

Final Technical Report

ZF0077 - Review of biometrics of non-timber forest products

**Natural Field Computing Limited
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Executive Summary

The harvesting of non-timber forest products is a significant element in subsistence and livelihoods of forest dependant peoples. It is desirable from many perspectives not least food and income security as well as UNCED'92 commitments that such harvesting is undertaken in a sustainable manner. This in turn requires good management planning which itself should be based on sound assessments of resource availability. This project's purpose was to examine the biometric quality of current NTFP resource assessment procedures, to evaluate findings with the aim of developing a research cluster on NTFP inventory to be funded by FRP.

This report covers the initial stages of this programme; the preparation of a background paper on the biometrics of NTFP assessment methods and the funding of an ETFRN research workshop. The research element of the project was the synthesis and evaluation of case studies of NTFP assessment based on a review of published and grey literature available in English. This review revealed that out of the 126 studies examined 15% did not report the protocols in sufficient detail to judge their biometric quality. Of the 97 studies that did report protocols only 40% passed three criteria designed to test for objectivity, replication and plot independence. This is an academic viewpoint on the subject. An ETFRN research workshop was convened at the FAO headquarters in Rome in May 2000 to examine research needs from the users or practitioners perspective. The overall conclusion of the Rome workshop was that there are three main areas which need to be addressed;

- a need to increase awareness of the desirability of sound assessment of NTFP populations and dynamics,
- research to provide better assessment methods especially those that are simple and easy to apply and also adequate for the determination of harvesting levels,
- provision of advice on existing NTFP inventory and analysis methods to field workers.

The outputs of the project are the workshop and the background paper which has been edited and published as number 13 in the FAO NWFP series of publications.

These outputs have been widely disseminated and have begun to stimulate interest and awareness of the complexity of NTFP inventory. The material has been incorporated into university and college level teaching, initiated the preparation of a guidelines for NTFP inventory by FAO, promoted a trial of adaptive cluster sampling for *Prunus africana* and resulted in many requests for direct advice from the project team.

What remains is a need to consolidate and build on the initiatives and interest stimulated by this study.

Disclaimer

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List of annexed papers

- Killmann, W., Preto, G., Russo, L., Vantomme, P., Wilkie, M.L. and Wong, J. (2000) The potential of non-wood forest products in sub-Saharan Africa: towards a better assessment of forest resources providing NWFP. Paper presented to IUFRO meeting April 2000 by FAO, Rome. Unpublished. 9 pp. [Killmann et al paper.doc on floppy disk]
- Ganz, D. (2000) Trip report. Seminar on "Harvesting of non-wood forest products". Joint FAO/EVE/ILO Committee on Forest Technology, Management and Training. Menemen, Izmir, Turkey 2-8th October 2000. Community Forestry Unit, FAO, Rome. [Izmir seminar report.doc on floppy disk]
- Lorbach, J., Russo, L. and Vantomme, P. (2000) Needs and constraints for improved inventory and harvesting techniques for non-wood forest products. pp 191-199 in: UNECE, FAO and ILO (2000) Seminar proceedings: Harvesting of non-wood forest products. 2-8 October 2000, Menemen-Izmir, Turkey. Ministry of Forestry, Turkey. 432 pp. [Hardcopy only]
- Wong, J. (2000) Developing needs-based inventory methods for NTFPs. Report of the ETFRN research workshop held 4-5 May 2000 at FAO in Rome. ETFRN News 32 Winter 2000-2001: 56-59. [Hardcopy only]
- Wong, J.L.G. (2001) Biometrics and NTFP inventory. Paper presented at the IUFRO 4.11 meeting 'Forest biometry, modelling and information science' 26-29 June 2001. Greenwich. 12 pp. [Greenwich paper.doc and NTFP biometrics.ppt on floppy disk]

List of publications presented with report

- Baker, N. (ed.) (2001) Developing needs-based inventory methods for non-timber forest products: Application and development of current research to identify practical solutions for developing countries. Report on workshop held 4-5 May 2000 in Rome, Italy. European Tropical Forest Research Network. ETFRN series No. 2. 103 pp. [On CD-Rom]
- Wong, J. (2000) The biometrics of non-timber forest product resource assessment: A review of current methodology. Background report prepared for FRP project ZF0077. Department for International Development, Forest Research Programme, UK. 174 pp. [On CD-Rom]
- Wong, J.L.G., Thornber, K. and Baker, N. (2001) Resource assessment of non-wood forest products. Experience and biometric principles. Non-wood forest products series number 13. FAO, Rome. 118 pp. + CD-Rom. [On CD-Rom]
- Wong, J.L.G., Thornber, K. and Baker, N. (2001) Évaluation des ressources en produits forestiers non ligneux. Expérience et principes de biométrie. Produits forestiers non ligneux 13. FAO, Rome. 118 pp. + CD-Rom. [On CD-Rom]
- Wong, J.L.G., Thornber, K. and Baker, N. (2001) Evaluación de los recursos de productos forestales no madereros. Experiencia y principios biométricos. Productos forestales no madereros 13. FAO, Rome. + CD-Rom. [On CD-Rom]

Abbreviations

ACP	African Caribbean Pacific region (as used by FAO)
ACS	Adaptive cluster sampling
CD	Compact disk
CD-Rom	Compact disk - read only memory
CFU	Community Forestry Unit (FAO)
DFID	Department for International Development, UK
ETFRN	European Tropical Forest Research Network
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FRP	Forest Research Programme of DFID
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH
IUFRO	International Union of Forest Research Organisations
NGO	Non-governmental organisation
NTFP	Non-timber forest product (term used by FRP)
NWFP	Non-wood forest product (term used by FAO)
OFI	Oxford Forestry Institute
PRA	Participatory rural appraisal
USA	United States of America
USDA	United States Department of Agriculture

Acknowledgements

Many people assisted in the implementation of ZF0077 often with great personal commitment and enthusiasm. Nell Baker assisted in the review while Kirsti Thornber painstakingly re-worked the background paper into a more accessible style. Final editing of NWFP 13 was undertaken by Laura Russo and her team in FAO while Marco Perri put together the CD.

The workshop was a major logistical exercise and thanks are due to Willemine Brinkman, Evelyn Whyte and the webmaster of ETFRN. In FAO thanks are due to Laura Russo, Lois Marcolongo, Tina Etherington and the rest of the conference team. Jane Thornback ably chaired the meeting for ETFRN. The workshop was greatly enhanced by the papers that were prepared, the involvement of the participants and the frequent visitors from FAO.

1. Background

The informal harvesting of non-wood forest products (NTFPs) is an important element of forest use, local livelihoods and subsistence for forest-dependant communities. Over the past decade there has been increasing interest in formalising NTFP harvesting within forest management plans (both those for community forests and state forests) and to as a resource capable of supporting income generating opportunities for rural poor. Unfortunately there has been remarkably little study devoted to the accurate assessment of NTFPs as a biological rather than socio-economic resource. Projects to promote increased harvesting of NTFPs, for improved household nutrition, employment and income, without knowing if increased harvesting is sustainable, would not accord with commitments to UNCED'92. It is therefore appropriate to assist development projects to make accurate and precise assessments of the NTFP resources at their disposal.

To address this shortcoming the Department for International Development (DFID) Forest Research Programme (FRP) initiated the ZF0077 pre-project to consider what research might be appropriate to develop biometric approaches to NTFP assessment. The context and terms of reference for the ZF0077 pre-project are given in Annex 1.

2. Project purpose

The purpose of ZF0077 was to promote the application of biometric principles to NTFP development plans. It is contended that this will increase the chances that resource management will be sustainable and consequently a basis for food and income security for the rural poor who depend on wild resources collected from forested land.

The overall aim of the wider NTFP project is to 'develop experimentally the most biometrically adequate procedures for assessing the standing stock, the production dynamics, the harvestable components and the actual harvests of the main types of NTFPs in the tropics and sub-tropics'.

The study as initially conceived (20 June 1998, see Annex 1) was to be achieved through a series of activities:

- a) background or position paper;
- b) circulation of position paper for comment;
- c) restricted call for proposals to manage long-term project;
- d) selection of project management organisation;
- e) workshop to be organised by the European Tropical Forest Research Network (ETFRN);
- f) issue of sub-contracts to collaborators for comparative experiments on biometrically-adequate methods and the collection of associated data on the costs of assessment;
- g) workshops at intervals for collaborators and for testing of biometrically-preferred methods;
- h) multi-part field manuals, videos, posters etc., for dissemination; it is likely that the manuals will detail a variety of biometrically-adequate methods and provide decision support systems to guide users to select the most appropriate method for their own purposes;
- i) training courses for clients.

This report concerns the ZF0077 pre-project contract intended to undertake activities; (a) the preparation of a background paper and (e) the ETFRN research workshop. These two linked activities were administered under two consecutive contracts with Dr Jenny Wong as the principal investigator and project leader. Since the workshop involved ETFRN and the Food and Agriculture Organisation (FAO) who influenced the development of the workshop it is appropriate to consider the detailed objectives of

each project component separately. It is against these intentions that the outputs of ZF0077 should be judged.

2.1. Purpose of the position paper

The purpose of the position paper was set by FRP in the contract terms of reference as follows. 'A position paper is required to:

- i. examine functional typologies of NTFPs and develop or adapt a typology for the purposes of the project;
- ii. review the biometric adequacy of NTFP assessment methods reported in the formal and grey literature for each major class in the typology, with respect to the production stages mentioned in paragraph 5 above, pointing out both desirable and undesirable procedures;
- iii. draw attention to particular problems with the assessment methods reported to be in use or to have been used, and suggest how they might be solved;
- iv. recommend the types of comparative experiments which should be carried out for each major class of the typology to develop assessment methods congruent with the needs for the production stages mentioned above;
- v. suggest an organisational framework for the efficient implementation of a project to improve the biometric adequacy of NTFP assessment, including provision for expertise broadly dispersed in industrialised and developing countries.'

2.2. Objectives of the Rome workshop

The workshop under activity (e) was funded by FRP and hosted by ETFRN and FAO. After a period of negotiation between these three institutions the objectives for the workshop were established as:

- to highlight the role of biometric rigour and natural sciences in the sustainable development of NTFP exploitation;
- to discuss the needs and constraints of NTFP inventories; and
- to identify and prioritise research themes for further action.

3. Research Activities

A contract covering activity (a) the preparation of the background paper was agreed with Dr Jenny Wong on the 25th June 1998. The draft background paper was presented to FRP in March 1999. After external review the background paper was considered suitable for its purpose (provide the basis for a research workshop) and finalised as Wong (2000a). Subsequently, a contract to manage an ETFRN research workshop was issued to Natural Field Computing Limited on the 25th February 2000 to conduct an ETFRN workshop to present the findings of the background paper and discuss research needs arising from it. This workshop was held on the 4-5 May 2000 at the FAO headquarters in Rome.

The background paper was prepared as a review of literature available in English from within the UK. This included grey material as well as formally published literature. In order to judge the biometric quality of the case studies it was necessary to establish some criteria by which to judge them. It was also found necessary to devise a new hierarchical approach to the development of inventory design which is used as the basis for recommendations in the background paper. Both of these elements of the study benefited from discussions with the Reading University Statistical Support Centre and in particular, encouragement and support from Bob Burn and Sandro Leidi. Nell Baker assisted with the collation of relevant material from Oxford Forestry Institute (OFI) and prepared the draft of the sections dealing with participatory rural appraisal (PRA) and other sociological assessment methods.

4. Outputs

The primary outputs of the study were to be an ETFRN workshop together with a background paper on which the meeting was to be based. This section reviews the findings of the background paper (Wong 2000a) and summarises the discussions at the ETFRN Rome workshop (Baker 2001). As the study developed it became apparent that the background paper was of sufficient interest to warrant formal publication. FAO accepted to publish the paper in their non-wood forest product (NWFP) Series of which it eventually became number 13 (Wong, Thornber & Baker 2001) and translated into French and Spanish. These two outputs, the workshop and NWFP 13 are described in this section with other activities arising from the response to the background paper and ideas discussed at the workshop reported in Section 5 below.

4.1. Results

The terms of reference for the study restricted the background paper to tropical and sub-tropical NTFPs with an implicit bias towards plant based products. As the review progressed it was realised that there is a large body of experience with resource assessment of NTFPs in temperate regions, especially in northern and eastern Europe including Russia and much innovative work in North America and Japan. From the wildlife sector there is also much interest in the development of sustainability criteria for harvesting of bushmeat species and much of relevance in range management. It was therefore decided to extend the scope of the literature search to include animals and northern experience. The case studies used as the basis for the review were drawn from a wide range of disciplines including; biodiversity inventory, social science methods (PRA etc), ethnobotany, econometrics, forest inventory, wildlife management and autecology.

At the end the review identified 126 NTFP resource assessments suitable for analysis. Each study was evaluated against a few simple biometric criteria as follows:

- Reporting of protocols
- Objectivity in sampling design
- Level of replication
- Eliminating pseudo-replication

Of the 97 quantitative studies, 14% did not give details of the sampling design and 26% did not report the exact number of plots used.

Perhaps the most important aspect of a scientific approach is the conscious attempt to achieve *objectivity* and thus avoid *bias*. This is usually interpreted in terms of sampling designs as requiring random sampling but should also include systematic sampling. Examination of the collected protocols revealed that 35% of the case studies had used subjective sampling schemes and are therefore not biometrically sound (though often sufficient for the purpose of the study).

In order to be able to generalise results from what is contained within the sampled locations to the wider landscape it is necessary to replicate samples. Of the 90 studies which reported sample numbers, many (12%) only used one plot which is obviously inadequate for extrapolation. There are no hard and fast rules for determining the number of samples for biometric rigour but 30 is a commonly quoted minimum number. If this is taken as a threshold then almost half (48%) of the studies have inadequate replication. Allied to replication is the need to ensure that plots are independent of each other. It can be argued that this is an impossibility as there is a degree of autocorrelation across landscapes at all scales. However, there were several studies which treated contiguous plots as separate samples, a practice termed pseudo-replication. Touching plots obviously influence each other and should be treated as sub-plots.

Applying the above criteria to the 126 reviewed studies gave the results illustrated in Table 1. The overall conclusion is that only 62% of the studies had reported their protocols in sufficient detail for the three criteria to be evaluated. Only 40% of the studies passed all four criteria. Perhaps the greatest concern is the finding that 43% of resource inventory studies and 90% of yield studies failed in some way. These are studies that generally have quantification as a primary objective. From these results it is apparent that there are biometric concerns with the methods currently used for NTFP resource quantification.

Table 1. Overall biometric assessment of reviewed studies

Study type	Number of studies	Provided protocols (%)	Pass all biometric criteria (%)
Biodiversity	3	66	0
Population demography	9	44	22
Ethnobotany	10	50	20
Experimental studies	5	80	80
Harvesting studies	5	80	60
Resource inventory	42	69	57
Mapping	3	0	33
Inventory methodology	11	64	55
Monitoring	12	50	25
Use of secondary data	6	17	17
Yield studies	13	46	8
Other studies	7	43	14
Total	126	56	38

Nevertheless, not all NTFP assessments need be biometrically rigorous. As in all forms of inventory the methods used need to be matched to information requirements and need not be biometrically rigorous as long as objectives are met and assumptions explicit. However, it is contended that biometric rigour is an important consideration because it can provide reliable, good quality information. Such information is important for;

Livelihoods – giving the right advice: Decisions based on resource assessments can influence the long-term survival of species and thus livelihoods. Over-simplification of complex situations, risking giving poor recommendations, should be avoided. It is critical that community-based assessments provide useful and reliable information – advisors should see this as an ethical obligation.

Secondary use of data – being able to generate a strategic overview: The use of NWFP data by people not involved in the inventory requires some level of standardisation of what is measured and data quality. Without this it is difficult to integrate data from different sources or to place confidence in the results.

Credibility – avoiding political bias: Ensuring that data is biometrically sound can add weight to recommendations based on that information. Where governments have to defend their reasons for setting quotas to those who lobby for higher (industry/trade) or lower (conservationists) levels, reliable data is important.

4.2. Findings of the ETFRN Rome workshop

An ETFRN research workshop was held in Rome on the 4-5th May 2000. This was funded by FRP, FAO, the European Union (EU) and ETFRN. The EU provided sponsorship for eight African participants and FRP for six participants from DFID forestry partner countries. Logistical costs (hotel, meals etc.) were provided by FRP while FAO provided the conference facilities (meeting rooms, conference staff etc.) while ETFRN undertook the workshop arrangements and provided the workshop chair (sent out invitations, organised flights and subsistence expenses). In all 40 participants attended the workshop (see Annex 2).

The workshop was concerned with the scale of the problems identified in current practice and generally confirmed that awareness raising, research into the biometrics of NTFPs and dissemination of best practice was urgently required.

In terms of research needs the workshop identified three scales at which NTFP assessment takes place and suggested priorities for research at each level as presented in Table 2.

Table 2. NTFP quantification needs as expressed by participants at the Rome workshop

Scale	Research priorities
Species	Sampling, assessment, monitoring and analysis
Community	Participatory methods Interface between local and scientific knowledge
National	Integration of data from a wide range of sources Integration of NTFPs in large-scale multi-purpose resource inventory protocols

The scale of the problem is evident in the identification of just about every aspect of resource quantification being identified as a research need. The demand for awareness raising coupled with better delivery of advice on NTFP resource assessment from practitioners present at the workshop was unequivocal. Among these was the provision of biometric advice on the design and analysis of NTFP inventory, the development of innovative designs to improve on the rather low cost efficiency of existing methods and methods for optimising the synergy between local and scientific knowledge.

4.3. Workshop dissemination

ETFRN set up a web page for the workshop and this was used as a forum to continue discussions from May to October 2000. The web page from which the workshop papers and report can be downloaded is still active and can be accessed on the following web page: <http://www.etfrn.org/etfrn/workshop/ntfp>.

The final report of the ETFRN workshop was prepared in May 2001 by Nell Baker (Baker 2001) with ETFRN and FRP jointly funding the editing and printing of the report. In all 250 copies were printed and distributed, along with copies of NWFP 13 to all ETFRN focal points, partner networks in the South and to the European Tropical Forest Advisors Group. The following download statistics indicate the level of interest generated by the workshop and its associated papers and resources.

Table 3. Download statistics from ETFRN website 2000-2001

File	2000			2001						May 2000 to Oct 2001
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
Background paper	85	16	15	36	18	6	16	43	107	710
Appendices	40	7	10	18	10	3	12	35	112	583
Draft workshop report	86	8	4	20	12	2	11	15	5	> 163
Final workshop report									34	241

To support the workshop 50 copies of the background paper (Wong 2000a) were printed and distributed to the participants. In addition to this FAO printed and distributed at least another 100 copies at relevant meetings and to their regional offices, in particular those in southern Africa. Copies were also made available by e-mail on request. It is difficult to gauge how many copies of the workshop papers have been distributed but it seems likely that the workshop background paper and final report have reached 1,000 and 500 people respectively.

4.4. Publication of background paper - FAO NWFP series no. 13

The background paper was accepted for publication by FAO in the NWFP series with the proviso that it was edited and re-formatted for a less academic audience. Provision was made within the FRP budget to edit the document and a sub-contract was issued to Kirsti Thornber of LTSI in October 2000 to prepare a draft publication from the background paper. The draft was finalised and standardised to FAO requirements under the direction of Laura Russo in FAO. Marco Perri prepared a compact disk (CD) to accompany the publication which has the following content:

- text of NWFP 13 in English, French and Spanish,
- searchable database of 400 English references,
- database of protocols for the 126 case studies used in the review,
- databases of more than 100 French references and case studies collated by the GCP/RAF/354/EC project (see below and Annex 4),
- the Winter 2000-2001 ETFRN Newsletter on NTFPs
- the entire FAO NWFP web site as at August 2001.

It was agreed with FAO that FRP would fund the editing of the English document, translation into Spanish and publication of 2000 and 800 copies respectively. In the event, the project was also able to fund translation into French. FAO paid for publication of the French version, an additional print run of English copies, additional editorial inputs and all distribution costs. The first print run of 1,500 English copies was published in September 2001 and was out of print by October. The French run of 1,500 copies came out in January 2001, while the second print run of 1,500 English copies came out in February 2001 and the Spanish also in February 2001. The publication will also shortly be available in all three languages on the FAO NWFP web site: <http://www.fao.org/forestry/FOP/FOPW/NWFP>.

Dissemination and sales of NWFP 13 is the responsibility of FAO. Distribution through the FAO NWFP mailing list will automatically send out around 3,000 copies reaching all FAO partner countries. In addition, FAO has posted announcements on Gyde Lund's Forest Information Update, Unasyuva, NWFP News and the NWFP Electronic Digest (both published by FAO). In order to reach academic and non-forestry audiences review copies of the publication have been sent to 20 English and two French language journals with the intention of sending Spanish copies to relevant journals when they become available (see list in Annex 3). To date, three journals have confirmed that they will be publishing reviews. Reviews are likely to come out over the next six months and it is anticipated that this will generate further demand and sales of the publication.

4.5. Other papers

Several opportunities to present the findings of the project to a wider audience presented themselves during the course of the project. The ETFRN newsletter for Winter 2000-2001 was a special issue on NTFPs and included a short resume of the findings of the workshop (Wong 2000b). The entire newsletter was later incorporated into the NWFP 13 CD-Rom.

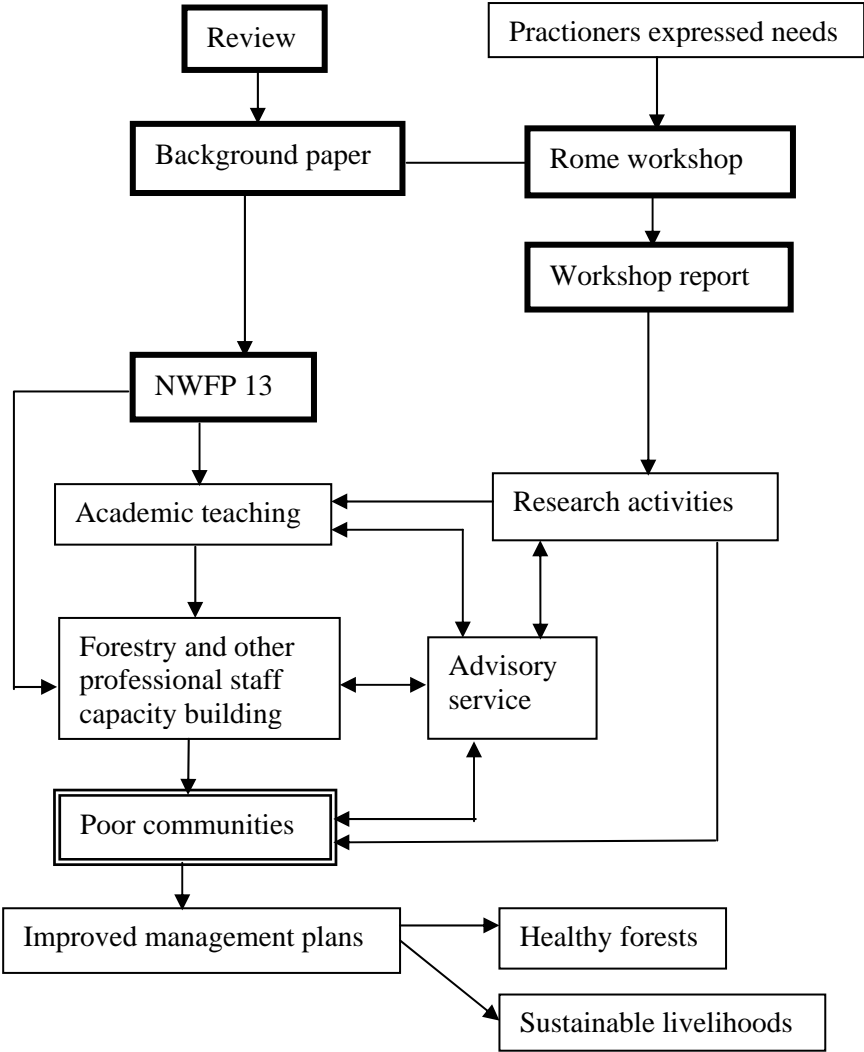
A paper summarising ZF0077 findings (Wong 2001) was presented to the IUFRO 4.11 meeting held at Greenwich in June 2001. This was an ideal opportunity to present the project to an international group of forest biometricians with the intention of arousing interest of specialists to work on NTFP inventory problems particularly the more innovative sampling designs which require statistical research inputs.

A paper on NTFPs in the UK has been requested by the Quarterly Journal of Forestry and will provide a means of applying the findings of the workshop to UK experience.

5. Contribution of Outputs

There are three main outputs of ZF0077 but these are intended to achieve a particular purpose, namely the promulgation of a research agenda for NTFPs in largely the academic world. In order to judge the effectiveness of the outputs it is necessary to consider how the publications will reach and influence the intended recipients and the eventual beneficiaries which are designated as poorer people utilising NTFPs for sustenance or livelihoods. For research which is done in an academic milieu to influence the lives of poor people the findings need to be disseminated and interpreted at many different levels. In order to ensure that this happens requires a concerted effort to sponsor the results through the maze of potential linkages and hiatuses. In the case of ZF0077 at least some of these pathways can be visualised as in Figure 1.

Figure 1. Promotional pathways for ZF0077



It is evident in Figure 1 there are several pathways that lead to poor communities indicated in the double edged box at the bottom from the ZF0077 activities and outputs in the thick outlined boxes at the top of the diagram. Communities could benefit from being partners in the research promoted by ZF0077 as it is recommended that this should be participatory in nature. However, this will only directly benefit relatively few communities, the greatest benefit is indirect through improvements in the quality of the advice and teaching targeted at those who work directly with NTFP harvesting communities.

Capacity building among those who support the communities in their forestry ventures be these NGOs, forestry departments or other development agencies will deliver benefits to many communities. The findings of ZF0077 suggest that this capacity building requires three activities; (a) delivery of current best practice in the form of suitable manuals etc. (b) incorporation of findings and current best practice in teaching at the academic and professional level and (c) research to provide more and better quality advice. Progress towards these is outlined in the rest of this section and this latter activity is perhaps the main pathway by which ZF0077 will contribute to improved forest resource management and thus to sustainable livelihoods for NTFP dependant poor.

Figure 1 also illustrates another delivery agent and pathway, one which could potentially operate as a direct link between research and practice. This has been cast as a technical advisory service which could support research, teaching and provide advice directly to communities on request. The service would provide a conduit to the highest level of technical and academic skills and be available on request. Many of the newer DFID projects are demand led so it seems appropriate to consider how to display the high level of technical advice we wish to put at the communities disposal so that they can appreciate and request it. Given the lack of institutional and funding arrangements to support such an advisory service the only option is to consider whether it can generate its own funding by selling its services in a commercial sense. The idea of an advisory service comes directly from the practitioners present at the Rome workshop were it was touted as potentially the most effective means of disseminating findings and more importantly in raising the biometric quality of NTFP assessments being undertaken and supporting research focused on solving practical problems.

Whether sustainable management results from improved biometric rigour in NTFP resource assessments is outside the scope of this project. Nevertheless it is clear that if the social, tenurial and economic elements are favourable that the biological sustainability of management will be more certain if it is founded on good quality assessments, sound monitoring systems and innovative analysis.

5.1. *FAO NWFP assessment guidelines project*

In January 2000 FAO commenced an EU funded project GCP/RAF/354/EC "Sustainable forest management in African ACP countries". Component 4 of this project concerns the "Development of techniques to assess non-wood forest products". This project component contributed to the Rome workshop principally through the sponsorship of eight participants from sub-Saharan Africa. After the project the interest generated by the workshop prompted FAO to initiate a contract to carry forward the preparation of NWFP assessment guidelines under component 4. The information note describing this work is presented in Annex 4.

Briefly, the contract is intended to develop guidelines for the design of NTFP inventory for use by intermediate level advisors and practitioners (district officer and non-government organisation (NGO) advisor level) in sub-Saharan Africa. The consultancy contract was given to Jenny Wong and it was agreed that the project would adopt the recommendations of the background paper to create generic guidelines and case studies to test and develop new approaches to NTFP inventory. So far an anglophone expert workshop has been held in Lusaka, Zambia with a second francophone workshop planned for February 2002. Three case studies have been initiated in; Zambia for multispecies inventory, Malawi for miombo mushrooms and Kenya for baobab fruit. Three further case studies are anticipated in francophone countries. The project is due to end in December 2002 with the completion of draft guidelines for further evaluation.

5.2. *Teaching*

Two research seminars have been given to the staff and students of the School of Agriculture and Forest Sciences in Bangor (October 2000) and the Renewable Resources Assessment Group of

Imperial College London (10 January 2002). These seminars were attended by staff and postgraduate students.

Much of the findings and recommendations of the study have been incorporated into University level teaching both in the UK and internationally.

- Jenny Wong, has used material in both undergraduate and postgraduate teaching for the School of Agriculture and Forest Sciences in Bangor from 2000.
- Marc Parren has incorporated the entire text of the background paper into a reader on NTFPs for use by the Department of Forestry and Nature Management of Larenstein University of Professional Education in the Netherlands (Parren 2001).
- Coert Geldenhuys has adapted his teaching on forest inventory in South Africa to incorporate material from the background paper (*pers comm.*).
- Nell Baker of OFI has made extensive use of ZF0077 material in a course prepared for Fort Cox College of Agriculture and Forestry in South Africa. The modules were part of the Forestry Diploma in Development Forestry course and will probably be used for other college level teaching in South Africa. They were prepared under the auspices of the Rural Development Forestry Education and Training Project funded by DFID.

5.3. Citation of ZF0077 outputs

Dissemination of ideas and the sharing of literature resources has been taking place since the early stages of the project. The utility of these resources has been demonstrated through citation of ZF0077 outputs in independent publication by several collaborators.

There was a useful and prolonged exchange with the United States Department of Agriculture (USDA) Forest Service Pacific North West Research Station based in Corvallis, Oregon, United States of America (USA), in particular with David Pilz and Becky Kerns. The Corvallis team is engaged with the development of a manual for NTFP assessment for the USA. The first draft of a chapter in the new USDA forest inventory manual (Kerns *et al.* 2000) refers to the background paper (Wong 2000a) and adopts a similar approach to the design of NTFP inventory.

The FAO NWFP branch has largely adopted and promoted the viewpoints expressed in the background paper and Rome workshop. This is evident in the extensive use of material from ZF0077 by FAO in the papers and presentations by Kilmann *et al.* (2000) and Lorbach *et al.* (2000) and distribution of ZF0077 publications at several international meetings. The FAO Community Forestry Unit (CFU) also recognised the necessity of increasing the quality of inventory to support community forestry initiatives as evidenced in the Izmir report by Ganz (2000) to the CFU.

Eric Boa who attended the Rome workshop on behalf of CABI was able to make use of the Eastern European references in the background paper (Boa 2000) for the CABI Miombo mushroom project funded by the DFID flexibility fund.

It is notable that institutions in both the South and North have benefited from exposure to each others work. This is an important function of state of knowledge reviews and of ZF0077 in particular. It is also noteworthy that there is much in common in approaches and issues in NTFP management and there is much to be gained by globalising NTFP assessment advice and research.

5.4. Requests for advice on NTFP biometrics

Perhaps one of the more significant outcomes of ZF0077 has been the confirmation of the demand for biometric advice on NTFP assessment through formal and informal requests for assistance with NTFP inventory design and analysis. Some of these requests have been from PhD students: Tiziana Ulian at Greenwich researching an alpine perennial herb in Venzuela, Lauren Coad at Cambridge and Stephen

Ling at Imperial College both involved with assessment and modelling of sustainable bushmeat hunting.

More formal requests for short term consultancy inputs have also been received. CABI Bioscience requested assistance with the analysis of monitoring data for miombo edible fungi for Malawi. While the Swiss Intercooperation commissioned a review of a draft NTFP assessment manual for four Nepali NTFPs.

Perhaps the most interesting development was the execution of a pilot study of adaptive cluster sampling (ACS) for *Prunus africana* around Mount Cameroon as a prelude to a national inventory. This work was funded by GTZ and DFID and represents the first trial of ACS for a NTFP species. Although the determination of sampling errors was problematic for the ACS data it was judged successful as it provided a great quantity and quality of co-variate data which could be analysed to provide useful insights into the species ecological footprint (Underwood and Burns 2001).

6. Discussion and recommendations

Consideration of the terms of reference in Section 2 indicates that ZF0077 forms a part of a larger project which is intended to include a cluster of research projects and eventual NTFP assessment manuals. Although FRP has not as yet funded these later stages of the project it is clear that the review and workshop have been successful in stimulating activities which contribute to the developments envisaged in the original project concept. In particular, there is the development of teaching based on the findings of the background paper, the initiation of trials of novel NTFP assessment methods (notably ACS) and the development of assessment guidelines (by FAO).

The overall findings of ZF0077 are timely and echoed in other recent reviews (Neumann and Hirsch 2000) and guidelines (Cunningham 2001). In both of these studies it is made clear that there is an urgent need to address the ecological aspects of NTFP utilisation. The ZF0077 work complements these studies by considering the biometrics of undertaking such studies where Neumann and Hirsch (2000) consider the wider implications of successful commercialisation while Cunningham (2001) does not give a comprehensive treatment of sampling theory.

ZF0077 has revealed that it is often not possible to undertake biometric studies of NTFPs because insufficient attention has been given to the development of cost effective sampling designs, data collection, analysis and interpretation. Even where knowledge is good it is locked within disciplinary boundaries and not readily accessible. In order to address these shortcoming there is a need for cross-disciplinary research (particularly using participatory approaches and local knowledge), for training, capacity building, manuals and ideally in the form of a responsive advisory service. All except the latter are provided for within the overall project concept outlined in Section 2 which, having been ratified should be put into operation. The latter falls outside research funding and could potentially be provided in a commercial manner.

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Appendices

Appendix 1: Terms of reference

[file NTFP98.08E]

updated 20 June 1998

Dr. J. L. G. WONG

Terms of reference

Position paper on biometrics of assessment of NTFPs

Introduction

1. Domestic use and national and international trade in non-timber forest products (NTFPs) has declined substantially since the beginning of the twentieth century. Products harvested mostly from natural forests have been replaced by industrial products processed in integrated factories, sometimes using synthesised chemicals to replace natural substances. However, use and trade of some NTFPs has continued or even increased as rising incomes permit households to pay higher prices for products based on renewable natural resources; for example, green forest foliage for floral displays and fungi harvested from the wild command substantial price premia in the Pacific Northwest of the USA. In developing countries, where choices are starker, loss of markets for traditional NTFPs has removed seasonal sources of employment and income generation from relatively unskilled groups. But NTFPs remain important for the poorest of the poor, those whose crops are most likely to fail and leave them with no income, and the landless. In spite of massive urbanisation, absolute number of rural poor and forest-dependent people continue to increase.

2. Damage to residual forest from unsupervised logging was used heavily by environmental NGOs during the 1970s/1990s as a reason for promoting less environmentally damaging forms of forest use. The harvest of NTFPs was advertised, and promoted by some NGOs and the private sector, as being environmentally neutral and sustainable, at least in comparison with uncontrolled tractor logging. Subsequently, participatory assessment of NTFPs was promoted as a means of generating interest in the definition of household and community claims to resource rights (R6352). The promoters of these assessments were sometimes strong on social sciences but almost invariably weak on biometrics. The frequent assessment of multi-stemmed bamboos and rattans, as if they were single-stemmed trees, is an example of the errors.

3. The Government of the United Kingdom re-emphasised its commitment to eradicate poverty in the White Paper on International Development published in November 1997. Projects to promote increased harvesting of NTFPs, for improved household nutrition, employment and income, without knowing if increased harvesting is sustainable, would not accord with the U.K.'s commitments to the UNCED'92 agreements from the environmental summit meeting in Rio de Janeiro in 1992. It is therefore appropriate to assist development projects to make accurate and precise assessments of the NTFP resources.

4. Although NTFPs have been used and traded for thousands of years, remarkably little study has been devoted to their accurate assessment. Forest products so widely and traditionally traded have naturally been taxed, and much of the large volume of legislation on NTFPs concerns their assessment for tax purposes. The FRP study may involve association with the efforts of FAO/FOPW to determine national-levels flows of NTFPs, especially for FRA 2000, but it is not primarily directed to that end.

Purpose

5. The primary purpose of the FRP study is to develop experimentally the most biometrically-adequate procedures for assessing the standing stock, the production dynamics, the harvestable components and the actual harvests of the main types of NTFPs in the tropics and sub-tropics.

6. The study will not deal with assessment methods for products transformed or processed beyond the usual first point of sale. For example, the study might examine methods for determining losses due to cleaning, washing, drying and preliminary grading but would not deal with methods for losses during solvent extraction. The study might take note of methods in traditional or current use for NTFP assessment by households and at local community level, but it is not the purpose of this project to reconcile biometrically-adequate methods with "household" methods. This latter task might be taken up in subsequent projects specific to particular products and communities.

Clients

7. The anticipated clients for this work are community-based organisations, NGOs, private sector and government forest managers who need reliable information for determination and allocation of sustainable yields of particular NTFPs in particular forests (local forest management units). It is assumed that the clients are literate and moderately numerate.

Project sequence

8. The study as currently envisaged would involve the following stages:

8a. background or position paper (see paragraph 9 below);

8b. circulation of the position paper by mail and Internet for comment;

8c. restricted call for proposals to manage a long-term project;

8d. selection of a project managing organisation;

8e. workshop to be organised by ETFRN to agree more precisely on experimental sub-projects, implementing agencies, sub-project logframes with activities and outputs (QQT), accounting and reporting procedures, communication systems between collaborators, publication and promotion methods, training;

8f. issue of sub-contracts, perhaps after bidding processes, to collaborators for sub-contracted comparative experiments on biometrically-adequate methods and the collection of associated data on the costs of assessment;

8g. workshops at intervals for collaborators and for testing of biometrically-preferred methods;

8h. multi-part field manuals, videos, posters, etc., for dissemination; it is likely that the manuals will detail a variety of biometrically-adequate methods and provide decision support systems to guide users to select the most appropriate method for their own purposes;

8i. training courses for clients.

Background or position paper

9. A position paper is required to:
 - 9a. examine functional typologies of NTFPs (including Brown & Shiel, Peters, Stork, Wyatt) and develop or adapt a typology for the purposes of this project. This typology would not necessarily correspond to the groupings used by FAO or for tax purposes. Categories might distinguish motile/sessile; clumped/dispersed; single-/multi-stemmed; fruits & nuts; gums, resins and latex; leaves; lianas, bamboos and rattans; forest cave products; hidden products such as incense wood and tropical amber. The following products should NOT be addressed: timber, fuelwood, charcoal, lac, medicinal plants harvested as whole plants.
 - 9b. review the biometric adequacy of NTFP assessment methods reported in the formal and grey literature for each major class in the typology, with respect to the production stages mentioned in paragraph 5 above, pointing out both desirable and undesirable procedures.
 - 9c. draw attention to particular problems with the assessment methods reported to be in use or to have been used, and suggest how they might be solved.
 - 9d. recommend the types of comparative experiments which should be carried out for each major class of the typology to develop assessment methods congruent with the needs for the production stages mentioned in paragraph 5 above.
 - 9e. suggest an organisational framework for the efficient implementation of a project to improve the biometric adequacy of NTFP assesment, including provision for expertise broadly disprsed in industrialised and developing countries.
 - 9f. be presented in a form acceptable for immediate publication (camera-ready) as a printed document, with full bibliographic apparatus, and also in a form which can be readily loaded into and be accessible from an Internet website.

Resources available

10. It is anticipated that this work will require sixty (60) full days, at a consultancy rate of £ 250 per day. It is likely that travel will be required to study in the libraries in Chatham (NRI), Edinburgh (IERM), Oxford (OFI). E-mail contacts should be established or reinforced with major NTFP working groups, such as those centred on CIFOR (Manuel Ruiz Perez in Bogor and Mike Arnold in Oxford), on FAO (Paul Vantomme and Laura Russo) and on New York Botanic Garden (Chuck Peters).

11. Financial resources have been calculated as:
- | | |
|--|----------|
| ➤ fee for 60 days FTE at a consultancy rate of £ 250 per full day | £ 15,000 |
| ➤ travel and subsistence
(NRIL rules for subsistence are in the body of the contract) | £ 1,000 |
| ➤ miscellaneous expenses, including telecom, copying and printing | £ 500 |

12. An interim invoice may be submitted after 30 days of work, together with a draft which at least covers the sections on typologies of NTFPs, including the recommended typology.

13. Payment of the final invoice is subject to satisfactory external review of the final report.

Appendix 2. List of participants at Rome workshop

	Name	Affiliation
1	Kofi Affum-Baffoe	Forest Service, Ghana
2	El Hag Mekki Awouda	FAOR Office, Sudan
3	Nell Baker	Oxford, UK.
4	Eric Boa	CABI Bioscience, UK
5	Charlotte Boyd	ODI, UK
6	Willemine Brinkman	ETFRN, The Netherlands
7	Jeremy Broadhead	FAO, Rome
8	Esperanca Chamba	FAO, Mozambique
9	Robert de Wulf	University of Ghent, Belgium
10	Yaye Kene Gassama-Dia	University of Dakar, Senegal
11	Michelle Gauthier	FAO, Rome
12	Carol Grossman	University of Freiburg, Germany
13	David Hammond	Iwokrama, Guyana
14	John Healey	University of Wales, UK
15	Christine Holding Anyonge	ICRAF, Kenya
16	Gunilla Holmberg	University of Finland, Finland
17	Peter Holmgren	FAO, Rome
18	Uwem Ite	Lancaster University, UK
19	Christoph Kleinn	CATIE, Costa Rica
20	Jelle Maas	Tropenbos Foundation, The Netherlands
21	Michel Malagnoux	FAO, Rome
22	Pieters Malepe	Community Development Project, South Africa
23	Elaine Marshall	University of Edinburgh, UK
24	Martinez Pascal	FAO, Rome
25	Mpho Mosate	Veld Products Research and Development, Botswana
25	Patrick Moshove	FAO, Mozambique
26	Deep Narayan Pandey	Indian Institute of Forest Management, India
27	Dieter Pelz	University of Freiburg, Germany
28	Ram Prased	Indian Institute of Forest Management, India
29	Giovanni Preto	FAO, Rome
30	Gabriel Robles	CATIE, Costa Rica
31	Laura Russo	FAO, Rome
32	Kate Schreckenber	ODI, UK
33	Charlie Shackleton	CSIR/Environmentek, South Africa
34	Daniel Shallon	FAO, Rome
35	Patrick So	FAO, Rome
36	Phosiso Sola	SAFIRE, Zimbabwe
37	Jane Thornback	Tropical Forest Forum, UK
38	Paul Vantomme	FAO, Rome
39	Mette L. Wilkie	FAO, Rome
40	Jenny Wong	Bangor, UK

Appendix 3. List of journals to which NWFP 13 has been sent for review

ENGLISH	Status
African Journal of Ecology	
Agroforestry Systems	
Biological Conservation	
Biotropica	
Bulletin of the British Ecological Society	
Conservation Biology	
Economic Botany	Accepted
Forest Ecology and Management	
Forest Science	
Forest, Trees and Livelihoods	Accepted
Forest, Trees and People Newsletter	
Indian Forester	
International Forestry Review	
Journal of Applied Ecology	
Journal of Forestry	
Journal of Non-timber Forest Products	
Journal of Tropical Ecology	No longer does book reviews
Journal of Tropical Forest Science	
Journal of Tropical Forestry	
Southern African Forestry Journal	Accepted
Tropical Forest Update	
FRENCH	
Annals of Forest Science	
Bois et Forêts des Tropiques	
SPANISH	Not yet available
Bosque	
Sistemas y Recursos Forestales	

Appendix 4. FAO project information note

Information Note

Sustainable forest management in African ACP countries, Project GCP/RAF/354/EC

Component 4: Development of techniques to assess non-wood forest products

NWFP Resource Assessment Expert Consultation Meetings

Background and justification

The purpose of the NWFP component of the project is to contribute to sustainable forest management in ACP countries by developing and testing practical guidelines for assessment of forest resources providing NWFPs and of the socio-economic context of NWFP production. Such guidelines will enable national forestry administrations to implement improved and regular monitoring of the NWFP resource base and to develop sustainable harvesting regimes in partnership with local and indigenous communities. In line with other project activities, two expert consultant meetings are planned to present current developments in FAO global forest inventory including NWFPs, to share personal information and institutional experience of NWFP inventory and to initiate the field phase of the project. An anglophone meeting will be held in October 2001 and a francophone meeting in January 2002.

General Objective

To develop practical guidelines for assessment of NWFP resources to contribute to sustainable forest management in African ACP countries.

Specific objectives

- (i) The expert consultation meeting will evaluate and further develop a proposed methodological approach to the design of NWFP resource assessments.
- (ii) The meeting will contribute to the identification of priority generic problems in NWFP inventory and make suggestions for protocols to address these problems in a limited number of field tests.
- (iii) Information sharing on current developments in FAO global inventory including NWFPs.

The two expert consultation meeting will include:

- Presentations of the following:
 - The findings of the ETFRN Rome workshop 'Developing needs based inventory methods for non-timber forest products. Application and development of current research to identify practical solutions for developing countries'.
 - NWFP paper 13 'Resource assessment of non-wood forest products: Experience and biometrics principles'
 - Draft guidelines in the form of a decision-support framework for NWFP resource assessment.
 - Current developments in FAO global forest inventory including NWFPs.
- The experts will be requested to:
 - share personal and institutional experience of NWFP inventory,
 - critically review the proposed decision-support framework to ensure that it will address needs and is relevant to practitioners,

- assist in the further development of the draft guidelines,
- to contribute to the development of protocols to address priority problems in the field.

Outputs of the expert meeting consultation

- Information provision for further preparation of draft guidelines for inventory of forest resources providing NWFPs.
- Priority NWFP resource inventory problems identified.
- Development of TORs for national consultants to be contracted to undertake case studies to field test the guidelines on NWFP resource assessment inventory on selected forest products.

Post - expert consultation

Opportunity for further involvement with the project will be provided for participants. Senior inventory professionals may be invited to draft sections of the manual based on a desk review of literature. Practitioners involved in NWFP assessment will be requested to consider undertaking a field trial of the guidelines or to address specific inventory problems prioritised by the meeting. Ideally, the field trials should be complementary to existing work programmes and will be provided with technical support by FAO. Case studies of the field trials will be incorporated into the evolving guidelines.

Number of participants

These consultations are intended for inventory professionals and NWFP practitioners and will be limited to 10-15 participants.

Criteria for selecting participants

- Active involvement / interest in NWFP assessment OR
- Knowledge and experience of forest or wildlife inventory

In practice this means:

- University lecturers responsible for teaching inventory or NWFPs
- Inventory officers from national or state forestry departments
- People in NGOs etc. supporting community resource management
- People from international institutions with an interest in NWFPs e.g. ICRAF, CIFOR (preferably with direct involvement in resource assessment)

Venues : The two meetings are planned as follows:

- Anglophone expert consultation, Lusaka. October 2001. - Organiser: Ministry of Environment and Natural Resources.
- Francophone expert consultation, Yaoundé, January 2002. - Organiser: CIFOR.

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