Darwin Initiative Main Project
Half Year Report
(due 31 October 2015)

Project Ref No	22-012 ref App2701
Project Title	Harnessing agricultural ecosystem biodiversity for bean production and food security.
Country(ies)	Tanzania, Malawi and UK.
Lead Organisation	Royal Botanic Gardens, Kew
Collaborator(s)	**Nelson Mandela African Institute for Science and Technology, Arusha.** **Natural Resources Institute, University of Greenwich** **Lilongwe University of Agriculture and Natural Resources.** **Charles Sturt University, Orange, Australia**
Project Leader	*Prof Philip Stevenson*
Report date and number (e.g., HYR3)	*HYR1*
Project website/Twitter/Blog /Instagram etc	*None developed yet.*
Funder (DFID/Defra)	*DFID*

1. Outline progress over the last 6 months (April – Sept) against the agreed baseline timetable for the project (if your project has started less than 6 months ago, please report on the period since start up to end September).

Project planning workshop held in Arusha 22-25 September 2015 attended by UK and Tanzanian partners to plan implementation of outputs and appoint McKnight Foundation Funded PhDs.

Output 1. Ecosystems & plant species that are habitats for key natural enemies identified.

Preliminary plant surveys (4 locations at 3 altitudinal zones). Plant diversity observed and insects' visits to plants recorded. Abundant plant species at lower altitudes included *Euphorbia heterophylla, Justicia bracteata, Achyranthes aspera, Commelinna benghalensis, Senna spectabilis*. Some including *Ageratum conyzoides, Bidens pillosa* and *Galinsoga parviflora* noteworthy as being exotic (S. American) weeds, abundant in several locations, supporting large numbers of bees, Syrphidae (hoverflies), and butterflies and in the case of *Bidens* and *Ageratum* known pesticidal properties. The natural enemies of bean pests, tachinid flies, long-legged flies, robber flies and assassin bugs were restricted to just one *indigenous* species *Phaulopsis imbricata.* Invertebrate surveys showed that the insect assemblage changed across the growing season and from one location to the next.

Output 2: Key invertebrate pollinators of beans and their key habitat established.

Invertebrate surveys (pollinators, natural enemies and pests) across 3 ecological zones undertaken across 4 farm locations. Invertebrate biodiversity in field margins and within fields estimated. The number of functional invert. groups at different elevations and different times within crop relatively stable across the 3 zones but reduced as the season progressed whereas in field margins the functional diversity was lower at higher altitudes. As an illustration of the type of data see figs below showing abundance of Syrphidae which was lower at higher altitude and lower towards the end of the cropping cycle.

Fig 1. Number of functional insect groups at different elevations and different months within the field crop.

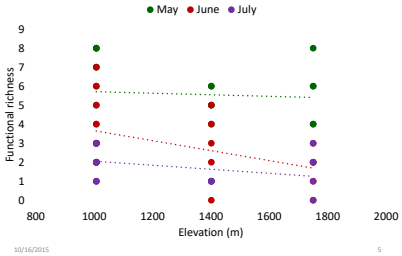


Fig 2. Number of functional insect groups at different elevations and different months on field edges (margins).

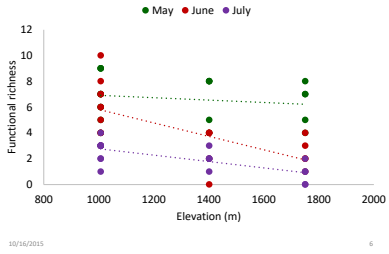


Fig 3. Abundance of Syrphidae at different locations throughout the sampling period.

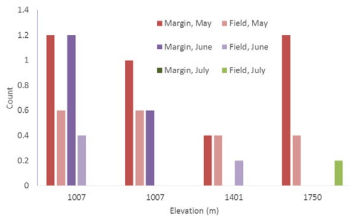
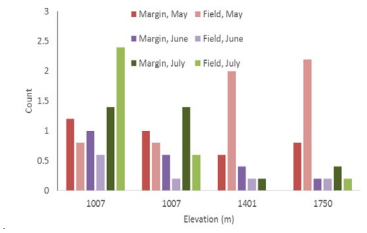


Fig 4. Abundance of bees at different locations throughout the sampling period



Output 3: Capacity of 400 lead farmers increased by information and guidance on exploiting and maintaining agricultural biodiversity for improved crop yield.

A consultant socio-economist, Ms Julie Tumbo, was recruited to undertake the baseline and end of action surveys. We developed a survey tool that will be implemented by her with assistance from students during year one. Originally planned in the first 6 months but due to delays in recruiting students will now be done in the second half of year one.

Output 4: This work will not be undertaken until year 2.

Output 5:Post-graduates trained in conducting biodiversity surveys and carrying out field and laboratory based research.

The first pilot survey for invertebrates and plants was undertaken as described alongside training of 3 NMAIST MSc students under the supervision of Kew and NRI specialists and local partners. The work will be the main research activity written up for at least one MSc student's degree thesis and has provided pilot data for development of future surveys. We proposed to recruit 1 PhD student in the original proposal. However, after approval of our application to McKnight Foundation in round 1 we increased the request to cover the costs of 2 X PhD students to compensate for a possible shortfall in MSc Students which may results from a change in government policy towards funding MSc research. This request was accepted but not until late August 2015, thus the recruitment of the PhD students was delayed longer than hoped and delayed progress we had hoped to make in the year 1. This issue was raised with LTS as soon as possible and we have agreed to move some of the budget from year 1 into years 2 and 3. We will at the end of year 1 reproduce a new GANNT chart. The two students will likely focus on two different aspects of the research activities and propose one to focus on the wider landscape plant assemblage and how this supports pollinators while the second will likely focus on immediate field margin species with a stronger focus on natural enemies and in particular parasitic wasps.

2a. Give details of any notable problems or unexpected developments/lessons learnt that the project has encountered over the last 6 months. Explain what impact these could have on the project and whether the changes will affect the budget and timetable of project activities.

Project 22-012 is up and running. We have undertaken a pilot survey at 4 sites in Arusha to optimise our approach for major surveys for next growing season. We have also undertaken the project inception meeting and planning workshop and developing the baseline survey tool. We were rather hurried into action as the bean growing season bridges the (Darwin/UK Govt) year end and year start (Feb - June) but we have still been able to learn very useful information from this early survey.

One hurdle has been the approval for 2 X PhD students by McKnight Foundation (a major *contribution-in-kind* to supplement this Darwin project and undertake a major component of the survey work and project delivery). While it was a great achievement to win funding for these PhD students, the approval from the McKnight Foundation (donor) was provided much later than expected (July 15th). Consequently, the positions were not filled until October and the candidates can not start until January 2016 so will delay commencement of some activities particularly around botanical surveys and chemical ecology. This means there will be no need for Kew chemical ecology input in year 1 (only 10% of 1 persons time originally allocated to this task) from Kew – but will be required after the next survey of the first full growing bean season (March -July 2016) i.e., in year 2 and input from the Kew botanists will be lower than expected in year 1. The overall budget for the botanical staff input from Kew was front loaded (year one 35% year 2 10 % and year 3 0%) as we predicted most of the input would be required early on to support the new PhD students - however, the delay in the PhDs starting will reduce this need. Also prior to our project being approved but after submission to stage 2 of R21 the named botanist, Dr I Darbyshire was given a major new institutional undertaking to deliver a major part of the new science strategy at Kew - Tropical Important Plant Areas (TIPA) and this will occupy a substantial amount of his time in the 2015/16 year and will not allow for him to contribute 35% of his time to the project as originally proposed.
2b. Have any of these issues been discussed with LTS International and if so, have changes been made to the original agreement?
Discussed with LTS: Yes/~~No~~
Formal change request submitted: Yes/~~No~~
Received confirmation of change acceptance Yes/~~No~~

3a. Do you currently expect to have any significant (e.g., more than £5,000) underspend in your budget for this year? **Yes** ☒ **No** ☐ Estimated underspend: £23071
3b. If yes, then you need to consider your project budget needs carefully as it is unlikely that any requests to carry forward funds will be approved this year. Please remember that any funds agreed for this financial year are only available to the project in this financial year. If you anticipate a significant underspend because of justifiable changes within the project and would like to talk to someone about the options available this year, please indicate below when you think you might be in a position to do this and what the reasons might be: *We have already discussed these and they have been agreed by LTS.*

4. Are there any other issues you wish to raise relating to the project or to Darwin's management, monitoring, or financial procedures?
No

If you were asked to provide a response to this year's annual report review with your next half year report, please attach your response to this document.

Please note: Any planned modifications to your project schedule/workplan can be discussed in this report but should also be raised with LTS International through a Change Request.

Please send your **completed report by email** to Eilidh Young at Darwin-Projects@ltsi.co.uk . The report should be between 2-3 pages maximum. **Please state your project reference number in the header of your email message e.g., Subject: 20-035 Darwin Half Year Report**