



Environmental
Change Institute
UNIVERSITY OF OXFORD



Methodology for planning sustainable management of medicinal plants in India and Nepal

Final Technical Report
R8295



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Cover picture: the forest at Baishakheswori, Dolakha District, Nepal

EXECUTIVE SUMMARY

1. The project addresses the question “Can non-timber forest products (NTFPs) provide communities with a reliable livelihood at the same time as conserving species and habitats?” by developing scientific participatory research methods with communities, foresters and facilitators managing forests collaboratively in India and Nepal.
2. It engages with earlier criticisms of participatory research that it is non-rigorous, un-replicable, unreliable and tends to idealise local knowledge, by developing a rigorous approach that is relevant to rural communities in many settings, and provides reliable valid information for adaptive collaborative management.
3. A significant aspect of the research is that it was conducted in the context of common property regimes, under the management of Forest User Groups in Nepal and Village Forest Committees in Karnataka, India.
4. The institutional framework was developed through partnerships with NGOs in each country that have high standing with both policy makers and communities. Each partner NGO invited colleagues to form a project advisory committee, and FUGs / VFCs to form research committees (or task teams, as they were designated in India), in communities where the NGOs already had an established relationship with the FUG / VFC.
5. Participatory methods were used to share existing knowledge, and to identify drivers of change in NTFP populations and forest quality, factors which were under the control of forest user-managers (such as harvest method, or treatment of regeneration) and those which were not (wider socioeconomic factors), and possible changes in management that could improve sustainability.
6. Awareness levels rose during this process and unplanned but valuable outcomes included wider awareness of community forest boundaries and diplomatic negotiations with neighbouring communities to respect boundaries.
7. Scientific principles were used help village research committees formulate testable hypotheses and indicators based on the factors identified. This was a challenging but central step, which sharpened the planning and interpretation of results. The approach developed the concept of ‘business as usual’ or BAU as the reference point, for comparison with experimental treatments. It also proved challenging to define BAU in each case, but again the process led to much reflection and analysis, usually with the conclusion that BAU was not ‘good practice’.
8. A biometrically sound protocol was developed and tested to establish monitoring and experimental plots, in a scientifically and socially acceptable manner in the forest. These were designed to test:
 - a) the effect of management on harvest quantity and quality; and regeneration
 - b) the usefulness of proxy indicators which will be easier for communities to use in assessing yield, avoiding the need for harvest and measurement
 - c) the maintenance of yields over time.
9. Fifteen treatments of eleven species were tested in four communities.¹
10. Results have been analysed by scientists and community research committees leading to revised recommendations incorporated in community management plans. In each case this is the first time that management guidelines for NTFPs have been included in community management plans. Furthermore, and very significantly, VFCs have developed new harvesting rules and management regulations which have been reinforced by foresters. The

¹ Most species were medicinal plants as indicated by the project title, and these are the NTFPs with the highest profile in both countries, but other NTFPs were included to wide the generic application of the methodology.

scientific basis of the participatory approach contributes explicitly to improved respect for each others' knowledge and decisions, between foresters and forest users.

11. Despite constraints (which are discussed in more detail in the report) the methodology contributes directly to DFID's development goals of supporting environmental sustainability in the interests of poor people's livelihoods by providing tools to reduce variability and risk in production, supporting information pathways on which to base adaptive forest management decisions, improving control of access to relevant forest resources, enhancing institutional capacity for information generation and decision-making, and enhancing relations with the state foresters and NGOs.

ACRONYMS

BAU	Business as usual
CFM	Collaborative forest management
CFUG	Community forest user group
CIFOR	Centre for International Forestry Research
CPR	Common property regimes
CTCT	Community-to-community training
DFID	Department for International Development
DFO	District Forest Officer
ECI	Environmental Change Institute
ETFRN	European Tropical Forest Research Network
FECOFUN	Federation of Community Forestry Users, Nepal
FRLTH	Foundation for the Revitalization of Local Health Traditions
FRP	Forestry Research Programme
FTR	Final technical report
FUG	Forest User Group
GIS	Global Information System
GPS	Global Positioning System
ICIMOD	International Centre for Integrated Mountain Development
INGO	International Non-Government Organisation
ISSC-MAP	International Standard for the Sustainable Wild Collection of Medicinal and Aromatic Plants
IUCN	The World Conservation Union
KSFD	Karnataka State Forest Department
MAPPA	Medicinal and Aromatic Plants Programme in Asia
MOU	Memorandum of understanding
NGO	Non-governmental organisation
NTFP	Non-timber forest product
OP	Operational plan
PLC	Project Liaison Committee
PRA	Participatory rural appraisal
RFO	Range Forestry Officer
RNRRS	Renewable Natural Resources Research Strategy
SH	Stakeholder
VFC	Village Forest Committee

BACKGROUND

Researchable constraints:

Sustainable harvesting of medicinal plants by forest-dependent poor people is inhibited by (among many other factors) lack of methods for

- a) measuring the available resource and the impact of harvest on the resource, and
- b) comparing different harvesting practices in an objective and rigorous manner.

The need for the research

The literature, and demand expressed by target institutions and inception workshop participants, are documented fully in the PMF and Inception Workshop Report (annex 108). We demonstrated a convergence of opinion from sources focusing on NTFPs, livelihood strategies of the forest-based poor, participatory biodiversity assessment, collaborative forest management and participatory action research (Carter 1996; Malla 1997; van Veldhuizen *et al.* 1997a; van Veldhuizen *et al.* 1997b; Baker 2000; Lawrence 2000; Lawrence *et al.* 2000; Wong 2000; Cunningham 2001; Wong *et al.* 2001; Shanley & Gaia 2002; Lawrence 2003; Malla *et al.* 2004), that

- a) methods for monitoring population change in NTFPs needed to be based on much more reliable and hence rigorously collected data, subject to biometric analysis
- b) the sustainability of forest resources contributing to the livelihoods of the rural poor needed to go beyond joint monitoring, and actively test alternative management strategies using a participatory research approach.

Furthermore during the course of our own research, the following publications stand out as significant:

The 2005 special issue of Biodiversity and Conservation (volume 14 issue 11) on Monitoring Matters: exploring the potential of locally based approaches, edited by Finn Danielsen, Neil Burgess and Andrew Balmford. In particular, (Danielsen *et al.* 2000) provide important quantitative data on the conservation management interventions resulting from 2.5 years of monitoring by 97 rangers and 350 community volunteers over 1 million hectares of Philippine protected areas. They conclude that 98% of these interventions were meaningful and justified, 47% targeted the three most serious threats to biodiversity at the site, and 90% were implemented without external support, suggesting that the interventions were relevant and could be sustained over time at the local level. Our research goes beyond monitoring to experimentation, but benefits from this important evidence of the impact of participation in forest monitoring.

Again from the ecological perspective, (Ticktin 2004)'s review of 70 studies of the ecological implications of harvesting non-timber forest products has been widely cited and draws important conclusions about 1. the scarcity of information on the ecological implications of harvest; 2. the effect of NTFP harvest on ecological processes at many levels, from individual and population to community and ecosystem and the scarcity of research other than at population level 3. variation in tolerance to harvest according to life history and the part of plant that is harvested. 4. specific management practices *in addition to gathering* are necessary for many NTFP species to withstand heavy harvest. Management practices can be carried out at different spatial scales and some are highly effective in fostering population persistence. And most significantly, after a solid scientific review, she concludes *Researchers and forest managers need to work with local harvesters in designing and evaluating management practices that can mitigate the negative effects of harvest* [emphasis added].

References citing her review include (Olsen & Larsen 2003; Peres *et al.* 2003; Endress *et al.* 2004; Ticktin 2004; Boll *et al.* 2005; Bruna & Oli 2005; Bruna & Ribeiro 2005; Cumming *et al.* 2005; Emanuel *et al.* 2005; Ghimire *et al.* 2005; Nilsen *et al.* 2005; Rodriguez-Buritica *et al.* 2005; Shackleton *et al.* 2005; Trauernicht & Ticktin 2005; Walters 2005a; Walters 2005b; Walters *et al.* 2005) and these will provide an important basis for drawing out the wider scientific implications of our research, which time constraints have not yet allowed.

On the practical front, an important contribution to methods is made by (Stockdale 2005). The manual is available on the internet and is written clearly for a wide and practice-oriented audience. It is a synthesis of methods shared at an NTFP measurement workshop, and our own handbook will be complementary to it, in that it provides a structure and process for planning and monitoring experiments in the *management* of NTFPs, and detail on the statistical analysis.

Concurrently with the timeframe of our project, the German Federal Agency for Nature Conservation has provided support to IUCN / WWF / TRAFFIC and a number of local partners, to develop an International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants. This has taken the form of a framework of criteria and indicators (C&I) currently going through several rounds of testing. Our Indian partner FRLHT has participated in the consultations, and secured funding for a short period of testing through the application of the C&I to the trials established by our partner communities in this project. This process is an explicit attempt to develop a *generic* framework that provides international consistency but within which national and local variations can be developed; the enormous challenges of this have generated considerable debate (see development implications section below for more detail)

Our work is particularly significant in the context of resource management in common property regimes. An emerging trend in the literature that has developed over the course of the project is an increasing focus on the social / natural interface in community forestry, with papers such as (Donovan 2001) asking 'where's the forestry in community forestry?' CFM particularly in South Asia has moved beyond the early challenges of establishing tenure, legal protection and regulation, and the technical skills to develop and implement a management plan, and the discourse now concerns itself with the so-called 'second generation issues' of equity, benefit sharing and organisation-building. Nevertheless this shift in focus can neglect the challenges of bridging the technical / social interface. The concept of *adaptive* collaborative management highlights this, and is here linked with the meagre experience of participatory research / participatory monitoring in forestry, to focus on the development and institutionalisation of the requisite technical skills for sustainable NTFP harvesting, within real social contexts in South Asia. This focus ties in with the high priority accorded to participatory silvicultural research in the survey of research priorities conducted for FRP by this project leader (Lawrence & Green 2000).

Carter, J. (1996) *Recent approaches to participatory forest resource assessment*. London, UK: Overseas Development Institute.

Malla, Y. B. (1997) Sustainable Use of Commercial Forests in Nepal. *Journal of Wood Forest Resource Management* 8: 51-74.

van Veldhuizen, L., Waters-Bayer, A., Ramírez, R., Johnson, D. A. & Thompson, J., eds. (1997a) *Farmers' research in practice*. IT.

van Veldhuizen, L., Waters-Bayer, A. & Zeeuw, H. d., eds. (1997b) *Developing technology with farmers: a trainer's guide for participatory learning*. IT.

Baker, N. (2000) Developing needs based inventory methods for non-timber forest products: application and development of current research to identify practical solutions for developing countries. In: p. 103. Rome: ETFRN.

Lawrence, A. (2000) *Forestry, forest users and research: new ways of learning*. ETFRN, Netherlands.

- Lawrence, A., Ambrose-Oji, B., Lysinge, R. & Tako, C. (2000) Exploring local values for forest biodiversity on Mount Cameroon. *Mountain Research & Development* **20**(2): 112-115.
- Wong, J. (2000) The biometrics of non-timber forest product resource assessment: a review of current methodology. In.
- Cunningham, A. B. (2001) *Applied Ethnobotany: People, Wild Plant Use and Conservation*. Earthscan, London.
- Wong, J., Thornber, K. & Baker, N. (2001) *Resource assessment of non-wood forest products: experience and biometric principles. Non-Wood Forest Products 13*. Rome: FAO.
- Shanley, P. & Gaia, G. R. (2002) Equitable ecology: collaborative learning for local benefit in Amazonia. *Agricultural Systems* **73**: 83-97.
- Lawrence, A. (2003) No forest without timber? *International Forestry Review* **5**(2): 3-10.
- Malla, Y. B., Branney, P., Norris, K. M., Dangal, S. P. & Paudel, K. P. (2004) *Participatory Action and Learning: Training Manual*. DIRD, Reading & LFP, Kathmandu.
- Danielsen, F., Balette, D. S., Poulson, M. K., Enghoff, M., Nozawa, C. M. & Jensen, A. E. (2000) A simple system for monitoring biodiversity in protected areas of a developing country. *Biodiversity and Conservation* **9**: 1671-1705.
- Ticktin, T. (2004) The ecological implications of harvesting non-timber forest products. *Journal of Applied Ecology* **41**: 11-21.
- Olsen, C. S. & Larsen, H. O. (2003) Alpine medicinal plant trade and Himalayan mountain livelihood strategies. *Geographical Journal* **169**: 243-254.
- Peres, C. A., Baider, C., Zuidema, P. A., Wadt, L. H. O., Kainer, K. A., Gomes-Silva, D. A. P., Salomao, R. P., Simoes, L. L., Franciosi, E. R. N., Valverde, F. C., Gribel, R., Shepard Jr., G. H., Kanashiro, M., Coventry, P., Yu, D. W., Watkinson, A. R. & Freckleton, R. P. (2003) Demographic threats to the sustainability of Brazil nut exploitation. *Science* **302**: 2112-2114.
- Endress, B. A., Gorchov, D. L. & Noble, R. B. (2004) Non-timber forest product extraction: Effects of harvest and browsing on an understory palm. *Ecological Applications* **14**(4): 1139-1153.
- Boll, T., Svenning, J. C., Vormisto, J., Normand, S., Grandez, C. & Balslev, H. (2005) Spatial distribution and environmental preferences of the piassaba palm *Aphandra natalia* (Arecaceae) along the Pastaza and Urituyacu rivers in Peru. *Forest Ecology and Management* **213**(1-3): 175-183.
- Bruna, E. M. & Oli, M. K. (2005) Demographic effects of habitat fragmentation on a tropical herb: Life-table response experiments. *Ecology* **86**(7): 1816-1824.
- Bruna, E. M. & Ribeiro, M. B. N. (2005) The compensatory responses of an understory herb to experimental damage are habitat-dependent. *American Journal of Botany* **92**(12): 2101-2106.
- Cumming, G. S., Barnes, G., Perz, S., Schmink, M., Sieving, K. E., Southworth, J., Binford, M., Holt, R. D., Stickler, C. & Van Holt, T. (2005) An exploratory framework for the empirical measurement of resilience. *Ecosystems* **8**(8): 975-987.
- Emanuel, P. L., Shackleton, C. M. & Baxter, J. S. (2005) Modelling the sustainable harvest of *Sclerocarya birrea* subsp. *caffra* fruits in the South African lowveld. *Forest Ecology and Management* **214**(1-3): 91-103.
- Ghimire, S. K., McKey, D. & Aumeeruddy-Thomas, Y. (2005) Conservation of Himalayan medicinal plants: Harvesting patterns and ecology of two threatened species, *Nardostachys grandiflora* DC. and *Neopicrorhiza scrophulariiflora* (Pennell) Hong. *Biological Conservation* **124**(4): 463-475.
- Nilsen, E. B., Pettersen, T., Gundersen, H., Milner, J. M., Mysterud, A., Solberg, E. J., Andreassen, H. P. & Stenseth, N. C. (2005) Moose harvesting strategies in the presence of wolves. *Journal of Applied Ecology* **42**(2): 389-399.
- Rodriguez-Buritica, S., Orjuela, M. A. & Galeano, G. (2005) Demography and life history of *Geonoma orbignyana*: An understory palm used as foliage in Colombia. *Forest Ecology and Management* **211**(3): 329-340.
- Shackleton, C. M., Guthrie, G. & Main, R. (2005) Estimating the potential role of commercial over-harvesting in resource viability: A case study of five useful tree species in South Africa. *Land Degradation & Development* **16**(3): 273-286.

- Trauernicht, C. & Ticktin, T. (2005) The effects of non-timber forest product cultivation on the plant community structure and composition of a humid tropical forest in southern Mexico. *Forest Ecology and Management* **219**(2-3): 269-278.
- Walters, B. B. (2005a) Ecological effects of small-scale cutting of Philippine mangrove forests. *Forest Ecology and Management* **206**(1-3): 331-348.
- Walters, B. B. (2005b) Patterns of local wood use and cutting of Philippine mangrove forests. *Economic Botany* **59**(1): 66-76.
- Walters, B. B., Sabogal, C., Snook, L. K. & de Almeida, E. (2005) Constraints and opportunities practice in tropical forestry: an for better silvicultural interdisciplinary approach. *Forest Ecology and Management* **209**(1-2): 3-18.
- Stockdale, M. (2005) Steps to Sustainable and Community-Based NTFP Management. A manual written with special reference to South and Southeast Asia. . In: pp. 1-191. NTFP Exchange Programme for South and Southeast Asia.
- Donovan, D. G. (2001) Where's the Forestry in Community Forestry? In: *Cultivating Forests: Alternative Forest Management Practices and Techniques for Community Forestry*, Bangkok, Thailand.
- Lawrence, A. & Green, K. (2000) Research and participatory forest management: comparing the priorities of resource users and development professionals. In: *Forestry, forest users and research: new ways of learning*, ed. A. Lawrence, pp. 63-70. Waningingen, Netherlands: ETFRN.
- Belcher, B., Ruíz-Pérez, M. & Ramadhani, A. (2005) Global patterns and trends in the use and management of commercial NTFPs: Implications for livelihoods and conservation. *World Development* **33**(9): 1435-1452.

PROJECT PURPOSE

“New knowledge applied to problems in forest and tree resource management, the resolution of which benefits forest and tree dependent poor people in the forest / agriculture interface.”

where:

- the identified problem = the research constraint described above
- the knowledge applied = accumulated experience in structured experimental method for forestry research, local knowledge, and the use of participatory action learning in collaborative research
- the benefit to the forest-dependent poor being greater reliability of supply of the chosen NTFPs through sustainable harvesting practices, and of income from it, as well as stronger working relationships with foresters and NGOs through proven ability to develop and implement management technologies.



Medicinal plant traders at Bangalore city market, Karnataka, India

RESEARCH ACTIVITIES

The project activities are shown in table 1, which also points to the annexes where each activity is described in detail. This table is a modification of the original activities plan contained in the PMF. The main difference is the addition of a further cycle of research permitted by the extension of the project for one year, allowing us to obtain at least one season of *post-treatment* data, and research stakeholders' reactions to the approach and results.

The approach has built up stakeholder involvement beginning with inception workshops in Bangalore and Kathmandu, to plan the project with all collaborators and invite input from other interested institutions. Their commitment was then cemented through the formation of project advisory committees. Each project partner NGO then approached communities where they are already known, with the idea of starting the project. The communities that chose to participate then formed research committees or task teams, and participated in community workshops to identify threats to medicinal plant populations, suitable species and forest areas for experimentation.

Two villages were selected in each country, representing four different forest types. Community research teams have been formed in each village, known as 'NTFP research committees' in Nepal and 'Task teams' in India. With the support of researchers and NGO staff, they laid out the groundwork for output 2, by conducting a baseline inventory, selecting species for the experiments, developing hypotheses to predict how management would change harvest quantity and / or quality, laying out plots, and preparing data recording sheets established for output 2. The species and treatments are summarised in table 2, and the schedule for treatments in table 3.

A key element in the activities table is the production and use of the statistical protocol (annex 45) which in turn has been refined and incorporated into the overall research protocol

documented in detail in the project handbook (annex 52) which has in turn gone through one cycle of internal review and one of testing with client institutions (annex 139).



Savanadurga task team

The project timeframe of 2.5 years is short for forest-based research, especially where participatory methods require time to build up joint understanding and the organisations (e.g. community research teams) necessary to make this research meaningful. However there were good reasons to start even a short duration project, and partners anticipated and perceive concrete lessons on how we can combine biometrics with the participatory processes of research, as well as initial sets of data which can be taken up by the participating organizations, including the country research partners.

The combination of the three partner organisations brought unique advantages and strengths: ECI (links to wider discourse on research problem and innovation), FRLHT (rich substantive knowledge on medicinal plants, and strong links to government organisations and policy makers in India), and ForestAction (strong participatory research experiences and links to policy makers in Nepal).



Scenes from the inception workshops

Each project partner maintained a strong presence in the research sites, with visits of up to 14 days at a time. This meant that project philosophy and results were constantly promoted and feed back received through informal knowledge networks. Our innovation has been already recognized by the wider stakeholder community (for example Baisakheshwori received the prize for best FUG in Dolakha district, partly as a result of participating in this project).

We write this FTR at a time of maximum communication, reflection and analysis (both quantitative and qualitative), the results of which have not yet been translated into more formal written form. Our priority has been to complete the research cycle which provides the data necessary both for our own analyses, and for the communities to reflect on any changes they wish to implement in their forest management practices. We all feel this has been an unusually productive process, which provides fertile ground for future publications, some of which are indicated in the sections below on outputs and communication.

Within the time available we are feel that the project has achieved considerable levels of interpretation and communication, and consequent interest at national and international level. A contributing factor has been the way the project has been structured, with regular internal cycles of action and reflection (annexes 9 & 101-108). Both partner NGOs employed such approaches in their implementation of the project, and together with the UK partner specialise in such approaches to project management. Furthermore the project budget included adequate funding to allow six exchange visits between country partners to take place (three from India to Nepal, and three from Nepal to India: one each at inception workshop, mid-term review, and project maturity workshop).

Incomplete and modified activities

There are two variations between the planned and achieved activities.

- Due to political circumstances in Nepal at the end of January 2006, the PMW (activity 4.3) was not held there. However Nepal project staff participated in the India PMW.
- Activity 2.9 has taken place, but the OVI is significantly different from that planned.

Both variations are explained below.

Activity 4.3: The project maturity workshop in Nepal was planned for 19-20 January 2006. The community and international participants all arrived for this workshop, and the first meetings were held to reflect on the importance of the research to the community research committees. However early on 19th it became clear that planned political demonstrations on 20th were to be met with a strong reaction by the government, and by the afternoon it was announced that a full daytime curfew was to be held on the very day of our main workshop. As highlighted in international news bulletins this was followed by street violence and killings, and the political security situation has continued to deteriorate. However a second date for the PMW has been chosen for 28 March, when the project leader will be returning from Bhutan and able to join Nepali stakeholders. PMW reports and evaluations will be submitted if this event takes place, although as we write this report rumours are again circulating of a two-week shutdown in late March.

ForestAction adapted timing and form of the activities in a way which was highly sensitive to the changing insurgency situation, to the extent that most project activities were unaffected. However, the political situation in Nepal further constrained the regular dissemination and uptake of results, affecting in particular the relations between NGOs and the state Forest Department. Foresters stationed in the District Forest Offices consider themselves particularly vulnerable to Maoist attack and it is rare for them to venture into rural situations, particularly in

Dolakha District. Unfortunately due to government declaration of local Municipal election none of them accepted invitations to the PMW. In Nepal, the movement of government staff is forbidden for three months before the election. Thus despite the interest of Dolakha DFO to participate in the PMW, the Director General of Forest Department did not/could not ask DFO to leave the district or invite DFO in PMW). More interest and regular interaction was shown by foresters at higher levels particularly in the Ministry of Forests and we believe that good relations at this level will have some effect in preparing the ground for wider dissemination when the situation has moved on from the current unrest.

Activity 2.9: With only one year of post-treatment data in most cases, project partners and communities did not consider it feasible to draw definite conclusions on the maximum sustainable harvest intensity range and methods, nor to draft guidelines on general indicators for monitoring systems. In fact the approach taken by the communities involved, and supported by our partner NGOs, was to review information about the treatments and indicators from three sources:

- their own qualitative impressions of the various management treatments;
- the data produced through the quantitative measurements; and
- the statistical analysis of such data

for each treatment of each species, and discuss action to be taken. For each species the partner NGOs produced systematic reports of the communities' reactions to each hypothesis and action to be taken if any (see annexes 145-147). This led to important data too on the role of statistics in contributing to adaptive collaborative management, which will form the basis for an academic paper in the near future.



Starting the climb down to Baishakheswori's research plots

Table 1. Research activities

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
0.1 Initiation workshop	Planning meeting (PM) Finalisation meeting (FM) Stakeholder workshop (SHW) Community workshops (CW)	To bring together project collaborators, client institutions and other stakeholders (SH) in planning for the project	Participants are those known to the collaborators, who responded to invitations.	17-30 June 03	<ul style="list-style-type: none"> • Workshop report • Resolutions/declarations, Letters of interest • Revised PMF • Study protocols • Promotion strategy • Milestones • ESSN 	All milestones and outputs related to activities 0.1 – 0.6 are contained in the inception workshop report, Annex 108
0.2 Project Liaison Committee (Advisory Committee, Nepal) formation	Members approached formally by FRLHT and ForestAction	Participants at the Indian workshop requested that the FRLHT nominate members of the PLC. In Nepal, organisations from which representative should be targeted for the PLC were nominated (Annex 13, Initiation Workshop Report (IWR))	NA	July 03	PLC member list (Annex 15, IWR)	

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
0.3 Site selection	Annex 10	<ul style="list-style-type: none"> • Prospect finding visit • Consultation of stakeholders 	NA	July 03	Community agreements/ resolution/ decision	
0.4 Community level planning meetings, and decision for conducting research. Local 'task teams' formed	Meetings to discuss objectives, activities, actors, time schedule (work-plan) and resolutions or draft MoU.	<ul style="list-style-type: none"> • Clarity of objectives and commitment to activities, • Trust building, • 'Task team' approach is expected to make future working more manageable 	NA	July/ Aug 03	<ul style="list-style-type: none"> • Task team constitution • Work plan- time schedule • Draft MoUs or resolutions 	
0.5 community research agreements signed	Meetings to discuss objectives / activities.	<ul style="list-style-type: none"> • Clarity of objectives and commitment to activities • Trust building 	NA	July – April 04	Community resolutions signed	

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
0.6 Other collaborators agreed	Meetings, letters	<ul style="list-style-type: none"> • Clarity of contributions (time, accommodation, vehicle etc.) from and benefits for • KSFD & • PLC • Collaborators from IW 	NA	July / Aug 03	<ul style="list-style-type: none"> • Letters of support, • Recommendations • Collaborators decisions from IW. 	
1.1 Species selection	Discussion with communities, FD; prioritisation methods (matrix scoring diagram) see Annex 11, IWR for species selection criteria discussed during inception workshop	<ul style="list-style-type: none"> • By discussion with all SH species of interest to them will be considered as a priority by the project. • Criteria discussed during the Initiation workshop 	NA	Aug 03 – October 03	List of selected species, basic information on habit, habitat, distribution, part used, local name etc.	Annexes 10-12, 36-44, 47-50, 54 & 123

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
		ensure species selection stays within project specifications.				
1.2 PRA, social survey and key informant interviews	<ul style="list-style-type: none"> • Systems diagram, • Seasonal Diagram, • Mapping, • Social survey • Focus group discussions • Key informant interviews, • Trend diagrams, • Time line, • Seasonal changes See Appendix 3 for details	Document different stakeholders' perceptions and experience of the institutional (including tenure), economic, social and ecological situation.	NA	Ongoing	Local context documented - historical trends, folk knowledge of species ecology, drivers, yield predictors, traditional/ current collection methods	Annexes 1, 2, 3, 5, 6, 13, 14, 78, 109-118, 121, 122, 124
1.3 Literature review	Internet, grey literature, reports, libraries etc.	Clarification of current research and methods. Documented information on selected species compiled.	NA	On-going from July 03	Research contexts documented	Annexes 33-44
1.4	<ul style="list-style-type: none"> • Discussion with 	By drawing on	NA	Oct 03 –	Hypotheses & Indicators	Annex 100

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
Formulation of hypotheses and indicators	<p>communities and relevant local SH</p> <ul style="list-style-type: none"> Lessons from literature, past project experience 	<p>information from Activities 1.2 and 1.3, hypotheses can be formulated and participatory, feasible indicators of change suggested.</p>		April 04	(to be refined and tested in Activity 2.2)	
1.5 Documentation and dissemination of research contexts and local practice.	<p>Group discussions with communities and other local SH, with 1-2 visits of 2-3 days each.</p>	<ul style="list-style-type: none"> Discussions can provide better reflection of SH concerns. Oral recognition can be the “soft” benefits to communities participating in the project 	NA	Ongoing	<p>Report prepared and shared with local people and SH (qualitative status of resources & practices prior to intervention), with markers, hypotheses, indicators, methods finalised</p>	Annexes 1, 3, 5, 6, 8, 46, 54-59, 78, 112-118 & 122-124.
2.1 Delimit and stratify the forest and estimate area	<ul style="list-style-type: none"> Develop maps using participatory approaches (transect walks, maps – see , Appendix 3), forest department data and aerial satellite images Stratify forest 	<p>By combining these different types of maps a better representation of the forest will be available. There will be a balance between the number of</p>	Transect walks	Oct 03 - Apr 04	Cartographically accurate map showing forest strata and PRA derived auxiliary information	Annexes 51, 134-136 & 147-148.

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
		strata, accuracy of data and time and resource available to check plots.				
2.2 Develop experimental treatments	By discussion with communities and expert consultation: <ul style="list-style-type: none"> • Revise basic protocol • Determine exact treatments based on experience of 1.4 & 2.1 gauge the feasible work elements 	Treatments suggested in the proposal are modified to suit local conditions, and to test hypotheses / assumptions made in Activity 1.4. Harvesting will be varied by either intensity, method, frequency or timing. Local communities can feel ownership and gain better understanding regarding the protocol	NA	Nov 03 – Apr 04	Revised sampling protocols Experimental treatments noted	Annexes 1, 3, 4, 9, 46-50, 52, 61-68 & 70.
2.3 Preliminary sampling	<ul style="list-style-type: none"> • Random location of 10-20 sample points in strata identified with focal species 	See Statistical Protocol, Section 3 Baseline data	See Statistical protocol, Section 3.	Nov 03 - July 04	<ul style="list-style-type: none"> • Confirmation of locations of focal species • Selection of plot size 	Annexes 47-51 & 79-88.

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
	<ul style="list-style-type: none"> • Determine size and shape of plots • Monitor time to set up plots • Enumeration of number and size of focal species within preliminary sample plots • Rapid qualitative sampling of strata believed not to contain focal species • Data analysis, including bias and accuracy of different plot types 	collection			<ul style="list-style-type: none"> • and sample number required • Selection of plot shape from preferences of field workers • GIS database and field demarcation of sample plots • Estimate of current population size and variance. 	
2.4 Training in sampling and enumeration	<p>See Statistical Protocol (Appendix 4) for details</p> <ul style="list-style-type: none"> • Practical exercise / discussion / workshops • Field workers check for accuracy and precision. 	<p>Community and staff need to be aware of sampling processes, so that it can be used to their advantage in the future. Task teams trained in sampling methods, and</p>	N/a	Jan – Apr 04	Training tools and guidelines	Annexes 51, 52, 54-73, 119, 125 -133, 137-139

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
		enumeration techniques for biological variable and plants.				
2.5 Develop plant yield and quality indicators	Practical / discussion Concurrent with 2.4	We need to find indicators (both locally and scientifically suggested), which are correlated to the yield or quality of the plant. The model will be used to increase the efficiency of future sampling by measuring those variables found to be the most important predictors	As per statistical protocol documented in Inception Workshop report.	Dec 03 – Apr 04	Documentation of chosen indicators and their correlation with yield or quality Measures of yield and predictor variables for random subsets of individual plants	Annexes 89-100
2.6 Set up experimental plots	–Plot number, size, location and shape determined by 2.3. –Random allocation of experimental treatments –Buffer zones set up.	To test hypothesis	As per statistical protocol documented in Inception Workshop report.	Jan – July 04	Map depicting location of plots (and enumeration results)	Annexes 47-51 & 79-88

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
2.7 Enumerate experimental plots	<ul style="list-style-type: none"> • Environmental factors • Plant variables • Control and sample plots must be sampled concurrently just before harvesting 	Plots must be enumerated before harvesting in order to generate baseline data.	As per statistical protocol documented in Inception Workshop report.	Jan 04 onwards Depends on harvest season	<ul style="list-style-type: none"> a) Estimates of plant population size, quality and yield for all forest strata and treatments b) Estimates of harvesting impacts in 05. 	Chapter 1 in Abstracts and papers of PMW (Annex 30a), and Annexes 79-88.
2.8 Data collection and monitoring	<ul style="list-style-type: none"> • Of harvests (quantity and quality) • Of strata in which species do not occur 	<ul style="list-style-type: none"> • Harvest levels must be monitored to assess quantity and quality of product removed from each plot and treatment area • Strata in which species do not occur need to be periodically monitored by rapid qualitative sampling to assess invasion of focal species. • Data collection 	<p>Quality and quantity checks of harvested products</p> <p>Rapid qualitative sampling</p>	Jan 04 onwards Depends on harvest season of spp (N)	Records of quality and quantity of harvested product from each plot	Annexes 79-99

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
		must be ongoing, and responsibility should be gradually handed over to communities.				
2.9 Data analysis	<ul style="list-style-type: none"> Impacts of harvest analysed in 2nd year Different levels of data analysis depending on SH (Repeated measure General linear models; t-tests, chart population size) 	In order that SH can gain the most from the work, they will analyse data themselves at a level appropriate for them to understand and reuse the methods. The most important and useful indicators will be identified.	Na	April 04 onwards	Estimation of maximum sustainable harvest intensity range and methods Draft guidelines on general indicators for monitoring systems	This was not considered feasible by the communities based on the single year of experimental data available in the timeframe of the project. Instead they reviewed their own qualitative impressions, and response to the quantitative results, for each treatment of each species, and produced systematic reports of their reactions to each hypotheses and action to be taken if any. Annexes 69, 101-104, 107, 137,138 and145
2.10 Community assessments	Feedback meetings: results returned to community	Creation of awareness and commitment for	NA	June 04 onward	Report comparing yield from various treatments and with pre-harvest	As above

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
		ownership			estimates	
3.1 Annual Monitoring Review	<ul style="list-style-type: none"> • Discussion of manual • Trainers trained • Discussion of methodology and indicators • Forest visits 	<ul style="list-style-type: none"> • Milestones and markers will be assessed, and concluding strategy devised. • Understand how and to what extent communities can continue gathering and analysing data 	N/a	Oct 04	<ul style="list-style-type: none"> • Updated information documented. • Mid term workshop report 	Annex 140
2.8 Data Collection and monitoring round 2	<ul style="list-style-type: none"> • Of harvests (quantity and quality) c) Of strata in which species do not occur 	<ul style="list-style-type: none"> • Harvest levels must be monitored to assess quantity and quality of product removed from each plot and treatment area • Strata in which species do not occur need to be periodically monitored by 	<p>Quality and quantity checks of harvested products</p> <p>Rapid qualitative sampling</p>	<p>Jan 04 onwards</p> <p>Depends on harvest season of spp</p>	<ul style="list-style-type: none"> • Records of quality and quantity of harvested product from each plot 	<p>As for activity 2.8 (same milestone, previous year)</p> <p>Annexes 79-99</p>

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
		<p>rapid qualitative sampling to assess invasion of focal species.</p> <p>Data collection must be ongoing, and responsibility should be gradually handed over to communities.</p>				
2.9 Data analysis round 2	<ul style="list-style-type: none"> Impacts of harvest analysed in 2nd year d) Different levels of data analysis depending on SH (Repeated measure General linear models; t-tests, chart population size) 	<p>In order that SH can gain the most from the work, they will analyse data themselves at a level appropriate for them to understand and reuse the methods. The most important and useful indicators will be identified.</p>	Na	April 05	<p>Estimation of maximum sustainable harvest intensity range and methods</p> <ul style="list-style-type: none"> Draft guidelines on general indicators for monitoring systems 	Annexes 69, 89-100, 101-104 & 107.
2.10 Data analysis workshop	<ul style="list-style-type: none"> e) Methods of analysing data discussed f) Practice with existing data from 	<p>To aid understanding of statistical methods of analysis for the collaborators</p>	Na	Jan 05	<ul style="list-style-type: none"> Collaborators trained to understand data analysis and continue without excessive support. 	Annexes 52, 69

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
	both countries. g) Cross country learning				<ul style="list-style-type: none"> Training methods included in manual 	
2.11 Community Assessments round 2	h) Feedback meetings: results returned to community	Creation of awareness and commitment for ownership	NA	June 04 onward	<ul style="list-style-type: none"> Report comparing yield from various treatments and with pre-harvest estimates 	Annexes 102-105, 107
3.1 Annual Monitoring Review	<ul style="list-style-type: none"> Discussion of manual Trainers trained Discussion of methodology and indicators i) Forest visits	Milestones and markers will be assessed, and concluding strategy devised. Understand how and to what extent communities can continue gathering and analysing data	N/a	Oct 05	Mid term workshop report	Annex 139-140
3.2 Comparison of indicators	j) Community workshop k) Comparison of indicators between sites and years	To find overlap / gap between scientific and local indicators	N/a	Oct – Nov 05	<ul style="list-style-type: none"> Indicators documented with refinement Draft guidelines on general indicators for monitoring systems 	This was not considered feasible by the communities based on the single year of experimental data available in the timeframe of the project. Instead they reviewed their own qualitative impressions, and response to the quantitative results, for each treatment of each species, and

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
						<p>produced systematic reports of their reactions to each hypotheses and action to be taken if any.</p> <p>Annexes 101-105, 107</p>
3.3 Trainers trained and Training of communities in adaptive management concept and application to local management context	<ul style="list-style-type: none"> • Training of community members (by FRLHT and FA) • Training of Trainers (by AL 	<ul style="list-style-type: none"> • To develop a strategy for adapting the biometric design for use by communities in the future. • Promotion of ongoing monitoring and data collection for the benefit of communities in the future. • To create the realisation of the applicability of adaptive management in local 	NA	Oct 05 – Jan 06	<ul style="list-style-type: none"> • Report on feedback of local community, SH and neighbouring gatherers to finalise monitoring mechanism; • “phase out” strategy for continuation after the project ceases • Training material documented 	See section below on FOLLOW-UP INDICATED/PLANNED And Annexes 7, 52-77, 105-107

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
		management situations				
3.4 Joint SH assessment of the methodologies	<ul style="list-style-type: none"> • SH Workshop including Task Team • Discussion 	<ul style="list-style-type: none"> • Comparison of SH views with the community perceptions and across sites. • To make documentation clear and accessible 	NA	Oct 05 – Jan 06	<ul style="list-style-type: none"> • Response of SH to guidelines • Methodology documented 	Annexes 52, 101-107, 120, 141-144, 146-148, 150-160
3.5 Meta-analysis comparing India and Nepal	Comparison of contexts and outcomes, especially monitoring indicators and protocols. Sharing and reflection	It is necessary to “normalise” ecological and social context across sites in India & Nepal to generate wider applicability, and to make them generic in the regional context	NA	Oct 04 – Mar 05	Information documented	AL, SG, JK, GAK , JR & HL presentations at PMW Annexes 30a and 30b
3.6 Documentation and dissemination of 3.2 and 3.3	Scientific manuscripts, Popular articles in newspapers, magazines, CD, cassettes etc.	Wider dissemination of the project approach, experience and conclusions will	NA	Feb – 05 Jan 06	Journal article submitted Training methods documented. Dissemination list documented	Annexes 10-32, 51, 53, 54-77, 119-121, 125-127, 128, 130, 133, 149-151, 153-154, 156-160, 162-163 Also see list of Annexes.

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
		extend to similar scenarios				
4.1 Production and testing of guidelines	Draft and test decision tree incorporating all possible habits, parts used, indicators for measuring them, ecosystems, harvesting method, breeding system etc.	Thumb rules developed after first harvest impact assessment in '04 would be tested during second harvest	NA	Oct 05 – Jan 06	Field tested guidelines and manuals	Annexes 52, 139, 151, 156-159
4.2 production and dissemination of outputs for all target SH	<ul style="list-style-type: none"> • Policy brief • Dissemination workshop • Discussion workshops with communities • Target task forces • Presentations at existing conferences and workshops on the project 	Wider dissemination to influence policy & management, and enable awareness in different SH groups	NA	Oct 05 – Jan 06	Report on SH feedback for wider dissemination and internalisation; and strategy thereof Policy briefs Workshop documentation	Annexes 20, 25-30, 54-68, 70-77, 159-163
4.3 Training of users (NGOs and foresters other than project)	Training manuals & course modules Workshop	Building capacity amongst users and seeking their feedback for future improvements	NA	Oct 05 – Jan 06	Training Manual and report	Annexes 53-77
4.5 Project	<ul style="list-style-type: none"> • Workshop with other 			Jan 06	Project Maturity	Annexes 30, 52, 162,163

Activity	Method (see Inception Workshop Report)	Justification	Sampling approach	When	Milestone (Output)	Annex
Maturity Workshop	SH <ul style="list-style-type: none"> • Testing of Manual Findings disseminated 				workshop report Findings disseminated Manual produced	
4.4 Install markers for impact assessment	Rationalise reporting mechanism of C & I Discussion with collaborators	Facilitate adaptive management To find out changes / impacts at the community level	NA	Jan 06	Maps & charts in community hall Impact assessment documentation	Annexes 54-67, 70-73, 75-77, 164

OUTPUTS

As an action research project the outputs consist of processes, methodologies and changed attitudes, in addition to data. Given the short project timeframe we have focused on completing two annual experimental cycles in the forest with the communities.

The four outputs are listed below. The **most significant result** is the development and testing of a systematic, rigorous and repeatable process, which provides a *reliable* and *valid* information base for sharing and testing knowledge about NTFP population change and causality, leading to transparency and legitimacy of decision-making *in the context of collaborative management*. The significance of this is reflected in feedback from communities and target institutions documented in annexes to our final technical report.

Output 1 Drivers of change identified, and testable hypotheses and indicators formulated, with local communities and other stakeholders:

The full output is worded: “Factors that influence change in quantity and quality of selected medicinal plants explored and documented, and testable hypotheses and indicators formulated, with local communities and other stakeholders:”

Fifteen treatments of 11 spp. were researched in four contrasting communities (see tables 2a and b and 3). The approach taken was to combine participatory rural appraisal and scientific forest assessment methods to plan a systematic approach to prioritise non-timber forest products, identify possible changes in management that could improve sustainability and locate trial plots in a scientifically and socially acceptable manner in the forest. The formulation of the hypothesis was found to be the most challenging, but also the central part of this process, which sharpened the planning and interpretation of results. Another key part was to separate factors which were under the control of forest user-managers (such as harvest method, or treatment of regeneration) and those which were not (wider socioeconomic factors). As is common with participatory approaches awareness levels rose during this process and unplanned but valuable outcomes included wider awareness of community forest boundaries and diplomatic negotiations with neighbouring communities to respect boundaries.



Examining kurilo, Sundari, Nepal



Gymnema as a potential research species

Table 2a: Experimental treatments for species in India				
Species	Common or local name	Community	BAU Harvest	Test Harvest
<i>Cinnamomum macrocarpum</i>	Tamala patra Dalchinni	Agumbe, Western Ghats. Moist deciduous to evergreen forests	Collect all the leaves by cutting branches and twigs	Collect only the mature leaves Collect only by plucking individual leaves
<i>Vateria indica</i>	Saludhoopa	Agumbe, Western Ghats. Moist deciduous to evergreen forests	Collect all the fruits	Collect 50% of the fallen fruits
<i>Garcinia gummigutta</i>	Muragalu huli	Agumbe, Western Ghats. Moist deciduous to evergreen forests	Collect all the fruits by 2 nd and 3 rd week of June	Collect only the mature fruits Harvest at right time (July first and second week)
<i>Decalepis hamiltonii</i>	Makali beru	Savandurga, Bangalore district. Dry deciduous forest	Harvest all climbers Uproot all the roots	Collect roots from those climbers which are mature Collect only one side of the roots
<i>Feronia limonia</i>	Bela	Savandurga, Bangalore district. Dry deciduous forest	Collect all the fruits at once Collect the fruits by 2 nd week of March	Collect only the mature fruits Harvest at right time (March last week to April 2 nd week) Collect only the fallen fruits
<i>Azadirachta indica</i>	Neem, Beevu	Savandurga, Bangalore district. Dry deciduous forest	Collect all the fruits (includes shaking the trees, beating with sticks) Collect all the fruits at once	Collect only the fallen fruits Collect only 50% of the fallen fruits Collect fruits every 7 th day during the fruiting period
<i>Gymnema sylvestre</i>	Madunashini	Savandurga, Bangalore district. Dry deciduous forest	Collect all leaves Cut branches / uproot climber	Collect only the mature leaves Collect only by plucking individual leaves

Table 2b: Experimental treatments for species in Nepal							
Species	Common or local name	Community	BAU Harvest	Test Harvest 1	Test harvest 2	Test harvest 3	Test harvest 4
<i>Swertia chirayita</i>	Chiraito, Tite	Nawalparasi district. Tropical evergreen <i>Shorea robusta</i> forest, Terai	100% plants harvested in August – September. Plants not nipped and plots not weeded	100% plants collected in November. Plants nipped and plot weeded.	75% plants collected in November. Plants not nipped. Plots weeded.	100% plants collected in November. Plants not nipped, plot weeded	100% plants harvested in November. Plants not nipped and plot not weeded.
<i>Gaultheria fragrantissima</i>	Machhino, Dhasingare	Dolakha district. Deciduous forest, Middle Hills	All twigs from 100% plants harvested from about 60cm height	All twigs from 75% plants harvested from approx 90cm above ground level (where new shoot start to grow)	All twigs from 50% plants harvested from approx 30cm above ground level		
<i>Asparagus racemosus</i>	Kurilo, Satawari	Dolakha district. Deciduous forest, Middle Hills	100% tuber from all plants harvested.	75% of plants harvested entire tuber harvested from each plant. Plants replanted	50% of plants harvested only 50% of tuber taken from each plant. Plants replanted		
<i>Terminalia chebula</i>	Harro	Nawalparasi district. Tropical evergreen <i>Shorea robusta</i> forest, Terai		50% branches lopped (or small branches lopped)	100 % branches lopped (or big branches lopped)	50% of seed / fruit collection	100% of seed / fruit collection

Table 3: Harvesting seasons for all study species

The eleven species covered a range of habit types, including trees, shrubs, climbers and herbs, as well as plant parts harvested (roots, leaves, fruits, bark). Table 2 lists BAU and experimental treatments for all of them, and table 3 presents the annual production cycles for each.

Place	Common name	Scientific name	J	F	M	A	M	J	J	A	S	O	N	D
India														
Agumbe		<i>Cinnamomum macrocarpum</i>												
		<i>Garcinia gummi-gutta</i>												
		<i>Vateria indica</i>												
Savandurga		<i>Decalepis hamiltonii</i>												
	Woodapple	<i>Ferronia limonia</i>												
	Neem	<i>Azadirachta indica</i>												
		<i>Gymnema sylvestre</i>												
Nepal														
Dokakha	Chiraito	<i>Swertia chirayita</i>												
	Machhino	<i>Gaultheria fragrantissima</i>												
Nawalparasi	Kurilo	<i>Asparagus racemosus</i>												
	Harro	<i>Terminalia chebula</i>												



This output has been documented fully in the project handbook (annex 52), and in the India PMW presentations by Anna Lawrence, Giridhar Kinhal, Harisharan Luintel and Sarah Gillett (annex 30b). A more academic analysis will follow. In particular we have recently seen the final outputs from the CIFOR project on ‘Forest products, livelihoods and conservation: case studies of non-timber forest product systems’ (Belcher *et al.* 2005) and intend to conduct an analysis of our species according to the framework used there.

As explained in the handbook, we took as our starting point the model indicated in figure 1, which recognised that NTFP harvesting takes place within a complex system of ecological, socioeconomic, cultural and historical factors. Our approach encouraged participants to identify as much as possible of this system, and then to distinguish between the factors under their control (largely those in the inner circle of figure 1), and those beyond their control (largely those in the outer circle of figure 1). Where the factors in the outer circle permit, it is therefore feasible to attempt to modify the factors in the inner circle through the development of hypotheses to test changes in management. Our own assumptions in this process were that sustainability can only be achieved where communities harvest the product (and therefore have an incentive to maintain populations) whilst maintaining a viable population and supported by a healthy ecosystem.

To support conditions (b) and (c) they must have the tools to assess the viability of the population and health of the ecosystem

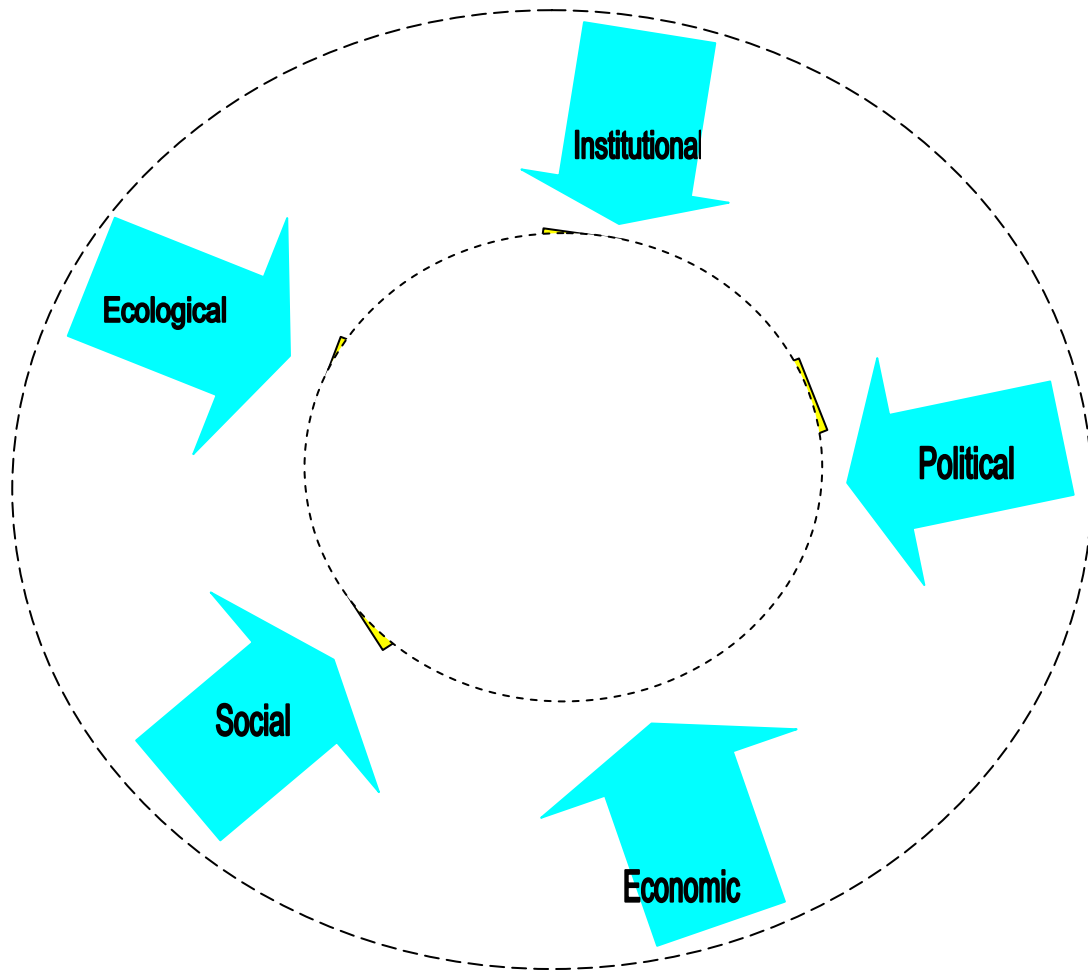


Figure 1: influences on sustainability of harvest

Local knowledge was explored through participatory mapping, causal diagrams, group discussions, interviews etc. The project approach both challenges and validates such local knowledge, because it has helped to validate local knowledge, and to regain respect for traditional healers and medicine, whilst demonstrating to outsiders that forest users routinely observe NTFPs, and any change in quantity and quality of the population. It led to an increase in awareness of many of the species being examined, and indirectly of the forest itself (annexes 105 and 107).



A community discussion of focal species, Baisakbeshwori CFUG, Nepal.

The hypotheses identified are listed in annex 100, with some examples highlighted in Lawrence's presentation at the India PMW (annex 30b). Two hypotheses have been selected to follow through the handbook (annex 52). The process used to identify hypotheses was:

- Through PRA and group discussion, define 'usual' harvesting practice ('Business as Usual' or BAU)
- This in itself can be a challenging task and lead to much reflection among the group
- Propose alternative management regimes that might produce a more sustainable harvest
- Formulate this proposition as a *management* hypothesis (of the form, If [treatment X] then [yield or regeneration Y] because X.
- Propose and formulate as *indicator* hypotheses, indicators to facilitate monitoring and evaluation of the proposed treatments.

There was a complex interchange of ideas and existing knowledge among diverse local actors – such as healers and collectors, and this helped us to carefully locate hypotheses for testing. One important lesson is based on the link between exchange of knowledge (local and scientific) and the subsequent formulation of hypotheses. For example, exchange of information between healers and other villagers led to the suggestion of harvesting only part of the Kurilo (*Asparagus racemosus*) tuber and replanting it (i.e. the villagers learnt from the healers).



Discussing the research plots in Agumbe, January 2005

The process of formulating hypotheses proved to be a challenging one whose usefulness was only realised by forest users at the stage of data analysis. At this point it became essential to refer back to the hypothesis in order to remind researchers what comparisons each trial was testing, and to offer answers to community workshops for their reaction. We also retrospectively found a need to emphasise more clearly the differences between

- A. *management hypotheses* (e.g. *if we change our harvesting practice, then regeneration will increase because more fruits will be available for reproduction*) and
- B. *indicator hypotheses* (e.g. *there is a significant correlation between stem diameter and tuber weight, which allows us to predict yield or monitor productivity without digging up the tubers*)

as the conceptual differences were not obvious to participants in the early stages. By linking each type of hypothesis to a statistical test (broadly, testing for significant differences between treatments, and testing for correlation between indicators and yield), the relevance of this difference became clearer.

We will be writing up this aspect of the research in a paper based on process analysis using action research methodologies².

Output 2 Hypotheses and indicators tested experimentally by combining biometric with participatory methods:

Appropriate statistical methods have been simplified, tested and applied to the interpretation of data from community plots. We have on the ground a experimental protocol, and first two sets of data, which can be continuously built upon by the local communities, and if funding efforts are successful, with active support from the country partners. An explicit comparison of community expectations, qualitative impressions from monitoring trials, and interpretation of statistical results presented by non-government organisations and foresters, is now available.

² Peter Reason and Hilary Bradbury (2006) eds. Handbook of action research: concise paperback edition. Sage, London 362 pp.

This output has been documented fully in the project bulletin (annex 9), handbook (annex 52), and in the India PMW presentations by Anna Lawrence, Giridhar Kinhal, and particularly James Keirstead (annex 30b). A more academic analysis will follow. Through the project we referred to the three principles of good design (see protocol, annex 45):

- Representation
 - Get a fair sample of the population
- Randomization
 - To avoid systematic error
- Replication
 - To increase confidence in results

Lessons on the *process* of hypothesis testing are summarised under output 1.

We emphasise here that the project timeframe allowed for one year of baseline data collection, and one cycle of treatment and further data collection. Results to date therefore allow us to test the *usability* of statistics in an adaptive collaborative management context, but not to draw firm conclusions about the results of the management changes themselves, nor about the sustainability of any given practice, nor about the reliability of a given indicator.

In summary, three types of data, and tests, are needed.

monitoring: to test the sustainability of ‘business-as-usual’ harvesting regimes (BAU), and / or any alternative harvesting regime;

experimentation: to test the effect of management on harvest quantity and quality, and on total yield, and on regeneration;

the usefulness of proxy indicators which will be easier for communities to use in assessing yield, avoiding the need for destructive measurement.

The collected data consisted of details about each plot (e.g. location, soil type, canopy cover and so on) as well as information on specific individual plants (e.g. height, girth, evidence of animal grazing, fruit weights). The treatments were then applied to the plots, keeping BAU and control plots for reference. Full details on how the plots and treatments were prepared can be found in the statistical protocol (Annexes 45 and 47-50).



Measuring NTFP yield in (left) cinnamom trees, Agumbe; and (right) Gaultheria fragrantissima, Baishakheswori

There were two primary challenges in this output. First when selecting treatments, the communities frequently wished to combine treatment variables, for example, by changing both harvest intensity and time period. This meant that the statistical power of the collected data was reduced and the results could only reveal the effect of the entire treatment and not the individual parameter changes. This practice was discouraged during the design phase but the communities were keen to continue with these hybrid treatments, even when it was explained that the results may be less useful.

The second challenge was dealing with the collected data. During the first year, some of the data spreadsheets were poorly presented, making it difficult to know how the data had been collected and what the tabulated values meant. For example, the data contained many zero values but it was uncertain whether these values meant that the parameter had been measured and the value was zero, or if the parameter hadn't been measured and zero was entered as a placeholder. After a discussion, protocols were agreed for both the design of the spreadsheets and the recording of data (annexes 79-88).

Both of these barriers are discussed in greater detail in the handbook case studies (annex 52).

Output 3 Methods evaluated by relevant stakeholders and recommendations made for management plans:

Changes have been made to the management plans by all four communities. Evaluation of methods has been documented in detail and incorporated into the handbook. At community levels of decision-making, the rigorous and systematic process has more effect than the statistics themselves, and in India some changes were made to harvesting practices and community rules as a result of the participatory appraisal workshops and forest assessment, before any experiments had been conducted. In Nepal the participating communities are more isolated and neglected by the state forest services, and are consequently more sceptical and hesitant to make management changes. Nevertheless changes to the management of two species have been endorsed in their

management plans, and one community has embarked independently on a survey of other non-timber species in their forests. The handbook has also been tested with relevant stakeholders in workshops in both India and Nepal. Comments and feedback from this workshop have been incorporated into the content and design of the handbook.



Research teams from Savandurga Task Team, FRLHT, ForestAction and ECI visit research plots in Savandurga

At community level, the project approach allows for the explicit comparison of four levels of understanding and rigour, which provides important material for a methodological analysis to really test the usefulness of both rigorous experimental method, and the application of statistical tests:

- a) Community hypothesis (before monitoring or experimentation) (Annexes 101-104 and 107)
- b) Community impression of results (based on regular observation of plots) (annexes 101-104 and 107)
- c) Statistical significance as interpreted by technical advisers (annexes 89-100)
- d) Community's response to statistical significance (annexes 106 and 107).

The comparisons required for item (c) have already been discussed under output 2. This section focuses therefore on the other three, before discussing evaluation of the methods by other stakeholders.

Towards the end of the project, each partner organisation held workshops in the participating communities to compare items (a) to (d). These workshops are summarised in annexes 101-105 (Nepal) and 107 (India). The partner organisations also used this as the basis to facilitate discussion in the Village Forest Committees (VFCs) (Karnataka) and Forest User Groups (FUGs) (Nepal) about the management implications. On the whole, the VFCs were more convinced by the experimental treatments than were the FUGs, and implemented immediate changes to their microplans. Both FUGs on the other hand reserved judgement about changing species management and chose to continue with the experiments for a further year (with committed support from ForestAction for another year after that).

The community reports also briefly present a summary of the statistical analyses performed. It was suggested that as a minimum the presentation of this data should include the name of the test, the null hypothesis, the test statistic and resulting significance values; additional detail (i.e. source data or detailed reports) should be available to support these figures. Initially the project partners faced some challenges in selecting the correct tests and applying them appropriately. However by staying with basic statistical techniques (e.g. t-tests, regressions, ANOVA) and by providing some training (e.g. screenshot tutorials of each methods and a decision making flow chart, see annexes 52 and 69) many of these issues were resolved. While there are minor issues with the statistical data presented in the final community reports (e.g. missing p-values), the results are presented clearly and it is easy to compare the statistical outcomes with the community perceptions.



Discussing the research plots in Baisakheshwori

In both countries changes have been made to community forest management plans – the microplans in the case of India, and the operational plans in the case of Nepal as follows:

Agumbe (Western Ghats, Karnataka) had no microplan and is now preparing one to include suitable NTFP harvesting levels (see annex 146);

Savandurga: The Five Year existing microplan is due for revision. The Executive Committee of the VFC has decided to incorporate a separate chapter for evolving sustainable harvesting of NTFPs in the revised microplan (see annex 146).

Baisakheshwori (Dolakha District, Nepal) have incorporated the map made in collaboration with ForestAction, based on the use of GPS map (the first in the district); and have included the design of their experimental plots in the OP. See annex 147.

Sundari had recently carried out their 10-year plan so modifications were less formal. See annex 148.

In the Karnataka case these changes have been made in collaboration with the Karnataka State Forest Department (KSFD) as part of the Joint Forest Management process (Annex 74 & 159-161). The close cooperation between FRLHT and the KSFD has been a major

benefit to the project, enabling a strong state-wide sense of ownership of the project results and commitment to their use and implementation. This NGO-GO cooperation was not possible to a similar extent in Nepal for the reasons discussed under ‘Activities’.

In addition, the methodology has been evaluated by the research team and target institutions, and recommendations consolidated into the handbook – see annexes 52 and 139. Target institutions and national / international policy advisers assessed the project methodology and provided responses documented in the India PMW (annex 162) [Nepal PMW pending].

Output 4 Project lessons synthesised and promoted:

We have conducted much reflection on, and documentation of, project lessons, as witnessed by the many annexes to our final technical report. However we are by no means finished with this stage, for two reasons: the short time available (our priority was to complete the second cycle of data collection), and the wealth of experiences this has generated for all the involved stakeholders, and consequent interest amongst target institutions. Most significant at this stage is the India project maturity workshop attended by 18 non-government organisations from 7 states, senior Indian Forest Service staff from 5 states, the head of the National Medicinal Plants Board in search of policy recommendations, and international staff from IUCN and ICIMOD. Participants coined the slogan ‘putting the science back into forestry’ indicating an appeal to foresters who have been alienated by a perceived over-qualitative focus of participatory research. Our efforts have been concentrated on reaching consensus about the form in which to promote the methodology through the handbook (included as a final draft in our final technical report), and on the project maturity workshops.



Members of Savandi VFC task team present examples of study species and products at the PMW, Bangalore, January 2006.

Our promotion strategy (see annex 12 of annex 108 and Annex 24a) was planned thoroughly as part of the Inception Workshop, with some additional ideas added at the IMA workshop in Bangkok in December 2004 (see annex 24b for changes). Numerous stakeholders have been contacted throughout the project with carefully targeted promotional materials. These are all provided in the List of Annexes, and Table 4

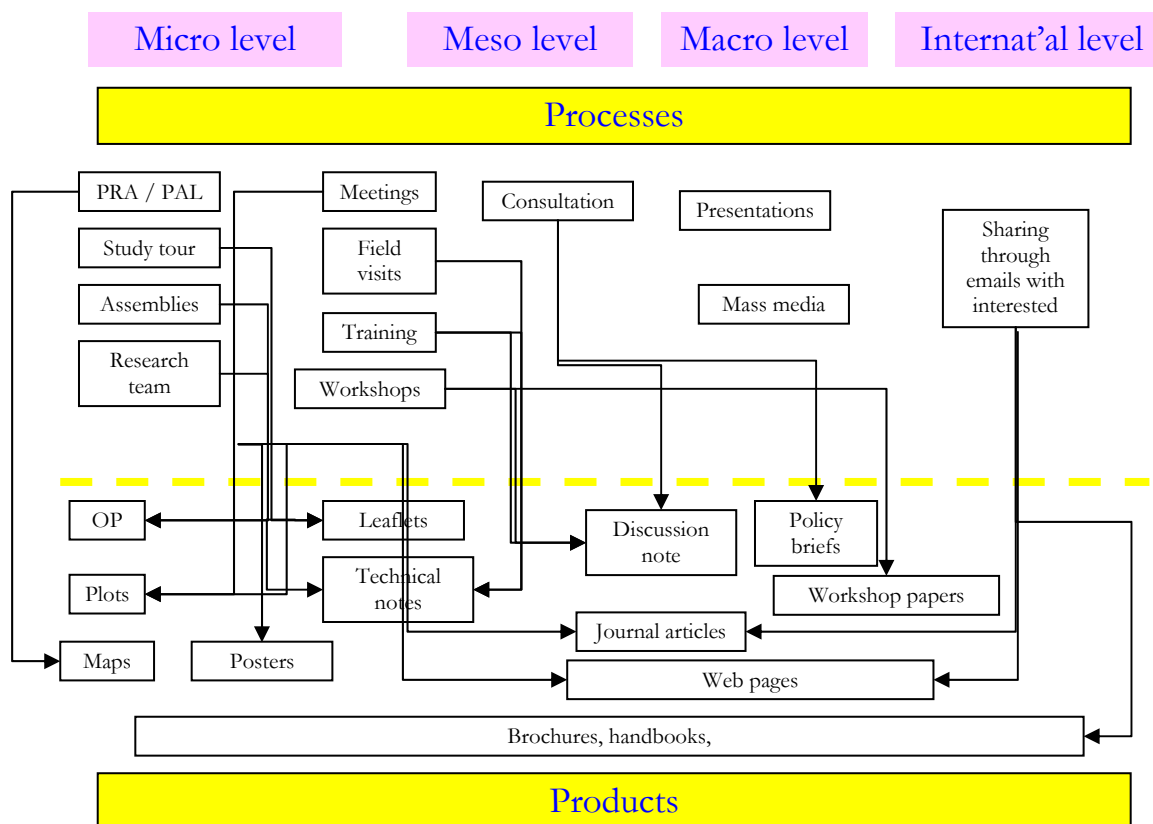
provides a summary of target stakeholders, the types of dissemination and promotion materials they've received and the corresponding Annex numbers.

Table 4: summary of promotion strategy

Target stakeholders	Type of material	Corresponding annexes
Communities	Brochures	Annexes 1, 2, 3, 4, 5, 6, 7
	Posters	Annexes 54-67, 70-73 and 75-77
	Community-to-community training	Annex 53
	Newspaper articles	Annexes, 13 & 17
	Study tours	Annex 120
	Festivals	Annex 150, 153 and 154
	Workshops	Annex 26
Forest Departments	Training	Annex 74
	Workshops	Annex 30 and Annexes 162 & 163
	Proposals for uptake and institutionalisation of methods	Annexes 159-161
	Handbook	Annex 52
	Technical notes	Annexes 10-12 and 15
	Newspaper articles	Annexes 13 and 17
	Manual testing workshop	Annex 139
Research institutions	Fact sheets, case studies and methodologies	Annexes 1-9, 36-44, 45 and 53
	Manual testing workshop	Annex 139
	Scientific articles and book chapters	Annexes 10-12, 15, 16 and 18
	Conferences and workshops	Annexes 21- 32
NGOs	Workshops	Annex 26
	Articles	Annexes 10-19 (including articles in local language)
	Manual testing workshop	Annex 139
	Handbook	Annex 52
	Internet	Annexes presented on websites
	Conferences and workshops	Annexes 21- 32
Media	Articles	Annexes 13, 14, 17 and 19
Policy makers	Policy briefs	Annex 20
	Articles	Annexes 13, 14, 17 and 19

The promotion strategy was conceptualised as indicated in figure 2 (see also annex 24):

Figure 2: diagrammatic representation of promotion strategy presented at IMA training workshop, Bangkok, December 2004



An initial joint assessment of the policy implications includes changes which need to take place to provide the necessary facilitating environment. We summarise them as follows:

- In many countries the economic potential of NTFPs is emphasised at the expense of attention to sources, sustainability and capacity building for NTFP management. Strong political enthusiasm for NTFPs can raise hopes and harvests, but lead to over-harvesting. The procedures need to be in place for joint researching of management options.
- Nepal has developed a new NTFP policy which focuses on the economic potential of NTFPs especially for the poorest parts of the country (which are also those most affected by the insurgency). This policy would benefit from translation into Act and Regulations.
- Both India and Nepal need to revise their procedures for microplans (VFC level, India), Working Plans (Forest Division level, India) and Operation Plans (FUG level, Nepal) to include NTFPs; without official recognition of the need for management planning of NTFPs it is difficult for participating communities to channel and institutionalise their findings;
- Government forestry guidelines, such as those on forest inventory, need to include NTFPs
- NTFP harvesting regulations must be developed locally and with the communities, in order to be relevant to the context and to be accepted (and implemented) by the communities.

- The kind of community-based research developed through this project requires clear and undisputed institutions (tenure, rights; processes for developing plans, rules and regulations; village organisations) and partnerships (defined and respected relationships between community forest users, state forest departments, and NGOs).

The more formal and therefore publicly available documentation of lessons has been based on the work in progress, notably annexes 9-12, 15, 16 & 18- 20. In addition the project gave rise to a number of innovative extension methods, including, in India:

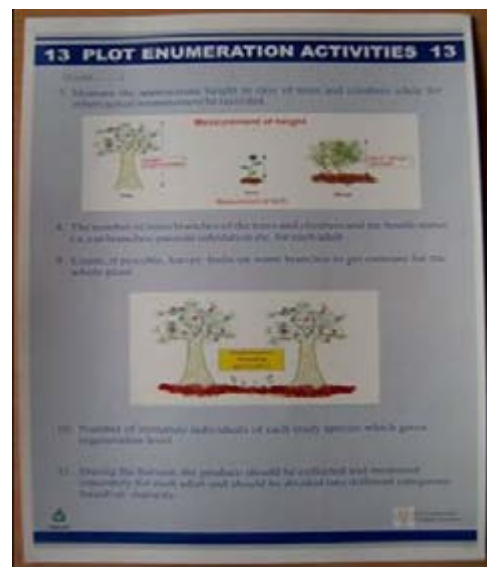
- A set of posters explaining in Kannada (local language) the process: annexes 54-67 and 70-73.
- Community-to-community training (CTCT) whereby participating communities visited others involved in JFM and used some of the posters to promote sustainable harvesting: annexes 53 and 74.
- A schoolchildren’s march to advertise sustainable harvest of NTFPs: annex 150



Community-to-community training, Karnataka



School march for sustainable harvesting, Savanadurga



Two examples of the posters produced for project training by FRLHT (a full set was also produced in Kannada (local language) and used by the village task teams in their community-to-community trainings

And in Nepal

- Study tour between participating communities. Annex 120.
- A strong emphasis on the social and political processes underlying this approach to forest management, resulting in a refinement of the Participatory Action and Learning process developed in earlier RNRRS projects. Annexes 126-127.

FOLLOW-UP INDICATED/PLANNED

At the final project reflection meeting, held immediately after the India PMW, plans to continue the research after project end (post FTR) were brainstormed, and are listed below in no particular order. Funding for these activities will come from core funds of the partner institutions, and multilateral donors where indicated:

FRLHT will:

Continue data collection in Karnataka for 1 year. (making baseline + 2 years worth of data)

Conduct five further CTCTs with the support of the KSFD

Monitor uptake of project methodology after CTCT

Prepare manual on CTCT

With UNDP support, will build on project methodology in three 3 states viz; Karnataka, Madhya Pradesh, and Tamil Nadu while theme sustainable harvest methodology will be transferred to other 6 states (West Bengal, Orissa, Rajasthan, Maharashtra and Kerala & Andhra Pradesh)

With GEF support, will build on project methodology in three 3 states (Uttaranchal, Arunachal Pradesh, Chhatisgarh)

Make video of the process in English and Kannada.

ForestAction will:

- Support Sundari CFUG to use FUG funds for further experimentation
- Provide further support and training for 5-6 people in Baisakheshwori and also Sundari CFUGs so that monitoring and experimentation can continue
- KB and HRN will help with monitoring, HL with analysis with FA core funds if cannot get more funding
- Explore the interest expressed by MAPPA (now hosted by ICIMOD) in coordinating projects and linking with FA
- Explore the new project reported by Sundari villagers apparently based on this project's methodology and adapted by forestry students from Kathmandu
- Sundari have started a Triphala enterprise which will continue
- FA are looking for further funding so that they can work more intensively.
- Data collection will continue for 3 years (making baseline + 4 years data) with core funds.

ECI will:

- Follow up interest expressed by IUCN Asia in adapting methodology through trials in range of South / South-East Asian countries
- Follow up interest expressed by BOKU University Vienna in adapting methodology in Bhutan (phase 3 of CORET project, funded by Austrian bilateral aid)

- Follow up request by IUCN (Germany) to participate in developing and testing the International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP).

Plans for dissemination



Project notice board, Savandurga

Publications to date are included in the annexes. All electronic outputs, including the existing data sets, will also be made available to through the ECI website in the first instance. It is a high priority to analyse and publish the project experience in academic journals as well, and compiling this FTR has been a significant step towards that goal.

Current possible themes for papers include:

- Summary of the final technical report in the International Forestry Review (formerly the Commonwealth Forestry Review).
- Science and local knowledge – based on abstract submitted to ISSRM (annex 31)
- Adapting scientific design and analysis to participatory forest research
- Livelihood case studies – based on Belcher framework
- Contribution of participatory research to adaptive collaborative management (link to the CPR literature)
- Review of CFM for *Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources* invited paper by Anna Lawrence
- Innovative extension for JFM
- Policy and institutional aspects that support adaptive JFM

Constraints to uptake

Constraints for the adoption of the methodology include difficulties of defending the forest where tenure is insecure; the need for monitoring to be on-going, and therefore for strong partnerships with institutions capable of doing the statistics *and* capable of respecting the contributions of local knowledge and the decisions based on such knowledge. Our approach takes these constraints into account and has demonstrated the value of a joint research approach for enhancing mutual respect and trust between stakeholders. Local regulations formulated by our Indian partner villages have been reinforced by the Karnataka State Forest Department, greatly enhancing their

effectiveness. Other constraints which present more of a challenge include highly uncertain markets, and the need for improved processing and marketing. We emphasise that policies based on commercialisation of medicinal plants need to pay attention to sustainability of the resource base, and that conversely projects attempting to support livelihoods through sustainable harvesting need to attend to downstream linkages.

CONTRIBUTION OF OUTPUTS

The outputs contribute most directly to MDG7 and to MDG1. The focus is on targeting a particular issue of environmental sustainability that has direct consequences for poor people. The links between environment and poverty are clearly set out in DFID's February 2006 report 'DFID's approach to the environment' and notable points in that document correspond to our own impact:

- Of DFID's six interacting principles to tackle environmental challenges we 'support the local processes that encourage sustainable development and improved capacity to manage the environment in a way that benefits poor people (p. 2) specifically
 - 'The role of local institutions and stakeholders ... in monitoring good environmental management' (p. 21) and
 - 'enabling stakeholders ... to participate in development processes and helping articulate environmental needs and influence policy and practice.'
- And (p. 13) DFID's 'primary environmental aim is to support sustainable use of natural resources, and equitable access and benefit sharing of environmental assets for poverty reduction.'

Specifically, within the context of the constraints described in the previous section, the approach will contribute directly to the goal of supporting environmental sustainability in the interests of poor people's livelihoods by:

- Providing tools to reduce variability and risk in production, and reduce destructive tree-product harvesting
- Supporting information pathways on which to base adaptive forest management decisions
- Improving control of access to relevant forest resources (particularly in relation to illicit harvesters, and neighbouring communities)
- Enhancing institutional capacity for information generation and decision-making
- Enhancing relations with the state foresters (or in the Nepal case, non-government organisations)
- Enhancing forest management skills.

Furthermore as markets are becoming increasingly influenced by concerns about certification of sustainability of source, fair trade etc. the methods will provide a transparent and context-specific means toward providing such guarantees. This relates to our potential to contribute significantly to the testing phase of the ISSC-MAP (as invited) by fleshing out the implications in real-life situations of the following criteria in particular:

Principle 3 Transparency

Criterion 3.1 information (systems of information established and maintained with local SH's_

Criterion 3.2 consultation

Principle 4 Assessments – regular assessments are preformed, documented and reflected in management planning etc.

Criterion 4.1 basis for assessment – includes baseline assessment (indicator 4.1.1) and need for uptake of results of re-assessments (indicator 4.1.2)

Criterion 4.2 knowledge about target MAP species – accurate identification of plants and sources; relevant biological characteristics understood

Criterion 4.3 knowledge about MAP habitat / collection area

Criterion 4.4 social / cultural /economic issues understood

Principle 5 Management planning

Criterion 5.1 MP development and revision is transparent; detail appropriate to context, takes the collection areas into account,

Criterion 5.2 all targeted spp and collection areas have a management plan

Principle 6 Monitoring

Criterion 6.1 based on up-to-date information, impacts of other activities in collection area known, results incorporated into management plan

Principle 7 Collection practices

Criterion 7.1 rationale is supported by knowledge; or new data collection is undertaken; those spp and plant parts best able to support sustainable harvesting are selected,

Criterion 7.2 rates of growth and regeneration are known, and monitored

Criterion 7.3 minimum age / size / class determined

Criterion 7.4 quantity collected minimizes negative impact

Criterion 7.5 frequency of collection minimizes negative impact

Criterion 7.6 timing of collection minimizes negative impact

Criterion 7.7 density and abundance allows for enough regeneration

Criterion 7.8 good collection practices are used

We anticipate that we will have a particular contribution to make on the criteria under principle 7, where our results suggest that not all criteria will be appropriate or available for all species, that an adaptive and experimental approach to choosing indicators will be needed, and that simplicity of information is need.

ACKNOWLEDGEMENTS

This report is an output from a research project funded by the UK's Department for International Development (DFID) for the benefit of developing countries. The views expressed here are not necessarily those of DFID. R8295 Forestry Research Programme.