villagers to develop alternative livelihood options during a "grace" period. The expectation is that at the end of the grace period, the FD will stop issuing permits and the restriction of any harvest of forest products within the reserve will be enforced. The villagers in Kosdanda identified a need to develop options for enrichment of home gardens as a priority for development.

In Kalugala, paddy cultivation is the primary livelihood activity for the villagers. The villagers depend on water from Warawwe Ela and two other tributaries for the paddy. Human pressures on the riparian systems is high and the lack of conservation and development efforts in the riparian areas is a concern for the villagers. The priority intervention to design and implement with the villagers of Kalugala will be riparian zone restoration and enrichment.

In Udailuka villagers depend on the service functions of the forest (e.g., stream water for irrigation of highland crops), while their livelihoods are primarily based on agriculture. The village is located near to the reserve boundary and near to some degraded lands that fall within the buffer zone. The Forest Department initiated a 20-acre pine plantation program in Udailuka with the community participation during the year 1985. The establishment and continued existence of the pine plantation has generated much controversy and bad feeling in the village. The villagers believe that natural forests are cleared by the FD to make way for pine plantations; this perception has contributed to the disfavoured view of the plantation that is near Udailuka. Forest fires were used traditionally by subsistence farmers in Udailuka, especially to convert forest to crop (chena) land and to reclaim pastures from invading weeds. They were also used along the forest fringe to improve grazing for cattle, for honey harvests and bush meat hunting. With the demarcation of the forest reserve boundary, fires in the buffer zone were prohibited. Nevertheless, fires continue to be used, leading to a decrease in forest area.

A questionnaire has been designed to gather additional information on socio-economic parameters and household level priorities for development from villagers in the three areas. As one objective of the project is to establish a participatory process, the questionnaires aim to gather information about perceptions about the reserve and conflicts related to the protected area, stakeholder characteristics, human-forest linkages, local livelihood systems, threats to livelihood systems, threats to the forest, local institutional structures and governance systems, market attributes and local production systems. Eleven households were interviewed using the questionnaires in February in Kosdanda. This work will continue through March, April and May.

Over the course of the second year, a long-term community development plan will be prepared. This plan will reflect in operational terms the community's vision and goals and contain its strategic objectives and targets. The community development plans will then be translated into specific action plans that describe the different activities to be undertaken over shorter periods of time. Some work has started on this plan with Kosdanda.

Along with the MPhil student that is funded through the project, a second MPhil student, Ms Anusha Prasangani, has been contracted by the project to examine local innovations in home gardens and priorities for development. A MSc candidate from UA, Ms. Namrata Dhakal, is developing a research proposal to examine the population structure of *C. urens* in the forest area near Kosdanda with an aim of evaluating the sustainability of harvesting the sap for treacle and jaggery.

Output: Recommendations for management of buffer zone of KFR

Remotely sensed data in the form of aerial photographs and high resolution satellite images are being assessed for their utility in mapping vegetation types and monitoring land use change in the reserve and the surrounding buffer zone. This work is a joint effort but is being led by Prof Wickramasinghe (UP) and a Teaching Fellow in the Geography Department at UP, Mr. Tilak Bandara. Mr Bandara is planning to do his doctoral research on policy changes in forest resource management and associated land use changes in the Knuckles Region.

3.2 Progress towards Project Outputs

Overall we have made good progress in moving towards all outputs. Assumptions and indicators that were identified in the original proposal still seem valid.

3.3 Standard Output Measures

Although progress has been made towards several of the projects outputs, none are completed to date. No publications have yet been made under the project.

Table 1 Project Standard Output Measures

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	TOTAL
4C	Postgraduate training	4 MPhil, 1 PhD				
15A	Press release	1				

3.4 Progress towards the project purpose and outcomes

The foundation work that will allow us to achieve the project purpose is underway, the indicators still seem adequate and appropriate. The assumptions remain true, however, it has become clear that the project team will need to invest a lot of time to broker negotiations between the Forest Department and the communities to establish benefit-sharing agreements for land within the buffer zone that is currently under FD ownership and management. For example, the residents of Udailaka would like to convert the nearby pine plantation to an agroforestry system that provides products useful to the villagers. The FD has agreed in principle to allow enrichment planting experiments in some of their pine plantations, however, the longer term rights and responsibilities over the land have not yet been discussed by the FD and the community involved.

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

The points raised under the previous subheading are relevant here. To date there is no measurable impact. If we are models of restoration in the grassland, cardamom and pine environments are successful, and the success recognized by the stakeholders with responsibility for implementing the management plan in the buffer zone, the potential biodiversity impact of the project would be large.

4. Monitoring, evaluation and lessons

Formal meetings of the project team are taking place every two months in UP to allow members to exchange information and to update each other on progress and issues arising. These meetings have been very productive to date for providing feedback to the team and for identifying items needing resolution. The Project Leader is in frequent contact with the Research Assistant (B Dhakal) and the UP Coordinator (Prof Gunatilleke). B Dhakal reports to M Pinard and Prof Gunatilleke every two months. The research students submit progress reports to their thesis committees every six months and they receive feedback from their supervisors on progress more frequently. There were academic staff exchanges (UA to UP or UP to UA) in August 06, December 06 and January 07.

The lessons learned to date are principally related to ways to improve the smooth operations of the project. We developed a system for booking project vehicles, equipment and staff and have been able to refine and improve this with experience and reflection. Logistically, the project is working well now. More consideration to how we can evaluate our outputs and outcomes in relation to the project purpose will be made this year.

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

Not applicable, this is our first annual report.

6. Other comments on progress not covered elsewhere

The changes to the project design to date are minor and have been described above. No significant difficulties have been encountered to date; the only development relevant here perhaps is that it is taking us longer than expected to confirm study sites and gain permission to conduct the restoration trials within cardamom and the enrichment trials within pine plantations. This is principally because the majority of the cardamom and pine sites are being used for either cardamom harvest or resin tapping. Our interventions would require access to the sites for these uses to be curtailed. Over the longer term this is not a problem, however, over the short-term, where landowners have promised access, it has meant that the pool of potential sites for the experiments is much less than what we had originally expected.

7. Sustainability

Our efforts to promote the project are described under the next heading (Dissemination). The number of private landholders expressing an interest and offering access to land is greater than anticipated and suggests that our activities and goals for restoration are relevant and welcome. The exit strategy hasn't changed substantially from that described in the proposal.

8. Dissemination

Dissemination activities to date include presentations at national and international conferences, and participation in national and local level workshops.

D Burslem presented a paper on the grassland restoration experiments in Knuckles at an International conference on Humid Tropical Ecosystems: changes, challenges, opportunities (4-9 December 2006) held in Kandy, Sri Lanka. The target audience at this conference was policy-makers, researchers, and government officials. Three of the MPhil students working with the project participated in the International Forestry and Environment Symposium (22-23 December 2006) held in Colombo where the audience was similar to that of the previous conference. B Dhakal presented the project to a national workshop on Environment and Biodiversity Research Priorities where the National Plan and Ten Year Strategic Plan for Sri Lanka were discussed. B Dhakal also presented the project concept to a meeting of local landowners of Knuckles (30 March 07) and discussed project activities and plans for the future.

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

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2006/07

Project summary	Measurable Indicators	Progress and Achievements April 2006 - March 2007	Actions required/planned for next period
<p>Goal: <i>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</i></p> <p><i>The conservation of biological diversity,</i></p> <p><i>The sustainable use of its components, and</i></p> <p><i>The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources</i></p>			<p><i>(do not fill not applicable)</i></p>
<p>Purpose To enhance the sustainable conservation of biological diversity and ecosystem services in the Knuckles Forest Reserve (KFR), Sri Lanka, by addressing the main threats to environmental protection through the development of options for buffer zone management that improve the livelihoods of local communities.</p>	<p>Recommendations for buffer zone management integrated in the updating of management plan for KFR</p> <p>New knowledge on methods for ameliorating the threat to KFR from fire and invasive species</p> <p>New knowledge on restoration pathways for grassland and <i>Pinus</i> plantation systems</p> <p>New knowledge on the compatibility of cash crop production and maintenance of ecosystem services in the forest resources and services in the KFR buffer zone</p> <p>Increased awareness of</p>	<p>The foundation work that will allow us to achieve the project purpose is underway, the indicators still seem adequate and appropriate.</p> <p>Results from research plots on grassland restoration suggest that tree seedling emergence, survival and growth in degraded grasslands are inhibited strongly by competition with grass and to a lesser extent by vertebrate herbivory and fire.</p> <p>The PRAs have contributed to increasing local awareness of concerns over local environmental issues and concerns for sustainable livelihoods. The participatory research in three villages is also reinforcing a recognition that the villagers themselves have the ability and capacity to design interventions</p>	<p>Workshop in GIS techniques for project team, staff of FD, IUCN, UP and associated organizations to support data management and analysis for management plan.</p> <p>Participatory planning for sustainable development interventions in Kosdanda, Udailuka, and Kalugala.</p> <p>Surveys for species selection for pinus enrichment experiment.</p> <p>Establishment of experiments</p>

	opportunities for sustainable development within buffer zone amongst communities, local government, Forestry Department and other stakeholders of KFR	to manage their environment.	
Output 1. Reports on methods of restoration of <i>Pinus</i> plantations, degraded grasslands and forest with cardamom and on the compatibility of cash crop production with conservation goals in buffer zone	Reports peer-reviewed and publication date established, distribution arrangements in place.	Work on each of the four components of this output is underway, the field based experiments have been initiated in two cases, and we are waiting for final approval of sites and the research plans for the other two. The indicators still seems appropriate.	
Activity 1.1 Stakeholder workshop with project team to agree workplan, define tasks and priorities, establish experimental and sampling designs.		Completed. Follow-up discussions among team members as appropriate.	
Activity 1.2 <i>Pinus</i> plantation enrichment trial established by yr 2; re-census yr 3		Potential sites have been identified and requests for permission to utilise them have been made to landowners; research design and detailed budget have been prepared. During the next period the experiments will be established.	
Activity 1.3 Forest fragment trial established to monitor regeneration and recovery from Cardamom cultivation.		Potential sites have been identified and requests for permission to utilise them have been made to landowners; research design and detailed budget have been prepared. During the next period the experiments will be established.	
Activity 1.4 Grassland restoration trial established by yr 2; re-census yr 3		Data collection underway at one site, two additional sites identified and experiments are being established currently. During the next period the experimental setups will be completed and data collection will continue.	
Output 2. Risk assessments for invasive species and impacts of anthropogenic fire	Risks posed by two significant alien invasive species assessed by yr 2	The baseline data required for undertaking the research have been collected and the field research is underway. The first indicator should be revised to identify one rather than two invasive species, as <i>Pinus</i> is the only significant threat that has been identified.	

	Risks posed by anthropogenic fire at three sites assessed by yr 3	Each research component is gathering information about threats posed by fire.
Activity 2.1. Collation of historical data on <i>Pinus</i> plantation planting records and fire frequency; mapping new regeneration of <i>Pinus</i> outside plantations		Completed first point; mapping of new regeneration is ongoing. During the next period, data on fecundity, distance of spread, and habitat vulnerability to invasion will be collected and analysed.
Output 3. Recommendations for management of buffer zone of KFR	<p>Sampling protocols for vegetation mapping defined by yr 2.</p> <p>Income-generating activities compatible with park management objectives identified.</p>	All of the output indicators are relevant to this output. It is perhaps more relevant to have the indicator related to vegetation mapping to actually be the vegetation map, rather the protocols for sampling.
Activity 3.1 Participatory appraisal with residents from 3 villages to prioritise development options for buffer zone.		Completed. Follow-up with participatory planning exercises and quantitative research on livelihood systems and forest-livelihood linkages.
Activity 3.2 Participatory research on production of cash crops within restoration sites in buffer zone		Underway in 3 villages. Further surveys will be conducted in other areas within the buffer zone, specifically to inform the <i>Pinus</i> enrichment experiments.

Annex 2 Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p>Goal:</p> <p>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</p> <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 			
<p>Purpose</p> <p>To enhance the sustainable conservation of biological diversity and ecosystem services in the Knuckles Forest Reserve (KFR), Sri Lanka, by addressing the main threats to environmental protection through the development of options for buffer zone management that improve the livelihoods of local communities.</p>	<p>Recommendations for buffer zone management integrated in the updating of management plan for KFR</p> <p>New knowledge on methods for ameliorating the threat to KFR from fire and invasive species</p> <p>New knowledge on restoration pathways for grassland and <i>Pinus</i> plantation systems</p> <p>New knowledge on the compatibility of cash crop production and maintenance of ecosystem services in the forest resources and services in the KFR buffer zone</p> <p>Increased awareness of opportunities</p>	<p>Annual reports and publications by Forest Department, IUCN Sri Lanka and private sector partner organisations.</p> <p>Project reports and publications.</p>	<p>Government policy remains supportive of conservation of KFR; Forest Department and other partner organisations remain committed to project and to implementation of outputs</p>

	for sustainable development within buffer zone amongst communities, local government, Forestry Department and other stakeholders of KFR		
<p>Outputs</p> <p>Reports on methods of restoration of <i>Pinus</i> plantations, degraded grasslands and forest with cardamom and on the compatibility of cash crop production with conservation goals in buffer zone</p> <p>Risk assessments for invasive species and impacts of anthropogenic fire</p> <p>Recommendations for management of buffer zone of KFR</p>	<p>Minimum of 15 staff from 3 partner organisations trained by yr 3 in vegetation mapping and GIS.</p> <p>Sampling protocols for vegetation mapping defined by yr 2.</p> <p>Income-generating activities compatible with park management objectives identified.</p> <p>Risks posed by one significant alien invasive species assessed by yr 2</p> <p>Risks posed by anthropogenic fire at three sites assessed by yr 3</p> <p>Reports peer-reviewed and publication date established, distribution arrangements in place.</p>	<p>Workshop reports</p> <p>Participants attendance records</p> <p>Vegetation map of KFR and associated legend.</p> <p>Project reports</p> <p>Risk assessment reports submitted to Darwin Initiative</p> <p>Published reviews and feedback on report.</p> <p>2 copies sent to Darwin Initiative</p>	<p>Trained staff remain in institutions and in positions where they can use the skills provided and train others in the skills</p> <p>Sites at risk identified by partner organisations</p>

Activities	Activity milestones	Assumptions
Workshops	<p>Yr 1: Stakeholder workshop with project team to agree workplan, define tasks and priorities, establish experimental and sampling designs</p> <p>Yr 1: Participatory Appraisal with residents from 3 villages to prioritise development options for the buffer zone</p> <p>Yr 2: Workshop in GIS techniques for staff of Forest Department, IUCN and UP</p> <p>Yr 2: Community-based training on monitoring and participatory research, SWOT analysis of opportunities for livelihoods and income generation in buffer zone</p> <p>Yr 3: Community-based workshops for dissemination and planning future activities</p> <p>Yr 3: Final workshop, for dissemination and work on publications</p>	<p>Users and relevant stakeholders are willing and able to participate in the process to develop agreements and protocols.</p> <p>Local communities are interested in livelihood options within the buffer zone and are willing to participate in project activities.</p> <p>Forest Department continues to support sustainable development in the buffer zone.</p> <p>Partner organisations assist with identifying sites for plantation and grassland experiments</p>
Research	<p>Yr 1: Collation of historical data on <i>Pinus</i> plantation planting records and fire frequency; mapping new regeneration of <i>Pinus</i> outside plantations</p> <p>Yr 2: Dendrochronological analysis of <i>Pinus</i> invasions in relation to fire frequency</p> <p>Yr 1, 2, 3: <i>Pinus</i> plantation enrichment trial established by yr 2; re-census yr 3</p> <p>Yr 1 and 2: Forest fragment trial established to monitor regeneration and recovery from Cardamom cultivation.</p> <p>Yr 1, 2, 3: Grassland restoration trial established by yr 2; re-census yr 3</p> <p>Yr 1, 2 and 3: Participatory research on production of cash crops within restoration sites in buffer zone (e.g., enrichment of <i>Pinus</i> and forest fragments with timber and non-timber species)</p> <p>Yr 2,3: Classification of vegetation within the buffer zone based on ecological attributes, livelihood options and management requirements</p>	

Checklist for submission

	Check
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Have you completed the Project Expenditure table?	
Do not include claim forms or communications for Defra with this report.	