‘Repackaging proven RNRRS technologies for dissemination via TECA’

Final Technical Report

17 November 2006

Karen Wilkin (NR International Ltd)
Tina Rowland (Random X Solutions Ltd)
Ken Campbell (Independent Consultant)
Graham Farrell (Plant Clinic Ltd)

MAIN REPORT

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[1] http://www.fao.org/sd/sdrr/index_en.asp

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[2] http://www.cirad.fr

Acronyms and Abbreviations

AFGRP	Aquaculture and Fish Genetics Research Programme
AHP	Animal Health Research Programme
CIAT	International Centre for Tropical Agriculture, Colombia
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement, France
CPHP	Crop Post-Harvest Research Programme
COAIM	FAO Consultation on Agricultural Information Management
CPP	Crop Protection Research Programme
CRD	Central Research Department of DFID
FAO	Food and Agriculture Organisation of the United Nations, Italy
DFID	UK Government Department for International Development
DST	Decision Support Tool
FRP	Forestry Research Programme
FTP	File Transfer Protocol (a mechanism for transferring files across the internet)
FTR	Final Technical Report
HTML	Hypertext Mark-up Language (a webpage formatting language)
INBAR	International Network for Bamboo and Rattan
LEAD	Livestock, Environment and Development, an FAO initiative
MoU	Memorandum of Understanding
LPP	Livestock Research Programme
M	Methodology
MB	Megabyte(s) of data
NARS	National Agricultural Research Systems
NGO	Non-governmental organisation
NRI	Natural Resources Institute, UK
NRSP	Natural Resources Systems Research Programme
PHFRP	Post-Harvest Fisheries Research Programme
PSP	Plant Sciences Research Programme
RNRRS	Renewable Natural Resources Research Strategy, a programme of DFID
R4D	Research for Development, a web portal of DFID
SDRR	Research and Technology Development Service of FAO
TAT	Transfer of Agricultural Technology
TECA	Technology for Agriculture, a web portal of FAO
TRFV	Technology requiring further validation
VT	Validated technology

Executive Summary

Background

TECA – 'Technology for Agriculture: Proven Technologies for Smallholders' – is an internet-supported tool for global technology exchange, developed since 2000 by the Food and Agriculture Organization of the United Nations: Sustainable Development Department – Research and Technology Development Service (SDRR). Its intended users include both technology providers and technology users – not smallholders directly but the organisations that provide advisory or policy services to them.

In 2005, NR International Ltd – having managed part of the UK Department for International Development (DFID)'s Renewable Natural Resources Research Strategy (RNRRS) for almost a decade – initiated a dialogue with SDRR with a view to disseminating the research outputs via TECA. The Communications Team of DFID's Central Research Department agreed to finance the present project – 'Repackaging proven RNRRS technologies for dissemination via TECA' – under the terms of an existing Memorandum of Understanding with FAO.

Objectives

The project's aim was to add value to DFID's investment in technology development under the RNRRS through a managed process of screening, repackaging, assigning metadata to and publishing the technology options for pro-poor natural resources management that were generated by some 1,500 projects between 1995-2006. It also made a commitment to document the project process, enabling the methodology and lessons learned to benefit future TECA partnerships. The project additionally agreed to record the decision-support tools and methodologies developed under the RNNRS, but not to publish them on TECA.

Approach

The project took place between November 2005 and July 2006. A large team was recruited with a wide range of skills to deliver the various components of the project, led by a dedicated in-house management team. In order to deal in a short space of time with a large backlog of knowledge generated by several hundred research teams, the process was centralised.

A workflow management tool was developed to track project progress at the level of each individual technology, to maintain the integrity of the data and ensure timely and efficient completion. A variety of tools were also developed for use by the team in reviewing the RNRRS portfolios, classifying the outputs, documenting the validated technologies using TECA 'record' format, reviewing the validation domain described in the records, copyediting and preparing the records for uploading, uploading itself and for obtaining feedback from the team. These tools are all presented in the Annexes and may be freely used by others.

The figure below shows the pathway followed in the project. In the report, we have tried to document our process in as much detail as might be needed by others if replicating or adapting it to publish their own technologies.

Lessons

At the end of each section, we have recorded 'lessons learned' about the methodology that we selected to identify, transform and publish this large backlog of existing knowledge. We have tried to be honest about our mistakes as well as what worked. It is hoped that the experience may serve as a pilot for future TECA partners to learn from.

The two key things we feel we got wrong were:

- to rely on existing documentation. The reporting requirements of the RNRRS did not generate the sorts of information needed to select, repackage and review the technologies for publication

via TECA. At all stages in the project, access to the 'tacit' knowledge of the original project teams would have improved the outcomes;

- to commission a peer-review of the technology records without thinking through properly how the feedback would be managed.

The two key things we feel we got right were:

- to develop a workflow management tool at the very start of the project;
- not to fear trying out different ways of achieving the objectives in respect of the different RNRRS programmes, and to invest resources in documenting and analysing lessons learned. The report draws heavily on contributions from the team.

Project pathway

See sections in this report	*Steps*	
3	Portfolio Review	
4	Quality assurance: technology screening	
5	Documentation of validated technologies	Review of project process and lesson learning. Documented as the project went along.
6	Quality assurance: review of technology records	
7	Quality assurance: Copyediting technology records	
8	Uploading	
9	Checking uploaded records	
10	Consolidation of recommendations for strengthening TECA	

Recommendations

From this experience, and knowledge of other projects similarly aiming to strengthen agricultural information markets, we have drawn out recommendations for SDRR to consider in any future development of TECA (Section 10). Some are suggestions to enhance the functionality and content of the database; others explore TECA's strategic aims. A follow-up visit to SDRR to present the lessons and recommendations is planned for late 2006.

The four key recommendations for SDRR are:

- turn the portal from a 'shop-window' into a 'market place', where users of technologies can make demands on the portal and provide feedback – both on the technologies they have discovered and the format in which the information was provided;
- decentralise the governance of TECA, moving away from populating and managing the database content and focusing instead on enabling its users to develop a governance model;
- introduce quality control mechanisms so that users can make a more informed comparison between the technology options;
- modernise the programming underlying the publishing process in order to speed it up and make it more user-friendly.

1 Background

1.1 What is TECA?

TECA – 'Technology for Agriculture: Proven Technologies for Smallholders' – is an internet-supported tool for global technology[3] exchange, developed by FAO's SDRR since 2000. It is public and free. To access the TECA portal, click here: http://www.fao.org/sd/teca/.

A series of searchable databases are fronted by a generic user interface (Box 1). This invites 'information consumers' to search the various databases, and 'information producers' to upload information. The present project has worked exclusively with one of these databases, the technology database known as the 'TECA Database'. To access it, follow this link http://www.fao.org/sd/teca and select Access TECA Database from the left-hand menu.

SDRR recognises that TECA's direct users are likely not to be smallholders themselves but organisations working on their behalf: (a) problem-solving, adaptive agricultural research organisations, (b) technical advisory services to smallholders and small enterprises (c) 'infomediaries' – organisations offering services in value-addition to information.

It is supposed that these organisations will adapt, validate and repackage the technologies for small firms and farms in ways suited to the local context. Thus, staying with the metaphor of an information market, the TECA database can be said to support pro-poor agricultural technology 'wholesale' to technology 'retailers'.

Box 1: Features of the TECA user[4] interface

- ✧ **TECA database** Publish and retrieve proven agricultural technologies for smallholders.
- ✧ **Technolibrary** Full text documents and references to CD Roms relating to agrarian technology including guidelines, technology assessment, gender issues, comparative studies and methodologies. Currently organised under the following headings: Methodologies, Policies, Communication for Development and Gender and Technology.
- ✧ **Decision-support tools database** Electronic tools to assist in decisions about technology assessment, transfer, validation, adaptation and adoption (Excel and htm documents, links to software supported on external websites).
- ✧ **Technology and Agriculture Directory** Gateway to other sources of information about agricultural technologies, including other FAO databases.
- ✧ **Newsletter** A platform for readers to exchange information about assessment, transfer, adoption and evaluation of proven technologies e.g. news, events, links, articles.

Governance of the TECA database is decentralised to the extent that the database can be copied onto partners' own servers and adapted; and partners[5] can customise the user interface. A degree of centralisation ensures that shared standards for technology selection and description are maintained by FAO: SDRR sets the standards and reserves the right to override publishers' decisions. Later in this report, we discuss how the potential for fully decentralised governance might usefully be exploited (Section 10.3).

When the present project was commissioned, field testing of the TECA database had taken place in the Democratic Republic of Congo and Honduras (reports are available from SDRR). The TECA technology database contained some 500 'records' (descriptions of individual technologies) from FAO projects and other partners; and a further 400 approximately were undergoing screening. At the time of writing, 790 records have been published of which 159 were contributed by DFID under the present project.

[3] TECA's definition of a proven technology is: 'Validated practices/techniques, tools/equipment, germplasm (plant or animal), know-how/skills, combinations of the above components'.

[4] Note that 'users' of TECA include users and providers of technologies.

[5] On becoming a TECA partner, click here http://www.fao.org/sd/teca/partners/join_en.asp.

1.2 TECA's strategic purpose

TECA was developed by FAO's SDRR in collaboration with WAICENT, in response to demand by FAO Member States. They believe TECA has the potential to empower their NARS and TAT organisations, facilitate south-south cooperation in research and technology development, and support FAO's Special Programme for Food Security. TECA was officially launched at the 2002 FAO Consultation on Agricultural Information Management (COAIM).

From the perspective of the technology user, TECA is a shop-window. Except in a few cases, TECA is probably not sufficient – without technical assistance / face-to-face or distance training – to enable an NGO (let alone a farmer) to effectively and safely implement the technology. Rather, it offers a menu of options and support in assessing and adapting these options to individual circumstances. It is likely that, for technology users, TECA substantially reduces the transactions costs of searching for otherwise dispersed information and of making a quality assessment of available technologies.

From the perspective of the technology provider, TECA is a publishing tool – a means of disseminating the outputs of technology development projects. It is not the only existing channel by which agricultural technologies can be accessed by extension workers, NGOs or infomediaries. However, TECA stands out for three reasons. Firstly, it is free. Secondly, it uses a standardised format for technology descriptions which makes the 'menu' of technology options much easier to read. Thirdly, the criteria developed by SDRR to select technologies for publication have the potential to cause TECA to become a brand – a guarantee of quality.

Another group of stakeholders in TECA are applicants for research funding in the context of internationally tendered competitive research grants. One of the most common reasons for failure by southern applicants noted by NR International, who have managed competitive agricultural research funds for many years, is that the research has been done before: the technology already exists. TECA can help towards levelling the playing field for southern applicants by centralising some of the information (although it cannot address other challenges e.g. relatively poor internet connectivity).

By providing an easy overview of what technology development has been done before, and flagging where expertise lies, TECA has the potential to support decisions about technology development policy, and the review of funding applications.

Finally, TECA supports the development of a 'community of practice' comprising technology suppliers and users by enabling them to inform each other about their existence and capability. Future plans of SRDD include e-conferences to promote interaction within the community.

1.3 DFID as a TECA partner

TECA is a collaborative initiative between FAO and a growing number of partner organisations – both global (e.g. IRRI, INBAR and now DFID) and national (including Nicaragua, Guatemala, Bolivia, Honduras and DR Congo).

In 2003, FAO and DFID signed a two-year MoU with a view to the RNRRS proven technologies being disseminated via TECA. Under the terms of the MoU, FAO would install TECA on DFID servers and provide a quality control function, at no cost to DFID.

For the first year, no action was taken. In 2004, RNRRs research managers based at NR International initiated a dialogue with the TECA team. At a meeting in Rome on 25/26 April 2005, also attended by DFID CRD Communications Team, it was agreed that:

(i) The existing DFID-FAO MoU would be renewed by the parties for an additional 2 years.

(ii) DFID CRD agreed in principle, subject to costing, to finance the non-FAO costs of identifying those technologies generated under the 10 DFID-funded RNRRS programmes which were eligible for publication via the TECA database; and of repackaging them in the TECA standard format for dissemination via TECA's user interface.

(iii) NR International would manage this process across all 10 RNRRS programmes.

It was also noted that TECA's technology database complements DFID CRD's *Research 4 Development*[6] portal (R4D), launched the following year in 2006. This publishes all of the RNRRS outputs, as produced by the projects without screening or further repackaging.

Following this meeting, an outline technical proposal was prepared by NR International, with assistance from FAO SDRR in the course of a working meeting in the UK at the beginning of June 2005. This was discussed at a video conference with DFID CRD and FAO SDRR staff on 9 June 2005. Further written comments on the proposal were provided by SDRR . The final proposal was submitted to DFID CRD on October 13 and the contract signed on 9 November 2005.

The project end date was scheduled for May 13 2006. A no-cost extension to 31 July 2006 was later approved and all activities were completed by that date.

2 Objectives and approach

2.1 Purpose

The project's purpose was to add value to DFID's investment in technology development under the RNRRS programme, through a managed process of screening, repackaging, assigning metadata to and publishing the technology options for pro-poor natural resources management generated by some 1,500 projects between 1995-2006.

2.2 Scope

A working meeting between the TECA manager and NR International at the beginning of June 2005 aimed to define the broad scope of the project. Through discussions with the five RNRRS programmes managed by NR International, an estimate was made of the number of technologies which may be suitable for dissemination via TECA, and of the human resources required to track down, transform and upload the existing documentation in the TECA standard format.

In terms of project scope, it was concluded that:

(i) TECA was a suitable vehicle for disseminating and preserving a large part of the RNRRS output, with the exception of:

- Technologies that are not yet validated;
- Upstream scientific knowledge not yet converted into technologies (e.g. *Studies on ulcerative disease rhabdovirus infection of rice field fish species in ASEAN countries* – AFGRP; or *Investigation of the immunogenic potential of heartwater (*Cowdria ruminantium*) grown in tick cell lines*; AHP);
- Needs assessment data (e.g. *Wet season post-harvest fish losses in the traditional fish processing sector of India - generating an understanding and defining interventions* – FPHRP; or *Market survey of plant-based fragrances in Ghana and Grenada* - FRP);
- Socio-economic impact data (e.g. *Impact of certification on UK forest management* – FRP; or *An evaluation of floodplain stock enhancement* - FMSP).

(ii) All 10 RNRRS programmes had generated technologies that were suitable for repackaging and disseminating through the TECA Database[7]. The number varied according to programme, being partly a factor of programme size. A rough estimate was 350 proven technologies across all 10 programmes; but this could not be confirmed without a more detailed assessment against the TECA standard, which would be undertaken as part of the project.

The degree of rewriting required would vary considerably within and between programmes. Where technologies were still embedded in Final Technical Reports, a day or more per technology

[6] http://www.research4development.info/index.asp

[7] The programme manager later revised this judgement in respect of the FRP – see Section 3.

would be needed to produce a description; whereas completing the TECA uploading template from existing extension manuals or textbooks would take only a few hours.

Much of the 'raw material' was not yet digitised, nor in fact was it even held by the organisations managing the research programmes. Nevertheless, it would be useful to link as much of this as possible to the relevant technology records. It was later agreed with DFID CRD on 9 June 2005 that only materials which had been digitised, or could be easily digitised, would be uploaded and linked to records.

(iii) Furthermore, the 10 programmes had generated an estimated 350 decision-support tools (DSTs) and methodologies. On 9 June, DFID CRD indicated that, whilst these were in principle suitable for dissemination via TECA (in a non-repackaged format via its DST Database and Technolibrary), it would focus its resources on disseminating them via its own R4D portal. Therefore this project was requested only to identify the decision-making tools and methodologies and report them to DFID CRD, and not to repackage or upload them to TECA.

(iv) Other sorts of information generated by the programmes – whilst not suitable for TECA – could in principle be disseminated via other FAO databases (e.g. policy briefs). However, DFID CRD indicated on 9 June that, since these outputs would be disseminated anyway via its R4D portal, the project should not concern itself with this information.

2.3 Expected outputs

The project committed to delivering the following outputs:

1. To review the 'stock' of technologies generated by all 10 programmes; to select proven technologies that meet the TECA standard; and to repackage and assign search criteria to as many of the technologies that meet this standard (up to a maximum of 350), attaching any existing supporting material, for use by agricultural advisory service providers.

   Note: The records will be adequate for agricultural advisory service providers to be aware of existing options; to make an initial decision about whether it is suitable for their context; and to know where to go for fuller user-instructions and/or training. If this material exists, we will attach it to the record. If it does not, we will not create it.

2. To record any technologies requiring further validation and report them to DFID CRD.
3. To record any methodologies and decision support tools generated by the RNRRS, and report them to DFID CRD. DFID has specified that these should not be loaded onto TECA.
4. To document the project process, enabling the methodology and lessons learned to benefit future TECA partnerships.

2.4 Methodology

The project was designed to cope with retrospectively screening and transforming a large backlog of knowledge produced by some 1,500 projects over 11 years. For efficiency reasons, we made a decision very early on (a) to centralise the entire process and (b) to rely on existing documentation.

An alternative approach would have been to decentralise the writing and uploading process and subcontract the original research teams to carry this out in respect of each individual technology. Our role could have been limited to a centralised quality assurance function.

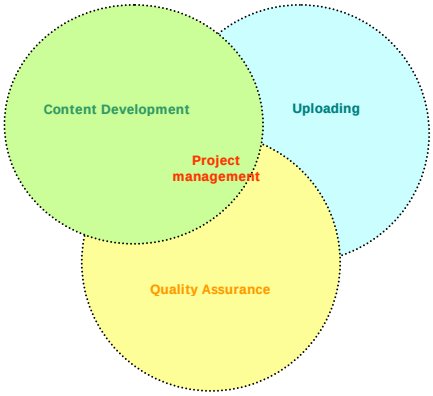
This is the approach used by the current DFID Research into Use Output Selection exercise. It is more costly in terms of administration; and the risks of definitions being interpreted differently are greatly multiplied. However, involving the original authors in documenting technologies has a huge advantage: it gives access to their tacit knowledge. In retrospect, our reliance on secondary documentation proved inadequate as the sorts of information needed to write a TECA technology record were not generally captured as part of the reporting requirements of the research projects (Section 5.4)

The workplan was designed around 3 interlinked processes (see Figure 1):

(i) Content development:

- Review the 10 RNRRS programme portfolios to identify and log the validated technologies (VTs), technologies requiring further validation (TRFVs), decision support tools (DSTs) and methodologies (Ms);
- Assemble the materials from which to compile records of each of the validated technologies (mainly project reports and extension materials in a variety of media and formats);
- Compile the records off-line to the standard template provided by TECA.

Figure 1: Project processes



(ii) Uploading:

- Enter information contained in each offline technology record (prepared for uploading by the copyeditor) into TECA's online form;
- For each record, upload the associated documentation (in a variety of media and formats) and link these to the record;
- For each record, create, upload and link pdf tables containing contact details, evidence of validation and, where necessary, especially lengthy lists of additional resources.

(iii) Quality assurance:

- Ensure that each selected technology meets the criteria for publication on TECA; is not already recorded in TECA; has genuinely been validated; and represents current best practice;
- Ensure that each offline technology record is an accurate and fair account of the technology and its potential, based on the available documentation; that it gives adequate information about associated health and safety risks; that spelling, grammar and punctuation are accurate, and that it makes sense. Prepare each record and supporting files for uploading;
- Ensure that, once published, each uploaded technology record is formatted consistently and that all supporting documents are correctly attached, labelled and linked to the text of the record.

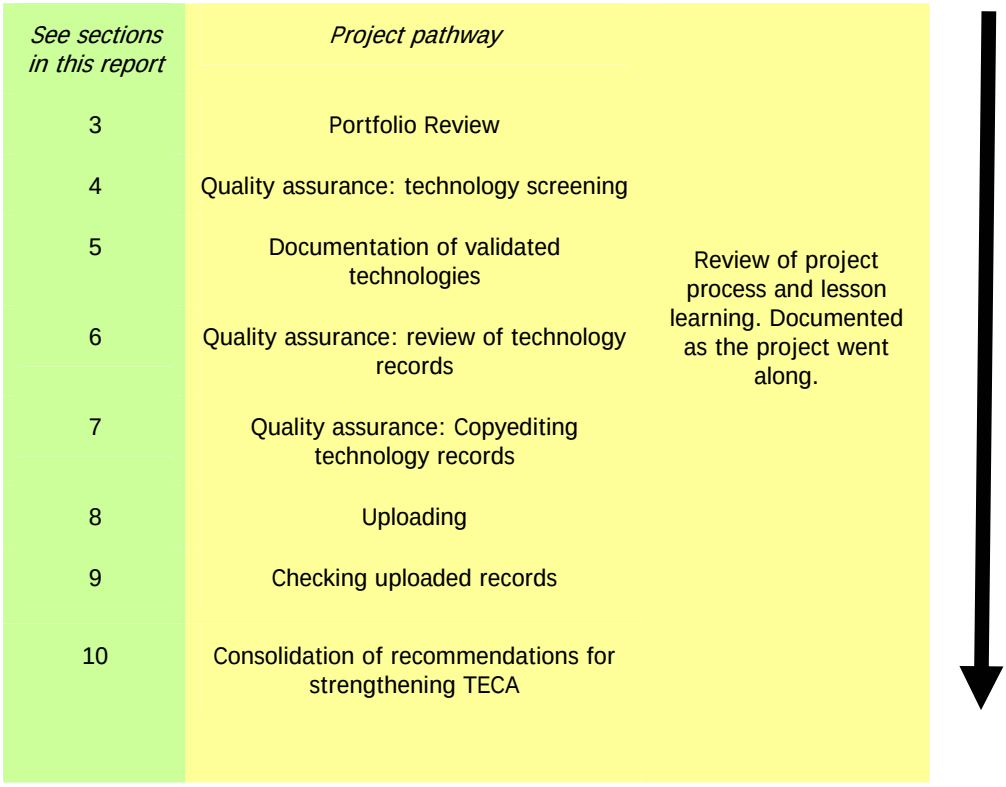
It was decided that the most straightforward way to work was programme-by-programme[8], since this was how the information management systems of the RNRRS were organised.

A pilot project workplan (Annex 2) was developed and trialled with CPHP, following which it was adjusted. Figure 2 shows the sequence of steps actually followed, and this report is structured around it. A detailed description of each step, with lessons learned, is presented in Sections 3-9 of this report.

Delivery of these different components demanded a widely varied skill set and the project team was selected accordingly (Section 2.7).

[8] The portfolio comprised 10 sub-sectoral research programmes, collectively known as the Renewable Natural Resources Research Strategy (RNRRS).

Figure 2: Actual project pathway



2.5 Project and workflow management

The project management function involved designing a workflow management tool to coordinate these three interlinked processes, designing tools for the team to implement the various steps, recruiting, training/briefing the team, ensuring project delivery and client satisfaction, managing finances and contracts, liaison with SDRR and DFID CRD, documenting the project process and lessons and reporting.

The workflow management tool (see below), and the tools used by the team to implement the various steps (see the Methodology part of each of Sections 3-9), were initially piloted with one programme (CPHP) and adapted. All the tools developed and used in the project can be found in the Annexes.

It became apparent at a very early stage in this project that the methods to be employed for determining which programme outputs were suitable for TECA, the gathering of relevant materials (hardcopy and electronic), the rigorous quality control checks, the write-up and the final upload of the technologies and the supporting materials would require close management and tracking to ensure that this process ran as smoothly as possible, on time and in such a way as to maintain the integrity of the data.

For this reason, and owing to the number of people and technologies involved in the process, it was deemed prudent to devise a technology progress tracking system, unique to each of the 10 RNRRS Programmes, to note the progress of the technologies and to ensure smooth and efficient use of time and resources and to track all the technology materials. This tracking system, supported by a spreadsheet tool that we called the 'Four Categories List', is described below.

(i) 'Four Cats Lists'

A method was devised in the form of an excel spreadsheet which became known as the 'Four Cats List'. The category columns noted on the spreadsheet were as follows:

- ID Code (allocated by the project, e.g. AFGRP0001)

- R Number (unique to the RNRRS programme)
- Programme Output (title of project)
- Synopsis
- FTR (Final Technical Report document name e.g. FTR R7889.doc)
- Dissemination Outputs (document name e.g. R7123 guidelines.doc or url of website to link to, etc.)
- Images (Image name e.g. image.jpg)
- Project Leader/Institution contact details
- Collaborators
- Have materials been collated? (electronically saved in readiness for uploading, hardcopies to be scanned in pdf format)
- Quality Control Check 1 (name of person performing check)
- Name of Technology Scribe assigned to this technology
- Name of Subject Matter Specialist assigned to this technology

And a further four categories for classifying the outputs:

- Validated technology (VT)
- Technology requiring further validation (TRFV)
- Methodology (M)
- Decision Support Tool (DST)

After the initial review of the 10 RNRRS Programmes, the project outputs were noted on the relevant programme Four Cats List and allocated a unique ID code (e.g. PSP0001, 2, 3). This proved invaluable for workflow management later, as there was not an exact correlation between project R Codes and technologies. (Some projects generated more than one technology; some technologies were generated by more than one project).

A short synopsis was added for each technology. The outputs were classified according to one or more of the four output categories: VT, TRFV, M or DST. From this list, only the validated technologies were taken through the rest of the process.

All of the available documentation, images, website urls, etc., generated by the projects were noted on the Four Cats Lists so that, at a later stage, the authors writing up the technologies could indicate on the Offline Template for Technology Records (Annex 12), within the main body of the text, which document/images/urls were required to be linked to the appropriate piece of text. This measure was put in place to ensure that the uploader linked the correct file to the required text, to ensure the integrity of the data, and to speed up the process of uploading the data.

See Annex 3 for an example of a completed Four Cats List for one programme, as it stood at this stage in the process.

(ii) 'Four Cats Lists' revised after technology screening

Each of the validated technologies was subjected to a quality control check (Section 4 and Annexes 5-7) which became known as QC1. Using the results noted on the QC1 spreadsheets completed for each programme (Annexes 6 and 7), the 'Four Cats Lists' were revised. Many technologies fell at the first hurdle for reasons discussed in Section 4.

(iii) 'Condensed Four Cats Lists'

In preparation for writing the technology records, a short version of the 'Four Cats List' was produced, displaying only the relevant information needed by the writers; this became known as the 'Condensed Four Cats List'. This measure was put into place for ease of reference for the technology scribes when

writing up the technologies. It aimed to help them both select and cross-reference to supporting materials.

The following categories were noted on the 'Condensed Four Cats List' spreadsheets:

- ID Code (allocated by NR International, i.e., AFGRP0001)
- R No (unique to the RNRRS programme)
- Programme Output (title of project)
- Synopsis
- FTR (Final Technical Report document name e.g. FTR R7889.doc)
- Dissemination Outputs (document name, R7123 guidelines.doc url of website to link to, etc.)
- Images (Image name e.g. image.jpg)
- Project Leader/Institution contact details
- Collaborators
- Validated Technology
- Methodology
- Decision Support Tool

The Condensed Four Cats Lists and electronic copies of the associated documentation were sent on to the designated science writer (Section 5).

(iv) 'Four Cats Lists' revised after writing of technology records

A few VTs were reclassed as TRFVs by the science writers (most of whom are active research scientists themselves). This was noted on the Four Cats Lists and these outputs went no further in the project process.

(v) 'Four Cats Lists' revised after review of technology records

Once the technology records had been written, a little over half were subjected to a second quality assurance check (Section 6 and Annex 13). Management of the reviews proved more complex than anticipated and, for reasons recorded in Section 6, recommendations by the reviewers to reclassify a few VTs as TRFVs were not acted upon, with one exception. Also only parts of their commentary on the validation domain of the technologies have been published within the technology records.

(vi) 'Four Cats Lists' revised after copyediting

The technology records were then sent on to the copyeditor, with all the associated documentation to be loaded and linked (Section 7 and Annexes 14-15). This led to a few further changes to the 'Four Cats Lists' as some technology records were merged and a few VTs were disqualified as TRFVs by the copyeditor (an active research scientist).

(vii) ID codes

Finally, the records came to the uploader. The uploading process automatically assigns a unique TECA ID code to each record. To track progress, the uploader prepared a spreadsheet showing the ID code allocated on the Four Cats spreadsheet to each VT and the corresponding TECA ID code. The TECA ID codes have been transcribed onto the Four Cats Lists.

(viii) Full histories

Thus, the full history of each programme output over the course of the project could be tracked on a single spreadsheet. These histories have been merged into one spreadsheet presented as Annex 1.

2.6 Lesson learning

The team's feedback on the project process, and on TECA itself as a tool for technology exchange, was requested at various points throughout the project (Annexes 20 and 21). We received a great

many thoughtful and challenging views and suggestions, and we have relayed them in this report as closely as possible in the team's own words (Lessons Learned under each of Sections 3-9; Section 10).

As part of their ToRs, we asked all the technology scribes, and the team who carried out the portfolio screening, to record any comments on TECA as a tool and advise on how the project process could be improved. Some provided formal reports (Rowland, Campbell, Farrell); others gave feedback by email, which was logged by the project. A feedback section was provided on the QC1 form (Annexes 6 and 7) but it was not used; email was preferred.

A team debriefing meeting in March 2006 provided useful comments on the project process, leading to some adjustments. It was pointed out that it would have been more effective to have done this at the project start.

Towards the end of the project, in June 2006, Tina Rowland and Karen Wilkin presented it at a meeting of a new peer-assist group called KM4NR[9]. At the same forum, NRI presented the Telesupport[10] project in India and some interesting comparisons between Telesupport and TECA were drawn. The two projects have very similar objectives but have developed different models to achieve them.

In July, we developed a short questionnaire (Annex 20) as an efficient way to obtain feedback from CIRAD. (Our initial plan had been that their team would hold a debriefing meeting internally and write it up). We received eight questionnaires back (Annex 21) and the feedback is summarised in Section 6.

The project submitted an interim report to DFID CRD in May 2006. No feedback was given at that point; but a follow-up visit to FAO is planned towards the end of this year to present and discuss the project process and lessons learned.

2.7 Project team

The project was staffed with a mix of internal and external personnel, led by a dedicated project management team. The full team is shown in Table 1. We would make some changes to the team profile if repeating this exercise (Section 5.4).

We did not fulfil DFID's request to contract where possible overseas experts. The project management suffered stresses due to a restructuring of NR International and did not make the extra effort required to identify and brief suitable overseas personnel. There is no reason in principle why we could not have contracted overseas experts for any of the steps excepting those that required an institutional memory based on managing the programmes.

Advice on project design was provided by Isabel Alvarez (head of SDRR), Mauricio Rosales (manager of the LEAD initiative), Francisco Lopez (then the TECA manager) and Giorgio Lanzarone (the TECA Programmer). Francisco and Giorgio provided training and technical assistance to the project management team throughout the project. See Box 2.

Box 2: Terms of Reference for FAO SDRR's support to project

Resources

12 days' staff time + small travel budget

Services

To provide the following services according to the schedule provided:

- To respond to any queries as they arise throughout the duration of this contact.
- Provide training on the use of TECA as and when requested.
- To implement amendments/additions to the TECA database categories agreed to be appropriate by both parties (SDRR, FAO and NR International).

[9] Set up in June 2005 by NRI and NR International.
[10] www.telesupport.org

Table 1: Project team		
Function	**Profile**	**Names**[11]
Dedicated Project Management Team	▪ Specialist experience of managing research and knowledge in the NR sector; ▪ Project, financial and contract management experience; ▪ Awareness of ITC systems design; ▪ Awareness of relevant IPR issues.	Joint team leaders were **Karen Wilkin** and **Tina Rowland**[12], supported by a contracts/finance coordinator (**Liz McVeigh**) and FAO SDRR (Box 2).
Portfolio review and technology screening	Detailed knowledge of individual programmes. We handled it by asking scientists (not subject matter specialists) with an institutional memory of RNRRS to do a 'first cut'; which was checked by the RNRRS Programe Managers.	Scientists: **Vino Graffham** and Graham Farrell-CPHP; **Andy Frost**-LPP, AHP, FMSP, AFGRP, PHFRP, PSP; Pete Golob-NRSP, CPHP; Simon Eden-Green-CPP. Programme Managers: James Muir, John Beddington, Christopher Floyd, John Witcombe, **Wyn Richards, Frances Kimmins, Tim Donaldson, John Sanchez**
Assembling available documentation about technologies and evidence of validation	▪ Access to project documents; ▪ Institutional memory of programmes' individual archiving systems.	**Tina Rowland, Jody Sunley, Isabel Carballal, Karen Wilkin**, Ken Campbell and the RNRRS Programe Coordinators.
Compiling technology records	Scientists with: ▪ Good knowledge of the clients for the TECA product, ie extension services, NGOs and other information 'retailers' in Africa, Latin America and Asia (What are their roles and incentives? What communication style do they find accessible? What they will subsequently do with the information? What other information sources do they have access to? Etc); ▪ Ability to write well for this audience. Note: From this experience we identified some additional essential characteristics that not all the writers we commissioned had: ▪ Specialist scientific knowledge and skills in the relevant subsector (forestry, livestock, crops and fish); ▪ Other contextual knowledge: infrastructure, regulatory framework, markets, etc., in which the information was generated and/or will be applied. ▪ Access to the right sorts of information. We would handle this step differently in future	**Vino Graffham**, **Andy Ward**, Graham Farrell, Liz Betser, John van Rijke, Ken Campbell, John Esser, Tony Swetman, Chris Mees.

[11] NR International in-house staff are shown in bold.

[12] Tina was made redundant in April and formed her own company, Random X Solutions, at which point leadership reverted to Karen Wilkin. Random X Solutions was subcontracted to upload technology records and to assist with documenting the project process, outcomes and lessons.

	(Section 5.4).	
Reviewing technology records	Independent subject matter specialists with: ▪ Specific detailed knowledge of the technologies being repackaged (in view of our original plan to have them check the factual accuracy of text written by non-specialists); ▪ Contextual knowledge: infrastructure, regulatory framework, markets, etc., in which the information was generated and/or will be applied (to comment on the validation domain) ▪ Good knowledge of the clients for the TECA product and of the TECA standard (to judge appropriateness for the audience).	Peter Golob; Simon Eden-Green; CIRAD staff (Maurice VAISSAYRE, Vincent LEBOT, Alain RATNADASS, Jacques LANCON, Gilles TROUCHE, Jean-François CRUZ, Nourollah AHMADI, Pierre LANGELLIER BELLEVUE, Kirsten VOM BROCKE. Departement CIRAD-CP: Andre ROUZIERE, Jean-Louis SARAH, Michel DOLLET, Philippe BASTIDE, Daniel DURIS. Philippe VERNIER, Cica URBINO, Thierry LESCOT, Serge QUILICI. Didier RICHARD, Renaud LANCELOT, Marc DESQUENES, Jeremi BOUYER, Genevieve LIBEAU, Jean-François BAROILLER. Jean-Michel MEOT, Dominique DUFOUR, Claude MAROUZE).
Copyediting technology records	▪ Skills in handling electronic data (text, numerical, databases, photographic); ▪ Attention to detail; ▪ (not anticipated at the project start) Active research experience in the natural resources sector.	Ken Campbell, (Karen Wilkin PHFRP pilot)
Uploading	▪ Track record in fast and accurate online data entry; ▪ Attention to detail.	Tina Rowland

3 Reviewing the portfolio

3.1 Objectives

- To review the portfolios of the 10 programmes, selecting validated technologies that are eligible for publication on TECA.
- At the same time, to log any technologies requiring further validation, decision-support tools and methodologies for the purposes of reporting them to DFID CRD.

3.2 Methodology

ToRs for the portfolio reviews are given in Annex 5. As planned, a 'first cut' was carried out by a team of scientists with an institutional memory of RNRRS[13] using the programme websites and Final Technical Reports. They first of all identified all of the outputs; then classified them according to category (VT, TRFV, DST or M). They carried out as part of the same process an initial quality assurance check (Section 4). The results were logged on a 'Four Categories' spreadsheet developed for each programme (Section 2.5). An example is given at Annex 3.

The portfolio analysis was then sent for checking by the respective Programme Managers in case any project outputs had been overlooked or wrongly classified. Comments were returned on all but the AHP portfolio. Technologies were added, reclassed as validated or alternatively disqualified as non-validated. Some technologies were merged, others disaggregated. These corrections arose partly out of the Progamme Managers' more detailed knowledge of the portfolios and partly out of their use of a different definition of 'validated technology' (Section 4.4).

[13] P Golob, A Frost, S Eden-Green.

3.3 Outcomes

In the case of FRP, on the advice of Programme Manager, it was quickly determined that the portfolio 1995-2006 had not generated any technologies suitable to disseminate via TECA (Box 3).

Box 3: Advice from John Palmer, Programme Manager, Forestry Research Programme

1. The kinds of simple techniques which are well described in many field manuals, but which have been republished in the forestry section of the TECA website, have sometimes been derived from FRP studies, especially in the days when FRP was a major and leading player in field techniques for industrial plantations and community forestry in tropical countries. You have said that TECA would count as a new technology the minor adaptation of previously published techniques to a different species or country. There are literally hundreds of examples of this adaptation taking place in relation to management of tropical tree seed and tropical nursery practices. It would be, as it were, money for old rope to extract yet again these techniques from standard publications and put them on the TECA website. As is proper for a global and strategic research programme, these minor adaptations were not funded by FRP itself and the publications can be found in many different series and formats. It is certainly not difficult to do this work from a base in a main tropical forestry library and indeed I hold many such publications myself.

2. However, these outputs on forest biology and post-harvest technology are not solutions to the major problems which impede forestry development and the improvement of rural livelihoods for forest-dependent peoples. Therefore, on the basis of the FRP poverty problem surveys from 1997, FRP has reduced and effectively stopped attention to the generation of minor technologies. It is focussed much more now on the problems which are major impediments. These are mostly of a policy and institutional nature. I remain unclear how the highly condensed TECA format can sensibly handle institution and policy matters. These often require a considerable understanding of the context and the particular opportunities and constraints in each local situation. Thus, while it may not be difficult to provide a relatively superficial description of improvements for institution and policy problems, how they play out in particular local situations need more space, I suggest, than TECA allows…".

John Palmer to Karen Wilkin, email dated 22 February 2006.

The numbers of outputs identified, before any classification or screening had been carried out, were as follows:

Programme	*Number of outputs identified*
AFGRP	20
AHP	40
CPHP	183
CPP	147
FRP	0
FSMP	30
LPP	33
NRSP	30
PHFRP	17
PSP	58
Total	558

The way in which these outputs were subsequently classified (Section 4) is shown in Annex 1 and summarised in Table 2 below. Please note that Table 2 shows the final classification as it stood at the end of the project, after two further quality assurance checks had been run (Sections 6 and 7).

Table 2: End-of-project results of portfolio review and screening

Programme	No of projects active between 1995-2006 (R nos)[14]	Outputs identified	Classed as M	Classed as DST	Classed as TRFVs	Classed as VT but not written up as insufficient information available in early/mid 2006	Published VT
AFGRP	55	20 (revised to 17)	0	3	11	1	2
AHP	118	40 (revised to 39)	5	10	10	14	14
CPHP	149	183	124	59	8	0	22
CPP[15]	450	147 (revised to 133 and clustered into 76)[16]	-	-	7	1	40
FRP[17]	105	-	-	-	-	-	-
FSMP	61	30 (revised to 22)	1	2	4	0	15
LPP	164	33	4	11	0	1	16
NRSP	191	30	1	0	14	1	14
PHFRP	16	17 (revised to 14)	0	4	1	1	8
PSP	110	58 (revised to 45)	0	0	33	0	28
TOTAL	1,419	458 (revised to 359)[18]	141	89	88	19	**159**

When interpreting the table, note that different definitions of the categories (M, DST, VT, TRFV) were used by the team (Section 4.4). The CPP screener felt the distinction between T, M and DST was

[14] Hard to determine precisely as, in addition to Operational funds (R-numbered projects), some programmes used Programme Development funds to develop technologies which have been selected for publication via TECA. So comparisons between programmes in terms of *no of projects funded* and *no of validated technologies identified* cannot be accurately made.

[15] With this programme, outputs were later heavily clustered.

[16] Of these, a number remain to be assessed; insufficient documentation; see Annex 1.

[17] The FRP manager determined that the latter part of the portfolio (1995-2006) had produced nothing that was eligible for publication on TECA (see also Box 3).

[18] See footnote 15.

unhelpful and classed them all as technologies. The CPHP/NRSP screener classed some technology as methodologies simultaneously. Ms and DSTs were screened out of the other seven programmes. Hence, comparisons cannot meaningfully be drawn by these figures either between programmes or between categories.

Amongst the Ms and DSTs, some are validated and some require further validation. These two categories were not analysed in these terms, as the project was simply asked to record them, which it has done in Annex 1.

3.4 Lessons learned

See Section 4.4.

4 Quality control: screening technologies

4.1 Objectives

Ensure that each technology selected

- meets the TECA criteria;
- is not already recorded in TECA;
- has genuinely been validated;

Originally, we had intended also to screen against the question 'Does the technology represent best practice?' but removed it at this stage because the team did not have the subject matter expertise to make this assessment. We later dropped it altogether on the basis that best practice is a subjective and context-specific judgement.

4.2 Methodology

(i) Does each selected technology meet TECA criteria?

The question was broken down into two:

- Is this a technology (as opposed to a decision support tool, methodology, data set or new scientific understanding)?
- Is it appropriate for the intended users of TECA?

As planned, it was handled as part of the portfolio review process for all 10 programmes and carried out by a general scientist with institutional memory of the RNRRS. The tools developed for this purpose are attached as Annexes 5, 6 and 7. They are:

- Terms of Reference for Portfolio Review (4 versions)
- QC1 form - Versions 1 and 2

(ii) Is the technology is already described in the TECA technology database; and if so, should it be added anyway?

This question was likewise asked as part of the portfolio review process, using the same tools as above.

(iii) Has the technology genuinely been validated?

The terms of reference for the portfolio reviews were intended to ensure that TRFV were screened out (Annex 5). However, the classificatory terms 'validated' and 'requiring further validation' immediately proved problematic. The term validated does not appear to have a standard meaning amongst scientists, for one thing; and as a category it was felt to be too undifferentiated from the perspective of someone using TECA to compare and select technology options. Validated in more than one village provides a different level of confidence than validated nationally.

The team looked at the existing records in TECA for guidance on how to define 'validated' but found a wide range of interpretations, as the comments below illustrate:

'TECA, … when I checked it out, seemed … undemanding perhaps, in its definitions of 'proven' technologies – some of which seemed just to be snippets of current practice…'

'…the quality of these technologies is extremely varied, ranging from the results of excellent science to reports of hearsay and old wives' (or husbands') tales…'

To address the problems, we asked one of the team (Dr Pete Golob) to develop some minimum criteria for defining 'validated' and a validation scale to enable differentiation within that category; and to trial them with CPHP (Box 3). Our aim was firstly to use a common standard across the DFID records at least, even if the standard varied across the TECA database. Secondly, we wished to trial a tool for differentiating types or degrees of validation that might be of interest to SDRR to incorporate into TECA.

Box 3: Trial validation criterion and scale

Technology = achieving a practical purpose by using the scientific method

Validate = to establish the soundness of, corroborate

Minimum criterion for 'validated' = assume that laboratory and field station trials are completed, although not a single end user may have been involved as yet

- Stage 1= Validated with one group of local farmers (or several sub-groups) for at least one season; for industrial processes validated in one location.
- Stage 2 = Validated in at least two villages or localities in the same general area; over two or more seasons; for industrial processes, validated in at least two locations or over two time periods.
- Stage 3 = Validated in different parts of the country (different agro-ecological/ethnic areas) in at least three villages/towns; over two or more seasons. Industrial processes validated in different countries.
- Stage 4 = Validated methodology in more than one country (at least meeting stage 2 in each); if equipment hardware, then commercialisation (at least three units sold) achieved in at least one country. For industrial processes, commercial introduction by factory.

Notes:

A technology wouldn't necessarily go through all the stages.

The aim of applying the scale is not to score a technology but to provide an indication of its replicability.

Presentation by Pete Golob at Team Meeting of 29 March 2006

Pete found his validation scale worked well in the post-harvest portfolio (results are shown at Annex 1 in the sheet labelled 'CPHP c'. With it, some CPHP technologies put up by the programme managers were disqualified by Pete on the grounds that they required further validation.

In other sub-sectors, it was less successful as can be seen from the reactions below. Two other team members, James Muir and Simon Eden-Green, developed an alternative scale/typology; Simon went on to use his to screen the CPP portfolio (results are shown at Annex 1 in the sheet labelled 'CPP').

'A commendable attempt to clarify, though I wonder how best to tie it in with development meaning, and also to avoid over-categorising? Essentially we'd need to be able to use each stage level as a definer of risks/acceptability/further uptake steps… a slight twist on this could be

- *Stage 1 – basically it works in practical field/household/manufacturing conditions – and has been fine-tuned as necessary? Indicators can be defined, including how compelling it is?*
- *Stage 2 – it is generalised, where appropriate (may not be needed for some technical applications) – and adaptive research parameters defined for spatial and temporal variations – indicators could include number of locations/cycles of use/ condition variants applied*
- *Stage 3 – it is fully validated, established, extent of application and potential well understood – competes on the market place with other concepts/products/technologies – indicators could include license agreements, market share, etc.*

Prof. James Muir (AFGRP manager)

'As to the question of validation, I think that we all agree that at the very minimum, "validation" means shown by some independent or at least objective criteria to work and, in the developmental context, to produce some actual or potential benefit in terms of (to use the jargon) improving livelihoods. I agree that it is useful to know not just whether a technology has got beyond this minimum threshold but also 'how far beyond that it has got',

and I'm happy to use Peter's proposed scoring system (perhaps with 'farmers' modified to 'users', etc., to allow for assessment of more upstream technologies).

However, I think that there is another and perhaps more important dimension that we should try to capture here. Many projects have validated technologies (i.e. shown that the technologies can work in the hands of the target user) with several groups of target users whilst knowing (although perhaps rarely admitting!) that these are rather unlikely to be adopted or taken any further. Often this is for reasons which are quite reasonably beyond the control of the project partners (the so-called enabling environment) but sometimes because the technologies are simply inappropriate or unsustainable.

I think that "validation" should include a judgement as to the extent to which actual (usually meaning spontaneous) uptake, use or adoption has been demonstrated. Of course, projects themselves often end before the extent of such uptake can be assessed and few impact assessment studies have been carried out after the event. However, many projects do report some spontaneous demand for their products or cases where project practices have been taken up by non-target communities. And of course, if a technology does bring real (i.e. net) advantages or benefits then it is likely to spread spontaneously to several localities, countries and where appropriate into commercial production.

By way of example, I have just reviewed two project FTRs on the integrated control of major diseases, one of maize and the other of sweet potatoes. Both developed "baskets of technologies" for each problem and claim to have "validated" these with several communities and in one case in several countries. Both had earlier project phases, in which the technologies had been developed and validated with a smaller range of users.

Although the data were in one case somewhat lacking (I believe this was included with an earlier report) there is little doubt that for both projects, the farmers targeted by the project training courses and extension materials had shown that the technologies "worked" in terms of reduced loss or improved production. Neither project included an actual assessment or evaluation of the likelihood, let alone the extent, of adoption of the technology packages, but it was very clear that the sweet potato project had generated very considerable demand for disease-resistant planting materials to the extent that some farmers had become profitable producers of such materials or were prepared to travel considerable distances to obtain them. "Grass roots" NGOs were also clamouring to get on board.

In contrast, the maize project was completely silent on any such indicators of uptake or adoption, despite considerable effort, expertise (and of course expenditure) on publicity, training of trainers etc. So in the circumstances I would be reluctant to rate the maize IPM very highly (if at all) as validated technology, whereas I would strongly rate the sweet potato project.

So, to come back to Peter's validation scale, I would first like to propose a more critical judgement of the term "validated". Of course, this is often something of a judgement call and I'm not sure how to quantify it, but perhaps something like:

> *<u>Category A:</u> Evidence that all or part of the technology is being or has been spontaneously (i.e. without external support or encouragement) taken up or adopted by target users in at least one site (i.e. developmental impact).*
>
> *<u>Category B:</u> Evidence that target users have confirmed that the technology provides net benefits to themselves and they propose to use or adopt at least part of it (this may or may not include cases where adoption is constrained by some "enabling" factor).*
>
> *<u>Category C:</u> Evidence that end users have participated in evaluations or trials that showed the technology worked (i.e. was capable of delivering net benefits outside of a research setting), but where the likelihood or extent of adoption is not yet clear. This is the minimum threshold.*

Peter's "extent of validation" indicators could still be applied (giving "scores" of A1, A2, A3, A4, A5, B1, B2, C1, C2 ... etc.) but obviously category C technology would be unlikely to achieve very high numerical scores (and if it did this might imply that the project had put an unwarranted amount of effort into promoting it!)'.

Simon Eden-Green (former CPP manager)

Pete's pilot validation scale generated so much difference of opinion amongst the team that we asked him to take over managing the discussion and to reach a team consensus on a tool that could be applied across the other eight programmes to differentiate grades of validation.

In a team review meeting on 29 March 2006, it was suggested that a typology was more appropriate than a progressive scale. The numbers could be removed from Pete's scale; perhaps it shouldn't even be called a scale. It might be better to use random symbols to indicate types of validation, not a numerical ranking.

The question was asked: could a single tool be appropriate to describe institutional solutions as well as hard technologies? Another question was: is 'numbers of people' the same as 'numbers of contexts', and does it matter? It was suggested that adoption information may be useful as a proxy for replicability.

At this meeting, a consensus could not be reached, and no such scale was applied across the other eight programmes.

Another problem faced by the technology selection team was the scarcity of independent evidence about validation (more will be available later this year once the DFID RIU Output Selection exercise reports[19]). As one team member put it:

'Technologies themselves are relatively easy to identify, and most project leaders are all too ready to maintain that these have been validated, but what this usually means is that they have been explained to target users who have confirmed that they understand them! Some projects really require quite a lot of "burrowing down" into FTRs to establish whether there is evidence that the target users really did trial the technology for themselves and have confirmed that it gave net benefits'.

Peer reviews of RNRRS project final reports, which would have provided fairly independent assessments of any validation processes within the project, were not used because of concerns over confidentiality. As for information about project outcomes several years down the line, the RNRRS did not systematically collect this. The assessment therefore relied heavily on the programme managers' memory and integrity.

4.3 Outcomes

See Annex 1 for the results of this screening, which are summarised in Section 3: Table 2.

There was not found to be any significant duplication with existing records in TECA; and no records were knocked out of the project on this account. TECA was at that time relatively unpopulated in respect of the sectors covered by the RNRRS.

Owing to the lack of independent evidence on validation and of a common understanding of 'validated', TVs and TRFVs could only be identified fairly tentatively at the portfolio review stage.

We therefore made a second attempt to develop and apply a validation scale or typology at the second quality control stage of the project which was undertaken by CIRAD. However, the CIRAD scientific staff advised that such a scale was best developed retrospectively having qualified the validation domain of a critical mass of technologies. Their ToRs were refocused and this suggestion was not carried out. For details, see Section 6.

4.4 Lessons learned

The screening team reported several substantial difficulties:

(i) What is the difference between a technology, methodology and decision support tool (or indeed a toolbox)?

They found the distinction between these terms difficult and indeed they applied them differently. Here are some reactions:

'The term 'methodology' is commonly interpreted to mean 'know-how' or 'process' – which FAO includes in its definition of a technology'.

'I think maybe that there is a danger here of not seeing the wood for the trees. … [some] "technologies" include methodologies and decision support tools as well as a whole range of natural and man-made products, appliance, utensils etc. Integrated pest management is a classic example of a mixture of these attributes…'

'For CPHP projects, I have assumed the terms are interchangeable and that methods should be included, unless it is obvious that 'the method' does not add to basic knowledge. For example, a description of a way to improve insecticide application to reduce losses would be included, whereas a series of cooking recipes for a new type of flour would not (the method *for producing the flour is the technology for inclusion)'.*

'*A random inspection of existing TECA entries shows that these comprise a highly diverse range of "technologies", aimed at a highly diverse range of target users including in some cases researchers (or what one might call applied scientists or technologists) and by no means always farmers or extensionists (for example: micropropagation of banana by somatic embryogenesis, not something your average peasant farmer is likely to find very useful).'*

[19] www.researchintouse.com

(ii) What to document in relation to new germplasm?

Germplasm is included in the TECA definition of a technology; and indeed some programmes (PSP and AFGRP) have developed new plant and fish germplasm; but we were unsure what to document in the technology record. Presumably TECA is not intended to be a genetic database, as FAO already has a network of these. We decided to focus the record on the process that led to the development of new germplasm. This raises a further question.

(iii) Whether the research process itself can be published on TECA?

Associated with all research projects is a research and/or validation process; this is clearly of interest to some target audiences of TECA; and, since the definition of technology includes 'know-how', the social and technical processes associated with technology development would seem to be eligible for publication on TECA. We have tentatively published some.

(iv) If a technology has been tried out and adapted in 7 locations, is that 7 technologies or 1?

This question was raised in connection with PSP. After much discussion with the programme manager, and admittedly against his advice, we grouped location-specific applications of a technology and published them in a single technology record.

(v) Some technologies are best applied as part of a package of interventions

In certain sub-sectors (perhaps especially crop protection), publishing technologies as stand-alone interventions makes little sense in farming terms; and many were clustered by the screener into packages of technologies.

(vi) What does 'validated' mean as opposed to 'requiring further validation'?

See Section 4.3 above.

(vii) How do we know if it's been validated or not?

The RNRRS managers generally did not have access to information about what had happened to a technology once the project (or sequence of projects) which developed, and in many cases went on to disseminate and validate, that technology had ended[20]. It was suggested we could have referred to data collected in 2005 to support DFID's evaluation of the RNRRS (the so-called 'PARC matrix') but too late in the day to apply this good advice.

Furthermore, the RNRRS programme managers were not required to hold copies of project reports and extension materials; only to record them. We managed to track down a great deal of documentation thanks to the RNRRS Virtual Libraries that were built up in the latter part of the programme, but not all.

Though the screening team were sent copies of all the available material, it was not sufficient in many cases to make confident judgements at the QC1 stage (see observations noted on Four Cats Lists at Annex 1). For example, many CPP outputs were labelled possible VTs but an assessment was prevented by lack of documentation (see Table 2 and Annex 1: 'CPP', where they are shown in amber).

5 Documenting validated technologies

5.1 Objectives

- Assemble existing 'raw materials' (project reports and text-based or multimedia dissemination/extension materials produced by the projects).
- Compile record for each proven technology using an offline template and select additional materials to link to the record when it is being uploaded.

[20] Once the Output Section exercise being carried out under DFID's RIUP reports, much more information will become available about subsequent validation; and the screening could be revisited.

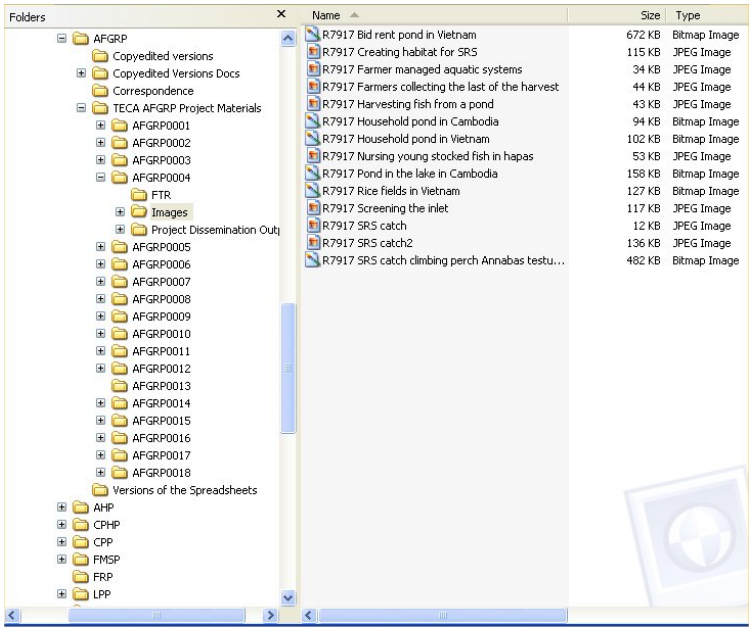
5.2 Methodology

(i) Collating the raw materials

This task was part-completed by in-house by staff with RNRRS experience[21] (see ToRs at Annex 9), with assistance from the respective programme coordinators, who had the best institutional memory of project documentation and access to it.

Their efforts were supplemented by the Technology Scribes and in particular the Copyeditor later in the project.

As the RNRRS never required projects to submit technical papers, extension materials, etc., to the programme managers, only to report them, tracking down copies of the materials was a tremendous task. We used largely pre-digitised material, and did not scan materials, as agreed beforehand with DFID.



At the earliest stage of the project, a process was devised for systematically collating the materials, making them easy to forward to the science writers, reviewers and copyeditor. All of the relevant documentation, images, etc., sourced for each output was electronically saved under the Unique ID Code (e.g. AFGRP0004) allocated to that output by NR International, by programme, in a folder on the company's shared drive. See view of folders below. The file names were logged on the Four Cats Lists.

When working on the very last programme, CPP, we devised an improved logging tool (see Annex 10) and we would recommend this tool to anyone repeating the task. It provides lots of information about the files that the copyeditor later found was needed by the uploader.

(ii) Compiling the technology records

For each proven technology, a record was compiled. For this task, we put together a team of scientists[22]. All had prior experience of working in support of RNRRS management; many had collated or repackaged the same project outputs for other purposes and so were familiar with the documentation. No project leaders were used; but two of the team were in-house programme staff. We called this team the 'Technology Scribes'. They worked on large batches of technologies.

The reason why we did not commission the 160-odd original project teams was not to do with independence but rather it was logistical. In retrospect, reliance on secondary data proved insufficient. If repeating the exercise, we would either ensure the writers interacted with the original project team and had access to their 'tacit' knowledge, or commission the original project teams directly.

Science Writers were sent Technology Scribe Information Packs (Annex 11) which consisted of the following:

- Condensed Four Cats Lists (Annex 4);
- Relevant supporting document on CD Rom
- TECA Map definitions (TECA Global Farming Systems maps for ease of reference);

[21] Tina Rowland, Jody Sunley, Isabel Carballal.

[22] Graham Farrell-CPHP, NRSP, PSP; Vino Graffham-CPHP; Tony Swetman-CPHP; Simon Eden-Green, CPP; Andy Ward- CPP; John Esser-AFGRP, PHFRP; Ken Campbell-LPP, AHP; Liz Betser-FMSP; John van Rijke-FMSP; Chris Mees-FMSP.

- Template for Technology Scribe (Annex 12);
- Instructions of the database search (TECA);
- Detailed description of what a 'technology' is;
- A note of the mandatory fields to be entered in the TECA database (they must contain data otherwise the TECA database system will not allow the record to be saved):
    - Category
    - Global Farming Systems (Maps)
    - Country
    - Detailed Description of the Technology;
- Form fields descriptions.

The TECA publishing area gives the option of filling in a template live and either publishing it immediately or hiding it until the author is ready to publish. We decided to ask the Technology Scribes to work offline altogether, and have a data entry specialist undertake rapid batch uploading at the end of the project, creating savings in terms of fee rates and time.

As planned, we developed an offline template for Technology Scribes (Annex 12) to use in documenting the technologies. Its format was based on the TECA form supplied to us; but we aimed to make some aspects clearer for the writers and uploader. We:

- Added further explanatory text to the form (e.g. we proposed a word limit to the project detailed description) and tried to make some of the question less ambigious (e.g. the Country category – does that mean where was the technology developed or where is it potentially applicable?).
- Put the checklist categories into alphabetical order (this is an essential element for the uploader when selecting from the validation lists on the upload form on the live site).
- Cross-referenced it to the spreadsheet Condensed Four Cats List which listed file names of supporting documents available to the writers.
- Added a standard Health and Safety caveat and asked writers to make notes on specific health and safety precautions.

It was requested that the Science Writers add within the Detailed Description of the text on the TECA Upload Form the unique name of the relevant document/image/url so that the uploader may hyperlink using html coding from the indicated piece of text to the correct document/image/url. This quality control check was put in place to ensure the uploader could easily refer to the correct item and speed up the uploading process.

The TECA website is in English, French and Spanish. The project descriptions are normally completed in the language of the raw materials, if these were in one of the five FAO languages. They are translated otherwise. Hence the RNRRS technologies were described for TECA in English. Some of the supporting material relating to the technologies was originally published in the vernacular, including Spanish, Swahili and various South Asian languages. We attached this in the original language without translation, as agreed with DFID.

Contact details for project teams were logged on the 'Four Cats List' spreadsheets at the project start; then checked and consolidated prior to uploading. The information is housed in 159 pdf tables, one per technology record, which were prepared by the uploader and linked to the records on TECA. They are also archived at NR International. They show:

- Name(s) and Email Addresses of Project Leader(s);
- Name and Physical Address of Lead Institution(s) (also called 'Managing Partner(s)');
- Names of Project Partners (also called 'Collaborators');
- Names and Physical Addresses of Partner Institutions (also called 'Collaborating Institutions').

An example is given at Annex 19.

5.3 Outcomes

Technology records were compiled for all the validated technologies identified at portfolio review, with the exception of a handful for which insufficient documentation was available and another few which were knocked out on the judgement of the technology scribes.

The portfolio reviewers may have disqualified as TRFVs some technologies that have in fact now been validated and would be eligible for publication on TECA. Follow-up on what happened to projects after they ended is only now being done through the Output Selection exercise of the DFID Research into Use Programme. Once this study reports later this year, one could look through the information and publish technologies on TECA that are now known to have been validated.

Furthermore, there are many Ms and DSTs that would be eligible for publication on the TECA database if one were to merge the distinction between Ms, DSTs and Technologies, as some of our screeners chose to do.

Hence, it is highly likely that at the selection process some project outputs were set aside that are eligible for publication on TECA, either because they were classed as M and DST, or because they have now been validated but we don't know it. Fortunately, DFID's new R4D portal (and the former RNRRS Virtual Libraries which are still live at the time of writing) house all the RNRRS project outputs in their original form; and hence whatever we overlooked is publicly accessible at least.

Please note that the number of validated technologies generated by each programme cannot be accurately inferred from the number of technology records published on TECA; and these figures should never be used to compare programmes' 'contribution to knowledge'. For example, the screener for CPP - the largest programme - did the most clustering of technologies, so the number of published records on TECA for CPP is far fewer than the number of validated outputs annually reported by the programme.

The writers duly made their selection of supporting documents which they wanted linked to the records; but they mostly did not flag these documents in the way we had envisaged, giving them other file names (or even a casual reference e.g. 'I believe there was a report written on…'), and not indicating clearly in the text where the hyperlink should go. This was due to insufficient briefing to the Technology Scribes on why this was so important. The poor cross-referencing made uploading of supporting documents impossible, hence the copyeditor stepped in to correct all the cross-referencing in the text of the records, prior to uploading (Section 7).

5.4 Lessons learned

(i) How to improve the template for technology records

There were many suggestions for modifying the TECA template designed by SDRR and these are recorded in Section 10.

(ii) Writers need access to the right sorts of information

At a mid-project review meeting, the technology scribes reported that they tended to use the Final Technical Reports as the first port of call and then turned to extension materials generated by the project. Information on outcomes and indeed on technical details was very scarce, and this made it extremely difficult to complete the TECA records.

The CIRAD review team later confirmed that that insufficient technical detail was provided in the records from a user's perspective. The records produced in this project are not technical fact-sheets, rather information about technologies. The information about validation is patchy and not up to date.

Graham Farrell expressed the general frustration felt by the technology scribes in his report:

'*One major query arose out of the work. If the TECA database is construed as a 'how to use a technology' set up, then many of the DFID projects won't match this paradigm because the FTRs or other supporting documents do not go into sufficient technical detail. There is thus a great opportunity to make the TECA record much more comprehensive and user friendly, but this requires that, from the outset, projects must provide sufficient technical detail; they must document the project story.*

…It was not possible to answer many of the questions because the supporting documents were silent. For

example, although all projects provided an introduction and background to the socio-economy, and some supplied prices at local markets or time and human work per day required, none gave an 'assessment of the key factors to success in the adaptation of the technology to similar or different environment or situations that can be foreseen (other crops, other kind of soil, etc.)'.

The guideline questions were perfectly adequate – full answers would have provided all the information I, as a reader, would need to form a judgment on the value of the technology. However, given that it was sometimes impossible to find an answer to the questions in the supporting documents, and given that answers to these questions are likely to be needed in the future, then the requirement should be made explicit when contracts are written.

Ensuring that data exists to answer these questions would assist in the compilation of annual and other reports, as well as helping reviewers and evaluators, both during and after the life of projects. However, since we cannot necessarily predict all of the questions that future reviewers will raise, it is imperative that all the raw data are kept by the programme managers from the outset. Maintaining a working project archive is critical to the long term value of any project'.

Graham Farrell

It should be emphasised that the fault lies not with the technology scribes for doing a poor job: the project made a wrong assumption that there was enough of the RIGHT SORTS of information in the reports to enable a TECA record to be filled in; and did not have time once the error was realised to correct it – for example, by contracting the 160-odd project teams to edit the records and fill in the gaps from their own knowledge.

(iii) Profile of technology scribe

We found that the writers needed – or at least needed access to – specialist scientific knowledge and skills in the relevant field and other contextual knowledge (e.g. the infrastructure, regulatory framework, markets etc., in which the information was generated and/or will be applied). Some last-minute rewriting of technology records by subject matter specialists was occasioned because the writers' knowledge of the specific field was not sufficiently deep. This could be better handled by either commissioning a specialist or pairing up a writer with a specialist (an approach successfully taken by CPP to write 'Perspectives on Pests').

(iv) Time needed to write a technology record

The average time allocated by the project for writing technologies (three-quarters of a day) was reported to be sufficient if the writer relied (as they did) on the available documentation provided by NR International on CD. It was not enough to follow up with calls to ex-project staff, search out outcomes information, nor check if the sources cited e.g. websites and 'reports in progress' truly exist.

(iv) Intellectual Property Rights (IPR)

The team meeting raised a question that we return to in Section 10.3: if a project output has been published in journal, the copyright may be owned by the journal. If time had permitted, we would have written individually to the journals to seek permission to reproduce the text on TECA, as access to many journals is through payment. A decision was taken to simply cite the article in this case; but at least one slipped through the net and will have to be withdrawn from TECA.

6 Quality control: reviewing technology records

6.1 Objectives

Originally, they were to ensure that each record

- is an accurate and fair account of the technology and its potential, based on the available documentation;
- gives adequate information about associated health and safety risks.

They were replaced by the following on advice from CIRAD to whom we commissioned the task (see explanation below):

- To review the validation domain of each record. The aim of the review is not to correct the technology record (although flagrant errors of fact should be pointed out) but to engage with it in a dialogue. The expert will highlight any problems with the claims made about the

validation domain; and provide additional information about the validation domain, thereby adding to the record. Apart from improving the quality of the records, this process will also illustrate the potential for a more interactive TECA.

6.2 Methodology

(i) Does the record give adequate information about associated health and safety risks?

This screen was implicitly included in CIRAD's brief and certainly was addressed by some reviewers; but arguably we should have made it a more explicit question. Also, CIRAD only reviewed a little over half the technology records.

(ii) Is the record an accurate and fair account of the technology and its potential, based on the available documentation?

We originally asked CIRAD to do this but they advised that it was not a good use of their skills and that a more effective way of checking factual accuracy would be to invite the original project teams to edit the material. Whilst we agreed with the suggestion in principle, it was unfortunately not possible in the time remaining to contact and contract each of 160-odd former project leaders. This step remains outstanding.

(iii) To review the validation domain

We commissioned this to be carried out by CIRAD. The experts were asked to write a paragraph in the text of the offline record qualifying and contextualising the information provided therein about the 'validation domain' of the technology, with reference to the expert's own experience. A third of a day was allocated to the task per technology record. See ToRs at Annex 13.

6.3 Outcomes

(i) Validation domain

Drawing on their subject matter expertise, the CIRAD team reviewed 90 technologies from 7 programmes (AHP, LPP, CPHP, CPP, PSP, NRSP, AFGRP).

The reviewers' comments on the validation domain of the technologies, based on personal, practical experience of adaptive natural resources research, covered:

- Comments on potential risks and challenges involved in putting the technologies into practice (including health and safety);
- Questions, challenges and additional information about the validation domain;
- Amendments to the metadata assigned to the technologies for classification purposes;
- Reactions to the records as communication tools, with suggestions for improving the technology descriptions (not part of the terms of reference but appreciated nonetheless).

Some of their comments were incorporated by the copyeditor into the text of the records. Section 6.4 gives more detail on how we dealt with the reviews.

(ii) Factual accuracy

As mentioned in Section 6.2, the factual accuracy of the records has not been verified. It currently relies on the ability of the science writers to have accurately interpreted the available material. It should be noted that they undertook the work on the understanding that it would be checked by subject matter specialists.

We would agree that this is not a satisfactory situation and we plan to raise this outstanding task with FAO at a project follow-up meeting later this year. It could be approached either by SDRR giving each project leader (or institution, as several project leaders work in the same institution) a password to edit their technology record; alternatively we could invite them to submit feedback to the TECA manager who would edit the record on their behalf.

6.4 Lessons learned

(i) How not to manage a peer review!

Management of the reviews proved tricky and we realised that we had approached the issue naïvely. Our intention in commissioning CIRAD had been twofold:

(a) to demonstrate or illustrate the potential of TECA to be a forum for dialogue between technology users and suppliers, and

(b) to expand the information provided to the user about the validation domain, drawing on experience in Francophone countries where CIRAD works.

The process was going to involve publishing the commentary as part of the text of the records, and attribute it to the reviewer – unless the reviewer recommended the record was unpublishable, in which case we would exclude it, or the comments were highly critical, in which case we would postpone publication of the record and put the review in this report to illustrate the potential of TECA to enable a dialogue between the team who had done the work and other scientists or technology users.

In other words, we had planned to put the reviews – whether they simply gave complementary information or challenged claims made by the research teams – in the public domain (either via TECA or in our report). See below:

'Si l'expert juge que la fiche ne mérite pas une mise en ligne, NR International devra prendre une décision selon un processus qui reste à être précisé. Possibles critères d'exclusion – démarche scientifique pas suivie, domaine de pertinence pas suffisamment vaste?

Si la fiche est à inclure, les commentaires de CIRAD seront incorporés en fin de fiche à titre personnel/CIRAD/relecteur scientifique/sans titre (a discuter) et donc mis en ligne. Dans les qqs cas ou il y aurait de fortes contradictions entre les affirmations de la fiche et celles de l'expert, la mise en ligne serait reportée. Ces cas pourront être utilises par NR International dans le rapport de fin de projet auprès de DFID et la FAO, pour illustrer les possibilités d'une utilisation plus interactive du TECA…'.

Extract from Minutes of Briefing Meeting at CIRAD, April 2006

[Vos suggestions] seront documentées dans un annexe de notre rapport. Nous pensons que TECA a beaucoup de potentiel comme outil de dialogue entre chercheurs et agents d'extension. Cette annexe illustrera bien ce potentiel; et nous servira d'appui pour recommander à FAO que TECA soit développé de manière plus interactive dorénavant.

Dans les fiches publiées sur TECA, nous avons crédité votre collaboration sous le titre institutionnel de CIRAD. Dans le rapport de fin de projet, nous créditerons chacun individuellement….

Extract from thank you letter to CIRAD from Karen Wilkin, July 2006

Once we got the reviews back from CIRAD, we realised that whilst our intentions were sound our approach was naïve, for three reasons:

Firstly, the bulk of comments were reactions to the records themselves (rather than the technologies). The reviewers wanted more detail on a certain aspect of the technology or felt that part of a record was not relevant and could be deleted. This illustrates well the potential for TECA to engage users in giving the authors feedback about what they want to see in a technology record.

Unfortunately, we had not allocated enough time to coordinate a response by the original project teams. The copyeditor made a valiant effort to plug gaps and delete redundant description, using project documentation. A dozen of the least satisfactory records were rewritten by the original teams at the eleventh hour. However, the records can mostly only be turned into comprehensive factsheets by capturing the project teams' tacit knowledge. We apologetically explained to CIRAD (see below) that we had not been able to respond to their requests for more detail.

[L'éditeur] a réagi là où il a pu aux suggestions. Cependant, dans la plupart des cas, il faudra que je revienne aux équipes originelles de chercheurs pour y répondre de forme adéquate. Même lorsque l'éditeur a fait passer vos commentaires aux auteurs des fiches pour qu'ils y réagissent, ceux-ci se sont trouves bloques par la qualité de la documentation disponible. …Vous serez donc peut-être déçu dans un premier temps de voir le peu que vos commentaires ont été prises en compte dans les fiches publiées sur TECA; mais vous serez peut-être rassures par notre intention de proposer a FAO que les droits d'éditeur en ligne soient accordes aux chercheurs originaux individuellement pour qu'ils puissant répondre a vos suggestions.

We had also faced a second problem. By placing the reviews in the public domain (even in an annex to this report), the relationship between the reviewers and the scientists who had done the work was at stake. Indeed, it is for this reason that peer review processes managed by journals preserve the anonymity of the reviewer; but by this stage it was widely known that CIRAD had been commissioned to review the records so anonymity was impossible to provide.

Thirdly, some of the CIRAD reviewers challenged claims made in the records about the extent to which the technologies had really been validated or argued they should not be recommended. In fact, rarely do academics agree completely on the quality of research or validation processes. Furthermore, the project had not provided CIRAD with very much documentation about the projects, in particular evidence of validation, and so the reviewers could only go by the claims made in the record. If these contradicted their experience, they naturally questioned the claims.

Clearly, neither copyeditor nor project leader had the evidence, nor especially the authority, to arbitrate in differences of opinion between reviewers and claims made in the records[23]. The way journals handle this situation is to send the researcher the comments to address them directly (the editor would not address them on the researcher's behalf) and these would be anonymous; but as explained above anonymity could not be provided and there was no time to coordinate a response from the original 160-odd research teams.

Consequently, the copyeditor gave the original teams the benefit of the doubt; took CIRAD's comments out of the records again; and, whilst we have kept the reviews on file at NR International, we have no intention of making them public. Naturally this will be a disappointment to the CIRAD team.

(ii) CIRAD's feedback

After CIRAD had returned all their reviews, we asked them to provide us with feedback on the process and on TECA itself, using a short questionnaire attached at Annex 20. Eight reviewers returned the questionnaires. Their feedback is recorded at Annex 21 and summarised here.

Reviewers had not heard of TECA before or not visited it, and had not used it for publishing their own work. They would consider doing so in the future but did not say it was a 'must'. They were aware of only a few of the existing mechanisms for north-south and south-south technology exchange besides TECA:

'FAO, CityNet, INPhO, some Internet "forums" '

'In the case of participatory research, CGIAR system-wide initiatives e.g. PRGA programme ('PRGA has maybe more general guidelines besides case studies, but maybe more restricted to CGIAR members or partners, PRGA mostly in English and more research-related')'

'To complement a hard copy, short video documents (on DVD or CD format) that explain and show a particular technology can be very efficient (and now cheap) for the same purpose. Video document can be downloadable on the Internet. With DVD format several languages (id: local idioms) for voice or subtitles can be proposed, that can be very useful for targeting illiterate people'.

'Paper "fiches", trainings. The two main problems that I see for TECA is: the poor internet connections in Africa and the fact that some techniques really need to be presented on the field. The main advantage is a wide diffusion and a low cost in comparison to international trainings'.

Extracts from CIRAD questionnaires recorded in Annex 21

Views varied widely as to who the fiches were targeted at; this could be explained by the fact that the technologies themselves were developed for different user types. Mostly they agreed that farmers could not use the information without further transfer work. More worryingly, some reviewers felt it was not clear who they were targeted at; it is possible that the project gave insufficient guidance to the technology scribes.

A common criticism of the records was the absence of precise data on results/ important technical data (also discussed in Section 5.4).

Most reviewers felt they had been able to add value to the records and the following ways were cited:

'Input on bibliography with some personal documents'.

[23] With a few exception where a great deal of evidence was available to show that a technology had been validated, was being adopted and was suitable to the socio-economic context it claimed to be designed for. This had not been shared with the reviewer.

I mentioned the lack of precise information about the application of the technology. It is important to give information about its feasibility in the different area because the target audience will not go easily to the mentioned literature'.

'In my case, the "West-African" field experience is somewhat different from the Eastern one because the main vectors of Trypanosomosis here are riverine species. I think that if my positions are taken into consideration, it would widen the application range of the presentations'.

'Because we are external agents to those programs we bring from our scientific and supporting background another view of the texts and read them as might do any other readers. So we can help to make the fiches more clear and comprehensive. More, we can give an opinion about the relevance of the program concern'.

'Difficult to say for one record only. However I do think the comment I made (mainly on the difficulties (technical and economical) of implementation of the technique which were not enough forwarded (lack of "caution" notice) may contribute to some added value somewhere, hopefully'!

'I pointed out some weaknesses of the technologies in order to be sustainable for users e.g. missing partnerships. Furthermore, sometimes the project detailed description did not really showed some of the categories or titles "ticked".'

Extracts from CIRAD questionnaires recorded in Annex 21

Our project coordination suffered briefly during the transition of workflow management from Tina to Karen, which coincided with the start of CIRAD's inputs. This caused some avoidable difficulties to CIRAD e.g. they were given quite short notice to complete the reviews; we sent them the technology records before finalising the list of records to be reviewed thereby raising expectations about the volume of work; we forwarded records for review without checking them first and some should have been withheld because (as pointed out to us by the writers) they had been written without access to the final project report.

The reviewers had found it difficult to review the fiches without access to the full project documentation. This had not been fully tracked down and assembled yet, and we (wrongly) thought the records could be reviewed without it. In retrospect, they should not have been asked to review the projects until the supporting documents had been selected, provided, and ideally already hyperlinked to the records, so that they could review the 'full experience' of reading a finished record.

Additional difficulties pointed out to us were: their unfamiliarity with TECA, lack of clarity about the audience for the record and how it would be used, and lack of clarity about what was expected of them. This last may be due to the change in the terms of reference early in our interaction; possibly the final ToRs were not communicated clearly enough to the reviewers.

CIRAD decided to place the records and supporting documents sent by NR International on a CIRAD-wide htp site and expect reviewers to pull off what they needed. Only one person disliked this mechanism and would have preferred to receive only the relevant documents.

We had allocated a third of a day per review; only one reviewer said it was not quite enough.

It was suggested that the list of supporting documents should have been annotated with a summary description of the item, to aid selection of what material to read; the title was not enough.

And finally, it was recommended that feedback from the author should have been integrated; we agree as discussed in the first part of Section 6.4.

7 Quality control: copyediting technology records

7.1 Objectives

The original brief was to check each record prior to uploading for spelling, grammar and sense. However, the copyediting turned out to be a much bigger and more complicated task, described below.

The copyeditor ended up doing a lot of work that we had planned to complete earlier in the project when assembling the documentation and writing the technology records, in terms of tracking down, digitising, formatting and labelling the documentation and indicating exactly where to link it to the text of the technology records. This was largely because the project leader had not briefed the team well enough on what was expected of them (discussed in Section 5), but also because of formatting difficulties with the project documentation that we had not anticipated.

7.2 Methodology

One copyeditor[24] carried out the copyediting single-handedly for the entire collection of offline records (see ToRs at Annex 14). Below is his report of the process. Karen Wilkin first trialled the process alongside Tina Rowland in respect of a few PHFRP records which reveal the extent of the challenges the copyeditor was to face.

(i) Initial read and preparation of materials

The process adopted during copyediting included a number of operations together with an initial read through the text:

- Removal of those parts of the offline record not required by the uploader.
- Checking that all fields in the offline form had been filled in by the scribe.
- Examination of outputs, documents and other resources associated with the record.
- Assessment of the suitability of the associated document (or other resource, e.g. a photo) for inclusion as a link to the TECA record. At this stage, a majority of documents that were simply available scanned images of reports were rejected. The file sizes of many of these were too large for the TECA system (also too large for many users to download). Furthermore, many of the scanned documents were of poor quality and judged not to be acceptable.
- Conversion of MS-Word documents to Adobe Acrobat PDF format where required.
- Some of the Word or PDF documents were found to include incorrect formatting. An example includes a document where a figure was included in a portrait oriented page whereas it was clearly designed for landscape layout and was only partly visible. Other examples included tables of contents with numerous "Error! Bookmark not found" instead of page numbers in the Table of Contents. Where possible these text strings were removed. Some FTRs included, on the cover, instructions for page margins. This detracted from a “professional” appearance and was removed. However, not all documents were thoroughly searched and it is inevitable that many of these and other instances of incorrect formatting have gone undetected.
- Optimization of PDF documents to reduce their size, and where required splitting them so that the TECA uploading system was able to cope with them. PDF documents were also optimized for smaller file sizes in order to facilitate downloading by users. Password protected PDF files posed particular problems in this regard. It was possible to obtain these passwords in some cases, but not in others. Where no password was available, it was not possible to optimize the PDF file, and in those cases where the file sizes were judged to be too large for TECA (based on feedback received from the uploader), these resources were not linked to the TECA record. In those cases where the resource was already available elsewhere on the Internet, a link to that location was provided.
- Renaming of the resulting PDF files to provide a short file name that is more suitable for including in an html link (long file names are not good practice in html). This also included replacing spaces with either hyphens or underscores. Spaces are translated into “%20” which makes the string less easy to read and longer than necessary (e.g. the file “CPP0011 R8484 FTR C Gold IITA.pdf” would appear as “CPP0011%20R8484%20FTR%20C%20Gold%20IITA.pdf”, but was renamed as “R8484_FTR.pdf”).

An initial read of the record first gave an overall impression of the subject matter, how this was explained, how easy it might be for a non-specialist to understand, and whether additional explanation was required.

A number of records were judged to require either additional material to make them more easily understood, or in some cases a complete rewrite. In the latter case, the rewrites were organised by Karen Wilkin (and some done by Ken Campbell). Rewrites were subsequently copyedited.

As part of the initial read through the record, text was simplified where this was considered to be necessary, and in many cases paragraphs were split to make them shorter. Spelling was checked and grammar corrected as required.

[24] Ken Campbell, a livestock/environment research scientist with strong digital formatting skills and copyediting experience.

The text of a significant number of records was improved by the addition of material that, for example, provided explanation of terms used, or further information on the general background concepts and ideas where this material was missing. The additional text was based on information provided in FTRs, in other resources linked to the records, or in cases where the required explanations/information was not available from these sources, from material located by searching on the Internet.

Comments by CIRAD were included in a proportion of the records. These comments were taken into account and the records modified, or text reworded accordingly where this was possible. However, some of the CIRAD comments were not possible to accommodate since the information was not readily available, whilst others were considered to be incorrect (e.g. were already accounted for elsewhere in the same records).

(ii) Headings

Few of the original records included headings and sub-headings. The omission of headings makes such records more difficult to read and less easy to understand, or to "take in" the message. In particular, it was felt that an introductory section was required for all records, with the heading of either "Introduction", or "Introduction and background", as appropriate. Where such introductory material was missing (the majority of cases), or judged to be inadequate, suitable text was added – sourced from the relevant research outputs and/or other Internet sources. Additional headings were added where possible.

(iii) References and Resources

After an initial read through the text, research programme web sites and/or project web sites were consulted in those cases where only a small number of resources were available. Additional documents or resources were obtained from these sources where available and where they were judged to be relevant and useful. Similarly, searches were conducted on the Internet for relevant published material, and it was often possible to include links to these resources, e.g. to articles published in journals, or to specific web sites with additional information on selected topics.

A complete list of available resources was then compiled. This was split between a section headed "References" or more usually "References and further reading", and "e-Resources". The former included references cited in the text of the record other related references for which linked documents were available (and which could be uploaded to TECA). The heading "e-Resources" included any material that could be sourced elsewhere on the Internet.

Articles published in journals represent a particular problem in that many are covered by the copyright of journals. Where the text of a published article was available (e.g. from Research Programme web sites), this may not have been the final published version – in which case it was considered inappropriate to attach to TECA. In many other cases, the published version is copyrighted by the journal and therefore not available. In many cases, the articles were available via web sites linked to the journals and links could be made to these sites.

The DOI system (Digital Object Identifier) was used to link to journal articles where a DOI was available. The DOI system provides information on where an article can be found, and this identifier should not change even if the actual location itself (i.e. web site address) changes. The DOI can be changed into an address by adding the suffix http://dx.doi.org/. The following example illustrates the use of the DOI, and also gives the URL:

> McALLISTER, M.K. and KIRKWOOD, G.P. (1998a). Bayesian stock assessment: a review and example application using the logistic model. ICES Journal of Marine Science 55(6): 1031-1060. DOI:10.1006/jmsc.1998.0425. URL: http://dx.doi.org/10.1006/jmsc.1998.0425

However, in a majority of cases, the DOI points to a site which provides the abstract of a journal article, and it is necessary to login (e.g. using an Athens login and password) in order to obtain access to the full article. The alternative is to pay for access to the PDF of the article.

In almost all cases it was necessary to modify the reference to fit the required format. Many records produced by the scribes included no proper reference at all – simply referring to a filename in the associated resources (e.g. [1] R7323 FTR). In such cases it was necessary to find the relevant files and decide what the full reference should be. Some of the research Programme web sites provided considerable assistance with this (e.g. LPP-online, http://www.lpp.uk.com/), but most did not. Even in cases where the reference was provided in full, it was normally necessary to add the name of the

Research Programme itself. Furthermore, some of the titles given were found to be incorrect when checking against the actual PDF or Word document.

Where possible, anonymous reports were avoided. In some cases it was possible to search and find the actual authors of a report, either on Research Programme web sites, or on the Internet. In general any reports that were both anonymous and undated were avoided and not linked to the TECA record.

Where URLs were supplied, e.g. to project sites, to sites where research articles were available, or to other Internet links, these were checked. In some cases these were found to be incorrect, or no longer valid, and where possible the correct sites were found by searching on the Internet. If no corrected link could be found, the reference was not included in the record.

Overall, it was considered that dealing with the references occupied a considerable portion of the total time taken.

(iv) Addition of html code

To facilitate the process of uploading, html code was added to the record, including for example:

	Example	With html code
Bold text (e.g. headings)	Heading text	Heading text
Superscript	50 kg N ha-1	50 kg N ha⁻¹
Superscript 2	3 m2	3 m²
Italics	Glossina palpalis	Glossina palpalis
Special characters	e.g. ô / ê / ü	ô / ê / ü

These were added to the text of the record and with the exception of and were highlighted in red.

A final read was carried out on each record before sending it for uploading together with those resources linked to each record. The prepared offline record was known as the Upload Form and an example is given at Annex 15.

7.3 Outcomes

A total of 182 records were received for copyediting by Ken Campbell, covering 8 research programmes (see Table 3)[25]. Some records were recommended for deletion, either by the copyeditor or as a result of comments by CIRAD (some records were deleted after being copyedited). Additional records were found to be very similar to other records and were judged not to be suitable for inclusion as separate records. These records were combined as appropriate.

Table 3. Summary of records received, copyedited and sent for uploading

	Records received	Records deleted	Needing to be combined	Forms sent for uploading
AFGRP	4	2		2
AHP	16	2		14
CPHP	22			22
CPP	40			40
FMSP	24	3	11	15
LPP	18	2		16
NRSP	14			14
PHFRP	2			2
PSP	42		16	28
Total	182	9	27	153

[25] In addition, five had been copyedited in a trial by Karen Wilkin.

A total of 153 records were finalised and sent for uploading[26]. There were no records that were received that were not processed, other than those that were for one reason or another deleted and not selected for uploading to TECA (some of these were copyedited before the decision was made to delete them).

A total of 287 hours was taken for this work, or an average of 1.6 hours per record received. Since decisions as to the need to delete or combine a record takes up time, basing the average time per record on the total of those received is more realistic than basing it on the number finally sent on for uploading. This time was equivalent to 41 days based on 7 working hours per day.

A problem remains with the linkages to html documents from one TECA record, number 1942, "DISSEMINATION MATERIAL FOR IMPROVED PRODUCTIVITY: Small livestock keepers in forest margins of Bolivia". The content of these linked html documents is still not displaying correctly. The graphics are the major part of the content, but these are not shown. This is a problem related to the TECA uploading and linking system and needs to be resolved by TECA.

Some of the text of these linked documents is displayed correctly, but the graphics – which are the main part of the booklets – is not displayed. Other pages linked to the opening page of each document are not displayed.

For some reason, it appears that the TECA system is currently unable to cope with the requirements of linking to these documents.

7.4 Lessons learned

As a general point it was felt that many of the project Final Technical Reports did not present an adequate account of what was done and achieved by the project, especially when the details of a particular "technology" were considered.

Instead, the impression was gained that in some cases FTRs were treated more as an administrative exercise. The details of research carried out were then assumed to be disseminated via published articles in journals or similar peer-reviewed publications. However, the wider availability of these publications within the potential target audience (those working with poor households in developing countries) is at best questionable, and likely to be insignificant.

Moreover the target audience for peer-reviewed journal articles is the academic community, and as such these articles do not present the much needed background information required to introduce and asses a technology. However, given the problems related to copyright and limited access to peer-reviewed journal articles (see above) the FTRs were sometimes the only available source of information that could be linked to the TECA records.

A number of projects had produced leaflets or short explanatory booklets which presented aspects of the technologies in an easily understood format. However, such booklets can only be used within a wider context – out-scaling and up-scaling – if they remain available in digital format. A scanned copy of a leaflet is generally not an adequate substitute.

The use of password protection on PDF files results in a series of problems that compromise their subsequent use. Password protection should only be used on PDF files if there is a clear requirement for this, and not be used as standard practice for documents designed to be used on the web. Few of the documents concerned (if any) contain sensitive information that needs to be password protected.

Problems include:

- Reducing the size of PDF files improves their performance, especially when used on the web. Password protection prevents any use of Acrobat software to Optimize the PDF file and reduce file size.
- Large PDF files needed to be split into two or more separate files in order to facilitate the TECA uploading, as well as to reduce file sizes for subsequent downloading by potential users. This is not possible with password protected PDF files.

[26] See previous footnote.

- Minor edits are not possible before uploading. For example, problems noted in the table of contents can not be corrected – including instances such as "Error! Bookmark not found".
- The user is unable to copy short sections or paragraphs and subsequently adapt these for wider use under different situations.
- Many search engines used on the web are able to search within PDF files by creating an index of words within the file. However, all of the different indexing software packages used by the author are unable to create an index from password protected pdf files. This seriously reduces the usefulness of such files in a web-based environment that includes full-text search facilities.

8 Uploading technology records

8.1 Objectives

- Enter information from Upload Forms on TECA's online template. An upload form is what we called the technology record once it had been prepared for uploading by the copyeditor. An example is given at Annex 15.
- For each record, upload the associated documentation (in a variety of media and formats) and link these to the record.
- For each record, create, upload and link pdf tables for the following information: contact details, evidence of validation and, where necessary, lengthy lists of additional resources.

8.2 Methodology

See ToRs for the uploader at Annex 16.

(i) Constraints on fields

Initially, the upload process was tested and it was found that many of the fields had character limits or did not accept html linking code. Therefore the decision was made to create Word document tables to contain any information which was either too lengthy to fit into the correct field or would not accept the html coding to link to the appropriate document/image/url. These tables were then converted to pdf format and uploaded to each record and linked via html coding.

The following tables were created, uploaded and hyperlinked to each record as deemed appropriate:

'Evidence of Validation' table (Annex 17): An appropriate field could not be found for the evidence of validation information; and it was not possible to easily add tables to the main body of the text; so the decision was taken to create a table in Word, convert to pdf format and link to text in a paragraph within the main body of the text under Detailed Description of the Technology. The length of upload time was not helped by the character limits set on some of the fields, namely the Source(s) and the Additional External Resources fields.

'Other Related Resources' table (Annex 18): As the Additional External Resources field is character-limited and does not allow html coding to link uploaded documents/images/urls, it was decided that the e-Resource materials would be added to the main body of the Detailed Description of the Technology text where the html link coding works and there are not character limits.

In some cases, where the information did not require linking to additional documents/images/urls and were within the character limits of the Additional External Resources field, they were added; but in some cases the character limit would not allow this, so a Word table was devised and converted to pdf format and added to some additional text in the Detailed Description of the Technology field and hyperlinked to the uploaded table.

'Research Project Teams' Contact Details' table (Annex 19): The Source(s) field also has the same limitations as the Additional External Resources field. It was decided to add a standardised piece of text referring the user to a paragraph within the main body of the text in the Detailed Description of

the Technology field; and once again a table was created in Word and converted into pdf format and linked via html coding to the upload pdf.

(ii) Time-out limit

The lengthy uploading process was hampered by the TECA time-out issue when creating a new record on the TECA database. Also uploading numerous tables and linking via html coding along with the inability to load more then one document at a time did not speed up the process.

The best approach devised after continuous use was as follows:

- Upload the text from the TECA Upload form but cutting and pasting directly on to the online form;
- Adding the html coding to force required font and layout of the text, ie bold, italic, underscore, bullet points, etc.;
- Save the record to bypass the 20 minute time-out limit;
- Reopen the record in the upload area and insert the html coding for each attachment and table referred to the within the text of the record and save the record again.
- Go to the upload area for the particular record and upload each document in turn, some records having 20 + attachments meant that this was the longest part of the task;
- Finally, reviewing the record via the live site to check each record, the text, font and layout and the hyperlinks to each attachment/url.

The lengthy process of uploading each technology record and the supporting documentation was eventually averaged out to 4 records per day.

8.3 Outcomes

159 records were uploaded to the TECA portal and can be viewed as a list by selecting the DFID option in the 'APPLICANT' field of the search form on TECA.

Additional documents were uploaded and linked to all the documents. It was found that the size limit on the uploader was set at 1.5MB. Most of the Final Technical Reports produced by the programmes are weighty tomes and many of their publications have images which mean the file sizes are on the large side as well. Most, in particular the early ones, had been scanned from hard copies which gives a much greater file size than creating an electronic version. This meant that the uploader was required to dissect the documents to parts, 1, 2, 3, 4, etc., and then upload the parts as separate documents and link them via html coding to the appropriate piece of text.

8.4 Lessons Learned

During uploading, 'troubleshooting' notes were systematically recorded, as were suggestions from the team on how the TECA database could be enhanced. These are presented in Section 10.

9 Quality control: checking uploaded records

The objectives were:

- Ensure that each online record is formatted consistently and that supporting documents are correctly attached.

This step was incorporated into the uploading process and carried out by the same person (Section 8).

10 Recommendations to FAO for further developing TECA

Output 4 of the project was 'to document the project process, enabling the methodology and lessons learned to benefit future TECA partnerships'. In Sections 2-9 of this report, we have detailed the process and lessons learned. Below are the combined recommendations of the team to FAO for

further developing and strengthening TECA, based on our experience, which has been primarily as publishers of information on TECA (as opposed to users of information accessed via TECA).

It is hoped that these suggestions add value to this project and may be useful to SDRR when taking TECA forward in the future. Some of our recommendations are strategic, others are aimed at enhancing the functionality or content of the technology database. Many have already been communicated to SDRR in emails and meetings during the past 18 months (as indicated below) but we felt it would be useful to set them down here as a consolidated list. Each is credited with its author.

10.1 Enhancing functionality

10.1.1 Uploading information

The majority of these recommendations are aimed at speeding up the uploading process, which we found to be extremely laborious. This was partly because we made demands on it that it was never set up to handle and we gratefully acknowledge SDRR's support.

✧ *Publishing information in table form (K Campbell)*

The use of information presented in a tabular format is a standard and very convenient means of summarizing data and/or comparing techniques. The use of nested tables within an html environment is also a standard means of formatting a "page". Unfortunately, it appears that the current implementation of the TECA uploading system does not allow for the easy use of html tables.

Attempts were made to import tables already formatted in html code. However, this did not work, with the resulting table requiring significant and time-consuming editing within TECA to restore to original html code, and to remove very large white-space that appeared above and below the tables. These edits were successful – see for example TECA record 1925. However, due to the significant amount of time required to edit the uploaded text, tables were not used in subsequent records.

The work-around of creating a PDF file from a table and then linking this to the text is a very poor substitute. The user first has to be sufficiently interested in a topic or theme to click on the link. Many users may not do so and are therefore not presented with potentially useful information.

✧ *Linking records to html documents (K Campbell)*

Problems were encountered when attempting to upload html documents (with linked/embedded graphics) and link these to TECA records.

An example where this was attempted is TECA record 1942, see http://www.fao.org/sd/teca/search/tech_dett_en.asp?tech_id=1942, which includes links to some of the main dissemination outputs relevant to this technology – a series of three booklets produced by CIAT and NRI in Spanish. Some of the original digital files are no longer available at CIAT, and the outputs available through the research programme were in the form of scanned copies. The file size of scanned booklets is up to about 40 MB, and clearly unsuitable for linking to the TECA record. However, versions are available in html format (created for the *Smallstock in Development* CD-ROM) and these should be ideal for linking to the TECA record.

Some of the text of these linked documents is displayed correctly, but the graphics – which are the main part of the booklets – is not displayed. Other pages linked to the opening page of each document are not displayed. For some reason, it appears that the TECA system is currently unable to cope with the requirements of linking to these documents.

✧ *Import of html documents (K Campbell)*

Html editors are increasingly common and user-friendly. It is suggested that the TECA uploading system could be modified to enable it to import documents in html format, including linked graphics – or to enable cut and paste of documents formatted in html without them being modified in unpredictable ways during import. Guidelines and/or a "template" could be provided.

✧ *Navigation when uploading (T Rowland)*

As one is not a 'parent' when viewing a TECA technology, when one exits out of it, one goes right out of the website, which is very frustrating!

✧ *Displaying records (T Rowland)*

Titles of fields on the uploading form centralise according to the data added to a particular field – this makes it harder to read when printing out the material. Ideally each title should remain static at the top, in line with the first line of information pertaining to the title. E.g. Additional External Resources – when one adds references to this field the title centralises. When printing the record, is it not clear if the information is under Source(s) or Additional External Resources.

✧ *Batch uploading (T Rowland)*

In this project, we chose to load large amounts of supporting data per technology record. This proved to be a very time-consuming process. I suggest a system for uploading batches of documents could be provided: a secure access area for the uploader to 'drag and drop' batches of documents to the TECA FTP area. Access was requested to FTP area but denied due to FAO IT security regulations.

✧ *TECA log-in areas – creating new users (T Rowland)*

I found this process overly complicated and slightly confusing. E.g. 'DFID, Surname' requires the person's full name, followed by their email and chosen Username and Password. The Username has to be unique as does the Password. This area requires some explanatory text or at least some examples of which type of information is expected in each field. It took a couple of attempts and some deletion of new users to get this right, so that only 'DFID' was displayed on the final record instead of the individual's name. We found that adding the information in the fields in this order ensures that DFID4 appears on the record entered instead of Peter Golob:

DFID; Peter Golob; Email; DFID4; CPHP6950

✧ *Menus on uploading form (T Rowland)*

The menu options under fields 'Factors underlying success' and 'Global Farming Systems' should be listed in alphabetical order. Countries are not listed in alphabetical order on site search.

✧ *Technology Assessment field (T Rowland)*

Some fields in the uploading form give the option to add a new menu category under 'Other'. When adding information to the 'Information available in support of the above' fields, the programming does not force a break between the new category and the information. A break cannot even be forced by adding html coding within the technology record. Individual occurrences have been amended but this should be an automatic process. See record 1925. Emailed Francisco Lopez to advise.

✧ *Field views (T Rowland)*

The field view for 'Detailed Description of the Technology' is far too small for upload purposes – it needs ideally to be at least three times the size it is now on the upload form so that the uploader may view more text at once.

✧ *Descriptive title of the technology (T Rowland)*

This field should ideally force the type and size of font to be larger and set to bold, so that – when printing the technologies or viewing online – the heading of the technology is standardised, which gives a professional look, and more legible when printing. At present, the uploader is required to insert html coding on each record to force font of title to bold. Emailed 21/06/06. Noted by Francisco Lopez.

✧ *Display of html document (T Rowland)*

Pictures are not displaying within the htm link. Our copyeditor provided three htm zipped documents for uploading so that the pictures, etc., would display on the link to the htm but it did not work. See Record 1942. Sent to Franciso Lopez under separate cover 28/06/06.

✧ *ID of technology not visible when uploading record (T Rowland)*

The database allocates a unique ID number to new technologies; however this is not avaible to see when uploading the data, therefore the uploader has to guess the number to insert into each html coded link. If guessed incorrectly, the uploader has to go back in and correct the number. Francisco Lopez suggested only adding the mandatory coding and saving the technology, then going back in and adding the rest of the information and html coding. Noted by Francisco Lopez, emailed 21/06/06.

✧ *Searchability of Upload Database (T Rowland)*

One is not able to search any of the map categories within the upload area. Emailed Francisco Lopez to advise.

When searching within the live site, Inland Fisheries (a new category added by request of Intenational) does not display for each technology presented in the search results.

✧ *Intermittent upload time (T Rowland)*

Emailed Francisco Lopez regarding this issue. Francisco suggested perhaps it was a 'time-out' problem and we should log off and log back in again. We have tried this but does not seem to solve this issue. Emailed Francisco Lopez to advise.

✧ *Correcting records once saved (T Rowland)*

'Type of Technology' field: I inadvertently left an '&' instead of an 'and' within the citation on one record; and on another record an was added instead of a . I then found I was unable to change it once the record had been saved. The programming retains the orginal information entered in the field and it cannot be amended/deleted from this field once saved. Emailed Francisco Lopez to advise. Francisco Lopez said SDRR would delete the records manually from the database if I could provide the TECA unique id record numbers. See record 1961.

✧ *Display when uploading countries (T Rowland)*

When uploading, one requires the country(ies) selected to be displayed; as, when the record is submitted, it appears to the uploader that the country selection has been reset to top option of the alphabetical listing.

✧ *Displaying linked documents (T Rowland)*

The uploaded documentation appears automatically at the end of each technology record. The system automatically lists them in alphabetical order, which is not necessarily the order they have been referred to in the above text. This is not a problem if uploader is conversant with html coding and can add links within the text of the technology record; but is problematic if the uploader does not link the document to the text of the record. In such cases, when reading the text, the user is required to scroll down to the documentation listing and identify the relevant document being referred to (assuming it has been labelled adequately so that the user may recognise it) and scroll back to where they were reading the text. This causes problems for the user if the technology record is several screens in length. The uploader may have to rename each uploaded document so that it is numbered to appear in the order required, which proved time-consuming and laborious. See record 1886.

✧ *Displaying images (T Rowland)*

The same problem arises in respect of images referred to in the technology records. The inability for the TECA records to display images from within the record is not user-friendly, nor is it usual on websites to display images in this way. For the user to view the images, they have to remember the image name given as a reference, scroll down to the image listing at the bottom of the record, and

hopefully – if the uploader has renamed all the images so that they appear in chronological order and their title is clearly relevant to the text – the user will find the image referred to, click on it and view it. The user then has to scroll back up and remember were they were in the main body of the text to continue reading, and repeat the process for each and every image.

✧ *Displaying logos (T Rowland)*

We would have liked to display the DFID logo on the individual technology records, so that it is displayed for the user to see when viewing the technologies online. We were unable to do this: the programming displays the title of the image only, within the listing at the bottom of the technology record.

✧ *File size limit on uploading linked documents (T Rowland)*

It was found that the file size limit on the uploader was set at 1.5MB. This is not noted anywhere on the uploading area. We recognise this has been set low in consideration of the low bandwidth found in many countries. We also acknowledge that the file sizes of documents we uploaded were unnecessarily big because they were created from scanned hard copy. Perhaps SDRR could either raise the limit on the basis that bandwidth is improving all the time; or at least make a note on the upload area warning the publisher.

10.1.2 Retrieving information from the technology database

✧ *Full text searching (K Campbell)*

TECA could be enhanced by the use of a full-text search facility, either instead of, or alongside, the existing search facility.

✧ *Integrated search facilities (K Wilkin)*

The distinction between decision support tool, methodology and technology is not particularly intuitive. It would be useful to integrate the TECA technology database search function with that of the other databases on TECA, so they can be seamlessly searched.

✧ *Bookmarks (K Campbell)*

The use of bookmarks is a standard mechanism for navigation within a web page, as well as for navigation between sets of web pages. For example, a set of links at the top of the page or record that a) list the major headings in the record, and b) navigate directly to them. An attempt was made to use bookmarks within a TECA record, but problems were encountered and this approach was subsequently dropped. TECA could be significantly enhanced if bookmarks and other standard techniques used on html pages could be easily used within a TECA record.

✧ *Software links (T Rowland)*

We recommend adding a link from the TECA home page to the Adobe Acrobat Reader website so that users can download the appropriate software to view the attachments contained within each technology.

✧ *Glitch when displaying record titles (K Campbell)*

When presented with a list of TECA records, the screen displays a limited number of record titles (which can be set by the user). Clicking on either the numbers for subsequent pages, or on the “(>>)” symbol at the bottom right of the page, results in an error message:

> The page cannot be displayed.
>
> There is a problem with the page you are trying to reach and it cannot be displayed.

✧ *Record of hits (T Rowland)*

This would provide some feedback to FAO on usage of the TECA portal in general; and could be set up to record the number of hits for any given technology, which is of interest to the publisher of that record.

✧ *Consistency of style (T Rowland)*

Control of font and text could usefully be added to the uploading area. As no tabbing is available for numbered paragraphs, if the uploader is not conversant in hmtl coding, the result when adding bulleted/ numbered paragraphs looks messy.

Consistency could be improved with the title font colours – for example, the titles in green vary in shade followed by black titles.

10.2 Enhancing content

✧ *Simplifying the categories (whole team)*

We recommend eliminating the difference between technology, methodology and decision-support tool; or making the distinctions clearer to both publishers and users of information.

✧ *Typology of validation (K Wilkin)*

A definition is needed of 'validated' as opposed to 'not yet validated' ie some minimum criteria for 'validated'.

A typology of validation would make it possible for the publisher to quantify and qualify the validation process, which would enable the user to make a more informed decision when selecting technologies to use. Based on information provided in the technology records about the recommendation domain of each technology, one could develop a validation typology made up of qualitative and quantitative indicators and trial it against the technologies already contained in the database.

✧ *Publishing work in progress (K Campbell)*

We propose that – as in the Telesupport project in India, for example – the TECA database enables work in progress to be published. E.g. AHP AHP20, AHP27 in Annex 1 that were set aside as 'technologies requiring further validation'.

✧ *Cross-linkages between TECA records (K Campbell/T Rowland/ F Kimmins)*

A number of the TECA records are related in that the technologies represent alternative solutions to a given problem, or are most effective when used together. For instance, publishing a solution (technology) is often of little use to a farmer without an accompanying decision-support tool to guide them in its use (this was raised in connection with AHP).

As the volume of information increases, the number of related records will inevitably grow. Attempts were made to create links between related TECA records, but problems were encountered, and the approach was subsequently dropped. Examples of technologies requiring linking: 1947, 1948, 1949 and 1950. Emailed Francisco Lopez to advise.

✧ *Farming systems (Ken Campbell)*

The list of farming systems are not very helpful, especially to someone who has been introduced to one of a number of a different farming system classifications. There is also no clear dividing line between some of the listed categories. A suggestion would be to include a more extensive set of categories that incorporates the different farming system descriptions currently in use, as well as agro-ecological zones.

✧ *Maps tool (A Frost)*

The maps are so generic and do not have any real detail of variation within country that I question the value these bring to the dataset. There are much better maps around within FAO that could be exploited and add much more value to TECA. Furthermore, an overlap with the poverty maps from ILRI would also be of value.

✧ *Range of beneficiaries (G Farrell)*

“Farmers” and “farm” are used on the uploading form but the descriptions are limiting in that many beneficiaries of the [RNRRS] programmes are tradesmen, employees, policy makers and so on. Is “stakeholder” more appropriate, or is FAO only interested in farm technologies?

✧ *Dating the record (G Farrell)*

It would be useful to add a field for the year the form was written, which may be several years after the work was concluded.

✧ *Where and when has the technology been validated? (Ken Campbell)*

In some cases, the basic technology may have been widely used over many years, and what is being described may be an application or adaptation to cope with a given situation in a different environment and under changed social, economic or cultural conditions.

An example from the livestock projects would be the "box-baling" technology (LPP0021 – see Annex 1 – from project R6619). This is essentially a technique for conservation and storage of fodder, based on hay making techniques that themselves have been evolving over a considerable time period. To understand and appreciate the "new" technology, a basic understanding of the background is also required.

✧ *This technology has been demonstrated to achieve the following benefits (Ken Campbell)*

Some of these categories are not very helpful, and several would appear to be saying more or less the same thing in different ways. One of the categories also falls into the potential trap of perceived quality and nutritional value. There is not necessarily any link between these two parameters (for instance apples are perceived to be of high quality, by both shops and consumers, if they have a series of attributes that have nothing to do with nutritional value - size, shape and colour). There is no clear distinction between "Stabilise farm production at higher output level" and "Increases farm production".

Perhaps a more helpful way of looking at this would be to list a number of potential attributes, and ask for ticks in columns for the impact of the technology on these attributes - negative, neutral, or positive/beneficial (with an additional possibility of no comment). Some of these attributes might include:

Attributes	Negative	Neutral	Beneficial
Income generation (to the producer)			
Production levels			
Employment levels on-farm			
Employment levels off-farm			
Quality of the product			
Nutritional content of the product			
Nutritional value to smallholder households			
Shelf life			
Environmental impact			
Use of non-renewable resources			
Genetic diversity			
etc...			

A similar approach could also be adopted for the next field: 'The technology has demonstrated the following characteristics'.

✧ *Factors underlying success (K Wilkin)*

The categories in this field are not discriminatory and therefore not useful as metadata. Surely all technologies loaded onto TECA should tick all these boxes. We recommend that they should be used at the screening stage to screen out any technology that doesn't meet these basic criteria, ie specified in the definition of a validated technology given in the user manual.

✧ *Cost-benefit data (G Farrell)*

In the technology description, asking the publisher to provide costs and a cost/benefit analysis can be misleading since inflation, currency fluctuations and exchange rates can make a technology financially viable, or not, from year to year, particularly for export crops. Perhaps SDRR could add a standard disclaimer in this field e.g. *"Technology was cost/beneficial in (date) but potential users must make their own investigation at current market prices".*

✧ *Health and safety disclaimer (T Rowland/V Graffham)*

In the uploading template, we recommend a standard health and safety caveat is included by SDRR. We developed the following as a suggestion and included this in the text of each of our records: "*The researchers, their institutions or this website cannot be held responsible for any damage resulting from the use of the materials or methods described here. The application or use of treatments, processes and technologies is the sole responsibility of the user".*

10.3 Strategic recommendations

The following suggestions arise from seeing a potential in TECA that is not yet being exploited and knowing that there are other projects with similar objectives, wrestling with similar operational challenges, that TECA could learn from.

✧ *Making TECA more user-driven – Option 1: Consult technology users on any further design revisions (Rowland/Wilkin)*

We wondered to what extent the selection of metadata has been validated with the full range of user types, including not only information publishers but information users. We understand that users already have the option of working with SDRR's programmer to customise their interface; but how much scope is there for users to specify the types of metadata that they find useful when browsing a menu of technologies?

In any further development of TECA by SDRR, we recommend that a wide range of types of technology user should be closely involved. This could be done simply in the form of a consultation exercise[27]; but ideally the portal would be transformed into a more interactive forum enabling continuous feedback and adjustment – see next suggestion.

✧ *Making TECA more user-driven – Option 2: From shop-window to market place (Wilkin/Rowland)*

> *'Added value lies in facilitating the sharing and exchange of human experiences and personal knowledge. This is where most peoples' interests lie. It is the personal and particular that are most pertinent'.* G Farrell

TECA is currently wholly supply-driven[28] – that is to say, technology users cannot use the portal to express demand for technologies, nor to ask follow-up questions about technologies they have seen

[27] When designing this project, we did propose to DFID that we could organise a consultation to provide some feedback by information users as part of the project; but the timeframe was felt to be too short.

[28] The TECA manager, in response to our suggestions, arranged for a 'feedback' field to be added to the interface last year. However, its value is limited as the feedback is apparently only accessible to the site administrator. What we are talking about

on the database, nor to provide feedback to the technology publishers about (a) the content or format of the technology record as a communication tool nor (b) the technology itself. It runs a very real risk of being an information silo.

The portal has the potential to be very much more demand-driven. Such mechanisms are currently being piloted through a growing number of projects including MPAIS in Uganda[29], Telesupport in India[30], SICTAF in Bolivia[31], the global LEAD initiative (see above) and VERCON[32] in Egypt amongst other countries. Below we have tried to apply to TECA some of the lessons learned from these projects.

It should be possible to further develop the portal so as to facilitate greater interaction between technology users and providers. The portal could be transformed from the current 'shop window' that it is to something closer to a 'market place', in which technology users can:

- Articulate their problems/demand for technologies. As one of the team said: *'TECA tries to make decisions for people about what information they need to compare and utilize the technology options'.*
- Give feedback on the technologies they have tried out and the context in which they have validated them. By allowing people who have tried out technologies source from TECA to comment on their experience, this will help to build a more comprehensive and dynamic picture of the validation domain and enable other consumers to make a more informed decision about their technology choices;
- Publish their own knowledge ie add to the database with new technologies or variants they have developed on existing ones;
- Comment on the format and content of the technology descriptions. This feedback can stimulate improvements to the quality and relevance of the technology descriptions;

and in which technology publishers can:

- Edit the content of their technology records (e.g. provide more information on a particular aspect) in response to feedback given;
- Respond to demand by publishing additional technologies.

This will prevent the database becoming a silo because the information is continually being recycled and augmented.

That said, we believe that an element of supply-drive should be retained (as in other market places), as technology users cannot ask for products of which they are unaware. A 'shop-window' element is needed to bring new ideas to organisations and communities that would not have expressed an 'explicit demand' for them, but nevertheless might find them useful[33].

Supporting the exchange of information between providers and users raises some very challenging operational questions; and the difficulties are perhaps exacerbated in a virtual context where they will never meet face-to-face.

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in this section is enabling the feedback to be shared directly with the publisher of the technology record and where appropriate other users.

[29] An online knowledge bank and trading area for agricultural information and advisory services in Uganda, funded by DFID's CPHP (East Africa office). http://www.mpaisuganda.com.

[30] A European-Indian framework to develop and test a model for two-way communication between rural communities in selected regions of India and European and Indian knowledge centres and networks to find solutions to local problems in agriculture and natural resources management. http://www.telesupport.org

[31] A natural resources knowledge network, supported by a web portal and knowledge management tools, that aims to strengthen communication processes at all levels of the sector. Funded by DFID's FIT programme. http://www.sictafpiloto.net.

[32] The Virtual Extension and Research Communication Network model uses ICTs to improve linkages among research and extension systems. A joint FAO-World Bank initiative. http://www.fao.org/sd/2001/KN1007_en.htm.

[33] The distinction between explicit and implicit demand, and the case for some supply-drive to be retained in an information market place, is made by the INNOVA project in BENTLEY, J; THIELE, G; OROS, R; VELASCO, C (July 2004) AGREN Paper 138. Overseas Development Institute.

(i) Currently, one has to have defined the solution to the problem before one can search for it on TECA. The question is: how could one interrogate the TECA database with a problem and find relevant options?

(ii) Even before that, how could one be helped through the diagnostic process to arrive at an accurate definition of the problem in the first place?

(iii) How could one be helped to compare the different options available on TECA? This requires the record to provide all the necessary information (where 'necessary' is defined by the user) and the user to have the skills and confidence to interpret it.

(iv) As mentioned elsewhere in this section, some technologies (this applies to Integrated Pest Management in particular) are most effective when used in synergy as part of a package. This requires cross-linkages to be made within the database.

(iv) How useful is a menu of technologies in isolation? Getting technology into use very often requires supporting interventions e.g. access to credit, market incentives, policy change. SDRR do recognise this and the template for TECA records does ask the writer to assess the factors for success; but we do not feel that the checklist approach is very successful. The checklist is so generic that it does not help the user to compare technology options in terms of suitability to a given context. Without much more detail, a policy maker could not use this information to design effective supporting policy.

Bearing these challenges in mind, we believe the full potential of TECA can only be achieved if it is embedded in capacity-building initiatives to strengthen the absorptive capacity of national innovation systems. In other words, if TECA is linked to regional or national initiatives which:

(a) strengthen skills in information consumption (e.g. integrate the TECA portal with complementary tools and methods such as El Promotor[34] that have been developed to support the articulation of demand and feedback on supply; and

(b) strengthen the enabling environment for the productive use of new technologies, such that TECA is not working in isolation but as part of an integrated programme for strengthening information markets.

Graham Farrell wrote the piece below suggesting blogs or clogs as a mechanism for interaction:

'What is a development web site for? Traditionally it was to document the development process and provide access to outputs of project text and images. We can go further and improve the value of web sites if we move away from the traditional information 'push' model to one that allows for 'pull' as well, by accommodating feedback to deliver personalisation and enhance ownership. This can be achieved through message boards, blogs or community blogs (clogs) to document how beneficiaries and commentators use and develop technologies over the life of a project. This increases the sense of ownership, helps develop community involvement and probably enhances entrepreneurialism in currently unforeseen ways[35].

Lack of access to computers to contribute to blogs/web sites could be limiting and so there is a need to allow uploading of phone messages, as well as text, given the widening access to mobile phones in developing countries, and likely increasing use of camera phones. Existing moblogs (mobile phone weblogs) provide a model.

The power of blogs lies in the sharing and democratisation of knowledge, to;

- *allow feedback from people directly and indirectly involved in technology development during the process, not just at the beginning or end of a project,*
- *facilitate community development, with people coming together for a common cause,*
- *facilitate 'short-circuiting' of development processes,*
- *embed coalitions within the communities they serve,*
- *facilitate community involvement in the technology development process,*
- *enhance the likelihood of micro-entrepreneurialism, probably in unforeseen ways,*
- *provide opportunities for commercial spin off, and*

[34] Developed by Claire Heffernan. See HEFFERNAN, C (2006) The Livestock Guru: Fighting Poverty with Knowledge. Final Technical Report. University of Reading, Reading, UK. 29 pp. http://uploads.vli.co.uk/lpp/disseminations/R8110/R8110%20FTR.pdf.

[35] DFID's *developments* magazine (Issue 31, third quarter 2005) gives a good overview of the value of mobile phone technology as a tool for short circuiting the development process and improving micro-entrepreneurialism and GDP.

- *allow sharing of experiences across regions and countries.*

Blogs can be used for short comments, message boards for longer or broader discussion, with combinations of text, photos and links to other blogs or sites. Blogs can have a wide focus on general development issues but in our context are more likely to have value (and be sustained) if they concentrate on local issues, perhaps cutting across countries or regions faced with similar problems. Blogs will develop in line with the needs of the users, who will determine whether the blog is sustainable.

Given that this is new territory and we do not know whether beneficiaries would use blogs to record their views and experiences of technology development (given that individuals would have to pay for use of the phone) it may best to establish a pilot, with phone hire provided by projects or programmes in the first instance, to seed the idea.

Those establishing blogs (coalitions or project leaders) need editorial guidelines or house rules, a privacy policy and someone to manage the blog(s) to remove bias, spam, illegal behaviour and ensure no harm or offence was caused. There also needs to be some technical oversight to check for factual accuracy. Management and/or technical overview could be provided at regional level if sufficient expertise exists locally'.

Extract from report to NR International by G Farrell

✧ *Decentralising quality assurance (whole team)*

Early on, concerns were raised by the team about the perceived 'poor quality' and 'out of date' nature of some of the technologies already on TECA ('it has not been produced according to the scientific method'...'this is no longer recommended practice'). They feared that this would taint perceptions of the DFID technologies (which the project had decided to screen for quality characteristics) published alongside them on TECA.

Some of the team felt that TECA should be promoting best practices, not existing practices. Either way, a consensus view was that the technology user needs some information about the quality of the technology, however quality is defined.

The current mechanism for quality assurance involves the publisher making a judgement about the extent to which a technology is 'validated'. This has some problems. Firstly, as discussed above, 'validated' need to better defined, and to be assessed in terms of a typology of validation. Secondly, this mechanism relies on the publisher's ability/ honesty to screen their own work in these terms; and on the user's confidence in the publisher.

We understand that the TECA team at SDRR subsequently reviews the uploaded technologies internally and deletes unsuitable records. This centralised mechanism is certainly one way to exercise quality assurance; but the task will grow with the size of the database and requires resourcing internally. Also, updating presents a particular challenge. As technologies are taken up and used and confidence gains in their replicability, how would SDRR come to know about this so they could centrally rescore the technologies?

Given the difficulties and resource-implications of centralised quality assurance, the team suggests SDRR might consider a number of decentralised options for achieving quality assurance, as follows:

Peer review: A semi-decentralised mechanism, which is being trialled in the Telesupport in India. This involves setting up panels of experts to review quality. This is akin to the system of internal review currently in place in SDRR. It is potentially costly and needs managing. Some countries e.g. Uganda have quality assurance mechanisms built into the provision of national advisory services that TECA could perhaps tie into.

The informed consumer: A fully decentralised mechanism. The SICTAF project in Bolivia is considering trialling this. Organisations using TECA to publish technologies are given the tools (e.g. to create a page under the TECA Partners section of the portal) to describe the quality control mechanisms they have used in selecting the technologies and writing the records (as we have done in this report). This would help readers to compare options on the database. They might want to know about its reliability (by what method was the technology developed?) and its replicability (how widely has it been validated?). Like the current mechanism used by TECA, this mechanism relies on honesty and trust, and the reader's ability to interpret what the information provided means for him/her. It is akin to the information that supermarkets provide on packaging about the source of a product and standards to

which it has been produced; or to a British kitemark or the internationally used symbol to denote 'made from recycled materials'.

Proxy indicators: As a variant on the above, users may find that the information currently displayed on the portal about who is using TECA is an adequate proxy for quality. This relies on the user having accurate knowledge about the quality control mechanisms used internally by the publishing organisations.

Developing a brand: TECA could over time come to constitute a brand of quality in its own right.

✧ *Fully decentralise the governance of TECA*

To achieve its maximum potential, we suggest that governance of TECA be transferred to its network of users. This would free up SDRR to refocus its resources away from populating and managing the database content onto facilitating user management of TECA.

One could contemplate a fully user-managed portal where all decisions are made by users through a mechanism that they agree, where users feel that they own the portal and that they are responsible for maintaining standards and keeping the information up to date. The practicalities of operationalizing this model are being explored through DFID's SICTAF project in Bolivia.

After the initial pilots, SRDD is now in a position to demonstrate and create demand for TECA; and to support the development of a sustainable institutional model within which information about existing technologies is compiled, uploaded, shared, evaluated/selected, applied, recycled and augmented. This is probably best developed and sited in-country.

SRDD talks about TECA as 'supporting/supported by a network of users'; but more investment is needed to catalyse and support the creation of this network, drawing on the pilot experiences to date. SDRR recognise that, once a critical mass of information is on the database, investment in marketing TECA will be needed. We note that the partners tend to be Latin American and suggest that SDRR looks also to form partnerships in Africa and Asia particularly in the context of existing 'research into use' strategies.

The early work done by in-house staff to input records was useful in that it created the critical mass of information required to demonstrate the TECA tool. In the long term, however, we suggest it is not appropriate for FAO to do the work of identifying technologies, compiling and inputting descriptions. Rather, this can now be handed over to its users; leaving FAO can focus its own resources on some key central functions:

Firstly, to **be responsible for the quality and relevance of the tool (not the database content**) This would mean focusing SRDD's role onto:

- Designing, building and continually adapting the tool to evolving demands on it;
- Providing (simple) minimum standards for technology exchange;
- NOT compiling descriptions of technologies;
- NOT uploading descriptions of technologies or analysing the contextual factors;
- NOT deciding what should go on or come off the technology database (quality control).

These last three functions can be decentralised; and supported by FAO field offices or other organisations.

Secondly, to facilitate the design of a decentralised model for user-management of TECA. This might include a sustainable financial model, decision-making mechanism, incentives, accountability structures, quality control mechanisms, IPR agreements.

✧ *Marketing TECA*

Graham Farrell points out 'The TECA site needs to be marketed to end users; relying on simple web searches is not sufficient to bring up the records. For example, a search for "farmed fish" (a topic on the TECA front page) throws up 3.2 million web sites on Google but the TECA site does not appear in the first 20 pages, by which time anyone but the most diligent searcher will have given up'.

✧ *How to incentivise the private sector to publish on TECA?*

Publishing technologies on a portal makes it very hard to enforce copyright or patent rules as one is reaching a mass anonymous audience and has no way of knowing what uses are being made of the information. Given this, how can a portal such as TECA (developed as an international public good) promote the exchange of information that has a commercial value, and attract private technology suppliers into the TECA market place?

✧ *Broaden the user group (Farrell and others)*

The explicit strategic focus on smallholder farming was too narrow: there could be a wider audience for these technologies amongst agriculture-linked sectors.

✧ *Intellectual property rights*

There is a conflict often between the conditions under which DFID research funding has been awarded and publication rules of some journals which transfer the copyright to the journal. The research contract with DFID acknowledges that the copyright lies with the author (or his/her organisation). However it also grants DFID retains an indefinite, royalty-free license to the information and it is under this that we, acting on DFID's behalf, have been able to publish on TECA articles and other documents produced by the projects. So far, only one researcher has asked us to either remove from TECA or obtain permission from the journal to publish one of his articles; but we wish to bring this to SDRR's and DFID's attention for the future.