

Darwin Initiative Main Project 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

Darwin Project Information

Project Reference	21005
Project Title	Pesticide plants for organic cotton, livelihoods and biodiversity in Mali
Host Country/ies	Mali
Contract Holder Institution	Royal Botanic Gardens, Kew
Partner institutions	Institut d'Economie Rurale (Mali); Mouvement Biologique Malien - MOBIOM (Mali); Natural Resources Institute (UK)
Darwin Grant Value	£258,540
Funder (DFID/Defra)	DFID
Start/end dates of project	01/04/2014 – 31/03/2017
Reporting period (e.g., Apr 2015 – Mar 2016) and number (e.g., Annual Report 1, 2, 3)	April 2014 – March 2015 Annual Report 1
Project Leader name	Dr Moctar Sacande
Project website/blog/Twitter	http://www.kew.org/science-conservation/research-data/science-directory/projects/pesticide-plants-organic-cotton-mali
Report author(s) and date	Drs. Moctar Sacande, Serene Hargreaves (kew), Paul Green (Kew), Mr. Kader Sanogo (IER)– April 2015

1. Project Rationale

Mali is a Least Developed Country facing increasing pressure on its natural resources and biodiversity. In the regions of Sikasso, Segou, Kayes and Koulikoro, communities rely on cotton as one of the important cash-crops. However, Mali's fourth CBD Progress Report highlights that increased cotton cultivation is threatening ecosystems because of the harmful chemical pesticides used and the depletion of forest cover.

The growing organic cotton market provides an opportunity for farmers in Mali to nearly double their income in comparison to the sale of conventional cotton, while reducing their impact on the environment. However, producing this organic cotton currently relies on unsustainable wild harvesting of naturally occurring pesticidal plants to replace chemical pesticides.

A number of these pesticide species are in decline, threatening the long term viability of organic cotton production. Kew-led consultations with farmers have shown that there is a “trial and error” approach to using native pesticide plants, with a limited understanding of the volume / dilutions needed to protect crops. This causes waste and affects the reliability and efficacy of these natural pesticides. There is also no knowledge of how to collect, conserve, germinate and propagate seeds from these species to ensure sustainable supplies. Unless this is addressed, wild plants will disappear, threatening livelihoods, the resilience of communities and biodiversity.

The project takes place in Mali, situated in West Africa. Specifically the project works with farmers and communities in the four main cotton producing regions of Kayes, Koulikoro, Segou and Sikasso. Partner institutions of Institut d’Economie Rurale (IER) and the Mouvement Biologique Malien (MOBIOM) are based in the towns of Sikasso and Bougouni (indicated on the below map).



2. Project Partnerships

Lead institution: Royal Botanic Gardens, Kew

Partner Name: Institut d’Economie Rurale (IER) / CRRRA Sikasso, Mali

Partner Name: Natural Resources Institute (NRI), University of Greenwich, UK

Partner Name: The *Mouvement Biologique Malien* (MOBIOM), Siege a Bougouni, Mali

The project partnership between the lead organisation, RBG, Kew, and the main partner organisations in the host country, IER and MOBIOM, Mali, remains strong, with regular communications and project updates.

The inaugural project meeting held in April 2014 included meetings with IER, MOBIOM and the project leader, Dr. Moctar Sacande. In the framework of this project, the relationship with MOBIOM has been formally consigned in a memorandum of collaboration (MoC) in June 2014. This partnership clarifies roles, responsibility and accountability for activities within the project.

The cases of Ebola in West Africa delayed a planned visit to Mali in October, however contact was maintained through email and phone. At the start of February 2015, two face-to-face meetings were held, involving brief project discussions between members of IER and Dr. Sacande in Niamey, Niger followed by a week-long data workshop in Sikasso, Mali. This data workshop was planned to facilitate effective data exchange between the IER project coordination and Kew staff, including Serene Hargreaves who works with partners in West Africa. Training was conducted with two members of IER staff, Mr. Sory Sidibe and Mr. Kader Sanogo, IER ethnobotanist, both involved as technicians in the project. A database, with an annotated data structure, was created in collaboration with IER and training given on data entry, standards, geolocation and associated tools. A further template was created for data input of information from a questionnaire.

The appointment of Prof. Phil Stevenson to a permanent position within Kew's new science structure, in conjunction with his position at NRI, maintains the close collaboration with the institute. Two project planning management meetings have been held with Phil Stevenson (NRI/Kew), Moctar Sacande (Kew), Serene Hargreaves (Kew), Paul Green (Kew) to ensure communication and to update on progress.

In addition to the meetings outlined above, regular contact is maintained via email, phone and skype between all of the partners.

3. Project Progress

3.1 Progress in carrying out project activities

3.1.1. Output 1: Identification and authentication of pesticide species currently used by organic cotton farmers in target communities.

From April 2014 two questionnaires have been conducted by partners in-country to determine the base list of pesticide species used by MOBIOM farmers in the four regions of Mali covered by the project. A preliminary survey was conducted prior to project initiation, followed by a more comprehensive questionnaire early in the project determining the full range of biopesticide plants used. In early 2015 a second full questionnaire was conducted with 68 local farmers detailing the use, preparation and perceived efficacy of biopesticide plants over the past year (see Annex 4 for questionnaire). The preliminary list included local and exotic species, as well as species known only by local name, so any unknown or unidentified species were identified afterward by local experts and specialist IER botanists during the second questionnaire period in early 2015. One remaining *Combretum* species is still to be identified. Some of the herbarium vouchers collected are to be sent to the Herbarium at Kew for final verification.

A database containing the information has been created, containing taxonomic, distribution, use and other relevant information – see Annex 5 for screen shot. To date it contains 30 taxa used as biopesticides, 18 of which are known native species, 2 others are naturalised species (*Hyptis*), with 1 other species defined at genus level (*Combretum* sp.) and 9 exotic species. This database will provide the basis for the dissemination information to be provided by Output 5.

3.1.2 Output 2: Active compounds / ingredients in the key pesticide plants being used by cotton producers are identified and relative effectiveness of different species established.

In Mali, selected species from different provenances have been harvested and prepared for extract and bio-assay in the IER laboratory in Sikasso. 8 priority species used by farmers have been collected from several provenances in each of the four regions to test their relative effectiveness on pests (see Annex 6). These include plant fragments from bark, leaves, roots or extracted seed oils. The efficacy of three species, *Euphorbia paganorum*, *Lophira lanceolata* and *Zanthoxylum zanthoxyloides* was 80-100% on pests, with four species resulting in 60-80% efficacy and one species with less than 60%. It has been noted so far that the sites or localities of collection have no effect on the sample efficacy.

At Kew, two species identified as being used by MOBIOM farmers as botanical insecticides to protect against cotton plants from *Helicoverpa armigera* were also analysed in the laboratory. Extracts were tested against 5th instar *H. armigera* to observe if they had any effect on feeding behaviour. Two compounds, one previously identified from *Securidaca longipedunculata* and a structurally similar compound were also tested. Methyl salicylate (M2HB) deterred feeding, while methyl 4-hydroxy benzoate (M4HB), used in insect diets to inhibit fungal growth, stimulated feeding. Four different collections of *S. longipedunculata* all deterred feeding. A sample of *Cassia sieberiana* from the living collections at Kew also deterred feeding but chemical analyses to identify the compounds in this extract are not yet underway.

Chemical analysis (LC-MS) of the different *S. longipedunculata* samples showed that they did not contain methyl salicylate, but did contain a compound likely to be either a breakdown product or more likely a precursor (salicylic acid, SA) and a group of compounds previously identified as saponins. SA is known to be a factor conferring resistance to *H. armigera* and acts as an attractant for natural enemies of *H. armigera*. It is likely that both the volatile compounds (M2HB and SA) and the saponins contribute to the feeding repellence, but this needs testing in further laboratory bioassays to test the magnitude of this contribution. What is clear at present is that *S. longipedunculata* has the potential to be deterrent - even when levels of M2HB have declined during storage primarily due to evaporation - and to enhance the recruitment of natural enemies as part of an IPM strategy in organic cotton. This work will continue in year 2 and year 3 on receipt of more samples from Mali.

3.1.3 Output 4: Four community demonstration gardens established to strengthen the capacity of target communities to cultivate pesticide plants. This will provide an alternative to wild plant harvesting and ensure sustainable supplies of key plants in the future

During year 1, this project has worked with two of the four regions (Segou and Sikasso) to establish supervised village nurseries and demonstration plots of pesticide plant species. 11 species were planted in 4 ha of land in 4 localities in Bougouni and Yanfolila, (Sikasso). In Segou, two farmers' nurseries of 0.5 ha each have been established to produce 7 native pesticide species. Plants produced in these nurseries in Segou were planted in 1.5 ha in 3 different localities.

Seeds were collected and seedlings produced for 12 species in the two farmers' nurseries in Segou. IER has started data and information collection on seedling production/propagation protocols at village level and this activity will continue and increase in next project period (Y2). Survival and seedling growth information will be collected in year 2.

3.2 Progress towards project outputs

Overall progress has been good towards project major outputs. We have identified major pesticide species, with 30 species used by MOBIOM farmers for their organic cotton production. Of the 30 names, 21 taxa have been identified as priority species - 18 are native, 2 (*Hyptis*) naturalised and 1 (*Combretum* sp.) which is not yet determined at species level. 8 of these 21 species have already been tested in laboratories at Kew and at IER. 7 native species have been prioritised and produced in two farmers' nurseries in Segou regions, and pesticide seedlings have been planted in 7 localities with MOBIOM farmers in Sikasso and Segou, 2 of the 4 regions of the project. For its first year, the project has initiated all important activities as

planned, with only small delays caused by travel postponements due to the Ebola outbreaks. Partners in-country remain excited about the project and are committed to deliver what we set to achieve.

3.3 Progress towards the project Outcome

The project has had a satisfactory start, and local interest in taking up organic cotton farming remains high, as evidenced by new co-operatives being set up and affiliating to our project partner MOBIOM, which now with one addition, has 86 member co-operatives. The progress made so far, indicates that the project is likely to achieve the Outcome by end of funding, which is *'the sustainable use and cultivation of pesticide plants for organic cotton production leads to increased income generation among target communities, and reduces the loss of plant biodiversity in southern Mali.'*

3.4 Monitoring of assumptions

All outcome and output level assumptions are still valid and hold true. There have not been changes in these assumptions this year.

3.5 Impact: achievement of positive impact on biodiversity and poverty alleviation

The project is greatly contributing to the awareness on conserving native species through this thematic group of organic farmers. All the MOBIOM farmers are aware and have bought into the project through their general annual assembly meeting where the project has been explained in detail. This is in addition to discussions and surveys taking place between our scientific partners in country and the farmers. Feedback obtained so far suggest that farmers are very grateful to see such a scientific approach and studies on what they have always operated empirically. So far, it is observed that these interventions are unique in this region. This dissemination of information and heightened interest supports biodiversity conservation in the region. Through questionnaires we have been able to ascertain the number of farmers collected native species from the wild and in year 2 and 3 further assessments will be made in these areas to determine the population trends of these species. The setting up of nurseries in the regions of Sikasso and Segou will help provision and avoid plant over-collection from the wild.

Further research into the most efficient methods to extract and use biopesticide plants and their subsequent dissemination will aid in poverty alleviation in the area. The project is providing a great opportunity for improving rural farmers' working conditions, quality of their organic production and their welfare through capacity development and sharing scientific information on critical pesticide species they use.

4. Project support to the Conventions (CBD, CMS and/or CITES)

This project aims work with the national focal points in Mali to meet their obligations under the CBD by enhancing and contributing to:

- Raising awareness of the values of (plant) biodiversity and the steps needed to conserve and use it sustainably (Aichi Target 1). Progress has been made towards this target in the first year through the questionnaires and discussion with local stakeholders.
- Governments, business and stakeholders taking steps to keep the use of natural resources well within safe ecological limits (Aichi Target 4).
- Preventing the extinction of threatened species particularly of those most in decline (Aichi Target 12).
- Sharing, transferring and applying scientific knowledge to improve the status and trends of biodiversity (Aichi Target 19).

- Assessing the conservation status of plant species to guide conservation (GSPC 2)
- Preserving threatened species *in-situ* and in national, *ex-situ* seed bank facilities (GSPC Targets 7 & 8);
- All wild harvested plant-based products sourced sustainably (GSPC Target 12)
- Strengthening partnerships and co-operation with appropriate national and international institutions (GSPC Target 16)

An institutional meeting has been made by IER, part of Forestry research and an interim project report has been exchanged with the Direction National des Eaux et Forêts, Bamako, which include Mali's CBD focal point managed by Mr. Boureima Camara. They are interested and engaged in following up progress made by the project with rural farmers of MOBIOM.

5. Project support to poverty alleviation

Working on threatened or limited resources of native pesticide plants with rural farmers is helping them to be more resilient in their production system, improve their yield and preserve and sustainably exploit natural resources. In the first year of this project the farmers that will be directly impacted by the project have shown commitment and interest through their continued engagement with IER in Mali. There is a great hope that the outcome of the project will help standardise the use of native pesticide plants, allow restoration/replacement planting of land with native species and improve local farmers working conditions and earning potentials.

The direct beneficiaries of this work are primarily the MOBIOM farmers, producing organic cotton by using pesticide plants. MOBIOM has 86 co-operatives of 10,500 farmers. The improvement in the use of natural pesticides will go a long way to support their farming system. Pesticide plant material, research and the subsequent dissemination of information provided by the end of the project to farmers will support poverty alleviation. Engagement and learning events, through training sessions that are to occur in year 2 will provide a further contribution to this aim. The poverty scorecard assessment (Schreiner, 2010) was discussed at face-to-face meetings with IER in early 2015 and is aimed to be conducted in year 2 to provide a measure of baseline of current levels of household income. This measure will be used to measure the impact of the project on farmers' incomes.

The direct impacts on the environment are in the enrichment of farms and village woodlots with planted native species. In the longer term, the project will help reduce desertification, improve soil conditions for continuous and sustainable production, maintain biodiversity through reducing the impacts on harvesting from the wild, and improve farmers' livelihood.

6. Project support to Gender equity issues

MOBIOM is composed of some 3,150 women farmers, out of the 10,500 organic cotton growers, who are expected to benefit directly from the project. It has an inclusive membership and democratic structures including an elected Board which sets the strategic direction for the organisation and is accountable to members. The organisation's leadership is committed to promoting gender equality through its structures and operational procedures. MOBIOM women's expertise has been called upon to extract seed oils from *Balanites aegyptiaca*, *Carapa procera* and *Lophira lanceolata*, which were used for tests on pests in the laboratory. For the coming years (2 and 3), the project will work so that these women will particularly be at the forefront in terms of extraction and preparation of plant products that will be used as standards against pests.

For this year, the questionnaires were administrated and supervised by IER on communities of the four target regions, and the project requested that at least 10% of the interviewees be women, heads of household from each region.

7. Monitoring and evaluation

The activities and the project as a whole have been monitored through face-to-face meetings, email exchanges and phone calls. Dr Moctar Sacande visited Mali partners (IER and MOBIOM)

in April 2014 to commence the project and agree on activities, annual plans, management and reporting structure. Kew's project team, including Prof Phil Stevenson, Drs Serene Hargreaves Paul Green and Moctar Sacande, have had regular project development meetings. In Mali, there have been several visits to MOBIOM at the headquarters in Bougouni and on the ground for supervision of farmers, mainly during sample collection and seedling production. The indicators of achievement for the project will be measured by through the questionnaires, poverty scorecard survey and field surveys taking place through years 1, 2 and 3. There has not been any change made to M&E plan over this reporting period.

8. Lessons learnt

Feedback and continuous engagement with communities and partners is essential in the delivery of project activities. The cases of Ebola in West Africa have delayed parts of the activities due to travel ban. However contact was maintained as much as possible through email and phone. In future, critical face-to-face meetings will be conducted if there are travel restrictions in place, by meeting in neighbouring countries or in the UK.

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

Not applicable.

10. Other comments on progress not covered elsewhere

Not applicable

11. Sustainability and legacy

The profile of the project is high in Mali. All the other parties in Mali, i.e. CMDT, CBD, Forestry department, Forestry research have shown interest in the project. MOBIOM has increased the number of cooperatives to 86 this year. Already, MOBIOM have been approached by PAN/OBEPAB, a similar farmer organisation in Benin, to exchange information and to conduct a training visit on the methodologies used by each group. This underlines the importance of the project in the wider West Africa region, and the potential impact.

At Kew, the project is now embedded into a newly created Department of Natural Capital and Plant Health. This projects main themes of poverty alleviation where it matters most and of restoration activities such as planting to improve biodiversity are key components of the Natural Capital's assignments.

The planned exit strategy is still valid as the training provided, the information sheets on the most efficient uses of plant material, and improving the plant and conservation knowledge of farmers will help continue these activities when the project ends.

12. Darwin Identity

During the meeting in February in Sikasso, presentations on the project have been made to the team at IER, including a description of the Darwin Initiative.

At the annual Kew science meeting in December 2014 the project was promoted as one of the flagship new projects of the Natural Capital and Plant Health Department. The project page on the Kew website contains a description of the project, highlights the funding source and provides links to relevant pages, including the Darwin homepage.

13. Project Expenditure

Table 1 Project expenditure during the reporting period (1 April 2014 – 31 March 2015)

Project spend (indicative) since last annual report	2014/15 Grant (£)	2014/15 Total Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)				Socio-economist to be hired in Year2
Consultancy costs				
Overhead Costs				
Travel and subsistence				One international trip postponed
Operating Costs				
Capital items (see below)				
Others (see below)				
TOTAL	72,731		94.4	

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

I agree for 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)

During this Darwin Initiative project, IER Mali have begun the propagation of *Euphorbia paganorum*, a native biopesticide species (see picture below of leafy stem), which has been grown by cuttings for the first time at the nursery in Sikasso. The new propagation method, involving a period of cutting, drying and potting, post callus formation, is the first time this type of production has been attempted by the institutes in Mali. The stems and leaves of this native succulent shrub are used by farmers against a natural pesticide against cotton pests and slugs. Although this species can also be grown from seed, the propagation from cuttings produces larger plants and therefore products more quickly with these cuttings ready for planting in year 2. The dissemination of these methods will allow local nurseries to provide this species to farmers, avoiding the need to overharvest from the wild, and therefore aiding the conservation of native plants and habitats.



Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2014-2015

Project summary	Measurable Indicators	Progress and Achievements April 2014 - March 2015	Actions required/planned for next period
<p>Impact</p> <p>The sustainable use and cultivation of useful native plants support biodiversity conservation and poverty reduction in rural Mali.</p>		<p>(Report on any contribution towards positive impact on biodiversity or positive changes in the conditions of human communities associated with biodiversity e.g. steps towards sustainable use or equitable sharing of costs or benefits)</p>	
<p>Outcome</p> <p>The sustainable use and cultivation of pesticide plants for organic cotton production leads to increased income generation among target communities, and reduces the loss of plant biodiversity in southern Mali.</p>	<p>Important pesticide species show marked reduction* in losses, benefitting the conservation of wild populations</p> <p>Native pesticide plants successfully established in community demonstration gardens as farmer field schools in each of the regions by yr 3</p> <p>Yields of 'first class' organic cotton increase by 5% across target communities, increasing farmers' revenues and securing crop bonuses for reaching organic cotton production targets by yr 3.</p> <p>All beneficiary women farmers (30% of Mobiom) have increased their income by 10 to 25% in the four regions by yr 3;</p> <p>All direct beneficiary men farmers have increased their income by 10 to 25% in the four regions by yr 3</p> <p>>25% of cotton farmers in target communities use optimum standard organic pesticide and treatment regimes, reducing wastage by yr 3</p>	<p>(Report on progress towards achieving the project outcome, e.g., the sum of the outputs and assumptions)</p>	<p>(Highlight key actions planned for next period)</p>

<p>Output 1.</p> <p>Identification and authentication of pesticide species currently used by organic cotton farmers in target communities.</p>	<p>Established base list of pesticide species collated from desk study and questionnaires addressed to organic cotton farmers in the 4 Regions of Mali</p> <p>Collections of specimens of seeds and herbarium vouchers of pesticide species</p> <p>List of authenticated pesticide species with confirmed scientific and vernacular names</p>	<p>The base list of species and subsequent literature search is nearly complete with a database created of the resultant data. Collections of seed and specimens have been made, although some delays has been experienced through difficulties with travel and postponement of face-to-face discussions. These indicators remain a good measure of this output.</p>
<p>Activity 1.1: Survey through questionnaires and desk study on pesticide plant species used in organic cotton production in Mali.</p>		<p>Complete – see Annex 4 for questionnaire. Full questionnaires were completed early 2015, with a preliminary survey completed early in the project.</p>
<p>Activity 1.2: Field trips and collection of pesticide species specimens (known scientific and local names, seeds, herbarium specimens and photographs).</p>		<p>Several field trips were organised to collect seeds and specimens of prioritised pesticide species, which were used for seedling production and to prepare extracts for bio-essays.</p>
<p>Activity 1.3: Verification research on collected specimens at Kew Herbarium and Millennium Seed Bank (MSB).</p>		<p>Specialist botanists from IER in Mali have visited farmers during the second questionnaire phase and identified nearly all unknown species. One species remains to be identified.</p>
<p>Activity 1.4: Compilation of data from Kew and other databases, regarding candidate species seed collecting, handling, germination and propagation. Preparation of species pages (including field photographs).</p>		<p>Complete. Database created for pesticide plant species, containing lists of names and other relevant data – see Annex 5 for screen shot.</p>
<p>Output 2.</p> <p>Active compounds / ingredients in the key pesticide plants being used by cotton producers are identified and relative effectiveness of different species established.</p>	<p>Identification of chemical composition of the key pesticide species</p> <p>Establishment of relative effectiveness of different species</p> <p>Establishment of effectiveness and dosages of combined ingredients of different key species that cotton producers are to use</p>	<p>Progress on this indicator is good so far. Samples of plant extracts have been sampled in both Mali and Kew. Chemical composition work is set to continue with collections made in Mali early 2015 to be analysed at Kew. Relative effectiveness of the species is being assessed at IER. These indicators will be effective in measuring the achievements of this output.</p>
<p>Activity 2.1: Collection of specimens for by-product extraction and study in the laboratories in Mali and at Kew and efficient extractions by communities in Mali</p>		<p>Samples of plant fragments of 8 important species (see Annex 7) from different sites and provenances have been harvested and prepared extract for bio-assay in IER laboratory in Sikasso. The extracts include seed oils of three species, <i>Balanites aegyptiaca</i>, <i>Carapa procera</i> and <i>Lophira lanceolata</i>.</p>
<p>Activity 2.2: Bio-assay and identification of chemical composition of collected specimens, mainly at Kew</p>		<p>Kew laboratory assessment of the pesticidal properties of <i>Securidaca longipedunculata</i> and <i>Cassia sieberiana</i> have begun on <i>Helicoverpa armigera</i></p>

		(cotton boll worm). Work will continue in year 2 and year 3 on receipt of more samples from Mali.
Activity 2.3: Tests on pests of the extracted compounds in the field with communities, leading to standardisation of ingredients/composition and guidelines for use.		No progress on this activity as depending on the outcomes of bio-assays already initiated and is now planned for year 2 and year 3.
Output 3. Four small-scale organic pesticide producers established and trained to supply optimum standard organic pesticides to cotton farmers.	10 farmers from the 4 regions and Mobiom technical team trained in producing optimum standard plant-based products for organic crop production Small-scale supply branches of standardised pesticide products set up in each of the 4 Regions managed by the trained farmers as inputs Specific market niche of plant products and investments established	No progress, but not planned until next project period (Y2).
Activity 3.1: Develop improved methods for harvesting and efficient protocols for by-product extraction that optimise bioactivity and reduce over-collection and wastage		No progress, but not planned until next project period (Y2).
Activity 3.2: Training workshops for pesticide producers on preparation and presentation of standardised products (at least two trainer farmers per region)		No progress, but not planned until next project period (Y2).
Activity 3.3: Develop IPR, farmers' ownership and product registration protocols for organic cotton production according to the regulations in place in Mali		No progress, but not planned until next project period (Y3).
Activity 3.4: Exploit local industrial investment opportunities and economic markets to promote the use of optimum standard organic pesticides, similar to the traditional medicine model in Mali		No progress, but not planned until next project period (Y3).
Output 4. Four community demonstration gardens established to strengthen the capacity of target communities to cultivate pesticide plants. This will provide an alternative to wild plant harvesting and ensure sustainable supplies of key plants in the future	Establishment and maintenance of demonstration gardens of at least 1ha in each of the 4 Regions, planted with key pesticide species seedlings Seed supply and increased seedling production of pesticide species in nurseries to ensure individual needs and continuity of cultivation Assessing and annually collecting data on survival and growth of seedlings in the plots.	A total of 11 species were planted in 4 ha of land in 4 localities in Bougouni and Yanfolila, Sikasso region. In Segou, two farmers' nurseries of 0.5 ha each have been established to produce 7 native pesticide species. Plants produced in these nurseries in Segou were planted in 1.5 ha in 3 different localities.

Activity 4.1: Generate data on propagation methods for listed pesticide plant species, rare and/or commonly used by farmers in the four regions (also for journal articles)		Started data and information collection on seedling production and on species propagation protocols in the village nursery. This will continue in next project period (Y2).
Activity 4.2: Train, collect seeds of selected key species and produce enough seedlings in communities nurseries		Seeds of 12 species have been collected and seedlings produced in two community nurseries.
Activity 4.3: Plant out seedlings in communal demonstration plots (at least 1ha x 4) and establish community ownership for long term management and further development.		No communal demonstration plot established yet - but planned for year 2
Activity 4.4: Organise farmer and NGO workshops to inform the wider farming community about sustainable use of pesticide plants and their cultivation.		No progress, but not planned until next project period (Y2).
Activity 4.5: The benefits of cultivating pesticide plants for organic production promoted through farming fairs, exhibitions (video) and local radio.		No progress, but not planned until next project period (Y3).
Activity 4.6: Reproduction of guide/hand book, leaflets and posters through Kew Publishing (in local language)		No progress, but not planned until next project period (Y3).
Output 5. Increased awareness of pesticide plant use for organic cotton production among policy makers in Mali (CMDT/Dept. of Agriculture/Dept. of Forestry)	<p>CMDT/Agriculture/Forestry use project guidelines for managing native pesticide plants</p> <p>Dept. of Agriculture and Forestry recognise the importance of local useful trees/plants and work on reversing farming practices focus on land clearing before planting crops</p> <p>CMDT/Agriculture/Forestry integrate the ecological resilient of farming system in rural communities' development</p>	No progress, but not planned until next project period (Y2).
Activity 5.1: Present research findings and guidance to and organise farmers' field visits of woodlots for CMDT directorate who provides technical advice to farmers regarding cotton production		No progress, but not planned until next project period (Y2).
Activity 5.2: Present project findings and guidance to and organise farmers' field visits of woodlots for Dept. of Agriculture directorate who provides technical advice to farmers regarding sustainable farming		No progress, but not planned until next project period (Y2).
Activity 5.3: Present project findings and guidance to and organise farmers' field visits of woodlots for Dept. of Forestry who manages and advises farmers regarding conservation and sustainable use of non-timber forest products.		No progress, but not planned until next project period (Y3).

Annex 2: Project's full current logframe

Activity	No of Months	Year 1				Year 2				Year 3			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Output 1 Pesticide species identified and authenticated	30	X	x	x	x	x	x	x	X		x	x	
1.1 Survey through questionnaires and desk study on species		X	X						X				
1.2 Field trips and Collection of pesticide species			x	X				X	X				
1.3 Botanical and biological research on collected specimens			x	x	X	X	X	X	X				
1.4 Compilation of data from Kew and other databases			x	x	x	x	x	x	x		x	x	
Output 2 Compounds / ingredients in pesticide plants identified	30		x	x	x	x	x	x	x	x		x	X
2.1 Collection of specimens for by-product extraction and study			x	x		x	x		X				
2.2 Bio-assay and identification of chemical composition			x	X					X	X			
2.3 Tests on pests and standardisation				x	x		x	x	X			X	
Output 3 Small-scale organic pesticide producers established	18						X	x		X	x	x	X
3.1 Develop improved methods for harvesting and extraction							X	X		X	X		
3.2 Training workshops on standardised by-products							X	X		X		X	
3.3 Develop farmers' ownership and product registration protocols										x	x	X	
3.4 Develop local industrial investments and markets												x	X
Output 4 Four community demonstration gardens established	33	X	x	x		x	x	x	x	x	x	x	X
4.1 Generate data on species propagation methods								x	X			X	
4.2 Train, collect seeds and produce seedlings		X	x	x		x	x	x		x	X	X	
4.3 Planting seedlings and maintaining demonstration plots			x	x			x	x			X	X	
4.4 Farmer and NGO information workshops								X	X		X	X	X
4.5 Promotion via farming fairs, exhibitions (video) and local radio										x	x	x	x
4.6 Reproduction of guide/hand book, leaflets and posters										X	X	X	X
Output 5 Increased awareness of pesticide plant use for organic cotton production among policy makers in Mali	18							x	x	x	x	x	X
5.1 Present research findings and organise field visits (CMDT)								X		X	X	X	X
5.2 Organise field visits of woodlots for Dept. of Agriculture								x	x	x	X	X	X
5.3 Presentation of project findings to national policy makers										X	X	X	X

Annex 3: Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Gender of people (if relevant)	Year 1 Total	Total planned during the project
Established codes				
6A	Number of people to receive other forms of education/training (which does not fall into categories 1-5 above) *	Men (so far)	Two MOBIOM farmers trained in nursery technique and native plant production- 5 training weeks.	At least 1 Village technician trained in each of the 85 co-operatives, which should include women farmers
6B	Number of training weeks to be provided	Men (so far)	Two IER staff trained in botanical database management – 1 training week	
7	Number of (e.g., different types - not volume - of material produced) training materials to be produced for use by host country		Annotated botanical data structure and training given on data entry, standards, geolocation and associated tools.	
20	Estimated value (£'s) of physical assets to be handed over to host country(ies)		Estimated £3,786 of seed collecting and laboratory basic equipment sent to IER, Mali	
22	Number of permanent field plots and sites to be established during the project and continued after Darwin funding has ceased		Two farmers' nurseries established in 1 region, Segou	4 demonstration plots, one of at least 1 ha in each of the 4 regions
23	Value of resources raised from other sources (e.g., in addition to Darwin funding) for project work			

Table 2 Publications

Title	Type (e.g. journals, manual, CDs)	Detail (authors, year)	Gender of Lead Author	Nationality of Lead Author	Publishers (name, city)	Available from (e.g. website link or publisher)

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	✓
Is your report more than 10MB? 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.	