Networking for sustainable development: the Papua New Guinea National Agricultural Information System

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Abstract

The Papua New Guinea National Agricultural Information System (NAIS) is a partnership of seven agricultural institutions, agencies and Government bodies. Funding from the Australian Government in 2000 facilitated the development of a library system for a single institution, but it was the enthusiasm and commitment of agricultural librarians and information officers in subsequent years which led to its expansion to six other institutions. Comprising 18 libraries, it is much more than just a library system. NAIS is a vehicle for providing information access points at various locations in a country renown for its lack of connectedness. NAIS is a means of sharing information between participating institutions, and to the communities they serve whether they be farmers, researchers, extension agents, policy-makers or teachers. It is also an opportunity to support agriculture teachers and their students, by providing access to appropriate learning resources.

Uniquely, NAIS is not connected by wires, and does not rely on any communications technology other than limited access to email. It works because the most basic of tools is employed: the desire among participants to share knowledge and information; to maintain the integrity of the system; and most of all, the desire to reach towards a common, shared vision. The system is structured such that it has no head, although it has a co-ordinator who can be one of many; all its partners take equal responsibility for its management so that even if one partner is constrained in their participation, as so often happens, others can continue to manage. In a country with as many social and political constraints as Papua New Guinea, this is no mean achievement. The approach used and the skills learnt in the eight years since this initiative was conceived are easily adaptable, not just to other countries in the Pacific, but to other developing countries.

Keywords: Information systems, Information networks, Libraries, Information dissemination, Papua New Guinea

Introduction

Consideration of a national agricultural information system for Papua New Guinea (PNG) was put forward formally in 1996 (being a recommendation made at the National SDI Management Workshop, organised by the Pacific Regional Agricultural Programme, 28 October to 1 November), and informally since the first national agricultural librarians’ workshop in Port Moresby, November 1991.

1 The use of the term ‘agriculture’ in this paper should be taken to include forestry and fisheries, i.e. the whole natural resources sector.
In terms of agricultural research and development, information is needed by different categories of people, at different times and in different forms. For example, information is needed:

- by **researchers**, prior to conducting research, to ascertain what work was done previously and the extent of knowledge gained – trial reports, scientific papers;
- by **researchers**, whilst implementing research, to keep abreast of developments in the same or similar area – research journals, studies;
- by **agricultural planners and policy makers**, to inform their decision-making – industry studies, consultancy reports, statistical information;
- by **extension and outreach staff**, as a resource to draw on to respond to farmers’ requests or to create awareness among their clients of new technologies or opportunities – technical reports, newsletters, extension materials in all formats;
- by **farmers**, for information on specific problems, or information about new technologies or opportunities – items in the popular media (newspapers, radio broadcasts), extension materials in all formats;
- by **agriculture teachers**, in support of their teaching – textbooks, basic handbooks, popular and technical periodicals, resource kits comprising extension materials in all formats;
- by **agriculture students**, in support of their learning – textbooks, basic handbooks, extension materials in all formats;
- by **manufacturers**, in terms of opportunities for value-adding, processing technologies and market opportunities – industry studies, market studies, demonstrations and shows; and
- by **agricultural traders** (sellers and buyers), for information about the sector being supported, market opportunities and trading potential – trade catalogues, industry studies, market surveys, trade studies, statistical information.

Clearly, there is a need for information at every level and in all endeavours. Lack of access to information or lack of access to appropriate and credible information in a timely manner compromises the ability of an institution to fulfil its potential or carry out its mission. A national agricultural information system is a means of bringing all relevant resources together so that access to information is facilitated.

**The beginnings**

The opportunity to realise the dream of a national agricultural information system came about in a curious way. In 1999, the author was invited by the Australian-funded ACNARS (Australian Contribution to a National Agricultural Research System) project to design and implement a library and information system for the newly-established National Agricultural Research Institute (NARI). The Institute was created in 1997 out of the Department of Agriculture and Livestock’s Agricultural Research Division, and as such inherited seven research stations located in different parts of the country, and one laboratory in the capital, Port Moresby. If anything provided a test-bed for a national agricultural information system, then responding to NARI’s needs fitted the bill perfectly.

It should be noted at this point that none of the research stations nor the laboratory were connected as part of an integrated computer network, and that at best each site had access to telephones and faxes for most of the time, and email some of the time. The fact that email was available, however limited, meant that it was possible to conceive of a decentralised but shared library catalogue database, with record amendments and additions being moved between the
sites as simple text files. The result was that no matter which research station was visited, the
same shared database would be available. The only library management software identified as
being able to manage this process easily was Inmagic’s DB/TextWorks.

The inclusion in 2001 of what was then the PNG Coffee Research Institute (now
Coffee Industry Corporation (CIC), Research and Grower Services Division) in the system
provided yet further useful experience2. By 2003, the successful integration of CIC into the
NARI system became the incentive to extend the information system to other institutions; it
simply became too great an opportunity to ignore.

Formal discussions on a national agricultural information system (NAIS) were held on
several occasions with different stakeholders in October 2003 and March 2004. Three different
options were identified: (i) the ‘do nothing more’ option which would see NARI and CIC
continue to collaborate, under the sole responsibility of NARI; (ii) extend the system to other
institutions, but rely on NARI to manage the enlarged system on behalf of all parties; and (iii)
extend the system to other institutions, but under a different management structure with equal
partnership and shared management and financial responsibility.

It was decided that the second option provided the best short to medium term outlook
in terms of feasibility and success, but that steps should be taken to begin the discussions that in
the longer term will lead to a greater chance of sustainability of the system, not to say a more
equitable solution. In part, the decision was based on an awareness that it is far easier to make
long-term commitments if there is something tangible to see, rather than some abstract concept.

And then there were seven

Participation in NAIS has never been just about databases and computers, however important
they are; it is about managing information and knowledge assets such that whatever resources
are held contribute towards achieving the objectives of the institution by providing support for
research, outreach and decision-making processes. The best way to manage tangible
information assets such as reports, papers and maps, is to organise them in a library in such a
way as to ensure they are retrievable. This was how the process started at NARI and CIC. The
willingness to share assets was what brought the institutions together as partners, and also
strengthened the resource base.

Each of the five new partner institutions came with a set of assets at different stages of
organisation and usability. New Britain Palm Oil Ltd (NBPOL) is a very successful commercial
enterprise, with a strong albeit commercially-oriented research programme (elite oil palm
seeds). NBPOL not only had an organised library collection at Dami Oil Palm Research Station
(West New Britain), but it maintained a series of EndNote databases comprising thousands of
unique (to PNG) records. So there was a good basis for NBPOL’s inclusion in NAIS. Ramu
Sugar Ltd (RSL) is also a successful commercial enterprise and also had a library collection,
but the organisation was a little idiosyncratic and required the potential user to guess where a
document might be located. To the management’s credit, it was recognised that an organised
and documented library would be beneficial to the company.

The Cocoa Coconut Institute of PNG (CCI) came on board during a time of great
internal organisational upheaval and also with a formidable task. Whereas there is a room set
aside for a library at the CCI Headquarters at Tavilo (East New Britain), there has never been a
library collection. CCI recruited a trained librarian, and the librarian from the NARI station just

2 The reason, at the time, that PNG Coffee Research Institute was able to participate was that they shared a research library
with NARI at a station at Aiyura in Eastern Highlands Province. That was all the leverage necessary.
down the road at Keravat was able to mentor her progress, and help her out with tasks that she was unfamiliar with. Just having someone close to hand is a bonus and an excellent example of the philosophy of ‘shared responsibility’ which imbues the system.

The PNG Oil Palm Research Association (PNGOPRA), a collective of six commercial oil palm enterprises and the PNG Oil Palm Industry Corporation (a smallholders’ association) joined bringing with them their network of three research stations (one of which shared with NBPOL at Dami) and range of technical and research publications.

Lastly, in 2006, the ‘poor cousin’, the national Department of Agriculture and Livestock (DAL) was able to participate, bringing with it a network of agricultural stations, links to Provincial departments of primary industries, and its extensive collection of DAL publications, and technical and consultancy reports.

The agricultural information resource base

With seven partner institutions, encompassing 18 libraries and information centres, the PNG national agricultural information system (NAIS) comprises five components:

- a co-operative library catalogue database;
- a publications database of seven publishers;
- a database of researchers and other specialists in Papua New Guinea;
- a database of institutions and their capabilities in Papua New Guinea; and
- a bibliographic database of Pacific agricultural journal articles (from 1920).

The principal aim of the library catalogue database is to document all materials in the libraries of NAIS partners. However, what is being attempted is a definitive database of all documents on agricultural research and development in Papua New Guinea, and with the new partners coming onboard, that ambition is closer to being realised. This is a unique exercise, not just in Papua New Guinea, but elsewhere in the region. The library catalogue contains records of: books (monographic and in series); individual chapters (if about PNG agriculture); conference proceedings; individual conference papers (if about PNG agriculture); journal articles; dissertations (Masters and above); journal/periodical titles (including books published ‘in series’); unpublished papers, technical reports, trial and survey reports; raw and unanalysed trial or survey data; video and audio recordings; databases; web sites; and electronic documents (e.g. PDF versions of NARI Toktoks). The database was first launched in December 2000; there are 32,797 records in the database (as of 31 May 2008).

As a complement to the library catalogue database, and accessible from the same menu, a prototype database is being trialed, which includes information on all researchers and other technical specialists, mostly at NAIS partner institutions. Data included for each person are their name, position title/s, programme/s, base, contact details, qualifications, disciplines, specialist expertise, particular skills, languages spoken, projects worked on, employment history and a photograph. There are 109 records in this database (as of 31 Dec 2007). Outputs available include staff lists (i.e. by institution), lists of specialists, individual CVs and information on the employing institution such as contact details, mission statement and office locations. A complementary prototype database provides information on agricultural institutions in Papua New Guinea. Data included for each institution are their name, acronym, contact details, type of institution and information on publication and library services. There are 53 records in this database (as of 31 Dec 2007). Outputs available include staff lists (i.e. by institution and department) and lists of specialist institutions.
The ability to prepare publications’ lists is a feature of the library catalogue database; discussed as a separate element. Alongside of this is a database of information on publishers and/or suppliers of agricultural publications in Papua New Guinea. The user is thus able to see what agricultural publications have been published in Papua New Guinea, and find out the cost and where to obtain copies from. There are 735 publications listed from 10 publishers of which six are featured on the main menu. Outputs available include publishers’ lists (by institution), series lists (by series title), and information on the publisher including contact details, distribution points, distribution details (cost of postage, etc.), ISBN publisher codes and series titles.

The Pacific Index to Agricultural Journals (PIAJ) is included by default. PIAJ is an attempt (begun by the author in the late 1980s) to catalogue and index all articles in agricultural journals published in the Pacific Islands region. What makes PIAJ important is that it is the only bibliographic database that contains everything published in 13 agricultural journals, from 1920 until the present day. The database thus represents over 88 years of agricultural research and development in the Pacific Islands. As of 30 June 2005, the database comprised 3,400 records of articles indexed. Outputs available include lists of papers (i.e. by author), subject bibliographies, lists of references and journal indices.

Strengths – or why the system works

If prompted for a spontaneous answer, it could be said that the system works because of the people. There is little doubt that the NAIS operators are a considerable part of the reason for its success. Despite the odd interruption here or there – staff moving on, budgetary constraints, computer and phone problems – two years after the ACNARS project ceased, NAIS is still very much alive. The reason such interruptions have not impacted on the system as much as might be expected is because of the system architecture: there is no head, although it has a co-ordinator who can be one of many. Management of the system relies more on a shared sense of ownership by the operators; that no matter how little or how much a single individual does, it serves a common purpose. It is significant that many of the leading operators have been with the same institution for many years; indeed, several were also participants at the agricultural librarians workshop in Port Moresby in 1991, where the dream was born, so naturally there is a strong commitment to making the system work.

Another dimension, not always noted, is that every participating institution came to NAIS with networks of its own. If information access and information use are goals, then this is a significant benefit. For example, NARI had established a series of research advisory committees, at farmer level; DAL has its links to Provincial agriculture departments; CIC its links to coffee growers. Instead of expecting a single institution or initiative to disseminate agricultural information to one loosely-defined ‘group of farmers’, each and every partner institution can supplement dissemination of its own information resources, to their specific target groups, with information from other institutions. The best example to prove that NAIS is a ‘network of networks’ (which incidentally gave rise to the title of this paper), is to consider the benefits of working with the University of Goroka, and specifically with its agriculture teachers programme. With 400 agriculture teachers in the country, all trained at Goroka, any resources made available to the student teachers necessarily find their way into classrooms throughout the country, and from there into homes in all the villages. Combined with the University of Goroka-led ‘Making a Living Programme’, aimed at school-leavers and intended to reduce rural–urban drift (and all that follows), there is an added incentive for the participating institutions to ensure that their information resources are available to the
University, in a suitable format. The intention is that the University will become a full partner in NAIS, and already has access to the databases.

**Threats – what might stop it working**

The greatest threat to the system as a whole lies in the ‘validation process’. All records contributed to the system, whether new or amended, are checked to ensure that data entry complies and indexing standards are met. Database quality control has not been imposed but is the result of years of discussions and practice, and is something supported by all operators as a way to maintain the integrity of the databases and thus the system. As the system expands, the extent of quality control work increases, but does not become more complicated. Currently there are two operators who are capable of and have experience in validating records. A further two operators are capable of being trained in this role. The strategy is to accept that an operator will move on after a period of time. Provided there are staff in each institution (or at least a staff member in more than one institution) capable of being the validator, then the loss of one will have only limited impact. Recent experience has shown that this strategy worked, when the validator went on maternity leave, and another operator was able to step into her shoes.

Nevertheless, the availability or otherwise of staff, and the skills and level of education they have pose a variable risk to the system as a whole. At the institutional level, if there is no one to manage the library resource and no one responsible for contributing records and updating the databases, then the institution will not benefit from its participation nor investment. At the outset, institutions are required to have at least one staff member available to be trained, and preferably two, the second to act as a backup. However, experience shows that once vacated, positions often remain unfilled for many months or years. The reason why this is such a concern is that it is often quite difficult to fill librarian positions in PNG. In part, this has to do with the dearth of librarians in places where institutions in the agriculture sector are based, i.e. in the rural areas. But it also has to do with the poor level of training of librarians in the country. This situation could be reversed were there to be an alternative approach to training paraprofessional and professional librarians in PNG.

The general level of education of the operators, and in particular, their understanding of the agriculture research and development sector and their role in it, is also a cause for concern. Some of the activities the librarians and operators are required to carry out, such as indexing, require a good general education, and good understanding of agricultural systems. Experience has shown that it is very hard for a trainee to index an article with – to them – an incomprehensible title, e.g. “Meristem-tip culture and virus indexing of sweet potatoes”. With experience, the operator will be able to index such esoteric content, but therein lies the problem: before an operator gains experience, he or she has to have the confidence to muddle through. The solution is to recruit individuals to operate the system who have a good basic education, and some experience of or a qualification in agriculture or natural resources management. However, there are so many useful skills which are learnt by trained librarians that to limit access to these positions just to agriculturalists, fishers or foresters, would also not be in the best interest of the system.

There is a risk that partner institutions will not be able to afford the cost of the small annual maintenance subscription. This will not affect their ability to use the software; it won’t just die. But should an institution not renew its maintenance, it will be out of step with the other institutions. This may not immediately lead to problems, but may do so in the longer term. For example, recent versions of the software would not run on older versions of the Windows operating system, so all institutions had to continue using an older version of the software to
ensure compatibility. This possible risk could be minimised if institutions commit to including
the annual maintenance fee into annual budgets.

In all instances, the matrix-like architecture of the network is a strength when faced
with threats identified above; this system can adapt more quickly to sudden changes than a
system which relies on a more centralised structure.

The future

Three years after opening up the information system to other institutions, a national agricultural
information system is a reality in PNG. There are strong indications that institutions are
participating because they recognise that by co-operating and sharing, they have a greater
chance of meeting their own information needs. Further development of the research and
development capabilities of institutions in the agriculture sector, and of their staff, can only be
realised fully if there is efficient and effective management of information.

Opportunities to expand the number of institutions participating in the system are
limited only by small amounts of funding for the software and training. This is not
insurmountable, especially with the proposed development of a national IT network,
PNGARNET; it is conceivable that it will be easier and less expensive to add more
participating institutions, and provide much better access to the information resources across
the country, at many different levels. Discussions have been held to export the system concept
to other countries in the Pacific, particularly to Melanesian neighbour, Solomon Islands. The
system content itself would be highly appropriate; the system architecture could be ‘adapted’
easily for the local environment; and trainers from among existing NAIS operators could
provide just the sort of training that would be most appropriate. A link-up in PNG between
NAIS and the Pacific Environment Information System, both using the same software, could
bring benefits such as data exchange and technical co-operation and support. This partnership
could be extended to the rest of the Pacific region.

Despite the risks to the system identified earlier, there is a strong commitment by the
NAIS operators to make it work. In discussions with the operators, they have stated that they
know that advice and support will not always be available from projects such as ACNARS, but
that they would do what they could to ensure the system was maintained. To have arrived at this
level of commitment is in itself a big contribution to sustainability. Any future support to the
sector, such as a funding for the national agricultural research and extension system, ought to
include a significant contribution to maintenance and further development of NAIS. Not to do
so would reduce the potential of earlier contributions.

In the near to medium term at least any solution to further development of the national
agricultural research and extension system will have to be cognisant of PNG’s limitations.
Specifically, that the telecommunications system is unreliable and its accessibility limited; that
the power supply is similarly challenged; that there is no fast computer network linking all
institutions in the higher education and research sector, although this might be about to change;
and that the training of librarians and other information workers in PNG is not adequate.
Dealing with these realities will require commitment combined with innovative thinking on the
part of both donors and beneficiaries. NAIS has shown that it is possible to develop a
home-grown solution to a specific need. All involved, especially the librarians and information
assistants, ought to be congratulated heartily on their achievement.
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