BRAHMS and SISTEM+: the completion of sustainable products (R6683 / ZF0003)

Distribution of monographic data-sets of *Calliandra, Inga, Leucaena, Parkinsonia*, and *Pinus* in electronic format – a model for future dissemination of botanical data (R7276 / ZF0087)

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Report enclosures

BRAHMS 4.8 reference manual

BRAHMS 4.8 reference manual contents pages in full

BRAHMS web site home page print out from www.brahms.co.uk

SISTEM+ Seed Manager SADC region report "Installation and training of the Seed Manager in South Africa and Namibia"

BRAHMS 'flyer' - produced by the IAN herbarium, Embrapa Amazonia Oriental, Brazil

"Acervo do Herbario IAN - *Meliaceae*" (booklet publised on Meliaceae collections by IAN herbarium)

Sample BRAHMS Software Agreement Form

BRAHMS database article published in the widely distributed Oxford Plant Systematics Newsletter OPS 6, December 1998

BRAHMS 4.6 Introduction to Version 4.6 (2 copies)

BRAHMS 4.6 Introdução à Versão 4.6

BRAHMS 4.6 Training exercises for BRAHMS and RDE

BRAHMS 4.6 Exercícios de treinamento

Database of plant biodiversity from Brazilian Amazon abstract

Contents

1 Summary

The purpose of these closely related projects has been:

- To create stable versions of the data management systems Brahms and SISTEM+, appropriate for wider distribution to forest management, botanical and biodiversity related projects (one year)

- To assemble monographic data disks for the key forestry genera *Calliandra, Inga, Leucaena, Parkinsonia*, and *Pinus* in an easy to transfer format and to distribute these data as widely as possible (four months)

As a result of these projects, both BRAHMS and SISTEM+ have been extensively upgraded and documented. Formal software distribution procedures have been drawn up and the project is now partially supported by income from system users.

Articles, newsletters, manuals, tutorial guides, project kick-start guidelines and pamphlets describing these systems have been prepared, some materials also in Spanish and Portuguese.

More than a dozen training workshops have been organised and run and further training programmes have now been drawn up.

A comprehensive internet site has been established for BRAHMS on www.brahms.co.uk and a further site is now in construction for the SISTEM+ Seed Manager. The BRAHMS web site optimises the distribution of both the software and useful data sets as well as providing current and potential system users with up to date project news.

The key target countries Malawi and Brazil have themselves organised regional database training courses, and generated reports, posters and publications. A Trapnell Fund has been secured to provide some additional inputs to the National Tree Seed Centre in Malawi and to extend seed database training in the Southern African region. Plans to extend the botanical data management work more widely in Amazonian Brazil are in the making.

The project has also explored more generally options for encouraging electronic transfer of botanical data between larger and smaller herbaria, providing improved curation support to herbaria in resource poor countries, examples being the type collection of the Netherlands and the data link now being forged between BRAHMS and TROPICOS.

In particular, this project has been concerned with the transfer of technology, management procedures and useful data from countries with high capability and resources to institutes and researchers in resource poor countries who can use and promote this technology for improving the management of natural resources.

2 Background and project purpose

The BRAHMS and SISTEM+ database systems have been developed to provide *in situ* management support to the forestry sector, herbaria, botanists and those undertaking research on biodiversity.

The development of the systems has been closely linked to practical demands from forestry, biodiversity and related natural resources management projects, many of these in DFID targeted countries. Their general objective is to enable projects to organise and make better use of their data and to act as a vehicle to transfer technology and data between countries, institutions, projects and individuals.

For example, the pressure on herbaria in tropical countries to provide base-line botanical information has increased sharply in response to the many new demands from biodiversity related projects. In many countries, basic floristic knowledge is poor and their herbaria, although often rich in botanical material, lack sufficient professional staff and/or adequate facilities to provide the information needed. Many of the recent developments with BRAHMS have been directly concerned with assisting small tropical herbaria, helping them to provide useful information with greater efficiency.

Another example is with forest seed. Many tree seed centres are hampered by a lack of perspective on the movement of seed from tree to seed store to customer. Information on accessions, storage history, demand and distribution is often inadequate and as a result, many seed centres have difficulty planning their seed procurement programmes. Poor seed documentation reduces the value of seed. The level of information supplied to customers is often very low. Low levels of documentation and poor marketing have an adverse impact on seed sales (national and international) and a negative impact on the forest sector. The SISTEM+ Seed Manager incorporates a range of functions, developed *in situ* with active seed banks, to assist with these problems.

These projects arose in response to feedback from system users who have requested improved software and improved software documentation. The project outputs have been selected to ensure that these database systems are sustainable and more widely distributed.

3 Research activities and outputs

3.1 R6683 / ZF0003

BRAHMS and SISTEM+: the completion of sustainable products (R6683 / ZF0003)

3.1.1 Technical developments

Brahms software extensively revised (Version 4.8), fully networked (multi-user) with greatly simplified data editing functionality throughout and enhanced output options. All changes to the system are documented in the BRAHMS manual. The most import additions are also summarised on the web site (About Brahms, New in Version 4.8).

The SISTEM+ package was substantially upgraded and altered to focus solely on seed management with all trial management functions being dropped (now transferred to the Trema package (Tree Management and Mapping). This is largely due to the duplication of effort between SISTEM+ and TREMA and fact that TREMA is able to integrate tree/trial data more fully with data from other categories of plot. Many of the "ideas" that were built into SISTEM+ for trial management have been embodied within TREMA. The future development of SISTEM+ will now be under the heading SISTEM+ Seed Manager. Further information is given under "Future software development and support to projects" below.

3.1.2 Training materials and introductory materials

Preparation of introductory literature and training materials for Brahms completed (English and Portuguese). Samples of these are enclosed with this report. These materials were widely distributed during the project.

Due to the rapid evolution of the software systems, such literature has a very short life span. Future policy will be to maintain these materials on the web site(s).

Introductory materials and a revised BRAHMS tutor are already on the web site. That for SISTEM+ Seed Manager will follow.

A considerable effort has been made to simplify procedures for starting new database projects. Installation and 'new project guidelines' have been added to the BRAHMS manual and web site. General and region-specific start-up data are also provided.

3.1.3 Manuals

Preparation of a comprehensive technical manual for Brahms completed. The BRAHMS manual has not yet been formally printed as it is primarily intended to be used on-line. The on-line manual includes extensive internal cross-referencing and also links to useful web sites. A draft, printed version of the manual is enclosed with this report. The manual can be (and has been extensively) freely downloaded from the web site www.brahms.co.uk (downloads page). One of the difficulties producing printed software manuals on a tight budget is that the text must continually change as the system is modified. Also, there is little doubt that the advent of internet distribution and widespread access to the internet has resulted in a movement of the manual objective goalposts. Nevertheless, there is a niche and need for the printed manual. Conventional printing is out the question. Digital photocopying is realistic. Copies of the 4.8 manual will be copied very shortly using the print budget assigned.

The Seed Manager manual was submitted to FRP near the start of this project. This manual does need to be upgraded now, following the "template" developed for the BRAHMS manual.

3.1.4   Target projects in Brazil and Malawi

3.1.4.1   Brazil

[The IAN project is also documented on www.brahms.co.uk under 'Projects']

The key target project link for Brahms, as stated in the project memorandum, has been **Embrapa Amazonia Oriental** in North Brazil. The work at the IAN herbarium is now well under way, the longer term objective being to database the entire herbarium. This is a substantial project in part supported through DFID bilateral support. The work has been further augmented by the acquisition (by the IAN herbarium curator Regina Martins-Da-Silva) of additional funds through the Brazil research agency SUDAM, to support the purchase of computing hardware and two years of data entry at IAN and at the nearby Museu Goeldi.

The BRAHMS project at IAN has exposed and familiarised the limited research staff there to database technology. Although there has been a tendency to prepare "slightly over the top" database poster presentations and related materials, the IAN herbarium is in the process of building a very substantial botanical database that does and will increasingly support a broad range of research and enquiry. The project is reviewed on the BRAHMS web site "projects" page.

Training inputs to this project have enabled local staff to run their own small, regional training courses for technical staff at the Museu Goeldi, INPA and the main herbarium in the state of Amapa. As a result of this, substantial data entry is now well underway at the Museu Goeldi.

The work at IAN has resulted in a number of modest, local publications, all of which acknowledge the role on DFID. Database outputs are now expanding.

A poster about the BRAHMS work at IAN and MG was presented at the XVI International Botanical Congress in Missouri, August 1999. This work was also submitted as an abstract and published in the congress proceedings:

Database Of Plant Biodiversty from Brazilian Amazonia by Regina Martins-Da-Silva (IAN Herbarium, Brazil), Ricardo Secco, Denis Filer, Gracialda Ferreira).

'*A database documenting Amazonian plant biodiversity is being developed by assembling botanical collection data from regional Herbaria. Two of the most important Herbaria in the Region are MG and IAN together holding some 320.000 samples collected from Amazonia. The database is being build using BRAHMS (Botanical Research And Herbarium Management System). Each data entry workstation is using a standard data entry format with access to shared collector, taxonomic and geographic dictionaries. After entry to simple spreadsheet-like files, the data are validated and imported to the core BRAHMS database. Here, the data can be processed to prepare curatorial, monographic and floristic outputs including loan forms, taxonomic treatments and distribution maps respectively. The database, currently holding c.60.000 collections. (SUDAM, DFID).*'

An example of the collaborative nature of this work regionally is the joint planning of collection data entry between IAN and the nearby Museu Goeldi, two of the largest Brazil-Amazon herbaria. Some further comments on this work are provided in Appendix 3 in relation to the Legume family.

3.1.4.2 Malawi

Support to the National Tree Seed Centre has continued. To promote and further continue the use of the SISTEM+ Seed Manager at FRIM and to extend their ability to train others regionally, an application was made to the Trapnell Fund (at Oxford). This application was successful and it hoped that Mr Gondwe will come to the OFI as soon as this is mutually convenient.

The work in Malawi is summarised in the Trapnell Fund application which is attached to this report as Appendix 4.

FRIM staff have undertaken SISTEM+ Seed Manager training courses in the SADC region with support from CIDA. A report made by Msau Makandiwire (FRIM), one of the database trainers, is attached with this report.

3.1.5 BRAHMS web site

3.1.5.1 Introduction

The Brahms web site has been completed and is available on www.brahms.co.uk. This is now the most important mode to inform users and potential users about the project as a whole and to distribute the software and software documentation. The web site is the simplest route to finding out about the BRAHMS project and its potential value to developing countries. The initial response from the draft site has been very positive. The site will be "advertised" on TAXACOM shortly.

3.1.5.2 Web site contents summary

- **Home:** introduction to site and contents page

- **About BRAHMS:** multi-sectioned and indexed page describing the uses and applications of BRAHMS with technical details as appropriate. Also includes a list of the main system additions.

- **Recent news:** annual newsletter article

- **Example projects:** a selection of projects illustrating the sorts of work undertaken with BRAHMS by reference to projects completed or underway. This include FRP funded work.

- **Sample outputs:** a range of checklist, monograph, curation and mapping outputs with some notes on how they were made.

- **Database support:** an explanation of the BRAHMS database support policy.

- **Register & download:** download links to the software, tutor, manual and mapper

- **Starting projects:** overview of key steps to start a new project, explained in detail in the manual.

- **Contributors:** a list of key project contributors including DFID/FRP

3.1.6 Funding options and software licencing

3.1.6.1 Introduction

Future funding options for continued software development linked to software licensing were investigated and an optimal way to fund BRAHMS work sought. Users and potential users

have been informally asked about this. Copyright issues have been discussed with DFID and the University of Oxford.

To survive, the BRAHMS Project at Oxford requires funding. Some projects have funds and can afford to pay a licence fee. Many others, including those that DFID are likely to consider worthy of support have no such funds.

The challenge then is to support BRAHMS development as far as possible by fostering links to well-funded projects that are able to make a financial contribution to the project yet continue to provide free software and support to less well off projects.

3.1.6.2   The role of RSO

A BRAHMS Software Licence Agreement form was prepared and has subsequently been sanctioned by the Research Services Office (RSO) at the University of Oxford – although not without several months of difficult negotiation reducing their initial legal blur to a more or less comprehensible 2- pager. The University of Oxford has copyright of BRAHMS.

3.1.6.3   Database development support on web site

The optimal solution achieved to date is stated on the BRAHMS web site. This approach will also apply to the SISTEM+ Seed Manager. The policy adopted is to allow anyone access to the software for free but to encourage projects with funds to subscribe to **Database development support**. The web site text is reproduced here:

> *While the BRAHMS system documentation tries to deal with the esoteric as well as the routine, a relatively small amount of help can make a big difference with project progress, especially at the start. It is worth bearing in mind that the construction of any substantial database is not a trivial task. Database work can absorb a lot of time and effort and may rapidly become a focus of project activity. In practice, most projects require some help as they evolve.*
>
> *Help with building BRAHMS databases can be provided through a database **development support contract**. It is not a requirement that BRAHMS users have a support contract to start and maintain a database. BRAHMS Version 4.8 can be downloaded and used **free of charge**. Also, it is recognised that some projects have limited access to funds for such support and in these cases, where possible, assistance may be provided free of charge.*
>
> *Nevertheless, the project policy is to encourage those building longer-term databases to subscribe to development support. The support contract provides database developers with the extra help needed to get things off the ground quickly and to develop the services and outputs required with the maximum efficiency.*
>
> *The BRAHMS **development support contract** entitles projects to database start-up advice, software and documentation upgrades and general assistance commensurate with the support arrangement. Contract terms are clearly laid out in a 2 page Software Licence Agreement prepared by the University of Oxford Research Services Office. The costs depend upon the scale and nature of the support requested but as a rough guide, range from US$ 250 to US$ 2,500.*
>
> *Development support income reduces the dependency of the BRAHMS Project on research grants and provides long term security both for future software development and system users. We believe this policy to be a responsible approach to the continued development of BRAHMS.*

3.1.6.4   Sample Software Licence Agreement form

An example licence agreement form is attached as an enclosure.

3.2 R7276 / ZF0087

Distribution of monographic data-sets of *Calliandra, Inga, Leucaena, Parkinsonia*, and *Pinus* in electronic format – a model for future dissemination of botanical data (R7276 / ZF0087).

3.2.1   Technical work

Data from existing databases have been assembled into up-to-date BRAHMS databases for the genera *Calliandra*, *Inga, Leucaena* and *Pinus*. These data sets combine collection data with species information, as available (*e.g.* old species names, common names, uses). The (much smaller) *Parkinsonia* data set has yet to be processed.

Software to import these data into existing Brahms databases, updating nomenclature, adding new collections, highlighting wrong species names has been prepared and integrated with BRAHMS.

3.2.2   Training materials

Tutorial materials focusing on the *Leucaena* data set were prepared in English and Portuguese. These have been enclosed with this report.

3.2.3   BRAHMS web site

Inga, Leucaena and *Pinus* can now be downloaded from the BRAHMS web site. *Calliandra* (section Racemosae) will be added shortly.

3.2.4   Link to TROPICOS

Plans to link these BRAHMS data sets to TROPICOS, the botanical database used at the Missouri Botanical garden, USA have now been drawn up with Bob Magill, head of Research at the Missouri Botanical Garden. A link between the BRAHMS site and the TROPICOS site is shortly to activated – leading to a direct, on-line search for the collections in these genera from BRAHMS via TROPICOS.

4 Contribution of outputs

The products generated by this project are closely linked to natural resources management and, indirectly, to poverty alleviation. This assumes a link between poverty and poor management of natural resources and the environment.

Improved access to and control over forest seed information (collection, storage, distribution) combined with improved seed marketing capability is beneficial to forestry and agriculture in the broadest sense. Herbarium and botanical data as stored in and processed by BRAHMS are an essential prerequisite to many facets of ecological research, practical forestry and agricultural activity and the many different types of biodiversity work that lead to an improved understanding of conservation issues.

The project target institutions and related beneficiaries are closely involved with the outputs of this project. They are actively using the software products and in training others to do so. They have been involved with the development of the project outputs (feedback with software development). Strong communication links exist between the UK based project, the target institutions and many other projects in economically less well off countries.

BRAHMS generated publications (from monographs through checklists to simple collection lists) are widely distributed and used as a foundation for further research. Two recent examples are "The plants of Mount Cameroon: a conservation checklist" and the "World Checklist and bibliography of Conifers", both documented on www.brahms.co.uk - Recent news.

Project publications, workshops and other outputs are listed in the project completion reports in Appendices 1 and 2.

5 Appendix 1 Project completion summary sheet R6683 / ZF0003

5.1 Summary

Title of Project:	BRAHMS and SISTEM+: the completion of sustainable products
DFID Project Reference:	R6683 / ZF0003
RNRRS Programme:	Tropical Moist Forest System
Programme Manager:	Natural Resources International Limited
RNRRS Programme purpose	Biodiversity in Tropical Moist Forest conserved
RNRRS Production system:	Tropical Moist Forest System
Commodity base:	Timber, non-timber forest products, wildlife
Beneficiaries:	Tree planters, forest dwellers, farmers, estate managers, researchers
Target Institutions:	Embrapa Amazonia Oriental (CPATU), Forestry Research Institute Malawi
Geographic focus:	Latin America and Africa – but also worldwide

	Planned	**Actual**
Start date	1 July 1996	August 1996
Finish date	30 June 1998	September 1998

Total cost	**£ 63,389**

5.2 Project purpose

The purpose of this project has been to create stable versions of the data management systems Brahms (Botanical Research And Herbarium Management System) and SISTEM+ (Species Information, Seed, Trials and Environment data Management), appropriate for wider distribution to forest management, botanical and biodiversity related projects.

A key objective of the project has been to round off the development and documentation of these systems so that they can operate in a productive and sustainable way without further immediate technical inputs. Accordingly, the project has been concerned with ensuring that these systems have adequate documentation covering initial set up, training, data entry, data output and database administration and that they are adaptable to local operating needs

The project has also investigated future software licensing and related funding options to a) ensure continued and sustainable database development and b) ensure that on-going projects receive necessary support.

5.3 Outputs

- Brahms software extensively revised (Version 4.8), fully networked (multi-user) with greatly simplified data editing functionality throughout and enhanced output options.

- Preparation of introductory literature and training materials for Brahms completed (English and Portugeuse).

- Preparation of a comprehensive technical manual for Brahms completed June 1999.

- Brahms successfully implemented with target project at Embrapa Amazonia Oriental, leading to further regional use.

- SISTEM+ package altered to focus solely on seed management, all "trial" management functions being dropped (now handled by the Trema package = Tree Management and Mapping).

- SISTEM+ Seed Manager software extensively revised (Version 3.8) and fully networked (multi-user).

- Improved project start-up procedures for Brahms and the SISTEM+ Seed Manager with the provision to supply region-specific set-up data disks.

- SISTEM+ Seed Manager reference manual completed.

- SISTEM+ Seed Manager successfully implemented with target project at National Tree Seed Centre, Malawi, leading to further use in SADC region.

- Policy to transfer of Brahms and Seed Manager to Windows (Visual FoxPro) drawn up. Selected Windows modules completed and distributed.

- Future funding options for continued software development linked to software licensing investigated. University sanctioned software license agreement form(s) prepared and implemented with projects in Europe. Final "user-friendly" software license form completed.

- Brahms and SISTEM+ Seed Manager Web sites (downloadable software included) drafted, ready to bring on-line by June 1999.

5.4 Contribution of Outputs to project goal

The overall output of this project has been to build completed and stand-alone products with enhanced capability to contribute to forestry and biodiversity work in DFID targeted countries. The principal focus of attention has been the preparation of sustainable software and its implementation in Malawi (SISTEM+) and Brazil (BRAHMS). Both of these projects have been successful, leading to take up by other projects.

Substantial technical advances have been made with these software packages. Reference and training documentation have been prepared. Plans have been drawn up to complete the advance of both systems into Visual FoxPro, a modern Windows environment. Internet-based software distribution in imminent. Software licensing arrangements have been put in place.

5.5 Manuals, reports, newsletters, leaflets, presentations

Filer, D.L. (1997) SISTEM+ Seed Manager Reference Manual (1st edition). Oxford Forestry Institute, University of Oxford. 149 pp. English.

Filer, D.L. (1998) Streamlining monography using the Brahms database. Invited paper given to Systematics Association Biennial meeting. University of Oxford. English.

Filer, D.L. (in prep) Seed Manger Reference manual (2nd edition). Oxford Forestry Institute, Department of Plant Sciences, University of Oxford. English.

Filer, D.L. (1999) Brahms Reference manual. Department of Plant Sciences, University of Oxford. English. *c.*300pp. English

Mkandiwire, M. and Chendauka, B. (1997) SISTEM+ Seed Manager database. Installation and Training of the Seed Manager in South Africa and Namibia. Report to SADC Tree Seed Centre Network Project. 15pp. English.

5.6 Other dissemination results

Filer, D.L. (1998) SISTEM+ Seed Manager Version 3.6. Department of Plant Sciences, University of Oxford. 3 disks. English.

The Dutch Herbaria (1998) Catalogue of type collections of the Dutch herbaria. Type collections for species from countries in Africa, South America and S.E. Asia. <http://rulrhb.leidenuniv.nl/>. English.

Filer, D.L. (1999) BRAHMS - Botanical Research And Herbarium Management System Version 4.8. Department of Plant Sciences, Oxford. 6 disks. English and Portuguese.

Filer, D.L. (1999) BRAHMS web site <http://www.brahms.co.uk>. English. Currently being translated to Spanish and Portuguese.

5.7 Training workshops

Filer, D.L. (1996) SISTEM+ Seed Manager training workshop [one week training for 4 staff]. English. ICRAF, Kenya.

Filer, D.L. (1996) Brahms training workshop [4 days training for 6 CPATU staff]. Portuguese. IAN Herbarium, Embrapa Amazonia Oriental, Brazil.

Filer, D.L. (1996) Seed Manager training workshop [5 days training for 8 staff]. English. National Tree Seed Centre, FRIM, Malawi. December 1996.

Filer, D.L. (1997) SISTEM+ Seed Manger training workshop [10 days training for 9 staff]. English. National Tree Seed Centre, Kitwe, Zambia. June 1997.

Filer, D.L. (1997) SISTEM+ Seed Manger training workshop [5 days training for 6 staff]. English. Kenyan National Tree Seed Centre, KEFRI, Kenya. Aug 1997.

Filer, D.L. (1997) SISTEM+ Seed Manger training workshop. [10 days for 5 staff]. English. Maracuene Seed Centre, Mozambique. Oct 1997.

Filer, D.L. (1998) Brahms training workshop. [12 days training for 10 staff]. English. National Bangladesh Herbarium, Dhaka. Jan 1998.

Filer, D.L. (1998) Brahms training workshop. [5 days training for 4 staff]. English. Mayaguez, University of Puerto Rico. Mar 1998.

Filer. D.L. (1998) Brahms training workshop [2 days training for 22 curators from North/North East Brazil]. Portuguese. Kew Herbarium techniques course, INPA, Brazil. July 1998.

Filer. D.L. (1998) SISTEM+ Seed Manger training workshop [5 days training for 10 staff from PCP Unit, National Museums of Kenya]. English. NMK, Kenya Sept, 1998.

5.8 Follow-up indicated/planned

The project products have been and will continue to be distributed on demand and are now (October 1999) freely available on the web site. Contact is maintained with all active projects by email and through occasional regional workshop activity.

The key priority is the completion of the translation of these systems to Windows. This will be partly funded by software licence revenue and links to specific projects. Further funds for this specific task need to be secured. Application to Darwin October 1998) failed.

Project support to Embrapa Amazonia Oriental (CPATU) will continue, given the interest in system expansion and collaboration with Museu Goeldi and possibly INPA. Some funds have been secured through Brazil agency SUDAM for this.

A small grant (airfare + subsistence for one Malawi Forest Officer) has been raised through the Oxford Trapnell Fund to continue collaboration with FRIM in Malawi, essentially to provide continued support to the Malawi National Tree Seed Centre.

6 Appendix 2 Project completion summary sheet R7276 / ZF0087

6.1 Summary

Title of Project: Distribution of monographic data-sets of *Calliandra, Inga, Leucaena, Parkinsonia*, and *Pinus* in electronic format – a model for future dissemination of botanical data

DFID Project Reference: R7276 / ZF0087

RNRRS Programme: Tropical Moist Forest System

Programme Manager: Natural Resources International Limited

RNRRS Programme purpose Biodiversity of the forest/agriculture interface conserved.

RNRRS Production system: Tropical Moist Forest System

Commodity base: Timber and related tree products

Beneficiaries: Tree planters, forest dwellers, farmers, estate managers, researchers

Target Institutions: Herbaria, tree seed centres and related research institutes in Latin America.

Geographic focus: Latin America – but also worldwide

	Planned	Actual
Start date	August 1998	August 1998
Finish date	March 1999	March 1999
Total cost	£ 27,730	

6.2 Project purpose

The purpose of this project has been to assemble monographic data disks for the key forestry genera *Calliandra, Inga, Leucaena, Parkinsonia*, and *Pinus* in an easy to transfer format; to prepare software to transfer these data into local databases helping with curation; to document the

data and related software; to distribute the data to relevant herbaria in Latin America; and to further advertise the data availability as widely as possible. The project has also aimed to explore more generally options for encouraging electronic transfer of botanical data between larger and smaller herbaria, providing improved curation support to herbaria in resource poor countries.

6.3 Outputs

- Brahms Monograph data disks prepared for *Inga, Leucaena* and *Pinus*. Data sets combine collection data with species – level data (*e.g.* old species names, common names, uses)

- Brahms Monograph data disks in preparation for *Calliandra* and *Parkinsonia, to be completed ASAP.*

- Software to import the data sets into Brahms 4.8 data; to auto-curate existing Brahms databases by adding new collections and updating species names completed; and to download the data into simple tables for subsequent incorporation in other databases or spreadsheet packages completed.

- Data-set specific tutorial materials prepared (English and Portuguese). Use of Brahms Monograph Series data-sets fully documented in Brahms reference manual.

- Data links to TROPICOS at Missouri Botanical Garden established.

- Datasets mounted on (and downloadable from) Brahms web site.

6.4 Contribution of Outputs to project goal

The type of botanical data processed on this project is representative of the large body of monographic and related botanical data published each year. The tendency is for these data to be buried away in printed text. The products of this project are a step along the road to increasing the efficiency of the management and exchange of botanical data, critical for improving the quality and value of biodiversity and conservation related research activities, especially in species rich, resource poor countries. The project highlights the immediate practical value of using a well organized databases in herbaria..

Draft versions of the monograph series disks have proved to be successful in three principal ways. a) They have provided ideal database training materials; b) Initial results show that the data can easily be incorporated into existing databases and are a highly effective method to update collections and names in herbaria; and c) the data sets provide immediate boost to herbaria wanting to get started with new database projects.

Evaluation of the uptake of the project outputs will be carried out Sept 1999 after all completed data sets have been mounted on Brahms web site and all relevant herbaria in Latin America have received written notification concerning the web site details.

6.5 Other dissemination results

- The software processing these data sets is distributed as part of Brahms 4.8.

- Completed data sets mounted on Brahms Web Site with relevant software and documentation.

- Draft data sets distributed to herbaria in Central America and Brazil.

Filer, D.L. (1998) Introduction to Brahms version 4.6. Department of Plant Sciences, University of Oxford. 16pp. English and Portuguese.

Filer, D.L. (1998) Training exercises for Brahms and RDE. Department of Plant Sciences, University of Oxford. 48pp. English and Portuguese.

Filer, D.L. (1998) BRAHMS database. *Oxford Plant Systematics Newsletter Dec 1998, No. 6. pp* 13-14. English.

6.6 Follow-up indicated/planned

The completed monographic data sets are (or will be) available from the Brahms web site. Plans are being drawn up to include further plant groups in the Brahms Monograph Series. A parallel "checklist series" with data from specific geographic areas may also be started. A sample disk has been prepared for Mount Cameroon.

Discussions have been held with T. Pennington at Kew about the potential to prepare further data sets for the Sapotaceae and Meliaceae families. Also refer to Appendix 3.

7 Appendix 3: Legume data in BRAZIL

The Leguminosae is one of several plant families targeted for early data capture at the IAN and MG herbaria. It has been selected due to its economic and ecological importance in the Amazon region.

A close examination of the Leguminosae collections data entered to date (approx. 80% of all collections) reveals the vast wealth of these collections. The challenge now confronting these herbaria is how best to make use of the data for curation and research initiatives and how best to 'market' these data to the scientific community at large. As general points:

- The Amazon is area of vast international interest and relatively poorly known from a botanical perspective

- The Leguminosae are one of the four largest plant families in the world

- The Leguminosae are especially diverse in the Amazon region

- These herbaria havea vast and well documented collections of Leguminosae from the Amazon region

The herbaria are in a good position to capitalise on this important data resource and to make an important contribution to studies on biodiversity of the Amazon along with a suite of pure and applied outputs including those linked to sustainable land management and the selection of protected areas.

One of the key challenges facing these herbaria now is to use these data to address relevant research questions and applied demands. The demand for this type of data has never been greater and these herbaria are in an excellent position to take a lead nationally and internationally with the provision of biodiversity information for the Amazon.

It would be impressive and scientifically useful to the international botanical scene if the Museum and Embrapa, ideally together with INPA, could demonstrate that they are sharing resources, exchanging data and preparing joint publications.

Some specific examples of outputs and research possibilities, based on the legume collections, are listed below as potential outputs.

- Vastly increasing the resolution of biodiversity knowledge beyond the crude degree square 'guestimates' based on scanty data to date - using the Leguminosae taxa as an example of the way forward with other taxonomic groups. Initially, simple, but high resolution species distribution maps.

- Reviewing the current state of sampling. Where are the collection gaps (geographic)? How representative are the collections - crude analysis of number of collections per taxon (auto from BRAHMS).

- Curatorial status of the legumes - date of last revision (genus) - commentary by specialists here - with implications for research focus and direction. External consultant 2 days. Send appropriate print outs e.g. list of Legume genera with species and collection totals + general checklist.

- History of collecting based on collection dates.

- Bibliography of legume collectors.

- Crude genetic hotspot analysis no of taxa per cell (e.g. square minute). Mapped with colour codes representing collection density, number of taxa and rough 'genetic heat' index.

- Basic checklist of legumes.

- Annotated checklist of legumes with a few more data elements added. Examples would be timber uses, common names, distribution and specimen citations, collection date range (based on collections). Synonyms could also be added.

Two longer term outputs:

- Biogeograpic interpretation - distribution genera/species linked to ecology.
- In collboration with MG, Embrapa (and INPA?), a Flora/Field guide/Checklist of Amazon legumes similar style to *Aves Da Grande Belém*.

8 Appendix 4: Trapnell Fund Application for Malawi

Proposal for a four week study-visit to Oxford of Mr Dominic Gondwe from the Forestry Research Institute of Malawi

Submitted by D.L. Filer, Oxford Forestry Institute

Summary

This proposal requests travel and subsistence funds to bring Mr Dominic Gondwe, a Malawian forester, to the Oxford Forestry Institute for a four week training and study period. His work in Oxford, to be supervised by Mr Denis Filer, will be concerned with the development of tree seed and forestry research data management systems for the Forest Research Institute of Malawi (FRIM). Mr Gondwe, who has played a key role in implementing data management systems at FRIM to date, has above average ability with databases and also has ability to train others both within FRIM and more widely in the SADC region.

Background

Mr Filer has worked with The Forest Research Institute of Malawi (FRIM) since 1990, helping to establish forestry data management systems for tree seed and forest research data. This work has mostly been carried out under the auspices of the Department for International Development (DFID) through the DFID-FRIM Support Project and the DFID Forestry Research Programme (FRP). The FRIM support project terminated over two years ago and since that time, FRIM has proved its commitment to the database work by operating these systems unaided.

The National Tree Seed Centre (NTSC) of Malawi is based within FRIM. The NTSC has a remit to collect store and distribute tree seed nation-wide, and where relevant to export seed to other countries. Much of the data management work with FRIM to date has focused on implementing an integrated seed management system for the NTSC and this work has been a success. Now used on a routine basis, their seed management system assists with all phases of the seed cycle from initial procurement, storage, pricing and testing to its final distribution.

FRIM is also responsible for managing a large volume of forestry data from different categories of forest sample area. These include forest inventory, introduction plots and permanent sample plots. Much of the data generated from these sample areas is scattered across a variety of non-compatible data file formats or remains on paper. There is a pressing need to assemble these data into a uniform format with access to basic data processing functions, for example the production of stand tables, forest checklists, biodiversity scores and forest maps. Following discussion with the research director of FRIM, it is apparent that these FRIM data are ideally suited to store in the TREMA (tree management and mapping) data management system. Related to the need to prepare basic tree stand maps, some researchers at FRIM also need to prepare more general species distribution maps based on botanical collections. As a starting point here, one FRIM staff member has built a large database for the genus *Uapaca*.

One of the target objectives of the work supported by DFID has been to establish FRIM as a regional centre of database expertise. FRIM has played an important role helping to implement their database, and the methodology it embodies, in other national tree seed centres within the SADC region. They have contributed to regional database training courses and to date, databases similar to that used at FRIM, are operating in Mozambique, Swaziland, Namibia and Zambia.

Purposed study-visit

It is proposed that Mr Gondwe should visit the Oxford Forestry Institute for 4 week period, armed with a broad range of FRIM data samples and backups of all existing databases. Mr Filer will co-ordinate allocation of office space, a suitable computer, his training schedule and local visits. His training programme will focus on the following subject areas:

- to consolidate and further strengthen the database work for the National Tree Seed Centre, enhancing their own in-house management capability but also strengthening their capacity to provide further SADC regional training.

- to provide training with the TREMA (Tree Management and Mapping) data management software package for the production of forest inventory maps, stand tables and other forms of output and to transfer a range of existing FRIM data into TREMA file format.

- to provide training with the preparation of botanical species distribution maps as required by FRIM for *e.g.* their work on the genus *Uapaca*.

During his visit, a number of study visits (within the UK) will be arranged for Mr Gondwe, these to include a full day at the Forestry Commission Seed Section at Alice Holt, Farnham.

Mr Dominic Gondwe

Mr Gondwe is a forest officer at FRIM with the overall responsibility for the database work. He recently completed a Forestry Diploma at Arusha, Tanzania. Mr Filer has worked with Mr Gondwe at FRIM on several occasions between 1990 and 1998 and has selected him as the most appropriate candidate to visit Oxford for a short study period. He has been largely responsible for the success of the database work at FRIM to date, showing well above average ability and interest.

Mr Martin Stewart, DFID project manger of the FRIM support project for over five years strongly supports the visit of Mr Gondwe. Mr Stewart currently works at Natural Resources International (NRI) and can be contacted on 01634 883869 or at M.S.Stewart@greenwich.ac.uk.

Approximate Budget

Local travel, passport/visa and related costs in Malawi	£250
Airfare Blantyre-Llilongwe-London return	£1000
Local UK travel	£200
Subsistence 30 days @ £50	£1500
Book grant:	£100
Photocopy and other misc costs	£250
Total:	**£3300**