



Darwin Initiative Research Exercise on Community Tree Seeds (DIRECTS) 162/12/001

Final Report

CONTENTS

Volume 1: Final report

Appendices:

- I. Contribution to CBD articles
- II. Outputs
- III. Publications
- IV. Contacts
- V. Logical framework
- VI. Summary of activities on species per country
- VII. Ghana (March 2006) conference report

Volume 2: Year 3 Country Reports	158 pp
Volume 3: Year 2 Country Reports	188 pp
Volume 4: Year 1 Country Reports	91 pp
Volume 5: Copies of publications (1 book chapter, 23 seed leaflets, 3 short articles, 3 papers)	81 pp

Darwin Project Information

Project Reference No.	162 / 12 / 001
Project title	Darwin Initiative Research Exercise on Community Tree Seeds (DIRECTS)
Country	UK / sub-Saharan Africa
UK Contractor	Seed Conservation Department, Wakehurst Place, Royal Botanic Gardens, Kew
Partner Organisation (s)	Sub-Saharan Africa (15 countries)
Darwin Grant Value	£ 187 k
Start/End date	June 2003/June 2006 + 3 months
Project website	www.ipgri.cgiar.org/SSA/SAFORGEN/DIRECTS.html
Author	Hugh W. Pritchard (with support from international collaborators, Helen Vautier, George Sarkis and Moctar Sacande)

1. Project background / rationale

Forest biodiversity, especially the multipurpose trees, supports the daily life of millions of people in sub-Saharan Africa. Nonetheless, they are disappearing at a rate of 1% a year. The identified priority tree species of the region for investigation in this project occur mostly in vulnerable areas of dryland Africa, are of known use, and over 30 % are red-listed by IUCN. Although the need for conservation and sustainable use of these species is clear, appropriate protocols for handling seeds of these species are far from optimal. The 4th Workshop for African Tree Seed and Biodiversity Centres (Burkina Faso, 2001), highlighted the need to strengthen the limited expertise of, and experience in, seed science and technology in institutes across Africa. Research, capacity building and networking on quality seed provision, their storage and use (efficient germination) will contribute to this urgent need. Hence, the DIRECTS project purpose was to enhance the capacity of sub-Saharan Africa institutes, to manage sustainably seeds of about 60 native species of local importance, through research guidance, training and information exchange amongst partners, and technical back-stopping from the UK. The project was developed with and involved National Tree Seed and Biodiversity Centres in 15 sub-Saharan African countries, which selected and worked on their own priority tree species for the region.

2. Project summary

The purpose and objectives of DIRECTS are summarised in the logical framework in Appendix V. The project purpose was to enhance the role and capacity of institutes in the research, handling and sustainable use of native tree seeds of species of community value. It was set to achieve the following outputs:

- Increased research base for listed community useful species;
- Increased capability of institutes' staff to undertake and promote / disseminate seed research on their priority species;
- Increased dialogue and information exchange between institutes on all aspects relating to tree seeds and conservation targets.

The original work plan aimed to deliver tree seed research on c. 60 species; actually 59 species and 3 named genera for which species were not listed, based on the work of countries in the SAFORGEN region. SAFORGEN is the sub-Saharan African Forest Genetic Resources Programme, started in 1999 to spearhead collaboration on the conservation and sustainable use of forests genetic resources in the region. The programme promotes development of national programmes for forest genetic resource conservation and use, networking among members and also generates knowledge on conservation and sustainable utilization of forest genetic resources. Sixteen countries in sub-Saharan Africa have endorsed the programme and appointed national coordinators. SAFORGEN is coordinated from the IPGRI (now Bioversity International) sub-regional office for west and central Africa in Cotonou, Benin (see <http://www.bioversityinternational.org/Networks/saforgen/default.asp>).

A key objective of the inception meeting at RBG Kew, Wakehurst Place, in June 2003 was to review which species in the three named genera in the SAFORGEN list (*Combretum*, *Entandophragma*, *Terminalia*) were of most importance to the collaborators. As a consequence, the number of species to work on was increased to more than 80 (Appendix VI). This new range of species would prove to provide some flexibility in working, as acquiring experimental samples of some species was impossible. This change was commented on by the evaluator of the Year 1 report. Overall, 37 of the original 59 species were worked on (i.e., 63%). In addition, 16 other species identified on the 2003 expanded list were studied. Finally, another 21 were investigated, bringing **the total species studied to 74**.

Articles 6, 9, 12 and 17 under the Convention on Biological Diversity (CBD) best describe this DIRECTS project. The project involves general measures for conservation and sustainable use (10%) and equally exchanges of information on the 60 priority species

(10%). In addition, this is an ex-situ seed screening / conservation project (30%) that trains partners (30%) in investigative research (30%) on their own important and priority species. Although direct linkage to in situ conservation assessments and NGOs was of interest to the project leaders and the evaluator, such course of action was not an original objective of this project.

The overall objectives of the project were met, in as much as: (1) the majority of the targeted species were worked on, and 'replacement' species also studied; (2) the project involved 82 staff / students from 17 countries in either the planning workshop in the UK (2003), the training workshops in Burkina Faso and Ethiopia (2003), or the final project meeting / conference in Ghana (2006) (**see 3. Scientific, Training, and Technical Assessment**), well in excess of the original research capacity building target; (3) information flow improved between the countries with clear indications provided at the Ghana workshop (2006) of countries planning new projects together (for full report of this workshop see Appendix VII of Volume 1).

3. Scientific, Training, and Technical Assessment

3.1 Science:

Following the planning workshop in the UK in 2003, we immediately held two workshops in Burkina Faso (CNSF, Ouagadougou) in August 2003 and in Ethiopia (EARO, Addis) in Sept 2003 to run through protocols and agree workplans. A final DIRECTS meeting was held in Kumasi, Ghana, organised as an African Seed Science Workshop, including a representative of IUCN and of IPGRI (now Bioversity International), and some Millennium Seed Bank Project partner staff and students (see Appendix VII, Volume 1).

Technical backstopping on scientific enquiries, and management support, was provided from the UK throughout the project. **Experimental work in the UK was carried out on 22 species, determining germination level and / or quantifying lipid content** (Appendix VII, Volume 1). In addition, parallel studies on four species (*Sclerocarya birrea*, *Ximения americana*, *Vitellaria paradoxa* and *Trichilia emetica*) were published by Pritchard *et al* in 2003-04. **Technical and advisory support was enhanced for the seven institutes also involved in the Millennium Seed Bank Project, through supervised study visits to the UK**, which provided access to a range of science specialists, laboratories and library facilities with electronic journals and abstracting services.

Overall project participants conducted studies of varying depth, covering 74 species (Appendix VI, Volume 1). **The initial target activity was an average of 4 species per country** on the basis of c. 60 species. Indeed, only **three countries** of the 15 full members in the project **failed to achieve this: Benin, Cape Verde (with whom there were communication problems throughout) and Botswana (who did not sign a MoU until 2005)**. The highest levels of research activity occurred in Burkina Faso (15 species), Ethiopia and Madagascar (12 species each). It is interesting to note that the first two countries hosted workshops in 2003 and Madagascar has been a long-standing collaborator with Kew. In Year 2 visits were made to Malawi, Burkina Faso, Ghana, Mali and Madagascar; and in Year 3 the final workshop was held in Ghana. The average number of species worked on was slightly higher for those countries with MSB Project connections (> 8, vs 6 for those not involved). These observations suggest the following:

- (1) that the holding of a 1-week workshop in a country (at an institute) provides a considerable stimulus to the subsequent laboratory work, possibly by impacting also on political will; and
- (2) that developing and sustaining a longer-term commitment, supported by occasional visits, also encourages enhanced activity.

Table 1: Scientific training (UK, Burkina Faso, Ethiopia or Ghana) and species work

Country (month / year MoU signed)	Collaborator affiliation (D = DIRECTS; M = MSB)	Total staff / students attending	Number of events attended (max = 4)
Benin, including IPGRI representative	D	2 / 0	2
Botswana	D & M	2 / 1	3
Burkina Faso	D & M	7 / 1	3
Cape Verde	D	2 / 0	2
Cote d'Ivoire	D	5 / 0	3
Ethiopia	D	13 / 0	3
Ghana (including IUCN rep)	D	21 / 0	3
Kenya*	M*	2 / 1	3
Madagascar	D & M	2 / 1	2
Malawi	D & M	2 / 1	3
Mali	D & M	1 / 1	3
Niger	D	2 / 0	3
Nigeria	D	3 / 0	2
RSA#	M	1 / 1	1
Tanzania	D & M	3 / 0	3
Togo	D	3 / 0	2
Uganda	D	4 / 0	3
	Total	82	NA

* attended the UK and East Africa training workshops in 2003, but did not sign a MoU.

Prof Pat Berjak and Sershen Naidoo attended the Ghana 2006 workshop. Both are directly involved in the Darwin Initiative CryoConservation Centre of Excellence for sub-Saharan Africa (CCESSA; 2005-08).

It is evident from the Annual Reports (see Volumes 2, 3 and 4 of this final report) that the detailed nature of the research undertaken varied considerably with country / institute. A summary is provided in Appendix IV of Volume 1.

Fifteen species were studied for development in terms of changes in seed quality (germination or weight / size) and five species assessed for density of trees in specific areas with a view to collecting seeds at some stage in the future. Fifteen species were also studied for seed storability. **The vast majority of species on the list(s) possess desiccation tolerant seeds, but some species required assessment for desiccation sensitivity (e.g. *Garcinia kola*, *Isobertina gaboensis* and *Bridelia macrantha*).** All 74 species mentioned above (and highlighted in Appendix VI, Volume 1) were germinated, although **some seedlots were clearly of poor quality** (see Annual Reports in Volumes 2, 3 and 4).

A few institutes provided good evidence of in depth studies via their annual reports, particularly Burkina Faso, Cote d'Ivoire, Ghana, Madagascar, Malawi, Mali and Niger. This probably reflects the level of understanding of seed biology in these quite well established institutes. Other institutes sometimes produced rather disappointing data and reports.

Perhaps our expectation was too high and / or staff in these institutes also struggled to write reports in a format expected within an international project. **Future projects of this sort should ensure that the basic level of scientific reporting is improved during the course of the project and guidance should be incorporated into the workshop curriculum.**

Nonetheless, data of value has clearly been created. Some of this information has been converted into **23 seed leaflets** in a well established series published in hard copy and on the internet (for example: <http://en.sl.life.ku.dk/upload/121net.pdf>) by the Danish Forest Seed Centre (DFSC), which is now part of the University of Copenhagen. In addition, we published **three peer-reviewed papers and a book chapter** (see Volume 5). More data is due to be published as leaflets and we are optimistic that more detailed data will be published as papers in due course; the target will be a specialist journal such as Seed Science and Technology. As a number of institutes still have strong links to Kew, we will continue to encourage the production of further publications from DIRECTS.

3.2 Training:

The selection criteria of trainees included at least two-year laboratory experience. However, in order to ensure that at least two staff member per institute were trained and to accommodate the extra interest in the host countries for the Africa-based workshops (i.e. Burkina Faso and Ethiopia), at least one-year experience was accepted for some participants. As a consequence, we achieved two staff trained for the participating institutes except in Benin. Also, **the countries hosting the workshops (Burkina Faso, Ethiopia) and final conference (Ghana) had by far the highest number of participants, ranging from 8 to 21 staff / students.**

For the research training, we used lectures, practicals and group discussions (workshops). The theory was supported by lecture handouts (e.g. Powerpoint, three slides per page, including space to make notes) and copies of relevant published and unpublished papers and technical reports from the Seed Conservation Department and other seed scientists. The practicals were run in small groups, each of which reported back to the whole workshop on their findings and interpretations. These contributed to the discussion sessions, although these were not restricted to practical matters. The discussion was wide-ranging and lively, as real experiences were dealt with; some of the issues were introduced during the individual presentations at the start of each workshop. There was also a 'paper exercise' on seed quality, requiring calculation of germination percentages, vigour rates of seeds and basic statistics. **Eighty two staff / students from 17 countries were involved in the four workshops.** Overall, the training was well received and were generally **evaluated as being good (c. 4 out of 5) for logistics, travel, accommodation, scientific content and relevance, clarity of handouts and presentations,** etc.

The evaluator wondered what lessons had been learned from the participant's feedback on the course and whether they had resulted in changes to the training. **The key challenge for us, which turned into a problem for some participants, was organising the workshops at short notice to enable the project to start efficiently in 2003.** As a consequence, there were some last minute travel arrangements made. Recently, we initiated another network project for the DI and informed potential collaborators of the workshop timings in Year 1 even before the outcome of the application was known. In terms of improving the course, there were no other training courses scheduled or delivered in DIRECTS. However, we will ensure in future that there is a little less detailed theory delivered and more time for practical work and discussion when similar courses are run in support of seed network activities.

The evaluator also sought evidence of wider impact of the training. We specifically asked for this information only in Year 1, which revealed **cascade training in five**

countries to 51 staff /students, equivalent to 36 training days.

4. Project Impacts

The project achievements have enabled the project purpose to be accomplished, as follows:

- ‘enhanced the role and capacity of institutes’ (82 individuals across 17 countries in sub-Saharan Africa)
- ‘in the conservation and sustainable use’ (data produced on seed collection, germination and storage)
- ‘of native tree seeds of community value’ (74 species investigated the vast majority of which are native to the region, not introduced).

The project has supported country obligations under the CBD in relation to numerous Articles (see Appendix I). In addition, more trained staff in African Seed Centres will enable greater sustainable use of seed resources as better handling should result in **lower requirements for seed collection**. This **should then reduce the risk to natural seed dispersal, which is recognised as an essential ecosystem service** (Millennium Ecosystem Assessment, 2005). Finally, **improved conservation and sustainable use of tree seeds will increase opportunities** for the Centres to meet country obligations for afforestation **for environmental sustainability as part of the Millennium Development Goals** (Target 7).

In terms of follow up on the activities of the 82 staff / students associated with the project, we do not have detailed data for all. As far as we are aware though, **most of the staff involved are still working at the Centres**. Moreover, a handful of Centres are still working with Kew’s Millennium Seed Bank Project and expressing the wish to extend the five year agreement. Thus, impact from DIRECTS looks likely to continue.

We hoped for direct collaboration between the Francophone and Anglophone countries through the sharing of some species targets; i.e. , some species were present in both west and east Africa. But this shared list was very limited. However, by the final workshop it was evident that discussions were in progress on sub-regional collaboration in either west Africa (across language lines) or in east Africa. This was a highly encouraging outcome for the DIRECTS management team.

In terms of civil and governmental impact, we are not aware of any specific change in policy as a result of DIRECTS. However, **most (all) of the Centres are linked to government (forestry) departments and they also tend to have extension activities into schools and local communities**.

5. Project Outputs

Project outputs are summarised in Appendix II

Publication outputs as hard copy are provided in Volume 5 and a listing is given in Appendix III. Two of the three papers appeared in Forest Genetic Resources Newsletter and Plant Genetic Resources Newsletter, which are freely available from FAO and Bioversity International, respectively. These were introductory in nature, sought to promote the project and to stress the importance of conservation and sustainable use of tree seeds. The target audience was administrators and forestry staff.

The three short articles (notes) in Kew newsletters have very wide distribution; sent as a targeted mail-shot to hundreds of institutes across the world, and available on the Kew Gardens website as downloadable PDFs.

The abstract of the paper in New Forests is freely available online, but the paper costs \$32 to download as a single purchase. The book chapter requires purchase of the conference volume (£85; 2006 [eds] S. A. Ghazanfar & H.J. Beentje, Taxonomy and Ecology of African Plants, their Conservation and Sustainable Use. Royal Botanic Gardens Kew). The target audience of both these contributions is seed biologists and tree seed specialists.

The 23 seed leaflets are freely available on the web and are part of an established series of publications. We expect these to be widely accessed particularly by forestry practitioners.

There has been a large amount of data produced in DIRECTS, particularly on germination, and we anticipate being involved in further publications. Some may emanate through other project associations. About 10 more leaflets are anticipated as drafts have already been started / completed. The costs for further publication releases will essentially be covered through gift-in-kind via staff time.

6. Project Expenditure

Current Year's Costs	Grant	Claimed	Unclaimed	Variance
Staff costs				
Rent, rates, heating, lighting, cleaning				
Postage, telephone, stationery				
Travel and subsistence				
Printing				
Conferences, seminars etc				
Capital items				
Others (please specify)				
<i>TOTAL</i>				

Whilst the grant applied for and awarded was £187,200 there was a small error in the totting up at the submission stage and the real cost of the award was £184,200.

The project was initiated three months late in 2003, i.e. June, which resulted in a 3 month carry over into a fourth year.

The main agreed changes in the budget resulting in variance were as follows:

- Underspend on staff costs in the UK as Dr Sacande took up another post at the end of Year 2. Some of these savings were balanced by the additional commitments made by Prof Pritchard to ensure completion of the project.

- Savings on web site costs, due to IPGRI's offer to host the site, and reinvestment in student time to help produce the 23 seed leaflets. Helen Vautier is a co-author on five leaflets and helped summarise information for about five more.
- Underspend on the printing budget as it was not possible to produce a conference proceedings.
- Underspend on the consumables (others) budget, adjusted to take into account the poor performance of a limited number of countries.

7. Project Operation and Partnerships

The UK planning workshop in June 2003 mainly involved managers from the collaborating institutes. This was crucial to the success of the project as we were able to explain in detail the requirements of DIRECTS, particularly with respect to budgetary constraints and the outline MoU. The training workshops involved scientific and technical staff who, to our knowledge, have been involved throughout. We believe that about two staff per institute were involved across the 15 main countries, e.g. Ethiopia (Year 3 report; Volume 2). However, higher staff numbers were involved in some countries, e.g. five co-authors on the Cote d'Ivoire Year 3 report and six for Madagascar (see Volume 2).

The collaborators were involved in initial discussions about the shortage of knowledge on African tree seed biology, conservation and sustainable use. This was prompted by meeting attendance in Burkina Faso in 2001 and followed-up through emails. So, the plans were developed after much local consultation. Letters of support were received from 17 countries, out of an initial target of 19 (communication with Sudan and Senegal proved impossible!). Thereafter, 16 main partners were identified and 15 signed agreements. Kenya participated in the UK workshop and the Ethiopia workshops, but failed to sign an agreement. Comments received indicated some uncertainty about the separation between the DIRECTS and Millennium Seed Bank projects. However, this was not a problem for 6 other dual collaborations and the MSBP does not have a specific African trees (SAFORGEN) focus. It should be noted that although Kenya participated in the final workshop in Ghana (2006), the invitation was to a MSBP-supported PhD student from the National Genebank, rather than the DIRECTS original participant, KEFRI.

A full list of collaborators in DIRECTS (from 17 countries) and their contact details is provided at the end of the Ghana (2006) workshop report (Appendix VII, Volume 1).

The African theme of DIRECTS overlapped with another Darwin Project Kew is involved with, CCESSA (Cryo-conservation Centre of Excellence for sub-Saharan Africa). The leader of the project in the UK is Hugh W. Pritchard and in South Africa, Prof Patricia Berjak. Prof Berjak and one of her PhD students (Sershen Naidoo) participated in the Ghana (2006) workshop, and Pritchard and Berjak made a joint presentation on the AU's Consolidated Plan of Action for Science and Technology. These Darwin Projects were promoted at the Joint AU – Economic Commission for Africa Science, Technology and Innovation exhibition in Ethiopia in Jan 2007 (see SAMARA Issue 12, Jan – June 2007; http://www.kew.org/msbp/scitech/publications/samara/samara12_english.pdf). Finally, Pritchard was an invited speaker in Chiang Mai, Thailand at a recent (Feb 08) meeting on the 'Future of Forest Restoration Research in IndoChina' at which he promoted three DI projects: DIRECTS, CCESSA and OSSSU (Orchid seed storage for sustainable use).

In terms of wider and lasting impact, the DIRECTS collaborators are still functioning within national tree seed centres. The Centres employ local people to help clean seed lots and often provide a nursery service to support local planting schemes as well as being involved in larger-scale afforestation.

8. Monitoring and Evaluation, Lesson learning

Building the network and gaining the trust of partners is the bedrock for a successful project of this nature. The high take-up of MoUs (15 countries) and the submission of country Annual Reports (only Cape Verde did not produce a report), the reports of cascade training and the number of species worked on indicate this has been achieved. The successes and weaknesses of the workshops were assessed through the evaluation forms, and the progress of the project as a whole has been monitored and considered by colleagues in Kew, who sit on the DIRECTS Advisory Team. This team met for the first two years and the meeting minutes were submitted in the annual reports. For the current OSSSU project, the advisory team includes an external (non-Kew) member, to bring even greater objectivity to the process.

The main lesson from these years work has been the need to be patient and cautiously optimistic about arrangements to get the MoUs approved, as identifying the appropriate authority is not always obvious in each country. We could not secure the participation of Kenya. In addition, we lowered our expectations of how IPGRI could help in the project as it became evident that they have other considerable commitments. In essence we traded in any expectation of wider assistance from IPGRI for a commitment from them to host the web site, investing the money saved on UK student support (Helen Vautier) to pull together information for the seed leaflets.

There is no doubt that the network dynamic is difficult to sustain from the UK without regular visits to the countries concerned. However with 15 partners, there are considerable logistical, financial and practical constraints. We tried as often as possible to piggy-back visits with business on other projects. This approach has been adopted in the OSSSU (2007-10) project, such that inception workshops in China and Ecuador were followed up by visits in Year 1 (which is only a 6 month period) to Thailand and Mexico.

We learned that it was impossible within the three year period (and subsequent year) to extract chapters for a book covering the species studied, even though detailed instructions to authors were distributed at the Ghana (2006) workshop. However, we wish to enable more seed leaflets to be published, and believe that a book on African tree seeds would be a valuable contribution to knowledge on biodiversity and support longer-term interests in habitat restoration. We will continue to develop this thinking.

Finally, we learned of the challenge of delivering the project when staff leave; Dr Sacande took up a new post at the end of 2005 and a request to replace him with short-term support was not approved as the named person was not at doctoral level. However, Dr Sacande did continue to provide some gift-in-kind to the project.

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

All issues raised in the reviews of DIRECTS annual reports were relatively minor and were dealt with quickly and discussed with partners.

10. Darwin Identity

The Darwin Initiative logo and DI funding support was publicised at all four workshops (handouts, banners, certificates, badges, etc). DI funding was also acknowledged on all published papers, articles, etc, and the logo appears on all 23 seed leaflets (see Volume 5). See also comments above about promoting the DI at conferences under **7. Project Operation and Partnerships**.

The recognition of the excellent work that the DI does was evident at the final workshop

in Ghana (2006), that was attended by nearly 50 people. Indeed, many were interested in applying for further funding. Generally, the DI project was seen as a distinct project with a clear identity defined nicely by the log frame. In terms of evidence of awareness of the DI objectives, feedback on the establishment of our new network project on orchids indicated awareness by some participants of the DI website and a very strong empathy for the work the DI does. Such empathy was perhaps not evident in 2003 at the start of the DIRECTS project, which may have reflected relatively restricted access to internet information in some African countries at that time. For example, during the running of the Ethiopian workshop we were restricted to about 1 hour at lunchtime to access the internet and connection was very slow.

11. Leverage

During the lifetime of the project, additional funds were mainly gift-in-kind from the partners, as costs for their salaries, laboratories (building and capital equipment) and logistics were covered by partner institutes. Efforts were made by RBG Kew staff to strengthen the capacity of partners to secure further funds for similar work in the host countries. For instance, we were successful in securing a 6-month placement of Joseph Asomaning from FORIG Ghana, funded by the Commonwealth Fellowship. He is now continuing his work on *Garcinia kola*, as part of his PhD programme. Two other overlapping PhD student projects are being supported by the MSBP. Other attempts were made to capture funds from international donors for continuing this work, but have been unsuccessful, so far. Also we are planning to bring some of the Centres into a collaboration with the International Tree Foundation that has local community projects in many countries in Africa.

12. Sustainability and Legacy

Several aspects of this unique project are being carried on through ongoing Millennium Seed Bank Project collaborations with six countries. Specifically, the screening of species for their storage behaviour is still underway; enhancing knowledge for some species already worked on and new work on other species that were compiled into Appendix VI, Volume 1.

Several in-depth studies (development, germination, storage) of key species are going on in partners' laboratories. DIRECTS has enhanced tree seed research capacity in Africa on a much broader scale than attempted before, and is used a model research programme for screening biodiversity by some partners, e.g. Burkina Faso, Ghana.

13. Value for money

The project was excellent value for money with respect to the range of species worked on (exceeded target by 15), the staff trained (exceeded target by 34) and the network approach (15 MoUs, but with two additional countries partially involved: Kenya and South Africa). We are not aware of a previous pan-African seed biodiversity project that involved this number of countries and participants were very positive about the attempts by / success of this project to bring diverse collaborators together. There are signs of greater sub-regional collaboration as a result of DIRECTS, particularly between Cote d'Ivoire and Ghana.

We had wished to publish information on about 60 species and this has not been achieved so far and so may be seen as less value for money. However, the species work has either been undertaken or is continuing and we will enable and encourage subsequent publications.

14. Appendix I: Project Contribution to Articles under the Convention on Biological Diversity (CBD)

Project Contribution to Articles under the Convention on Biological Diversity		
Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use	10	Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring	5	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	-	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation	30	Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity	5	Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.
11. Incentive Measures	-	Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.
12. Research and Training	30	Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness	5	Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts	-	Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.

15. Access to Genetic Resources	-	Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.
16. Access to and Transfer of Technology	5	Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies.
17. Exchange of Information	10	Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol	-	Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Total %	100%	Check % = total 100

15. Appendix II Outputs

Code	Total to date (reduce box)	Detail (←expand box)
Training Outputs		
1a	3 people to submit a PhD thesis	Work started with DIRECTS activities and has expanded to cover PhD investigations in Cote d'Ivoire (1), Ghana (1) and Madagascar (1)
1b		
2		
3	50 certificates of attendance	Certificates of attendance were produced and co-signed by Prof Pritchard and Dr Sacande (DIRECTS Kew staff) and the Heads of the hosting institute in Burkina Faso, Ethiopia and Ghana
4a		
4b	10 training weeks provided to undergraduate students	Training has been provided to undergraduate students in Niger and Nigeria, where the DIRECTS partners lecture
4c	48 people	48 trainees at the three workshops; plus 46 attendees at the final workshop in Ghana (2006)
4d	3 x 1 week courses	1 week training for each workshop, including scientific, technical and management
5		
6a	20 people receiving other forms of short-term education/training (i.e not categories 1-	See Cascade training provided to technicians

Code	Total to date (reduce box)	Detail (←expand box)
	5 above)	
6b	20 training weeks not leading to formal qualification	See Cascade training provided to technicians
7	1 set of Protocols and handouts (in English and French)	Training package including handouts for development studies and protocols for seed handling, germination, storage and data organisation, produced by Pritchard and Sacande, both trainers and facilitators of the four workshops (UK, Burkina Faso, Ethiopia and Ghana).
Research Outputs		
8	10 weeks spent on project work in country	In-kind contribution through the MSB project (about 2 weeks per year for the 4 MSB countries); Pritchard = 3 weeks (BF, Ethiopia, Ghana); Sacande = 7 weeks (Botswana, Burkina, Ethiopia Ghana, Mali, Malawi and Madagascar). Additional commitments to UK-based lab work and management support
9	0 species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	
10	23 formal documents (seed leaflets) produced to assist work related to species identification, classification and recording.	See Appendix III, Volume 1 AND Volume 5
11a	3 papers published or accepted for publication in peer reviewed journals	See Appendix III, Volume 1 AND Volume 5
11b	1 book chapter published	See Appendix III, Volume 1 AND Volume 5
12a	0 computer-based databases established (containing species/generic information) and handed over to host country	
12b	0 computer-based databases enhanced (containing species/genetic information) and handed over to host country	
13a	0 species reference collections established and handed over to host country(s)	
13b	0 species reference collections enhanced and handed over to host country(s)	
Dissemination Outputs		
14a	1 workshop organised to present/disseminate findings from Darwin project work	African Seed Science workshop in Kumasi, Ghana (DIRECTS final workshop, March 2006)
14b	2 conferences	Oral paper given at 17 th AETFAT congress in Addis Ababa, Ethiopia; Oral presentation at International Seed Testing Association Congress in Budapest (2004)
15a	Press releases	Burkina Faso, Ethiopia and Ghana workshops:- 4 in 3 national newspapers, 2 national radios and national TV (Burkina Faso, Ghana); 1 national newspaper (Ethiopia)
15b		
15c	UK press releases	UK workshop and project launch:- Achieved Oct 2003. In addition, coverage in the Times newspaper (July

Code	Total to date (reduce box)	Detail (←expand box)
		03), in two SAMARA Newsletter, 1 Kew Scientist Newsletter, plus Press Association / Reuters coverage
15d	Local UK press National TV	East Grinstead Courier (July 03)
16a		
16b		
16c		
17a	1 dissemination networks established	Functional network through email exchanges of information between all partners. Very regular email exchange with all partners (DIRECTS@RBGKew.org.uk)
17b		
18a		
18b	1 UK press releases	British Satellite News (handed to CNN also)
18c		
18d	2 Local UK radio	BBC Southern Counties, and Southern FM radio
19a		
19b		
19c		
19d		
Physical Outputs		
20	Estimated value (£s) of physical assets handed over to host country(s)	£ 45 000 across the 15 countries for 'consumable' costs.
21	0 permanent educational/training/research facilities or organisation established	
22	0 permanent field plots established	
23	Value of additional resources raised for project	MSB Project support for 3 PhD students approximates to about £42,000 (i.e. £14,000 each, in country registration and stipend).

16. Appendix III: Publications

Mark (*) all publications and other material that you have included with this report

Type *	Detail	Publishers	Available from	Cost £
(e.g. journal paper, book, manual, CD)	(e.g. title, authors, journal, year, pages)	(name, city)	(e.g. contact address, email address, website)	
International Newsletter	*Darwin Initiative award boosts research on African Community Tree Seeds. Sacande M. (2003). SAMARA 5: 3.	MSB/RBG Kew, London	www.RBGKew.org.uk/SAMARA/	0

International Newsletter	*Community tree seeds. Sacande M. (2003). KEW SCIENTIST 24: 4.	RBG Kew, London	www.RBGKew.org.uk/kew scientist/	0
International Newsletter	*Forest Seed Research in Mali. Sanogo S, Sacande M. (2004). SAMARA 6: 3.	MSB/RBG Kew	www.RBGKew.org.uk/SAMARA/	0
Journal (reviewed)	*Seed science and technology needs of SAFORGEN trees for conservation and sustainable use. Sacande M, Pritchard HW, Dulloo EM. (2004). Plant Genetic Resources Newsletter 139: 54-59.	IPGRI, Rome	-	Free (HTML)
Journal (reviewed)	*Seed Research Network on African Trees for conservation and sustainable use. Sacande M., Pritchard HW. (2004). Forest Genetic Resources 31: 31-35.	FAO, Rome	-	Free (HTML)
Conference proceedings (reviewed)	*African tree seed conservation research: opportunities and implementation. Sacandé M, Pritchard HW. (2006). In Ghazanfar SA, Beentje HJ. (eds.) Taxonomy and ecology of African plants, their conservation and sustainable use. Proceedings of the 17th AETFAT Congress Addis Adaba, Ethiopia. Kew: Royal Botanic Gardens, Kew. 427-436.	RBG Kew, London	http://www.kew.org/aetfat2006/proceedings.html	£85 for book but chapter copy available from authors
Popular papers	* <i>Adansonia digitata</i> – Moctar Sacandé, Charlotte Rønne, Mathurin Sanon, Dorthe Jøker. (2006). Seed leaflet 109.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Parinari curatellifolia</i> – Sidi Sanogo, Dominic Gondwe, Charlotte Rønne, Moctar Sacandé. (2006). Seed leaflet 110.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Cola nitida</i> – Christophe Kouame, Moctar Sacandé (2006). Seed leaflet 111.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Ximenia americana</i> – Moctar Sacandé, Helen Vautier. (2006). Seed leaflet 112.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Garcinia kola</i> – Juliana Agyilir, Moctar Sacandé, Christophe Kouame (2006). Seed leaflet 113.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Azelia africana</i> . Moctar Sacandé (2007). Seed leaflet 118	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Anogeissus leiocarpus</i> . Moctar Sacandé, Sidi Sanogo (2007). Seed leaflet 119	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Borassus aethiopicum</i> . Mathurin Sanon, Moctar Sacandé (2007). Seed leaflet 120	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Borassus akeassii</i> . Moctar	Forest & Landscape	www.sl.kvl.dk/Publication/seedleaflet	Free (online)

	Sacandé. (2007). Seed leaflet 121.	Denmark		PDF)
Popular papers	* <i>Detarium microcarpum</i> . Helen Vautier, Mathurin Sanon, Moctar Sacandé (2007). Seed leaflet 122.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Lannea microcarpa</i> . Moctar Sacandé (2007). Seed leaflet 123.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Parkia biglobosa</i> . Moctar Sacandé, Carol Clethero. (2007). Seed leaflet 124.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Pterocarpus lucens</i> . Moctar Sacandé, Mathurin Sanon. (2007). Seed leaflet 125.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Combretum aculeatum</i> . Mathurin Sanon, Moctar Sacandé (2007) Seed leaflet 127.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Combretum glutinosum</i> . Helen Vautier, Mathurin Sanon, Moctar Sacandé Seed leaflet 128.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Combretum micranthum</i> . Moctar Sacandé, Mathurin Sanon (2007). Seed leaflet 129.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Combretum nigricans</i> . Moctar Sacandé, Mathurin Sanon (2007). Seed leaflet 130.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Pentadesma butyracea</i> . Bonjaw Sama, Moctar Sacandé, Mathurin Sanon (2007). Seed leaflet 131.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Prosopis africana</i> . Helen Vautier, Moctar Sacandé (2007). Seed leaflet 132.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Sterculia quinqueloba</i> . Dominic Gondwe, Moctar Sacandé, Frank Kambadya (2007). Seed leaflet 133.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Sterculia setigera</i> . Moctar Sacandé, Mathurin Sanon (2007). Seed leaflet 134.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Dalbergia melanoxyton</i> . Moctar Sacandé, Helen Vautier, Mathurin Sanon (2007). Seed leaflet 135.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Popular papers	* <i>Carapa procera</i> . Sidi Sanogo, Moctar Sacandé (2007). Seed leaflet 136.	Forest & Landscape Denmark	www.sl.kvl.dk/Publication/seedleaflet	Free (online PDF)
Peer review journal	*Improving the collection and germination of West African <i>Garcinia kola</i> Heckel seeds. Agyili J., Sacande M., Koffi E., Peprah T. (2007) New Forests 34, 269-79.	Springer, Dordrecht, Netherlands	www.springerlink.com	Paid article (\$32 to download)

17. Appendix IV: Darwin Contacts

Project Title	Darwin Initiative Research Exercise on Community Tree Seeds (DIRECTS)
Ref. No.	162 / 12 / 001
UK Leader Details	
Name	Prof Hugh W. Pritchard
Role within Darwin Project	Project Leader
Address	Seed Conservation Department, RBG Kew
Phone	
Fax	
Email	
Partner 1	
Name	Dr Oscar Eyog-Matig (replaced Dr Ehsan M Dulloo)
Organisation	(IPGRI) Bioversity International
Role within Darwin Project	Main project partner in IPGRI (Bioversity International)
Address	IPGRI Coordinator, SSA, SAFORGEN Programme, IPGRI-WCA c/o IITA 08 BP 0932 Cotonou, Benin
Fax	
Email	
Partner 2 (if relevant)	
Name	A full list of collaborators is given at the end of the Ghana
Organisation	(2006) meeting report in Volume 1 (Appendix VII).

18. Appendix V : Logical framework

Project summary	Measurable Indicators	Means of verification	Important assumptions
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Goal:

To draw on expertise relevant to biodiversity to work with partner countries to achieve:

- **the conservation of biological diversity**
- **the sustainable use of its components, and**
- **the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources**

PURPOSE

To enhance the role and capacity of institutes in the conservation and sustainable use of native tree seeds of community value

New knowledge on seed biology and conservation methods for up to 60 species generated and shared.

Methods protocols on seed harvest, treatment, etc. in circulation and use

Seed conservation protocols are accepted by all the SAFORGEN and SADC partners as a valuable component of CBD-related conservation action.

Staff conduct collaborative research within the network but also show evidence of independent work

Information incorporated into tree BAPs, and institutional role acknowledged by government / State in official documents

Researchers use increased knowledge to guide future programmes.

Seed holdings at institutes expanded to include many of the species.

Increased and effective inputs to national conservation policies and conservation agencies.

Annual reports and staff publication lists.

Institutes commit to find resources to ensure elevated levels of activity.

OUTPUTS

Increased research base for listed species.	Species' seed conservation reports for c. 60 sp (incl. species distribution information).	List of the published papers, conference reports, and the annual reports of the institutes involved	Trained staff, competent in conducting the appropriate research and cascade training, are not assigned to other duties.
Increased capability of institutes' staff to undertake and promote / disseminate seed research	Number of species and research reports (literature) produced per institute increased, and c. 6 collaborative papers produced. 48 staff across 16 institutes effectively trained (primarily in country) on seed handling, etc.	Compare training evaluation questionnaires (pre- and post-event) Management meetings reports	Institutes encourage staff to commit adequate time to writing up the species reports / papers.
Increased dialogue between institutes on all aspects relating to tree seeds and conservation targets.	Functioning web-based system in place	Review traffic, number of hits on web site. Track enquiries, correspondence, etc.	In country resources promised are made available / committed and DI resources appropriately used.

ACTIVITIES

ACTIVITY MILESTONES (Summary of project implementation timetable)

Training/planning workshop in the UK - Two regional workshops in Africa and final workshop.	Yr 1: (July 03) UK-based inception workshop to discuss research/training protocols, participants' specific species of interest, administration issues, etc. (August 03) W-Africa training in Burkina Faso (in French). (Sept 03) - Training of E-S African partners in Ethiopia (in English). Yr 3: Final workshop in Kenya (timing to be decided, probably Dec05)
In-country research investigation on tree seed conservation techniques	Yr 1: Research on 15 species, data collection, analysis, write species reports. Yr 2: Research 30 species, write reports and 3 multi-authored papers. Yr 3: as Yr 1, plus commit seed to long-term storage as an investment for the future
Conduct back-up research and data management (UK)	Yr 1: Compile current baseline data and draft review paper. Yrs 1 -3: Replicate experimental work when necessary and provide advice, i.e. back stop. Yr 3: Help edit proceedings
Web-site and publications	Yr 1: Plan, design web in consultation with DEFRA, IPGRI and partners. Yr 2: Fully functional web network. Yr 3: Maintenance and continuing use for information flow

