



Darwin Initiative Annual Report

Important note:

To be completed with reference to the Reporting Guidance Notes for Project Leaders: it is expected that this report will be about 10 pages in length, excluding annexes



Submission Deadline: 30 April 2011

1. Darwin Project Information

Project Reference	17003
Project Title	Developing tools for reducing biodiversity losses in tropical agricultural landscapes
Host Country/ies	Malaysia
UK contract holder institution	University of York
Host country partner institutions	Universiti Malaysia Sabah, Malaysian Palm Oil Board, Forest Research Centre, Wilmar (PPB Oil Palm Bhd), Royal Society SE Asian Rainforest Research Programme, Dato' Henry S. Barlow
Other partner institutions	University of Leeds
Darwin Grant Value	£218,438
Start/end dates of project	1 June 2009 – 21 May 2012
Reporting period (eg Apr 2010 – Mar 2011) and number (eg Annual Report 1, 2, 3)	1 April 2010-31 March 2011 Annual Report number 2
Project Leader name	Prof Jane K Hill
Project website	http://www.york.ac.uk/biology/research/ecology-evolution/kane-k-hill/
Report authors, main contributors and date	Jane Hill, Keith Hamer April 2011

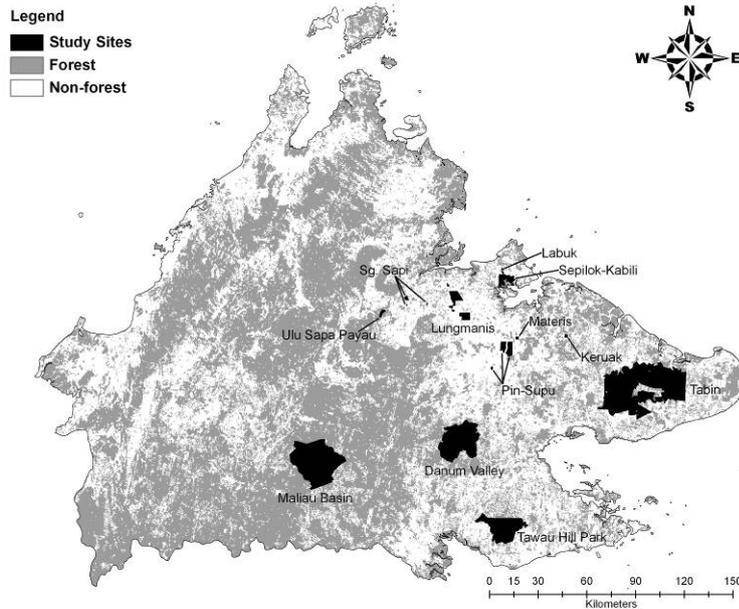
2. Project Background

The main aims of the project are capacity building, training and research to enable conservationists, land managers, and policy makers to assess the ecological benefits of promoting biodiversity within agricultural landscapes. Findings from the project will enable us to provide clear practical advice on the consequences for biodiversity and ecosystem function of incorporating natural forest remnants within oil palm plantations. In this way, to enable stakeholders in Sabah to promote responsible economic growth whilst maximising the conservation of biodiversity.

We shall achieve these objectives by: (1) collecting new field data on species richness of key target taxa and ecosystem functioning in natural rainforest remnants and adjacent areas of oil palm, (2) quantifying forest 'spill-over' effects and the contribution of forest remnants to biodiversity and ecosystem functioning of surrounding agricultural areas in relation to remnant size and location, and (3) using computer models to integrate these data and determine the effectiveness of natural forest remnants for promoting landscape connectivity and thus conservation of biodiversity and ecosystem function.

We are focusing on ants and butterflies, which are highly diverse with many endemic species on Borneo, are high-profile sensitive indicators of environmental changes, and comprise species with different ecological functions (herbivores, detritivores, predators etc) thus making it possible to examine changes in ecosystem functioning as well as diversity *per se*. The methods developed by the project will also be applicable to other taxa and we shall leave a lasting legacy of personnel trained in their application.

Map of study sites in Sabah (Malaysia; north Borneo)



3. Project Partnerships

The project partners at the University of York and Universiti Malaysia Sabah (UMS) have continued to work successfully together since the current project began in June 2009. The success of the collaboration is greatly helped by the fact that Dr Suzan Benedick was involved in three previous Darwin projects with the University of York. The management roles of the UK and host partners have not changed this year and remain as described in the original project application.

Jane Hill (York) is overseeing the project and training the two DRFs in quantitative invertebrate census methods, identification, and taxonomy. Keith Hamer (Leeds) is providing training in experimental design, assessment of ecosystem function and analytical methods. Colin McClean (York) is providing training in spatial modelling techniques and GIS. Suzan Benedick (School of Sustainable Agriculture, UMS) is co-ordinating the project locally and providing day-to-day advice and support to the DRFs during fieldwork campaigns. Chey Vun Khen (Chief Entomologist, FRC) provided permits to sample in forest remnants in Year 1, and in this year has primarily helped write up project findings for publication. Calley Beamish (Biodiversity & Conservation Manager, Wilmar International) has facilitated access to field sites in oil palm, and is providing support in-kind in terms of accommodation, subsistence and field support for DRFs during field work campaigns. Glen Reynolds (RS SEARRP) is providing practical support locally for field work through provision of trained field assistants, and by providing access to all research facilities at Danum Valley Field Centre, Sabah. The lead DRF1, Noel Tawatao, has been funded previously by the Darwin Initiative through a Darwin Fellowship (EIDPS012) and has been training the other DRF2 (Yen Yee Loh) in field protocols, experimental design, and statistical analysis.

In due course, Henry Barlow (RSPO) and Dr Siti Ramlah (Head of Entomology, MPOB) will comment on project results and policy recommendations and provide direct links to RSPO as well as to one of the largest oil palm producing companies in SE Asia (Sime Darby Bhd.) and to current Malaysian Government policy in respect to palm oil production and sustainability. We have recently submitted papers for publication, and we will provide non-specialist Summaries of these published papers to help disseminate findings. We are doing this at the request of project partners.

As in Year 1, most of the management of the project this year has been via email, supplemented with phone conversations. Two UK partners (Hill, Hamer) visited Borneo in July-August 2010 to supervise on-going fieldwork sampling ants and butterflies, and to liaise with host partners. There have been no major changes to the management structure in Year 2.

We have recently instigated a new collaboration with 'Earthwatch' (<http://www.earthwatch.org/europe/>) and are working with this organisation on biodiversity and ecosystem functioning in oil palm plantations in Sabah. The DRFs have been carrying out fieldwork with Earthwatch-funded PhD students and developing new collaborations which are adding value to their research findings in relation to ecosystem functioning in their study fragments. Jane Hill met up with Brian Fisher from the California Academy of Sciences when he visited Sabah to run an ant ID course at the main field site (co-organised by DRF1), and discussed new collaboration in relation to ant taxonomy and identification.

As yet, no link has been made with the CBD focal point for Malaysia (Ministry of Natural Resources and the Environment) but representatives will be invited to the end-of-project workshop and circulated into policy-related material arising from the project's findings.

4. Project Progress

Output 1. *Improved capacity for capturing, analysis and computer modelling of ecological data.*

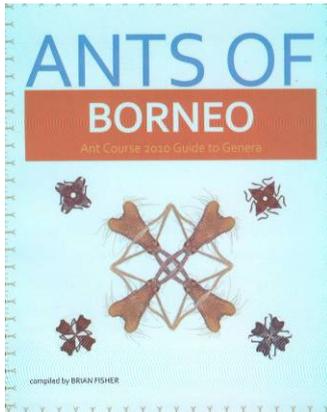
Indicators: *Two DRFs successfully trained in ant and butterfly sampling and identification techniques, in quantifying ecosystem functioning, and in spatial modelling of ecological data.*

Prof Jane Hill (York) and Dr Keith Hamer (Leeds) visited Sabah in July/August 2010 to supervise on-going field work, visit field sites and assess on-site training of DRFs. Project progress was discussed with all host partners.

In Year 2, Noel Tawatao (DRF1) completed 6 months of field work sampling ants in forest fragments and surrounding oil palm plantations. In Year 2, Noel also spent 6 months in the UK identifying his ant specimens, analysing data and writing up his findings. New ant material is currently being prepared for uploading on to 'Antweb' (www.antweb.org), and this will continue in Year 3 as the IDs of more ant morpho-species are confirmed. Noel attended and advised on an ant ID course run by the California Academy of Sciences at the main field site in Borneo (Danum Valley Field Centre) in August 2010. This helped develop Noel's skills in ant ID, and greatly increased the speed at which the identification of the ant material is currently progressing. All material will be uploaded onto the Antweb webpage, which will serve as an interactive guide for identifying ants of Borneo. This work is in collaboration with Dr Brian Fisher, curator of ants in the California Academy of Sciences. A preliminary hardcopy of the field guide was produced for participants at the Ant ID course in Borneo in August (see photo below).

In Year 2, Yen Yee Loh (DRF2) spent the first 6 months completing her registration for an MSc degree at the local University (Universiti Malaysia Sabah), and writing up her thesis proposal and outlining her project aims and objectives. She also received training in field skills from DRF1 and Dr Benedick in butterfly ID, butterfly sampling, and vegetation surveying from DRF1. The DRFs carried out field work together with Noel taking responsibility for ants and Yen responsibility for butterflies. Both DRFs collected data on environmental variables at field sites.

Hardcopy field guide to the ants of Borneo, limited number of copies produced for participants at the Ant ID course



Yen Yee Loh (DRF2) sampling butterflies using fruit-baited traps at Danum Valley Conservation Area, Sabah, prior to sampling in forest remnants and oil palm plantations.



Noel Tawatao (DRF1) sorting and identifying ant specimens from forest remnants and plantations at Danum Valley Field Centre, Sabah



Means of verification: *DRFs demonstrate competence in field sampling and data capture techniques.*

To date, we have sampled and identified a total of 254 morphospecies of ants from 53 genera and 11 subfamilies that have been sampled from 19 forest fragments of different sizes (5.41-120,00ha), and the surrounding oil palm plantations. Noel is taking primary responsibility for analysing these data. Some of these data have been accepted for publication in 2010 (see Table below), and the remaining data are currently being analysed and will be submitted for publication in Year 3.

The Table below shows the sites that have currently been sampled for ants. Forest Reserves and VJRs are plotted on the map above. The HCVF areas are too small to be plotted on the map but occur close to Sapi and Tabin. Sites in bold have also been sampled for butterflies.

Habitats	Area(ha)	Isolation (km)	No. of stations
<u>Forest Reserve</u>			
Danum Valley	continuous		5
Maliau Basin	continuous		5
Tabin	122,539	45	5
<u>VJR</u>			
Sepilok	5,529	48	5
Ulu Sapa Payau	720	8	5
Sungai Sapi C	320	15	5
Materis	250	32	5
Keruak	225	34	5
Pin Supu A	220	25	5
Labuk	120	46	5
Sungai Sapi A	45	5	5
<u>HCVF</u>			
Water catchment	120.71	14	3
Sabasar	87.7	24	3
Rekasar	85	18	3
Yong Peng	56.82	23	2
Meranti	30	16	2
Jatu	12.58	11	2
Lunpadas	11	19	2
Delilah	5.41	20	1

In Year 2, Yen Yee Loh received on-site training in butterfly sampling and ID, and Mark-release recapture methods. She carried out sampling at two sites near the main field station where Dr Suzan Benedick had previously carried out her PhD research. Currently, Yen has recorded 175 butterfly individuals of which 119 individuals were from 17 species in unlogged forest, and 56 individuals from 15 species in adjacent selectively logged forest.

In year 2, both DRFs have spent 6 months in the UK receiving training. Yen Yee Loh has attended Masters-level courses in statistical analysis, using R statistical software, and spatial modelling (including GIS). She has successfully used these new skills to manipulate landcover data for Sabah and to explore new methods for analysing habitat connectivity. This will be developed further in year 3.

Output 2. *Clear advice provided to managers and policy makers at national and regional levels and through RSPO group and ASEAN biodiversity network.*

Not expected until year 3 and 4 of the project.

Output 3. *Research data provided on how biodiversity and ecosystem function in oil palm areas relate to size and proximity of forest remnants.*

Indicators: *Databases constructed and used to produce species richness estimates for key taxa in forest remnants and surrounding agricultural areas, plus ecosystem function estimates.*

In August 2010, DRFs, Jane Hill and Glen Reynolds met up with Calley Beamish (Biodiversity and Conservation Manager, Wilmar International) to discuss project progress and current findings. To date, we have identified and sampled 19 study sites. Transects have been set up in these sites, and sampling of ants and butterflies will continue in Year 3.

Verification: *Academic papers published in peer-reviewed international research journals, public media articles and presentations at seminars and conferences in Sabah and internationally.*

Keith Hamer (Leeds) was an invited plenary speaker at the IUFRO Congress, Seoul , 22-29 Aug 2010 where he presented research findings from this project and allied research on Borneo. Both Jane Hill (York) and Keith Hamer (Leeds) were invited speakers at the Association for Tropical Biology conference in Bali in 19-23 July 2010 (special symposium on research from Danum Valley Field Centre, sponsored by the Royal Society) . Both Jane Hill and Keith Hamer have given seminars at UK Universities which have included findings from this project (3 seminars in year 2). Noel Tawatao has presented his work at a recent British Ecological Society Tropical Ecology group meeting (Newcastle, April 2011), and discussed his work with the UK-Sabah Youth Conservation Expedition in Danum Valley.

In addition to 3 research papers published in Year 1, a further three papers have been published in peer-reviewed journals in Year 2, which include findings from the current project and/or extend collaborations with host partners (details below).

Output 4. *Raising of awareness of project findings and latest research methods, and dissemination of information.*

Indicators: *Workshop held at end of project.*

Not expected until year 4 of the project.

DRFs 1 & 2 (Yen Yee Loh and Noel Tawatao) collecting vegetation data at a field site in Sabah.



4.1 Progress in carrying out project activities

Output 1. Improved capacity for capturing, analysis and computer modelling of ecological data. Development of standardized protocols for research.

1.1 Training of 2 DRFs. On-going as planned in Year 2. DRF2 registered for MSc, and attending Masters courses in the UK. DRF1 to visit California Academy of Sciences in year 3 to upload more ant images onto 'Antweb'.

1.2 Sabah collaborators visit UK. Completed.

1.3 Production of 3 educational packages. To be done in Year 3.

Output 2 Clear advice provided to managers and policy makers at national and regional levels and through RSPO group and ASEAN biodiversity network.

2.1 UK staff supervise fieldwork. Completed as planned in Year 2.

2.2 Production of management plan. To be completed in years 3 & 4.

2.3 Production of species data bases & reference collection. On-going as planned. New ant data collected from forest remnants and plantations and identification on-going. Some ant images uploaded, and remaining images to be up-loaded to Antweb in Year 3. Butterfly data from remnants and plantations to be added to the database in Year 3. Additional ant and butterfly data to be collected in Year 3.

Output 3. Research data provided on how biodiversity and ecosystem function in oil palm areas relate to size and proximity of forest remnants.

3.1 Submit papers for publication. Three papers submitted for publication in Year 2.

3.2 Presentation of results at conferences. Two international conferences attended (by Hill & Hamer)

3.3 Dissemination of results in media. To be completed in year 3.

3.4 Production of annual newsletters. Completed as planned in Year 2.

4.2 Progress towards project outputs

Progress has been excellent to date. Field work is on-going and new data on ant and butterfly diversity are being collected as planned. Important progress has been made in identification and taxonomy of Bornean ants through the link with 'Antweb' and the California Academy of Sciences that was established in Year 1. Based on Year 2's overall progress, the project is likely to achieve its outputs by its close. The output level assumptions still hold true.

4.3 Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	Total to date	Number planned for reporting period	Total planned from application
2	Number of people to attain Masters qualification	0	0	1	0	0	0	1
4B	Number of training weeks to be provided	24	24	24	0	48	24	72
4C	Number of postgraduate students to receive training	1	1	1	0	1	1	1
5	Number of people to receive at least one year of training	0	0	1	0	1	0	1
6B	Number of training weeks to be provided	24	24	24	0	48	24	72
8	Number of weeks to be spent by UK project staff on project work in the host country	8	8	8	0	16	8	24
9	Number of species/habitat management plans	0	0	1	0	0	0	1
10	Number of individual field guides/manuals to be produced to assist species identification.	1	1	1	0	1	1	3
11A	Number of papers to be published in peer reviewed journals	3	2	2	0	6	2	3
11B	Number of papers to be submitted to peer reviewed journals	3	2	2	0	6	2	3
12A	Number of computer based databases to be established and handed over to host country	0	0	2	0	0	0	2
12B	Number of computer based databases to be enhanced and handed over to host country	0	0	1	0	0	0	1
13B	Number of species reference collections to be enhanced and handed over to host country(ies)	1	0	1	0	1	0	2
14A	Number of conferences/seminars/workshops to be organised to present/disseminate	0	0	1	0	0	0	1

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	Total to date	Number planned for reporting period	Total planned from application
	findings							
14B	Number of conferences/seminars/workshops attended at which findings from Darwin project work will be presented/disseminated.	2	7	2	0	9	2	6
15A	Number of national press releases in host country(ies)	0	1	1	0	0	1	2
15B	Number of local press releases in host country(ies)	0	1	1	0	0	0	2
15C	Number of national press releases in UK	0	0	1	0	0	0	1
15D	Number of local press releases in UK	1	0	1	0	1	0	1
16A	Number of newsletters to be produced	1	1	1	0	2	1	3
19A	Number of national radio interviews/features in host county(ies)	0	0	1	0	0	0	1
19B	Number of national radio interviews/features in UK	0	0	1	0	0	0	1
22	Number of permanent field plots to be established during the project and continued after Darwin funding has ceased	10	9	0	0	19	10	10

Table 2 Publications (authors in bold are directly involved in the project)

Type (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
Journal	Hill, J.K. , Gray, M.A., Chey Vun Khen , Benedick, S. , Tawatao, N. & Hamer, K.C. Ecological impacts of tropical forest fragmentation: how consistent are patterns in species richness and nestedness?	<i>Philosophical Transactions of the Royal Society. B.</i>	Jane Hill	0
Journal	Proctor, S., McClellan, C.J. & Hill, J.K. Protected Areas of Borneo fail to protect forest landscapes with high habitat connectivity.	<i>Biodiversity and Conservation</i>	Jane Hill	0
Journal	Tawatao, N. , Harper, N.E., Mohamed, M., Chey V. Khen , Searle, J.B. & Hill, J.K. Impacts of forest fragmentation on the genetic diversity and population structure of <i>Pachycondyla obscurans</i> in Sabah, Malaysian Borneo.	<i>Asian Myrmecology</i>	Jane Hill	0

4.4 Progress towards the project purpose and outcomes

The project purpose is to increased capability at local and national levels to determine ecological benefits of natural rainforest remnants for reducing biodiversity losses in oil palm plantations. We have made excellent progress in developing and implementing sampling protocols for insect surveys in fragments and adjacent plantations, and identifying insect material. We are currently developing new computer modelling approaches to investigate habitat connectivity in oil palm plantations. The purpose level assumptions still hold true, and the indicators are adequate for measuring outcomes.

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

The findings from the project will feedback to stakeholders and project partners, and also to RSPO guidelines. Thus the project will have an impact on the potential to provide evidence for the development of more sustainable methods of oil palm production that reduce biodiversity losses in these landscapes. Our current links with the RSPO are likely to ensure this will occur.

5. Monitoring, evaluation and lessons

Progress is being monitored and evaluated by regular weekly email contact with DRFs when they are in Malaysia, and regular meetings in the UK. Both DRFs attend and present their findings at weekly lab meetings with other graduate students and researchers in York. There are also yearly visits by UK partners to field sites. Progress is also evaluated by the successful collection and analysis of field data. These data are being analysed to produce outputs and outcomes of the project that will directly contribute to the project. The indicators of achievements will be the training of DRFs and the successful completion of an MSc degree (DRF2), and the publication of findings in peer-reviewed Journals and in project reports to stakeholders. There have not been any changes made to the M&E plan this year.

Maintaining regular weekly contact with DRFs has been crucial to project success and we will continue to do this in future.

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

We have included more specific details on sampling data obtained as requested. We have included photos of field activities as requested.

7. Other comments on progress not covered elsewhere

The project does not face any particular risks. No difficulties have been encountered this Year.

8. Sustainability

This is a discrete project that will reach a stable and sustainable end point and has a clear exit strategy. Databases and fully catalogued insect collections will be housed with project partners (FRC, ITBC) and will continue to be updated for long-term monitoring of biodiversity in agricultural areas well beyond the end of the grant period. Policy documents written in the final year of the project will include recommendations for future monitoring and research. These will be written in consultation with Conservation Officers, Regional Forestry Managers, and Palm Oil managers to ensure that recommendations are implemented. Facilities for housing permanent faunal collections are already in place within partner organisations (FRC and ITBC) so that the availability of fully trained staff resulting from this project will ensure that research on biodiversity changes in agricultural areas on Borneo continues beyond the lifetime of the project.

9. Dissemination

In Year 2, the objectives and early findings of the project have been presented at International conferences and published in peer-review scientific papers.

10. Project Expenditure

Table 3 project expenditure during the reporting period (1 April 2010 – 31 March 2011)

Item	Budget (please indicate which document you refer to if other than your project application or annual grant offer letter)	Expenditure	Variance/ Comments
Staff costs specified by individual Jane Hill Colin McClean Noel Tawatao Yen Yee Loh			
Overhead costs			
Travel and subsistence			
Operating costs			
Capital items/equipment (specify)			
Others: Consultancy			
Others DRF UK subsistence Host country project co-ordination			
TOTAL			

** Additional DRF UK Subsistence due to change in host country personnel and thus the timing of DRF training in UK (as reported in Year 1 Annual Report). Extra funding vired from Landcover data fee: £4,400 (a contribution from the host country to the Landcover data provision has waived this requirement this FY). Bench fees to be paid in 2011/12, as also delayed due to project timing change, as above. Remaining funds vired towards travel undertaken for additional fieldwork in host country, also due to the above change reasons.

11. 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 LTS and the Darwin Secretariat to publish the content of this section (please leave this line in to indicate your agreement to use any material you provide here)

The project has made excellent progress in uploading new information and images for identifying Borneo ants onto 'Antweb'. This will continue and be completed in Year 3.

We have images of Borneo butterflies and ants, fieldwork sites and people working, oil palm plantation landscapes. Contact Jane Hill

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2010-2011

Project summary	Measurable Indicators	Progress and Achievements April 2010 - March 2011	Actions required/planned for next period
<p>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</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 the benefits arising out of the utilisation of genetic resources 		New data collected on insect diversity in forest remnants and plantations	
<p>Purpose Increased capability at local and national levels used to determine ecological benefits of natural rainforest remnants for reducing biodiversity losses in oil palm plantations.</p>	<p>Dialogue with stakeholders indicates that project outputs have contributed to application of management policy for promoting agricultural biodiversity in Sabah within 3 years of end of project.</p>	<p>Collection of new field data on ants and butterflies in forest remnants and adjacent plantations.</p> <p>Training of DRFs in UK</p>	<p>Collection of additional field data on ants and butterflies in forest remnants and adjacent plantations. New data collected on butterfly dispersal.</p> <p>Analysis and computer modelling of landscape connectivity.</p> <p>Data analysis and write-up</p>
<p>Output 1. Improved capacity for capturing, analysis and computer modelling of ecological data. Development of standardized protocols for research.</p>	<p>Two DRFs successfully trained in ant and butterfly sampling and identification techniques, in quantifying ecosystem functioning, and in spatial modelling of ecological data</p>	<p>Indicator is appropriate. DRFs continue training in field sampling techniques. DRF2 registered for MSc degree. DRFs attend training courses in UK</p>	
Activity 1.1 Training of 2 DRFs		DRFs successfully collecting new field data. Images and taxonomic keys being uploaded on to 'Antweb'. DRF2 trained in butterfly sampling and ID. DRFs in York for further training in year 3. DRFs complete field surveys in year 3.	
Activity 1.2, Sabah collaborator visits UK Activity 1.3 Production of 3 educational packages		Completed. Visit to Natural History Museum for moth ID and taxonomy. Years 3 & 4	
<p>Output 2. Clear advice provided to managers and policy makers at</p>	<p>Recommendations for management of forest remnants and agricultural</p>	Indicator is appropriate.	

national and regional levels and through RSPO group and ASEAN biodiversity network.	areas in Sabah drafted in year 3, revised year 4.	
Activity 2.1. UK staff supervise fieldwork		UK partners spend 8 person weeks on the field supervising and training DRFs, and liaising with Malaysian partners.
Activity 2.2. Production of management plan Activity 2.3 Production of species data bases & reference collection		Year 3 Ant images uploaded on to 'Antweb' to aid taxonomy and identification to continue and be completed in Year 3
Output 3. Research data provided on how biodiversity and ecosystem function in oil palm areas relate to size and proximity of forest remnants.	Databases constructed and used to produce species richness estimates for key taxa in forest remnants and surrounding agricultural areas, plus ecosystem function estimates. Data incorporated into spatially explicit computer models to quantify landscape permeability and to identify best areas for forest protection and reforestation.	Indicator is appropriate.
3.1 Submit papers for publication		3 papers submitted/published from on-going work with project partners
3.2 Presentation of results at conferences		2 international conferences attended and papers presented (Hill and Hamer invited speakers.
3.3 Dissemination of results in media		Year 3
3.4 Production of annual newsletters		Regular newsletters produced and distributed by DRFs to keep all project partners updated on progress.
Output 4. Raising of awareness of project findings and latest research methods, and dissemination of information.	Workshop held at end of project. Findings made available via the web.	Year 3

Annex 2 Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p>Goal: Effective contribution in support of the implementation of the objectives of the Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS), as well as related targets set by countries rich in biodiversity but constrained in resources.</p>			
<p>Sub-Goal: Reducing losses of biodiversity and ecosystem functioning in tropical mosaic agricultural landscapes of Sabah (Malaysian Borneo).</p>	<p>Conservation of rainforest remnants reduces biodiversity losses and supports ecosystem functioning in adjacent agricultural areas.</p>	<p>Field data quantifying biodiversity and ecosystem functioning in forest remnants and surrounding landscapes.</p>	
<p>Purpose Increased capability at local and national levels used to determine ecological benefits of natural rainforest remnants for reducing biodiversity losses in oil palm plantations.</p>	<p>Dialogue with stakeholders indicates that project outputs have contributed to application of management policy for promoting agricultural biodiversity in Sabah within 3 years of end of project.</p>	<p>Public dissemination of policy for reducing biodiversity loss in agricultural areas. Surveys of local agencies confirm implementation of policy.</p>	<p>Local agencies are capable of implementing management methods that promote biodiversity. A mechanism to promote this capability is provided through the RSPO.</p>
<p>Outputs (add or delete rows as necessary) 1. Improved capacity for capturing, analysis and computer modelling of ecological data. Development of standardized protocols for research.</p>	<p>Two DRFs successfully trained in ant and butterfly sampling and identification techniques, in quantifying ecosystem functioning, and in spatial modelling of ecological data.</p>	<p>Training workshop reports evaluated by Project Leader. DRFs demonstrate competence in field sampling and data capture techniques and apply them successfully in Sabah.</p>	<p>Darwin Fellows remain active and fully committed to project. This will be greatly enhanced by our strong links with local agencies and project partners, two of whom were Darwin Fellows on previous projects.</p>

<p>2. Clear advice provided to managers and policy makers at national and regional levels and through RSPO group and ASEAN biodiversity network.</p>	<p>Draft recommendations for management of forest remnants and agricultural areas in Sabah by year 2, revised year 3.</p>	<p>Management recommendations checked and discussed with forest and plantation managers in Sabah.</p>	<p>Managers capable of implementing policies. Biodiversity recommendations supported by RSPO This will be greatly enhanced by our collaborators' involvement in the project from the outset.</p>
<p>3. Research data provided on how biodiversity and ecosystem function in oil palm areas relate to size and proximity of forest remnants.</p>	<p>Databases constructed and used to produce species richness estimates for key taxa in forest remnants and surrounding agricultural areas, plus ecosystem function estimates. Data incorporated into spatially explicit computer models to quantify landscape permeability and to identify best areas for forest protection and reforestation.</p>	<p>Annual research reports, academic papers published in peer-reviewed international research journals, public media articles and presentations at seminars and conferences in Sabah and internationally.</p>	<p>Analysis of new field data provides clear interpretable findings that can be translated into management recommendations and policy.</p>
<p>4. Raising of awareness of project findings and latest research methods, and dissemination of information.</p>	<p>Workshop held at end of project. Findings made available via the web.</p>	<p>List of participants and workshop outputs.</p>	<p>Invited key participants available and willing to attend workshop. Experience from previous projects indicates this will not be a problem.</p>

Activities (details in workplan)

1.1 Training of 2 DRFs

1.2 Sabah collaborators visit UK

1.3 Production of 3 educational packages

2.1 UK staff supervise fieldwork

2.2 Production of management plan

2.3 Production of species data bases & reference collection

3.1 Submit papers for publication

3.2 Presentation of results at conferences

3.3 Dissemination of results in media

3.4 Production of annual newsletters

Monitoring activities:

Indicator 1 Continual assessment of data collection during field work

Indicator 2 Successful completion of MSc degree

Indicator 3 Successful publication of findings in peer-reviewed journals

Annex 3 Onwards – supplementary material (optional but encouraged as evidence of project achievement)

Checklist for submission

	Check
Is the report less than 5MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	√
Is your report more than 5MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	√
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	
Have you involved your partners in preparation of the report and named the main contributors	√
Have you completed the Project Expenditure table fully?	√
Do not include claim forms or other communications with this report.	