HIDDEN HARVEST

Research Series Volume 3 No. 5

LOCAL PERSPECTIVES ON FOREST VALUES IN PAPUA NEW GUINEA: The Scope for Participatory Methods

by Maryanne Grieg-Gran and Irene Guijt with Basil Peutalo

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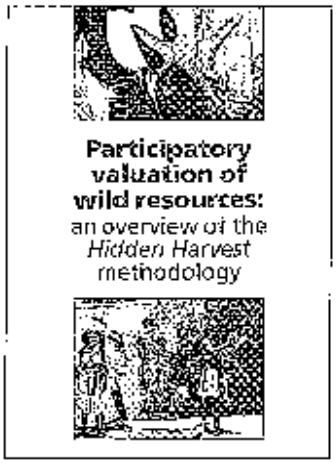
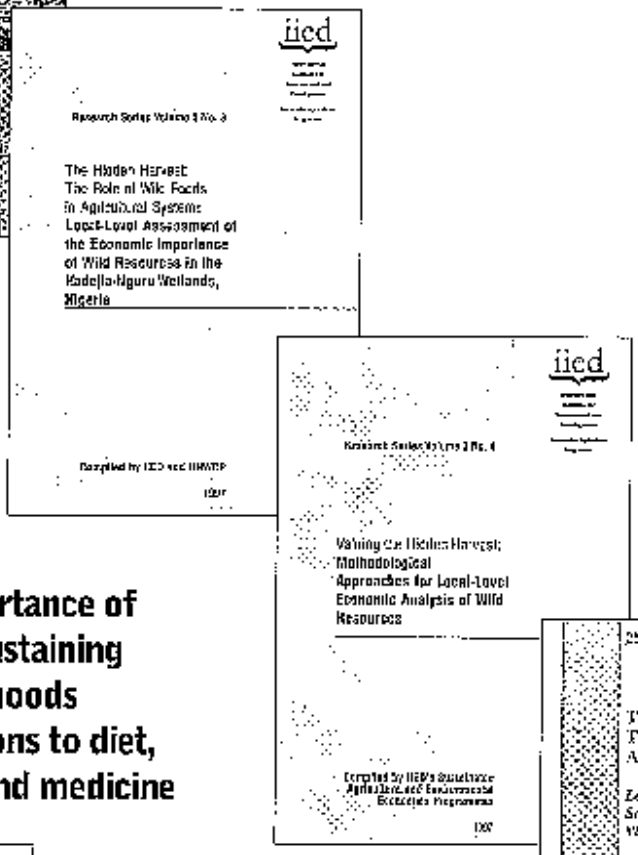
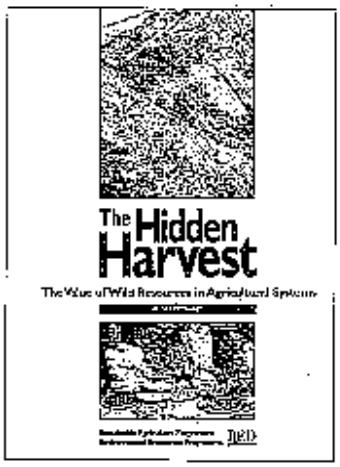




Exploring the importance of wild resources in sustaining rural people's livelihoods through contributions to diet, cash income, fuel and medicine



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Sustainable Agriculture and Rural Livelihoods and Environmental Economics Programmes

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"Herein lies Papua New Guinea's greatest challenge: the equitable participation of customary landowning communities in the exploitation of their forest resources. ... Unless provided with some meaningful means to participate, they will continue to be bystanders ... hoping somehow that if the government does not deliver, the logging company may do so, bringing infrastructure and cash into local economies. Whilst this happens on a piecemeal basis, the community has no sustainable investment in the forest resource and its harvesting."
Taylor 1998, in Filer and Sekhran 1998

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Acronyms

IIED	International Institute for Environment and Development
NTFPs	Non-timber forest products
PMVs	Local bus/taxi service in Mare
PNG	Papua New Guinea
PRA	Participatory Rural Appraisal
VDT	Village Development Trust

Acknowledgements

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1 INTRODUCTION

1.1 Background to the Hidden Harvest

Forests are about more than logs. Yet most land developers and many policy makers do not see the forest for the logs. In the process of extracting wood and turning this into national income, they forget that many other forest-based resources are being lost – resources that are important for local communities and sometimes critical for their survival. Wild resources that are not key commodities are often hidden and not given adequate consideration. Yet they play many important roles (see Box 1). If these other resources could be valued, then the value of logs could be compared against the other 'hidden' resources. Thus more informed land development decisions could be made that take into consideration a more comprehensive view of landscapes.

Given these important roles and their under-valuation, IIED's Hidden Harvest project set out to examine the role of wild resources in local livelihoods. The focus was on local-level valuation, the assessment by resource users of the value they attach to resources. The methodology chosen for this project was inspired by participatory rural appraisal (PRA) but focused on using the methods only, in combination with economic valuation approaches. Although originally conceived as long-term field research projects, funding restrictions limited the work to a series of shorter case studies. Thus the cases documented in the Hidden Harvest work (c.f., Bishop and Scoones, 1994; Hot Springs Working Group, 1995; IIED/HNWCP, 1997; Guijt, 1994; this report) are examples of rapid assessments, not participatory research in its full potential (see Section 1.3).

BOX 1. THE ROLE OF WILD RESOURCES

Local Roles

- Enhance food security by providing an important buffer during certain seasons and/or major periods of stress
- Supply vital nutritional supplements to diets based largely on carbohydrate-rich staples
- Have significant economic value by preventing the need for cash expenditure, for example on construction material, fodder and medicine
- Can provide ready sources of income to cash-poor households
- Have many cultural values, such as sacred sites or species used in ceremonies or for barter

Global Roles

- Hold the key for the future of agricultural production by providing essential genetic material
- Help to regulate climatic patterns and protect against natural disasters and degradation processes
- Represent as yet unknown medicinal values for future medical needs
- Provide essential indicators of environmental change

1.2 The Hidden Harvest Approach to Local-Level Valuation

IIED's Hidden Harvest project started with a comprehensive annotated bibliography (Scoones, *et al*, 1992) on the role of wild foods and resources in agricultural systems. This revealed that little is known about the value of these resources, particularly their economic value. This led the Sustainable Agriculture and Rural Livelihoods Programme and the Environmental Economics Programme at IIED to outline what, in theory, would be a novel and appropriate methodology to assess resource values (IIED, 1997).

Complementary methodologies have been the key to the Hidden Harvest project. While the focus was on exploring a range of economic questions about resource values and incentives, the need to look at local-level values required methods that allow such perspectives to emerge. Seeking local-level information, and incorporating local perspectives, into the final analysis also highlighted the importance of research flexibility and, thus, amenability of the participating researchers to more open-ended forms of research.

The difficulty of the research topic – wild resources – meant that estimation based on people's memories would be a critical component. On the other hand, the need for numeric data to influence policy makers and for local communities (for example, to compare with any compensation they might be offered) was also considered essential (see Box

2). Thus, the Hidden Harvest methodology was created by combining economic principles and methods with those related to Participatory Rural Appraisal.

BOX 2.WHEN CAN LOCAL-LEVEL VALUATION BE USED? (GUIJT AND HINCHCLIFFE 1998)

Local-level valuation studies can be used for several purposes:

- To address and challenge a particular natural resource, land-use or market policy that may threaten wild resources and wilderness areas;
- To conduct an environmental impact assessment of a planned development, such as plans to convert a local wilderness area to agriculture, focusing on the potential loss of value;
- To understand the costs and benefits of different development options, such as cultivating wild plants as opposed to opportunistic gathering;
- To seek improvements in local institutions that manage resources, such as resource sharing or community management schemes;
- To identify better markets and resource management options for wild resources and their products;
- To investigate people's livelihood strategies, and how these determine the constraints and options for making the use of wild resources sustainable.

This methodological 'merger' forms a middle ground between costly and lengthy resource assessments, on the one hand, and making assumptions about or ignoring local resources, on the other. It also allows for a valuation of wild resources that recognises not only direct use values but also indirect and non-use values, albeit indicative.

Economic valuation brings systematic analytical frameworks and a numerical 'language' that are widely recognised and accepted as able to estimate values. While economics can provide numbers sought by policy makers, the principles and methods of participatory research methods can help to establish vital information on seasonal variation in use, socially differentiated use and value, and the relative importance of indirect use and non-use values. Therefore, what PRA brings to the Hidden Harvest project are methods that allow for a sequence of discussions that build up a picture of local resource use, prioritisation of key resources, and an estimation of their use. Both approaches build on the information provided by the other.

However, in practice combining the two approaches is complex, as they are based on different principles – particularly those related to norms of trustworthiness of data. The Hidden Harvest research raised many methodological challenges (IIED, 1997b), some of which will be discussed in this report.

1.3 Hidden Harvest Activities

Following the publication of an annotated bibliography (Scoones *et al*, 1992) and documentation of various combinations of economics and PRA,[1] several case studies were undertaken. Training workshops with fieldwork were undertaken in Zimbabwe, Botswana, Nigeria, Brazil and Papua New Guinea. The limited availability of local-level valuation experts led us to adopt a back-to-back training-and-research approach, that in itself presented difficulties (see IIED, 1997a; Section 2.2). In particular the absence of experienced economists in most of the cases limited the research to a basic level of economic analysis.

The case study areas represent different types of ecosystems with distinct aspects of wild resource use by communities (see Table 1). In each case, existing use of these wild resources is threatened in some way by external developments. These threats might not always be perceived by communities as having crisis proportions, as some of the threats are emerging slowly. Some threats may be substituted by acceptable alternatives – and thus partially alleviated – or may intentionally be kept hidden from local people by those responsible. Irrespective of the nature of the threat, in no case had a thorough assessment been undertaken to understand people's use of wild resources and their decisions about land-use options based on what they would lose in the long term due to the 'threat'.

1 These were produced as a series of unpublished methodology papers (written by J. Bishop, J. Burgess, I. Guijt and I. Scoones, with B. Aylward and J. Thompson), the findings of which are summarised in IIED (1997).

TABLE 1. HIDDEN HARVEST CASE STUDIES

Country	Ecosystems	Threats to Sustainable Resource Use
Zimbabwe	savannah woodlands	excessive extraction of natural resources, without adapting management regime
Nigeria	wetlands	closing of river flow by water control development
Botswana	savannah woodlands	over-exploitation of palms due to growing basket industry
Brazil	less densely populated tropical rainforest	agricultural intensification and commercial logging on community land (legal and illegal)
PNG	more densely populated tropical rainforest (with coast line)	commercial logging by (foreign) companies and agricultural intensification

The degree of local participation achieved in the Hidden Harvest work to date has been limited to 'consultation' (see Table 2). The PRA methods were largely used to seek information about local resource use in a fairly quick way. Although villagers were involved in the analysis and review of some of the information in some cases, they did not control this process nor were they involved in using the information subsequently in their local resource management. The information being collected aimed to serve other interests set by an external research team. These features of the work were simply a function of the funding available for the fieldwork, thus making the studies 'rapid assessments'.

The situation we faced in PNG is similar to the other Hidden Harvest cases (IIED, 1997a):
"Collegial action and co-learning are participatory ideals that are often advocated but seldom achieved.... Most research activities (in contrast to action-oriented community development work) find the constraints to achieving fully collegial relationships overwhelming. ... Most participatory research tends to be consultative in style. For some this presents a fundamental contradiction. But it may also represent a pragmatic compromise and a realistic recognition of a variety of professional and institutional constraints (i.e., most research organisations are unable to work in anything but a consultative manner during certain periods of their existence)."

TABLE 2. FORMS OF PARTICIPATION (CORNWALL 1995)[2]

Mode of participation	Involvement of local people	Relationship of research and action to local people
Co-option	Token; representatives are chosen, but no real input or power	on
Compliance	Tasks are assigned, with incentives; outsiders decide agenda and direct the process	for
Consultation	Local opinions asked, outsiders analyse and decide on a course of action	for/with
Co-operation	Local people work together with outsiders to determine priorities, responsibility remains with outsiders for directing the process	with
Co-learning	Local people and outsiders share their knowledge to create new understanding, and work together to form action plans, with outsider facilitation	with/by
Collective action	Local people set their own agenda and mobilise to carry it out in the absence of outside initiators and facilitators	by

1.4 The Papua New Guinea case study

Current resource issues and existing organisational links in PNG made it an excellent case study choice.

First is the importance of the forest resource for the national economy, for ecological diversity, and for social systems. Forests cover over 60% of national land area (Filer and Sekhran, 1998). Moreover, they are almost entirely held under customary title, the social and political dynamics of which make them a particularly complex resource to manage in the face of high-impact land-use decisions, such as logging. PNG is experiencing rapid forest loss, particularly from

2 This is one of many typologies of participation (c.f., Guijt and van Veldhuizen, 1998). They should be used with some caution as they are based on the erroneous assumption of a static picture and simple differences between 'insiders' and 'outsiders'. They are normative, assuming some kind of 'ideal' form of participation, and simplify the diversity of experiences (Guijt, 1997). However, as the Hidden Harvest work was, in most cases, very rapid, slotting it into one category does not overly distort the type of participation involved.

agricultural plantations and logging, which affects all resource users. Furthermore, PNG is one of the most intensely diverse countries, in both cultural and ecological terms. Though is difficult to generalise about people's resource use, it can be said that financial returns on export-based forest exploitation are not generally invested in the rural communities who owned the timber (*ibid.*).

Second, PNG is undergoing much policy debate about the best options for forested land (c.f., Filer and Sekhran, 1998). Its forest policies to date have encouraged large-scale projects that, while ostensibly sustainably harvested, have tended to cover large expanses and provide significant government revenue thus discouraging the involvement of, and challenges from, customary land-owning groups. Opportunities to open up the policy debate, such as through the methodology offered by the Hidden Harvest project, are few.

Third, many communities in PNG are transition economies, in which subsistence and barter activities still play an important but decreasing role. Therefore the methodological questions related to valuation within the context of a limited degree of commoditisation are challenging. It is necessary to deal with issues such as the absence of steady labour markets and therefore reliable wage rates, and the identification of marketed substitutes for products that are extracted for subsistence purposes. This highlights the importance of understanding local people's preferences and experiences in order to estimate approximate values for some forest resources. The Hidden Harvest approach is therefore highly relevant in such circumstances.

Finally, there is a growing group of people and organisations interested and experienced in participatory forms of research and policy debate, and particularly PRA (Mayers *et al*, 1994). Earlier work in PNG by IIED's Forestry and Land Use Programme had established organisational links that allowed for the study described here to be taken up.

The PNG-based organisers of this study were Village Development Trust (VDT), a local NGO that has collaborated with IIED on previous forest-related research. They have been developing various practical and policy-related alternatives to increase resource owner involvement in the development and monitoring of forestry projects in PNG. Their motivation for undertaking the Hidden Harvest-related work was to develop their capacity to work with communities so that they can make more informed decisions about logging concession agreements. Their hypothesis is that with the proper valuation of forest resources, which includes locally-consumed game, fuelwood, fruits, and timber, the diverse nature of market and non-market values for forest resources is more likely to be recognised by community members and policy makers alike. Furthermore, if such studies are undertaken over a longer time period, institutional arrangements for resource management and use can be improved. Many other organisations besides VDT (see Annex 1) are keen to assess potential community support for local development options that are based on non-timber forest resources, such as ecotourism, butterfly farming, and small-scale saw-milling. Hence, there was considerable interest in hosting a Hidden Harvest training event in PNG.

1.5 About this Report

The Hidden Harvest reports to date focus on the findings rather than on the methodological issues that arise during the fieldwork. This report aims to highlight some methodological questions related to valuation in transitional communities, using examples from the fieldwork conducted as part of the workshop. It concentrates on understanding local perspectives on forest value and how participatory approaches can help in this. The questions are particularly pertinent for research related to economies that have not commoditised all natural resource management-related economic activities, and for professionals seeking to use complementary methodologies within the natural resource management sector in general.

This introduction is followed by a description of the research approach, preparations and the fieldwork process. The third section provides a general description of Buingim and Mare. Sections 4, 5, and 6 constitute the core of the report and discuss how different research questions were examined related to resource valuation and the types of findings and methodological challenges encountered. The final section reflects on the potential contribution of participatory methods given the nature of the challenges in local level valuation, and sets out the lessons learned from this case study.

2 THE RESEARCH METHODOLOGY

2.1 Linking Economic Valuation and Participatory Research Methods

The approach followed is based on standard economic approaches to valuation of marketed and non-marketed goods and services, and on the use of participatory methods to generate the necessary information. Therefore the Hidden Harvest case studies are not examples of participatory processes in the sense of proposing alternatives to standard economic models (type 2, Box 3), and are best considered as information-extraction exercises (type 3, Box 3) (also see Section 1.3).

BOX 3. DIFFERENT WAYS TO COMBINE METHODOLOGIES (IIED, 1997)

Type 1: Participatory methods can be used to describe the research context. This is needed to help identify relevant economic research questions and to design more appropriate questionnaire surveys.
Type 2: Participatory methods can also help to challenge existing disciplinary boundaries by seeking diverse local interpretations of value, notably indirect use values and non-use values.
Type 3: Economic models can outline the research questions and participatory research methods can be used to find the information needed.
Type 4: The economic values derived from questionnaire surveys can be verified using participatory research methods.

A starting point conceptually is to identify the range of natural resources to which the community has access and the various types of value associated with them. Economists (Barbier, 1992) typically classify values in the following way:

- **Direct use** – defined as environmental or resource-based goods and services such as food, medicine, building materials, etc., that can be consumed or used. This can include non-consumptive uses such as recreation
- **Indirect use** – refers to ecological functions of forest resources such as watershed protection, which ultimately can affect use values such as agricultural production
- **Option values** referring to the value placed on the option to make use of an environmental good or service in the future, or for future generations to be able to do so (bequest values)
- **Non-use or existence** values, which are unrelated to the use that can be made of the resource but where benefit is derived from knowing that the environmental good or service exists.

Each type of value calls for different methods of valuation.

Direct-use values related to goods and services that are marketed can be estimated on the basis of market prices. The value of the resource in its wild state or the net return to the community from extracting it is obtained by taking the market price and deducting the costs of harvesting, transporting, processing and getting the resulting product to the market. Where goods and services are not marketed but are consumed locally, valuation may be possible through examination of the price of substitutes.

Indirect-use values first require modelling of the biophysical relationships between the resource base and environmental services, for example, to predict how changes in forest cover will affect water resources. The effect of changes in environmental services on production then has to be modelled and the economic impact estimated, for example, how changes in water flow affect fishing and the value of output.

For estimation of *non-use values and option values*, the technique most commonly employed is contingent valuation, where people are asked through a questionnaire survey how much they would be willing to pay for improvements in environmental quality or be willing to accept as compensation for environmental degradation.

At the level of the community, the first step is to assess the magnitude and characteristics of the forest resources and the types of values that community members associate with them.

This case study – like others in the Hidden Harvest programme – focused primarily on direct use values. Indirect use values received less emphasis in this case study because such valuation requires considerable amounts of biophysical data and appropriate models. Similarly, no attempt was made to apply the standard economic techniques, such as

contingent valuation, to assess non-use values because of limited time and resources. But the relative priorities of use values and non-use values were partially revealed in ranking and scoring exercises.

Nevertheless, even with this simplified approach, given the limited time for fieldwork, it was still necessary to prioritise and select a subset of direct use values for analysis. This required some assessment by the community of the resources that they considered most important.

Assessment of direct use values from forest resources also requires some analysis of resource use over time. It is necessary to consider the sustainability of current patterns of community resource use, given the characteristics of the community's resource base, and how these patterns will change over time with population growth and social transformation. The critical question is whether or not the community can continue to harvest this quantity of resources without depleting the resource base.

A further step is to consider who benefits and how the benefits of community resources are shared and distributed within the community. Both this question and the preceding one depend to a large extent on how resources are controlled within the community.

These considerations translate into a sequence of questions for understanding local perspectives on forest values shown in Table 3. These formed the framework for the workshop training, and were subsequently used to guide the fieldwork. In the formal training, each session started with discussion of economic concepts related to the key questions in Table 3, and was immediately followed by discussion (and often practice) of participatory methods to support the economic analysis and generate the information required. The two case studies in Morobe Province aimed to build the capacity of participants to undertake local valuations with local people who use the forest. Due to the limited time available, a total valuation was impossible. Instead, efforts focused on assessing the most important direct-use values and grasping the basic idea of local-level valuation. Annex 3 gives further details about the workshop training programme and the approach to fieldwork.

Sections 4 to 6 discuss the questions and methods in more detail, highlighting the methodological challenges faced and assessing the contribution of participatory approaches.

TABLE 3. SEQUENCE OF FIELD QUESTIONS AND RELATED METHODS

What resources are there and what is used?	· resource maps, transect walks, flow diagrams
What is important?	· ranking and matrix scoring
What is the value of key wild products? - What is marketed? - What substitutes exist? - What quantities are used? - What are the costs of harvesting, transport, processing?	· actual market prices or prices of substitutes · maps, flow diagrams and pie diagram · substitute ranking · seasonal calendars, daily routines, social mapping · product chains/stories/transect walks · focused questionnaires
How sustainable is their use?	· critical event (and trend) analysis · historical matrices and transect walks
How are key products controlled?	· Venn diagram, social mapping, historical discussions

3 THE CASE STUDY COMMUNITIES

Buingim and Mare are both located in Morobe Province. While both have significant forest resources and subsistence agriculture, the two communities differ in ways that have implications for the topic and the methodology. Before discussing the fieldwork in more detail, this section describes the two communities, their similarities and differences.

3.1 Buingim

The Buingim community, which has a population of about 750, concentrated in a single settlement, has a total land holding of 3,100 hectares, of which approximately one third consists of primary forest resources. It is located on the coast about 60 km from Lae, the capital of Morobe Province, and the only means of access is by boat. The main activities in the village are marine fishing and agriculture, both mainly for subsistence purposes. The main subsistence crops are taro, banana, sweet potato and manioc. Apart from some sporadic sales of fish and vegetables, there is very little market-based activity within the village.

The community uses its primary and secondary forest for a wide range of products such as fuelwood, construction, medicinal plants, etc. At present there is no commercial logging of the forest, but in 1991 a concession was given to a company allowing it to harvest and transport logs by helicopter. Logging was discontinued, allegedly because of the high number of accidents. The community is aware that in the future discussions could arise about the appropriateness of giving concessions to companies to extract the timber. There are differences in opinion within the community as to whether concessions are a good idea. Some people, such as those involved in a local theatre group, are concerned and want to conserve the primary forest. The community was therefore interested in the possibility of exploring these issues.

3.2 Mare

Mare, unlike Buingim, is accessible by road, lying within one hour's drive from Lae, the capital of Morobe Province. The community boundaries are formed by the small Wampit River to the south, the broad Markham River to the east, and the low Ngoropan Ranges to the north. Mare has a number of separate settlements with nine clans that have rights to specific parts of communal lands. Its proximity to Lae has led to rapid changes, not least of which is commoditisation and all its consequences. The growing need for money is stimulating new income generation activities, with betelnut sales currently the largest income earner. It has a prominent and growing agricultural economy. Yet the forest still plays an important role in providing basic needs. For example, all households depend totally on local fuelwood collection and almost entirely on local materials for construction of houses. Wild pig and other wild animal hunting and fishing represent a steady source of food and raw material for the costumes used in local rituals.

In 1995, census data shows a population of 1,232 (630 men and 602 women). Many commercial ventures have been started but few are in operation. Most common are trade stores, with twelve active and six not operating, and poultry projects (eight active and twenty-three defunct), three PMVs (local taxis/bus service), eight small chicken farms, one chainsaw business, and nine and seven households engaged in cocoa and vanilla enterprise[3] respectively. It appears that the most widespread and regular income comes from betelnut sales,[4] with weekly incomes reaching peaks in the May to August season as high as K240.[5] People from the highlands come to Mare to buy betelnut. Marketing of pigs (each household has about fifteen), coconut, orange, mustard, and greens also takes place. Many residents have large land areas covered with betelnut trees.

3 Information from a small survey undertaken by Alphonse Malipu and subsequent group discussions.
4 Betelnut is a stimulant.
5 1 Kina = US$0.76 at the time of the research.

4 SURVEYING AND PRIORITISING FOREST VALUES

As discussed in Section 2, the training and fieldwork was conducted around a sequence of key questions (see Table 3). This section discusses the first two of these questions which aim to establish the range of forest resources perceived as valuable by the community, and examine their relative importance in more detail. Examples from Buingim and Mare illustrate methodological considerations for local-level economic valuation of the Hidden Harvest type. Each question is discussed at two levels: a description of the methods and the implications for valuation of applying these methods in small rural communities such as we found in Morobe Province. In particular we will focus on the dilemmas encountered, the variations that emerged and practical ideas for those keen to undertake similar work.

4.1 What Resources Exist and What is Used?

The first step was to identify the types of natural resources in the villages and to consider the different types of use associated with them. The main methods that were applied in Buingim and Mare were resource maps and transect walks.[6] In both cases, a number of different groups within the community prepared the maps thus giving an opportunity to present different perspectives. For example in Buingim, three groups were formed, men, women and youth, while in Mare maps were prepared by five groups– some of mixed genders and ages but some more homogenous.

Resource maps (see Figure 1) are perception-based maps sketched on the ground, using local materials, or drawn on paper by local people. They can include any topic, such as natural resources or social facilities. Writing can be used if helpful to everyone. Besides allowing for a dynamic and easy introduction between the team and villagers, these maps indicate the location of major resource areas and specific products from or functions of each area. They are good at provoking discussion about local concerns. People quickly become involved, adjusting and analysing the map as it develops. Making an accurate copy is helpful for further reference during the fieldwork.

Transect walks (see Figure 2) are focused walks by the research team with villagers through the area being researched. The walk focuses on specific themes or questions, such as 'Which forest sites are most intensely used, and what products are used from them?' or 'How is resource use managed in each area we are walking through?' The walk is represented as a two-dimension cross-section indicating major differences between one section and the next.

Once the various types of natural resources in the communities had been discussed, the forest-related resources could be examined in more detail. In both communities the maps and transect walks confirmed the prior assumption that the forest resources provided a wide range of products and services for the communities concerned. The many forest products listed included those used for food, medicine, shelter, handcrafts, construction, and traditional ceremonies. Sacred areas also appeared as a forest function (see Figure 1).

The transect walk ascended from about 18 metres above sea level to 150m above sea level. The aim was to see the sources of key building materials. Swamp can be found at the sides of the river. It mainly supplies the following products: sago, black palm, rosewood, *pitpits, erima* and big rain trees (e.g., *saniari*). Particularly sago leaves are harvested. Secondary forest and solofon (lowland rainforest) provides mainly: *kwila, labula,* sago and some medicinal plants. It is where the main Mare village is located. The area where PNG Forest Products is is now devoid of most hardwood, and small trees and shrubs are growing instead. On the hilly slopes covered with kunai grass, people hunt for bandicoots and *gonna*. The primary forest – *sazanno* – is very steep hills, and accessibility is difficult. Yet this is where wild pigs are hunted and other building materials are harvested. Several streams emerge that feed the main Wampit River.

Those involved in the mapping exercises in both Buingim and Mare provided detailed classifications of wood types and identified a strikingly diverse range of uses. Discussions about resource use in Mare led to the listing of woods for construction, fuelwood, making pallets, etc. For building a house alone, eleven types of forest products are used.

The implication for the valuation work that lay ahead was the complexity of estimating total economic value of the forest resource for these communities, given the number and diversity of direct, indirect and non-use values identified.

6 Flow diagrams are also useful but were not applied widely in these cases. Only once, in Mare, was the idea of a flow diagram used to start developing a map. The discussion initially focused on all resources in the forested areas and those that were used by the community. From this, a more differentiated map of the different forest zones emerged.

FIGURE 1. MEN'S MAP FROM BUINGIM (SHOWING SACRED SITES)

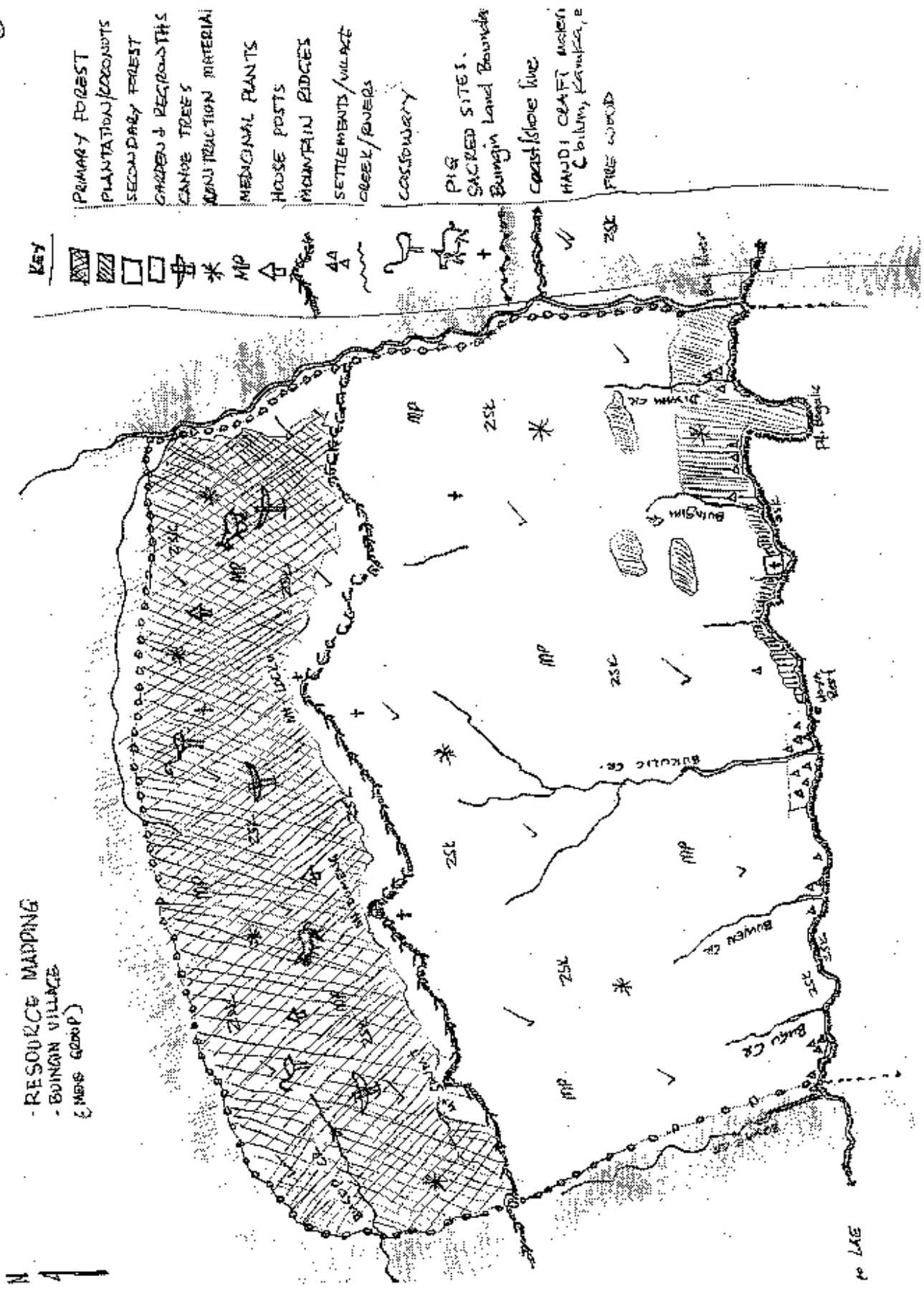
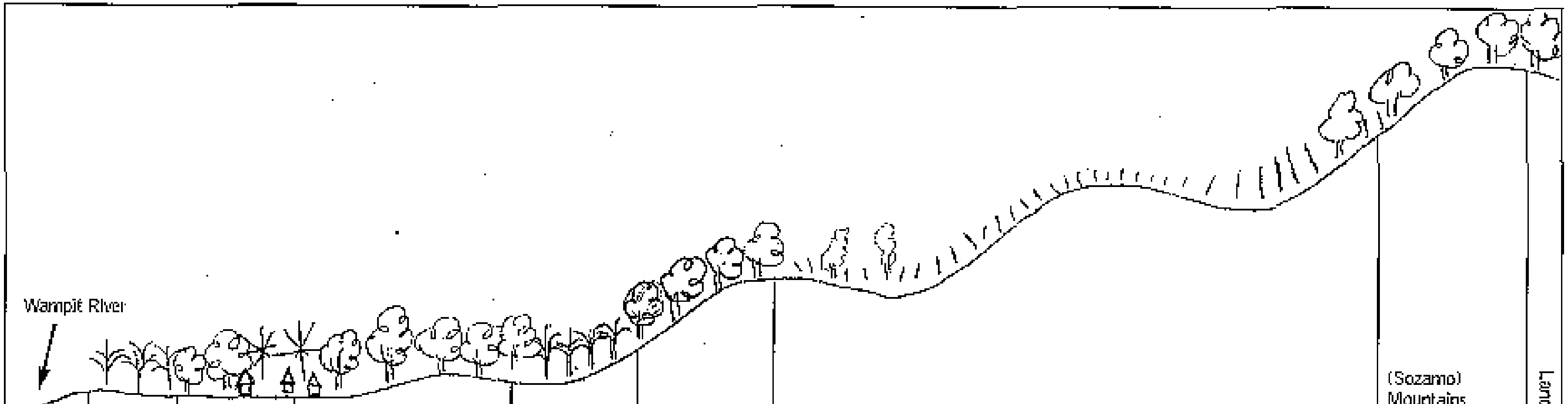


FIGURE 2. TRANSECT WALK IN MARE



Land Type	RIVER	Grassland Gardens	Secondary forest/villages	(Solofon) Villages/Secondary Forest	Swamp	Logged Forest	Hill Grassland (Kunai) Poadne	(Sozamo) Mountains Primary Hill Forest
Description	Sides Siltation Swamp	Grassland Gardens Black swamp Mud Homes Few gardens	Black soil Gardens Few houses Stores	Black soil Gardens Village – Mare Stores	Muddy swamp (water)	Clay and coarse soil Banana gardens (few)	Red soil and small stones/coarse soil Steep slopes/Loose soil	Hills, mountains Good top soil Streams Slopes
Tenure	Comm-unal	Individual	Communal and individual	Communal	Communal	Moswarang Ngasap Owangropon	Moswarang	Moswarang
History		Last 10 years (1986)	(old) 1938 (New)	Old (1936) (New)	Old	1996	Old	Old
Products	Black palm, kwila, rosewood sago, pitpit, erima rain tree	Pitpit, kunai, rain tree, bananas	Trees Partly dense forest kwila, labula Sago, ferns medicines	Erima, betelnut, coconuts, ferns, rain trees, galip, black palms, sago, labula	Sagos and ferns	Old tree stumps Small trees and bushes, vines, few big trees	Kunai grass (chidz, poache) Labula Bandicoot, lizard, wild pig	Wood for fuel Kwila for posts, Other wood for house, fruits and animals

Differences in maps

A critical methodological point is that each map gives a somewhat different picture of the resources in the community. There were major differences in the resources identified or the significance assigned to them in the maps according to the group involved and the resources they normally use, although this could reflect also differences in the way the questions were framed. These differences between groups were particularly striking in Buingim (Box 4). Pooling of the maps, therefore, gives a comprehensive picture of the resources in the community and the various ways in which they are used.

BOX 4. GENDER DIFFERENCES IN RESOURCE IDENTIFICATION

In Buingim, the women's map identifies where the women obtain different types of product. In the men's map, there was more emphasis on the different types of vegetation and on community land boundaries. The men's group identified various types of wood and their use in different types of building materials and canoes, which the women did not mention. The women instead identified food items, such as prawns, crab, etc. and betelnut and medicinal plants with specific female applications. But both groups identified some products more commonly used by both groups. For example, men identified fuelwood and materials for making bilums.7 Women also identified pigs although these are normally hunted by men.

Differences in the way that the younger and older generations perceive resources in the community are also highly revealing. In Mare, the youth group unlike other groups did not include specific resource areas in their map, apparently, because they are not very involved in hunting or collecting wild products (see Box 5). Thus such differences can give an indication of how resource use in the community might change in the future, in turn opening up questions about the sustainability of current forest use.

BOX 5. INTER-GENERATIONAL DIFFERENCES IN RESOURCE PERCEPTION

In Mare, five maps were produced by different groups on the first day. They identified the names of other nearby villages, mountains, hunting grounds and the location of wild resources in the forest. In Mare, after clearly identifying boundaries, the women identified sacred sites, forests, hamlets, water bodies, infrastructure (school, aid post, cemetery), and a range of specific resources: kunai grass, betelnut, sago, wild mango, shells, fish, crabs, bandicoot, wild pig, and cuscus. The young men made a simpler map, sticking to key hamlets, the main resource areas, and the area where logging is currently taking place. They did not include specific resource areas. In another group, when elders took over the process from the youth who had started it, discussions revealed that most of the youth do not go hunting or collecting wild resources these days, and therefore could not locate key resources on the map. The older people claim this is because the youth are lazy. Perhaps this explains the simpler map that the young men drew.

The main concern, then, in this stage of the local valuation is to ensure that different views on resources emerge. However, care needs to be taken that discussions are pitched at the same level. In both Mare and Buingim, each group used 'forest resources' as the starting point. When notes were compared, it became clear that some groups had focused on generic forest 'functions', while others had focused on specific products or species and others again on 'uses' of those products.

4.2 Which Wild Resources are Important?

Ideally, a local-level valuation would aim to estimate total economic value, taking into account the various types of value (see Section 2.1). In practice this is rarely possible given the range of resource uses that require attention, unless considerable time and funding is available for an extended period of fieldwork. Once an overview exists of the range of resources and values, choices have to be made about the focus of the fieldwork. Even where the focus is on direct use values, some prioritisation is necessary, as there are usually so many in total and not all species or functions are equally important. Such prioritisation is inevitably a decision based on available time for the study, skills of the research team, purpose of the study and, above all, local priorities.

In Buingim and Mare, we recognised that with the limited time available it would be possible to assess only a selection of the types of value associated with wild resources. Prior Hidden Harvest case studies had seen the resources prioritised and selected by the research teams on relatively arbitrary grounds. This time we opted for a process that

enabled selection to be made by community members. The methods used for this were ranking and matrix scoring, supplemented by community debate.

Ranking is simply allocating a value to items in a list in which the value reflects the relative preference that those doing the ranking attach to it. This method is useful when choices have to be made in terms of the focus of subsequent questions – for example, which of the forest functions are most critical – or to understand the relative distribution of various items in order to calculate averages – for example, how much more wood of type A is collected compared to type B or C? The simplest way to rank is allocating the numbers 1, 2, 3, etc. Alternatively, however, points can be given to each item out of a maximum score. For example, the group or person can decide that a maximum value of 30 means that it is the most important. Then all the items on the list can be allocated a value between 0 and 30 to indicate how important each is, compared to the maximum score. The second option provokes a more insightful debate between the participants than the straightforward ranking, thus providing further insights that may be of help in the research.

Matrix scoring exercises (see Table 4) are more complex, as they require the eliciting of criteria against which to assess similar options. A matrix is useful to discuss the different options that people might have related to a specific issue. These options must be comparable, such as the main types of forest functions or types of fuelwood used. Participants represent and place these options along one axis. They then identify the advantages and disadvantages of each alternative, which are the criteria. These criteria are written (or symbolised) along the other axis to create a matrix. The group then evaluates how well the options satisfy each criterion, by comparing them and giving them a relative score. They can use stones or seeds for the scoring, with more indicating higher scores. Making a matrix can lead to an animated discussion as people evaluate the options. Analysing the criteria they choose will reveal more about their preferences and constraints. In the case of forest functions, for example, when wishing to understand how the importance of functions might differ and why this is the case, criteria could be mentioned such as 'no replacement/substitute exists' or 'is essential for survival'.

TABLE 4. MATRIX RANKING OF FOREST PRODUCTS (MARE)

Uses Source▼	Cooking	Building material	Rituals – culture	Income	Kabang and Salt	Marasin	Strings (bilum)
Wara (Po)	7		1		1	1	
Kina shell	3		1	2	4		
Jempoz (wood)	8			2			
Saksak (Wood)	3	3	1	2	1		
Fish	6		4				
Tulip (wood)	2	2	1	1		1	3
Kaplal (wood)	6		2	2			
Sacred sites			10				
Timber		4	1	2	1	1	1

4.2.1 From group rankings to an overall community ranking

In both communities these ranking and matrix scoring exercises were carried out with several groups. Two different processes were followed in Buingim and Mare in order to come to an overall ranking of forest functions or key resources.

In Buingim, ranking exercises were conducted with three groups separately, each identifying some priority functions or products. Rather than calculating the average ranks across all groups, the community and research team opted for a more consensual approach. The various groups came together in a community meeting to discuss their priorities and select a single set. This enabled them to reconsider their priorities after hearing different points of view.

Thus the women initially emphasised a mix of food items (bandicoot, pig, tulip), construction material (*limlum*) and a medicinal/food plant (*gorgor*) with some sacred significance (Table 5). The youth group assigned least significance to sacred areas and materials used for traditional ceremonies e.g., bilas and most to shelter – 'house construction timber'. The men's group ranking was very similar to that of the youths. When all three groups discussed their rankings,

traditional/ceremonial uses were given more priority even though each group individually had given them low priority. Thus the final selection of five products in Buingim covered some basic survival needs as might be expected, such as wood for housing (shelter) fuelwood, fish, wood for canoes, medicinal plants (health) as well as spiritual needs e.g., wood for *garamut* drums used in traditional ceremonies.

TABLE 5 WOMEN'S RANKING[8] OF PRODUCTS IN BUINGIM

Product	Score	Rank
Bandicoot	12	1
Limbum (building material)	9	2
Tulip (for making *bilums*)	9	2
Firewood	8	4
Pigeon	8	4
Pig	8	4
Gorgor (medicinal plant)	8	4
Kavivi (wild betelnut)	6	8
Snake antidote	6	8
Prawns	5	10
Singsing palms	5	10
Pandanus (for making mats)	5	10
Crab	3	13
Tapa (for barkcloth)	3	13
Contraceptive vine	2	15
Bamboo	1	16
Mangas (for making *bilums*)	1	16
Tanget (medicinal plant and for wrapping food)	1	16
Eel	1	16
Poison vine (to catch fish)	1	16
Snake	0	17
Ila (vegetable)	0	17

In Mare, using the maps produced earlier, the team compiled a list of thirteen forest functions.[9] Several groups were asked to rank each function on a scale of 1 to 30, using stones (see Box 6). They then proceeded to the second stage, which was to take the two top-ranking functions and rank the products associated with them. The ranks assigned to each product were then averaged across groups to give a single ranking which could be considered representative of the community as a whole. Bringing the groups together to discuss their rankings was not practicable in this case because they were drawn from different settlements in the community, all at some distance from each other, and new groups were formed each day. In Buingim, the composition of the groups did not change very much in the course of the fieldwork and all group members lived in the same settlement.

BOX 6. A PROCESS FOR RANKING FOREST VALUES IN MARE

From resource maps and semi-structured discussions, thirteen key forest functions were compiled by the research team in Mare. To rank these, the following steps were carried out with four groups:

1. Ask each group to symbolise/write each function and place them in a row.
2. Ask them to think what the most important forest function(s) is/are.
3. Ask them to allocate a score to each function, with the most important function getting the most points (each function to get a maximum of 30 scores).
4. Review the final scoring with the group, and ask them to explain why they ranked the functions as they did.
5. For the top two functions, ask them to rank the products already listed for each function (collated from previous discussions).

8 The women were asked to rank various products that they had identified in their map by dividing 100 stones between them.
9 For each function, where relevant, the different products that had been mentioned by the villagers were also listed, e.g., under 'animal foods': wild pigs, fish, prawns, etc..

you lose the most in your life if the area were to be logged or mined?' Therefore the ranking focused around what the group needed for their survival. Another group left it more open, so that 'survival' was one amongst other criteria.

For Step 5 above, the criteria for ranking will vary for each function. The overall rank will then represent a composite score of all the criteria (unless a matrix scoring is done, in which case each criterion is kept distinct). For example, one group, after giving building material and animal food the highest score, ranked the trees and animals according to the following criteria:

- Building material: availability, durability, multiple uses;
- Animals: ease of catch, frequency of use, relative abundance, scarcity, cultural purpose.

4.2.2 Ranking of different types of value

While the monetary valuation for reasons of practicality concentrated on direct use values, the ranking exercises revealed how the community regarded other types of value. In Mare, these discussions revealed that complex functions related to indirect-use values, notably environmental protection, water, and land boundaries, were ranked as highly as those more clearly related to direct use values. After ranking water second they simply said: 'It is life'. They also said erosion control was vital, referring to landslides and floods in other villages in the Markham valley that had killed many people recently. As the complex functions involving indirect-use values could not be estimated in the time available other than through this type of relative ranking, the remaining fieldwork focused on the three top functions for which direct-use values could be calculated: construction materials, fuelwood, and animal foods. As the ecological and social functions were ranked highest, the value of the wild areas can be assumed to be more than the combined monetary values of the top three direct use values that were calculated (also see Hot Springs Working Group, 1995).

4.2.3 Understanding the basis for the rankings

The reasons given for the rankings varied but were often directly related to survival. For example, the women said that without a house or building, you cannot survive the extreme pressures of climate, so building materials were ranked first. Besides the need to understand group-based differences in prioritising certain resources above others, the basis for these priorities is also essential to understand as it can help determine whether a reported priority is a long-term priority or has been strongly influenced by recent events. For example, women's prioritisation in Mare of soil erosion was influenced by the recent nearby flooding they had experienced (in 1992 their gardens had been ruined). This indicates that recent events may well colour such rankings. Thus an advantage of this method is that it can help make explicit the basis for ranking, which would generally not be the case in a questionnaire survey.

It also shows the advantage of matrix scoring over simple ranking exercises. However, where there is a large range of values to consider, a matrix scoring exercise may be too unwieldy, and a simpler approach can be preferable. This proved to be the case for two of the groups in Buingim who opted for simple ranking. As they were able to discuss their priorities with the other groups, the reasons for the ranking were brought out into the open. A way of improving on the ranking exercise is to carry it out in stages. For example, in Mare, within each of the top three functions, subsequent listing and ranking were carried out to determine the main species to be valued. With fuelwood, a two-tiered ranking process took place after the initial ranking still left the research team with a list of preferred fuelwood types that was too extensive to be examined in the time available. The final subset of preferred fuelwood species became the focus of the valuation.

5 THE VALUE OF FOREST PRODUCTS

5.1 Overview of the Valuation Approach

As explained above, the focus of this Hidden Harvest study was on direct-use values. Once the key products derived from wild forest resources had been selected for valuation, efforts focused on obtaining the core data: costs incurred, quantities consumed, and unit prices. This method works back from the market value of the product concerned through the chain of processing, transport and collection to the value of the resource in its wild state in the forest (Godoy, Lubowski and Markandya, 1993). This is the same method that is used to estimate the economic rent of a resource, or the stumpage value in the case of timber.

Where forest products are marketed, or a market price can be assigned in some way to them, the basic relationship involved is as follows:

$v = (p\text{-}c)^*q$
where:

v is the value of the wild product to the community in its natural state before harvesting
p is the price of the wild product after it has been harvested, transported, processed and brought to market
c is the cost of getting the product from its wild state in the forest to the point where it is marketable – this includes time spent travelling to and from the harvesting site, tools etc.
q is the quantity consumed (including both subsistence consumption and the amount marketed).

This approach involves a number of simplifications:

- Valuation is based on the volume of wild resources that the community uses in a specified time period (i.e., a flow approach) rather than the total stock it holds or has access to.
- It is assumed that extraction levels are low enough to be within sustained yield limits i.e., resources are not being depleted (some attempt is made to address this in the analysis of sustainable use).
- Quantities extracted, price, and costs are assumed not to be changing significantly over time, e.g., with population increase.

The emphasis is on the value to the community and its members rather than to society as a whole. This removes the need to adjust estimates to take account of distortions such as subsidies and price controls. However, it is necessary to be aware of how future changes in policy might affect the estimated values. It is also reasonable to assume that production levels are relatively insignificant in relation to the total market such that community output has no influence on price.

In a well-functioning market and with these simplifying assumptions, estimation of direct use values would not present any major challenges. However, in communities that are only partially integrated into the marketplace, the estimation of price, quantity and costs is not straightforward and a number of conceptual issues arise. For example, how valid are the stated market prices when products are only sold sporadically and certain obligations (returned favours) may be reflected in the price charged? These challenges have been highlighted in a review of valuation studies on non-timber tropical forest products which concluded that most such studies were characterised by inadequate measurement of costs, quantities extracted, and prices (*ibid.*) These issues will be illustrated below in the discussion of findings from Buingim and Mare.

In the time available it was not possible to derive precise estimates for all the products selected. Most of the estimates cited here should therefore be regarded as preliminary, giving at best an initial impression of the importance of wild products in monetary terms. However, the fieldwork exercise was useful to highlight some of the conceptual issues and challenges involved in undertaking such research in communities that have limited integration into the market. For similar reasons, no attempt was made to go beyond "snapshot" values by estimating the value of resources used over a certain time period, discounting at an appropriate rate and comparing with returns from other land uses. The snapshot values can be considered as the first step in acquiring the information for such a comparison.

The methodological challenges that emerged during the local valuations in the two communities will be discussed in sequence:

'p', the prices of products (or marketed substitutes);
'q', the quantities consumed;
'c', costs incurred.

In each case the participatory methods that can be used to elicit such information are described. However, most methods can be used to elicit several types of information. For example, a product chain (see Section 5.4) can be used to obtain information on marketing channels and price, amounts collected and costs. Flow diagrams can be useful in the initial discussions to elicit forest resources in general, but also to help clarify travel time to different collection sites of a specific forest product. The type of data obtained depends largely on how the method is applied.

5.2 Prices

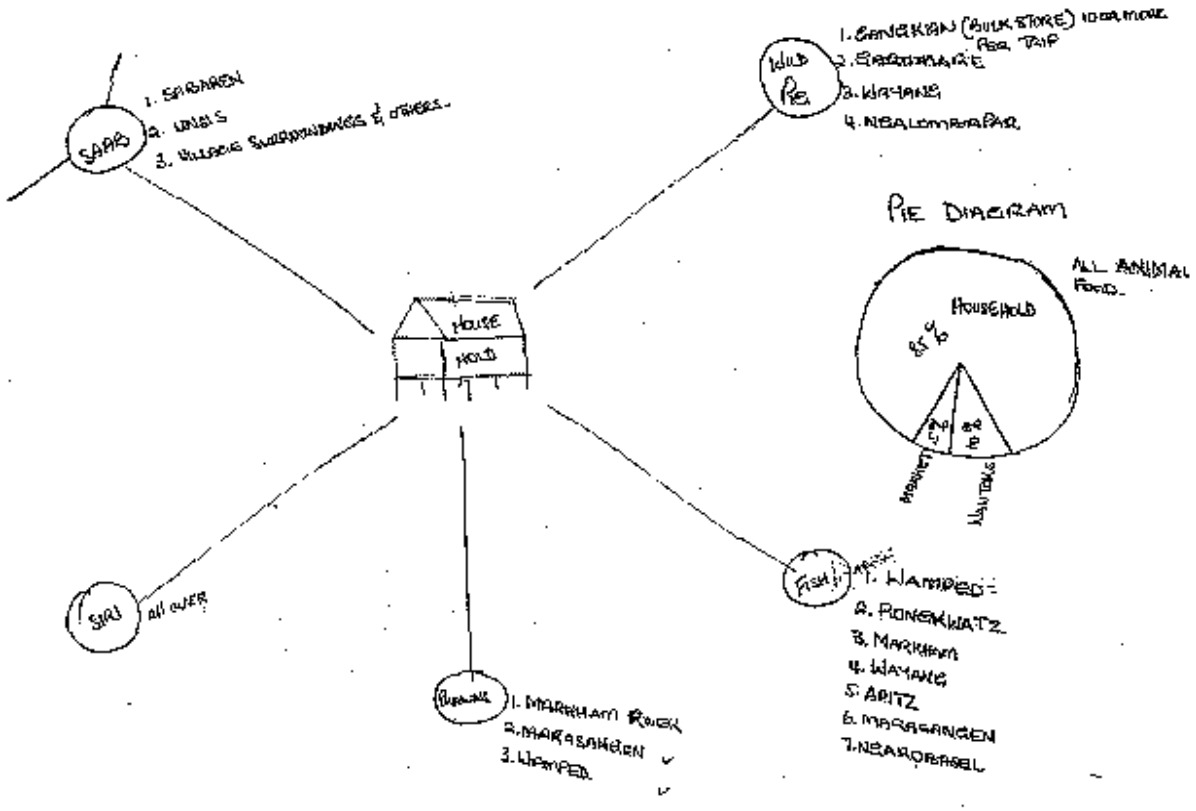
5.2.1 What is marketed?

The first step in valuing the prioritised wild resource-based products involves assessing the extent to which products are marketed, as this determines the type of data that will be sought. If wild resources are fully marketed inside or outside the community, then estimation based on market prices is the most straightforward approach. In some cases, wild resources are not marketed but may be bartered for products that do have a market price. The market value of the barter product can be the basis for estimation of the value of the wild resource. If a resource is not marketed at all, then recourse has to be made to close substitute products. Market prices for these need to be ascertained and the degree of 'fit' between the resource and the preferred substitute must be understood.

Participatory methods to examine marketing channels and the extent to which products are marketed include mapping, flow diagram and pie diagram.

Flow diagrams (see Figure 3) are useful to analyse the inputs needed for an activity and its outputs, or what comes out of a selected area (such as a forest) and to where the resources/products go. They can also be used to analyse the impact of a problem or activity on people's lives (though this application was not used in the Hidden Harvest work). To work well, the topic must be specific, such as 'sources and uses of fuelwood type X'. Creating a flow diagram on a topic as broad as 'flow of forest products from forest to community' can become complex and hard to portray clearly, though this clearly depends on the extent to which forest resources are used.

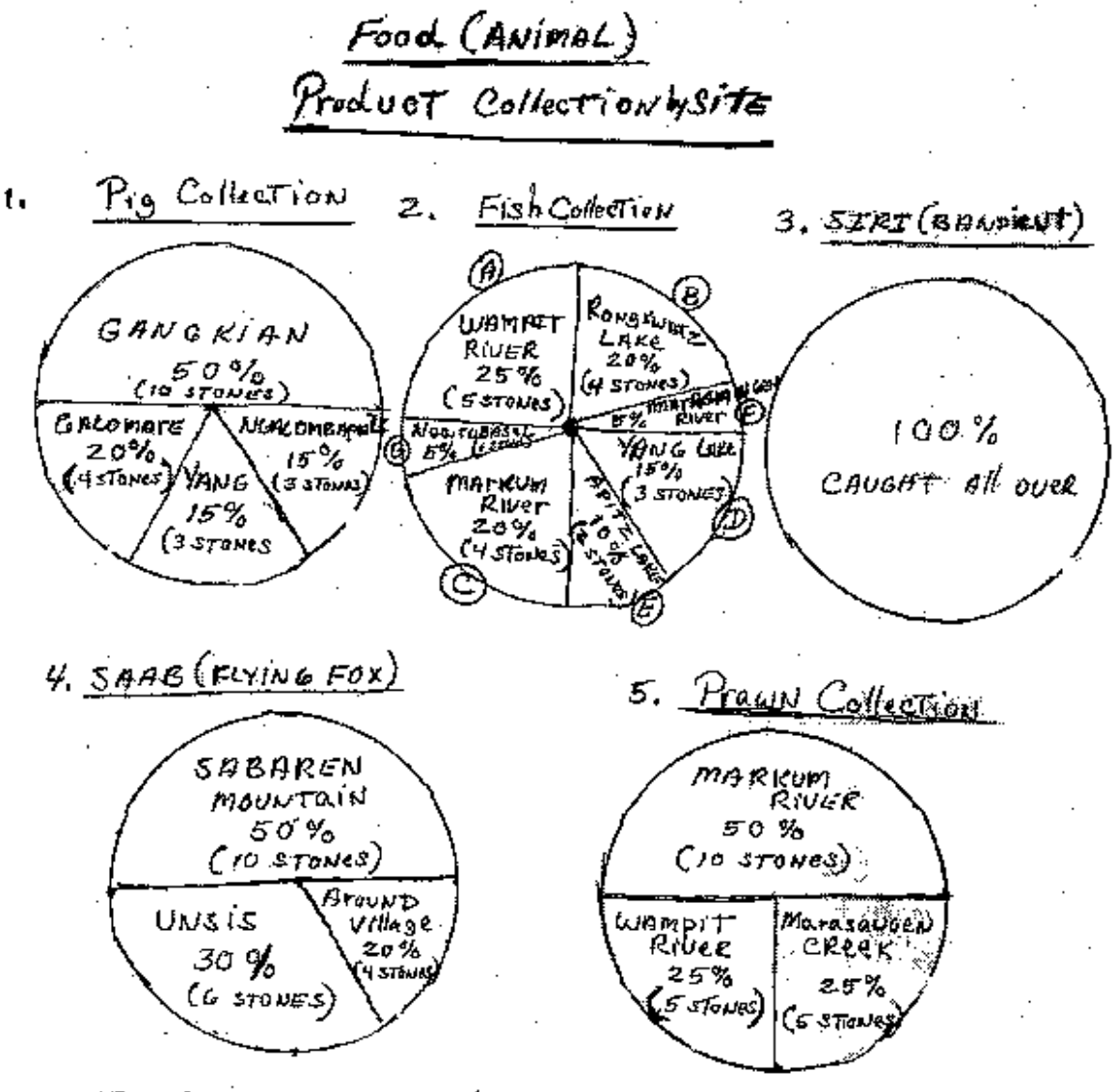
FIGURE 3. FLOW DIAGRAM FOR WILD ANIMALS IN MARE, WITH GENERAL CONSUMPTION PIE CHART



Pie diagrams (see Figure 4) can be useful when starting to compare similar items in terms of their relative use or contribution. It is simply a way of showing approximate percentages, for example the proportion of different types of fodder or fuelwood to daily consumption. Each item is shown as a proportion of the whole 'pie'. Pie diagrams are usually quite short exercises. They are useful for beginning a discussion about constraints or to find out why a specific item contributes little.

Overall about 85 % of all animal food that is caught goes to the household. Only about 5% is marketed, and another 10% is given to *'wantoks'* (family). The collection of wild animals is complex due to the varied animals and the many sites. Thirteen sources were depicted: 7 main sites for fish, 4 for pigs, 3 for prawn, and 3 for flying fox. Bandicoot is caught everywhere, opportunistically. Of the animals caught, only bandicoot and flying fox are marketed regularly. Fish, pigs, and prawn are kept largely for home or family use. Although there are still plenty of wild animals, they are moving further away from the settled village area.

FIGURE 4. WILD ANIMAL-SPECIFIC PIE DIAGRAMS, DEPICTING DISTRIBUTION OF SOURCES, IN MARE



NOTES:
- Quantity of product collected per year
- See FLOW map for sites Location
- For fish collection, the question of which site was visited most often was also asked, and the informants ranked them in order (A visited most, G least often)
- Maximum of 20 stones per product, all stones had to be used

In Mare many products are marketed, although some, such as fish and fuelwood, only on a limited scale, and opinions vary as to the extent of marketing (Box 7). In many cases, there was a mix of sale, barter and home consumption. This made it easier than in Buingim, where very little is marketed, to determine realistic prices for forest-related products.

BOX 7. FRESHWATER FISH IN MARE

Each family fishes almost every day of the 5 to 7 month season (mainly during the drier months). Women fish with nets; 50% of men fish with nets, and 50% with line and hook. Women do 70% of all fishing so net-based fishing was taken as the norm. Men make the nets. The data relates to two sets of group interviews, mainly with men, unless otherwise stated.

Product Chain and Costs of Production The process starts with the trip to the fishing site. With seven sites, an average travel time (weighted by the importance of each site in terms of amount collected and frequency of visits) was calculated of about 5 hours. Up to 4 hours is required at the site to catch the fish. Time is also spent cleaning the fish (either at the site or at home) which takes about 2.5 hours. Total time involved = 11.5 hours per catch, or K6.55 per trip (using the minimum wage rate at K0.57/hr).

The number of trips per year varied between the two groups. Although everyone was agreed that each family fishes almost every day (about 25 trips per month), estimates of the length of the fishing season ranged between 5 and 7 months. This implied 125 to 175 trips per family, or about K820 to K1,145 worth of labour costs per year.

In this process, a net is used which lasts anywhere between 2 and 15 years but usually 3 to 4 years. It takes 100 hours to make @ K0.57 = K57, or about K14 per year (for a 4 year life span). A hook and line lasts about a year, each hook is K0.30, which will be considered negligible. Sinkers cost K1 but it is not known how long they last.

Total costs incurred range between K834 and K1,158 per year per household, or between about K146,610 and K203,800 for Mare as a whole. This assumes 176 households based on the total population of 1,232 and an average household size of seven members.

Price The market price depends on location and size. In the nearest local market (outside of Mare on the road to Lae), K1.5-2 is paid per large fish, while in Lae this is can be up to K5. As most fish is marketed locally, local prices would be the most representative but no data on the average weight that corresponds to these prices were obtained. Therefore other data was used based on women catching a 10 kg bag with about 75 small fish. Small fish fetch about K0.50 each in the nearest local market, therefore giving a price per kg of fish of K3.75.

Quantity Women catch about a 10 kg bag per trip, while men catch about 18 kg in total. Women do 70% of all fishing, and men 30%. A woman therefore undertakes between 85 and 123 trips per year, and at 10 kg a trip catches between 850 and 1,230 kg. Men undertake between 40 and 52 trips a year @ 18 kg, or 720 and 936 kg. The yearly catch per household therefore ranges between 1,570 kg and 2,166 kg, or for Mare a total of 276,320 and 381,216 kg/yr.

Value of the wild resource Lower and upper estimates of the annual value to the community of the fish extracted from rivers in the forest based on ranges in both cost and quantity are as follows:
Lower estimate: V = (K 3.75/kg * 276,320 kg) – K146,610 = about K889,590/yr or K5,054 per family
Higher estimate: V = (K 3.75/kg * 381,216 kg) – K203,800 = about K1,225,760/yr or K6,965 per family

Issues
Number of trips Clearly, the length of the fishing season and hence the number of trips influences the final value of fish catches, although the order of magnitude of the value for Mare remains the same – about one million Kina.
Extent of Marketing How much is fish marketed, and where is it marketed? The answers differed considerably. One group said that only 5% was marketed, while the other said that up to 35% was marketed. This affects the calculations in several ways. First, time spent selling and travelling to/from the marketplace is between 1 to 3 hours travel, with 4 hours selling, pushing up the costs per commercial fishing trip up to K10.54. In the estimates above, these labour costs have not been accounted for and would push down the annual value of fish for Mare. Secondly, costs are incurred when marketing takes place further afield, as it costs K6 to go to the furthest place, Lae, plus K1 per bag transported, and a K5 market fee. The extent to which these costs would reduce the annual value would depend on the proportion of fish caught that is marketed in the different locations.

For products that are marketed another difficulty encountered was that the number of transactions involved are so limited that the price information is not very reliable. For example, there is a local market in Buingim but it functions sporadically on occasions when people have some surplus rather than on a regular basis. Villagers cited prices for products in the local market that seemed extremely low in relation to the amount of effort involved in harvesting and collection (e.g., see Box 8 below. In addition, the price villagers receive in some transactions may reflect market power on the part of the buyer. This might explain why the price received by villagers in Mare for a one-off supply of fuelwood to a local company seems so low in comparison with the cost of the equivalent amount of kerosene (Box 8). Payments are also commonly made in a mixture of money and products, which obscures the full price. For example, a limited number of canoes are sold in Buingim each year but the "price" includes a substantial element in kind (pandanus mats, laplaps[10], bilums and food (Box 8).

BOX 8. CANOES IN BUINGIM

Canoes are made by five families (13 people) in Buingim. Four types of tree are used: *akop* (preferred), *amin, anga* and *mansu* (least preferred).

Product Chain and Costs of Production
The process starts with the identification of the tree by the prospective canoe buyer.

The tree is then cut down and shaped into a rough canoe shape in situ. This takes 15-18 days and involves 2-3 people. The tools required are an adze costing about K20-30 new and an axe costing K10-15. Both will last for years and may be used for other purposes so the cost involved is small. For example, one carpenter interviewed was using his father's adze and a second-hand axe.

The tree is then pulled to the village by 20 or more men and women, often dressed with decorative flowers and paint so that it is almost a ceremonial process. There is usually a feast for all concerned. This takes one day.

The canoe is then smoothed and finished in the village and other parts such as the outrigger, and rope fastenings are added. This takes 2-2.5 weeks of work. In addition to the tools mentioned above a hand-drill costing K20-30 new is required.

Another key input is a sticky putty used to stop up leaks which is made from the seed of the *Inocarpus* family of trees. One such tree was brought from another part of PNG to Buingim specially. Other species of wood e.g., *kwila* will also be used for certain parts of the canoe e.g., the paddle.

Price If the canoe is being sold in Buingim, the prospective buyer provides food for the carpenter and the other workers involved, throughout the process, including the feast on the day the canoe is pulled to the village. This is estimated to cost K2/day giving a total of K138 for 69 days of labour involved. The buyer also pays around K75 for the feast on the day the canoe is pulled to the village, giving K213 in total. In addition, the buyer will give a variety of goods such as *pandanus* mats, *laplaps, bilums* and food in exchange and possibly some money also. The final price paid by the buyer is a little hard to determine therefore.

If the canoe is sold outside the village, the buyer will normally pay about K150-K200 in cash and in addition provide some goods in exchange bringing the total price equivalent to about K200-K250. In this case the buyer does not provide food during the process but does pay for the pulling feast, bringing the total price to about K275-K325.

Quantity The number of canoes built each year was determined from the percentage of households with canoes and the useful life of a canoe (2-6 years). A questionnaire conducted for one half of the village and a social mapping for the other half revealed that about 40% of households have canoes. Assuming that canoes last on average 6 years, this means that each year about 7% of households in the village buy a new canoe, equating to ten canoes per year. One tree of the species commonly used will provide sufficient wood for 1-3 canoes as well as fuelwood and building materials. Thus it is estimated that five trees on average will be used per year to make canoes in the community.

Value of the wild resource A rough estimate of the value to the community of the tree species used for canoes given

10 A wrap around cloth similar to a sarong

costs consist solely of rations payments.
Lower estimate: V = (275-213)*10 = K620 per year
Upper estimate: V = (325-213)*10 = K1,120 per year

Issues

Price Firstly, even though in these cases some prices are observable, e.g., to buyers outside of the village, they may not be representative of prices that would prevail in a market where there was more trading. The price may reflect cultural relationships rather than conditions of supply and demand. This is suggested by the price of substitutes such as dinghies, which cost at least K3,500 and motorboats, which cost about K3,000. While their useful life is twice that of a canoe they are still significantly more expensive than the price quoted for canoes.

Opportunity cost of labour The estimate of labour costs is based on payment for rations, which is relatively low. If instead the minimum wage rate of K4.5/day were used, the costs would be much higher and would exceed the price paid for the finished canoe. What is difficult to determine is whether the workers involved have other productive options or whether there is no other form of employment for them. In the latter case the rations payment would be sufficient. Another possibility is that the provision of their labour in exchange for just rations payments creates an obligation for the canoe builder to return the favour at some stage in the future.

5.2.2 What substitutes exist?

For products which are not marketed, valuation can be based on barter relationships and substitutes which are marketed. In this case, the price of substitutes was also considered in relation to some products that are marketed but only sporadically. The challenge was to identify substitutes which are sufficiently close to ensure a realistic price. Ultimately this is a matter of judgement. Where products are not marketed, substitute matrices can serve an important function in indicating the extent to which alternative products are preferred or not. Furthermore, when used in addition to a market price-based calculation they can help in checking whether the value calculated is being over- or under-estimated (see Box 9). Finally, if the trends of substitute use are analysed further, it can provide an indication as to the period of time over which the calculation for the resource value is likely to be valid. It may be the case that substitutes in some cases will over time partially or totally replace the use of a wild product in the village.

Substitute matrices (see Table 6 and Box 9) are simply tables that list the substitute products (potentially) available. These lists are then used to rank them in order of preference. This serves to guide the research team in identifying which substitute product is the 'best fit' for which, hopefully, more specific data can be found more easily.

TABLE 6. SUBSTITUTE MATRIX FOR CONSTRUCTION MATERIAL IN MARE

Product	Possible Substitutes (actual/potential)	Degree of Preference
1. Kwila	a. *tik*	4
	b. rosewood	3
	c. ofogulir (album proceral1)	1
	d. lamiro (leucaena)	2
2. Labula	a. muntiyafa (taua cedar)	3
	b. novang (makarongen)	1
	c. mapoa	2
3. Rosewood	Similar to *kwila* post	Similar to *kwila* post
4. Black palm	a. *zain* (buai or betelnut tree)	1
	b. mofop (palm)	4
	c. boagam (pandanus)	5
	d. *foflep* (sago fronds)	3
	e. *pulung* (bamboo)	2
5. Saksak (sago) Top – roofing Bottom – walling	a. zomel	1
	b. *boalog* (bamboo)	2
	c. *zgog* (kapok leaves)	3
	a. medgangkan	1
	b. yangklo (maladanga)	2
	c. *ompan* (black palm)	3

11 Latin names are given for those we were able to identify.

A drawback in such discussions is that people find it hard to separate 'price' from 'preference'. When asked if they prefer kerosene to fuelwood, their first response is no as it is considered too expensive. This was evident in discussions with workshop participants and in the fieldwork. It proved difficult for them to compartmentalise the various attributes of a product.

BOX 9. FUELWOOD AND SUBSTITUTES IN MARE

Fuelwood is collected mainly by women and is plentiful, so it is generally not sold. This is changing with the advent of chainsaws, which means that men are getting involved in harvesting for the purpose of commercial sales. Many different types of wood are used, which grow in different ecosystems and therefore have different collection times. Some are harder, requiring more cutting time. Some burn better thus are preferred and therefore more collected above others. Finding average values in this complexity took several stages. Of the twenty-six different types listed that are chopped frequently, five species are most commonly used: *chab, ngampur, warias, apich* and *esea*.

Product Chain and Costs of Production
The process starts with the trip to the harvest area (of which there are three – see below). Processing is different, depending on whether it is a dry (dead) tree or a wet (live) one. Dry trees that are lying down can be split immediately, while those that are still standing first need to be chopped down. The split wood is then bundled and carried home. Wet, standing trees undergo an additional stage of ring barking to kill the tree. In this process, an axe (worth K10-15) is used, a bush knife K5.00, plus rope for tying the bundles. All will last for years and may be used for other purposes so the cost involved is negligible.

One woman's experience of time spent was considered by the group to be representative. She had cut 63 bundles (estimated by the group @ 10kg each) in 10 hours, plus an additional bundling time of 30 minutes (which seems very fast at 2 bundles per minute). She had carried three bundles per load, so had taken 21 trips lasting 45 minutes each (15 minutes to and 30 minutes back home).

Total time taken = 1,575 minutes for 63 bundles = 25 minutes per bundle (or 2.5 minutes per kg).

Price
Prices for fuelwood were hard to ascertain, as only one woman was known to have sold some. However, a commercial enterprise, 'Niugini Table Birds' had recently paid someone in Mare K78 for a truckload of 3,000 kg of fuelwood (community gate price). This translates to K0.26 per 10 kg bundle of fuelwood.

Quantity Overall, the women said they use 5 kg per day for cooking. This totals 182.5 bundles per year, or 1,825 kgs per year.

Value of the wild resource
A rough estimate of the value to the community of the forest used for fuelwood, given current levels of use (i.e., with no substitutes) can be derived. If a minimum wage rate of K0.57/hour is used to cost the labour inputs, then production costs per bundle of wood come to K0.24.

V = (K0.26 – K0.24) = K0.02 per bundle and K0.02*182.5 = K3.7 per family per year.

Village level value of fuelwood = K3.7 (for family of 7) x 176 households (population divided by 7 member household) = K651 for the whole community.

Issues
For a number of reasons, the figure above is not a reliable estimate and is likely to underestimate the 'value' of the forest in terms of fuelwood used by the community.

Price
The price quoted above may reflect the relative market power of the buying company and the fact that it was a bulk sale. Thus it may not equate to what villagers would have to pay for fuelwood if they were buying locally and in smaller quantities.

Production cost
The time to cut one kg of wood will vary considerably. The example offered by the group of women conflicts with the collection times they gave overall. They estimated that 30% of the wood came from *kunai* grass area, which is 60 minutes walk, 20% from the swamp which is 90 minutes away, and the remaining 50% from the sozamo which is also 90 minutes away. Hence on average, a trip will take at about 80 minutes, not the 45 minutes given as a good example. This will put the time spent per kg of wood at 3.7 minutes per kg, or converted to wage rates, K0.35 per bundle. This then comes to more than the price paid, suggesting that minimum wage rates may not be an appropriate indicator of the opportunity cost of labour for women.

Changing sources of cooking energy
As fuelwood is marketed only very rarely and any prices that might have been paid are therefore not reliable, a relative preference ranking of substitutes was conducted. Kerosene emerged as the preferred option. Although it is considered too expensive and socially undesirable as it is an indication of a lazy person, given trends in PNG in general, it is likely that the use of kerosene burners will grow. Substitutes (points out of a maximum of 35): kerosene 32; stove 24; palms 16; shells 12; leaves 8; bamboo 8. Only kerosene has a market price. This makes for an interesting comparison.

Information came from the one woman participating in the group discussions who uses a kerosene stove. She pays K3.5 per 5 litres of fuel, that lasts 2 days (of 3 full meals) with a family of 7. Hence the annual cost of the fuel alone is K639. Fuel has to be bought in Lae, which costs K6 per return trip. If 15 litres are bought per trip, about one trip per week, then annual transport costs will be K365. Added to this is the time taken, 4 hours per round trip, or K2.28 (at K0.57 per hour minimum wage) per trip, or K139. This means that the annual cost of a fuelwood-equivalent comes to K1,143 for one family – more than the total standing timber value calculated for the fuelwood used each year by the entire village. If a price based on kerosene is used instead in the calculation of standing fuelwood value, the result is 1,143-0.24*182.5 = K1,099 per family or K193,459 for the whole village.

Non-domestic use As mentioned in Section 5.3.3, fuelwood also has non-domestic uses, such as bride price or for burials that could be considered non-use values. The women said that they collect an additional 50-60% to cover such needs. Hence the value of the forest in terms of fuelwood, all uses considered, would be higher yet than the value reached above indicates.

For some products that were marketed sporadically, the difference between their price in the village and that of identified substitutes was so high that it raised the issue of interpretation. The large difference could mean that the substitute was very different in its performance characteristics and other attributes. Alternatively, it could mean that there were distortions in the village price. This is demonstrated by the case of canoes in Buingim, which are less than a tenth of the price of substitutes such as steel and fibreglass boats. Substitutes for bush material houses raise similar issues. For Buingim the approach followed was to identify a very basic wooden house as a substitute and estimate its cost without items such as a zinc roof, which would not be comparable to the village situation (Box 13). In Mare, where there is little marketing of fuelwood, estimates of value based on the substitute, kerosene, were made. However only one woman in the village was known to use kerosene so all estimates of price and amounts used had to come from this one source. The difference between the value of fuelwood estimated on the basis of kerosene and that estimated from the one recent transaction in fuelwood is so large that the figures cannot be considered reliable (Box 9).

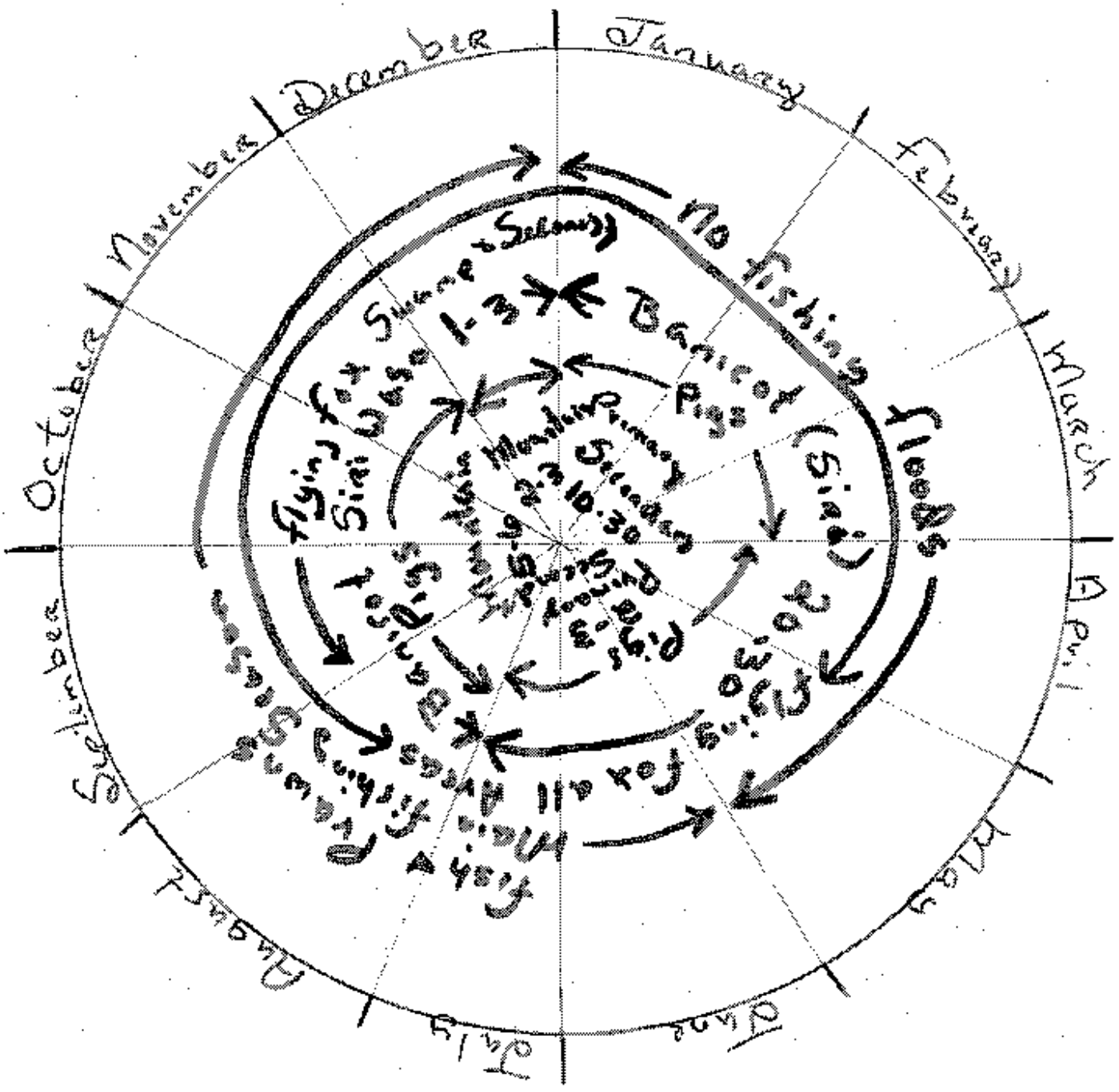
5.3 Quantities

It is essential for valuation to estimate the quantities of wild resources that are actually being extracted by community members for use. This is often challenging in small communities where subsistence use is more important, as people do not need to think in terms of specific quantities over a fixed period (like a year). Instead, they use forest products on an 'as-needed' basis or when they are available (see also Shanley *et al.*, 1997). Amounts used are often seasonally determined. It is therefore necessary to build up a picture of the amounts that can be collected on each trip by different types of user, the number of trips made at different times of the year, taking account of any seasonal influences which might affect the amounts collected, and the number of different types of user in the community.

Product chains (see Section 5.4) can be useful in linking different types of user and use with specific wild resources. Another method that can be particularly effective in eliciting information about temporal variation in quantities used is seasonal calendars.
Seasonal calendars (see Figure 5 for an unusual example of a round calendar) are critical for understanding the time of

year when products are used, gathered, hunted, etc.. A 12-month calendar is often used but people may choose to divide the year differently, thus this will first need to be clarified. In some areas, people might prefer to discuss seasons rather than months. After symbolising the months or seasons, they discuss different topics and show seasonal variations by creating a visual comparison between the months. For example, they can compare seasonal changes in availability of wild animals or in the harvesting of medicinal plants. They can discuss related problems and how they resolve them. For local valuation, they are an effective way to understand price and quantity variation over the year.

FIGURE 5. SEASONAL CALENDAR FOR ANIMAL HUNTING IN MARE



Social mapping (see Section 6) can be used to generate estimates of the numbers of households or people using specific types of resources, and draws on people's knowledge of what is going on in their community.

5.3.1 Estimating amounts per trip and the number of trips

It is important to distinguish between products for frequent consumption such as food and fuelwood, which involve harvesting on a regular basis and products such as building materials, which will be harvested only in the case of a specific event, such as when existing houses need replacing or a new household is being formed. For the former type, it proved extremely difficult to elicit quantitative information on the amounts collected per trip and the number of trips made. This was particularly the case for products like river prawns which are not used every day and for which consumption patterns will vary from household to household. Similar difficulties are presented by medicinal plants, for which the frequency of use will depend on the incidence of different illnesses and the availability of Western medicines in the village (see Box 10). For products like fuelwood, which are used on a daily basis, it was possible to work with estimates of how much was needed to cook two or three meals a day.

However, even in this case variation in units of measurement hindered clear information collection. As one participant researching fuelwood prices in Mare explained: 'Collecting information on quantities and substitute values to put a money tag on fuelwood was very difficult. This is because fuelwood is essential in daily needs of villagers, and none of the 700 languages in PNG has a standard unit of measurement to quantify fuelwood.'

This is less of an issue for resources which are made into products such as canoes and houses, for which the amount of materials required are fairly standard (although there can be variations in size).

BOX 10. MEDICINAL PLANTS IN BUINGIM

Fifteen plant species were identified by the community members in Buingim to have medicinal value. Most of these can be found in primary forest, secondary forest and near the village. Most have a specific application and only two are of general application.

Product Chain The analysis focused on four types of plant, two of which – duruc and insin – are used to treat snakebites, one – *alang* – is used to treat knife wounds and the remaining one, *mongomongo* – to treat headaches. For all of these the product chain is relatively simple as little processing is required and all that is needed for harvesting is a bush knife which is used for a wide range of other purposes. Thus the main cost involved in using such plants is the opportunity cost of the time spent in going to collect them. For the snake bite remedies, the people interviewed estimated this as ranging between 30 minutes for alang and 80 minutes for duruc. However, given the nature of the ailment, it is highly likely that these occur when people are already in the forest and the collection time may be considerably less.

Price These medicinal plants are not sold in the village. It is therefore necessary to look at the price of substitutes. For snake bites this is straightforward. Anti-venom antidotes cost K1,000 per snake bite and for this reason are not likely to be available in the village clinic. This is equivalent to nearly a year's wages at the minimum wage rate. Use of *duruc* and *alang* is therefore extremely important.

Quantity The main difficulty is in determining the frequency with which these plants are required and used to treat the ailments concerned. Attention was focused on the snake bite remedies as the substitute is so expensive. A questionnaire survey applied in all households one half of the village revealed that 8 people had suffered snake bites in the last year. In the other half of the village, through a social mapping exercise it was estimated that people had to be treated for snake bites on 5 occasions over the preceding year.

Value of the Resource On the basis of the substitute price, and assuming that collection costs are negligible, the *duruc* used in the village can be considered to have been worth K13,000 for the year examined.

Issues For the other type of medicinal plant it was not possible to arrive at estimates of quantities used. Given the wide ranging nature of the ailments addressed, it is not feasible for people to give accurate responses on annual incidence, and this will vary considerably from person to person. In contrast, a snake bite is easier to remember and is not likely to happen to someone more than once a year. However, the incidence of snakebites is likely to vary considerably from year to year. Conversion of the forest to other land uses might also reduce the snake population and the risk to villagers of snake bites, although this outcome would not necessarily be desirable when factors such as biodiversity conservation are taken into account. The other difficulty is establishing whether these medicinal plants are actually used if Western medicines are available in the village clinic and whether they are preferred or not to Western medicines.

5.3.2 Understanding intra-community variation in quantities collected

There will inevitably be some variation between community members in the amounts collected of different types of wild resource, depending on gender, age, household size, other productive options open to them. Estimates of the total quantity of a resource harvested by the community would need to take such variation into account. In Buingim and Mare, participatory methods proved useful for understanding gender differences in resource use as groups could be easily divided along gender lines or questions asked specifically about men's and women's use of resources. As discussed in Section 4.1, mapping exercises with groups differentiated by gender revealed that women and men harvest and use different types of wild resources. They may also collect the same type of resource but collect different amounts on each trip and have different trip frequency. This is illustrated by the case of fish in Mare where men were estimated to catch over twice as much as women on each trip but account for only 30% of all fishing trips made (see Box 7). However, care was needed to ensure that the characteristics of those participating in group discussions were sufficiently representative. In Mare, one seasonal calendar that aimed to find out when wild animal (food) collection/hunting took place[12] had to be repeated. The men dominated the discussions, particularly one young man who did not hunt. Women who do most of the fishing were edged out of the discussion. Moreover, no older male hunters were present, who would have longer experience and a better understanding of historical and seasonal variations on which to reflect.

Participatory methods, given the emphasis on group work, were perhaps less effective in revealing the implications for resource use of other types of differences such as status within the community, household size and access to other livelihood options. With more time it may have been possible to form groups along these lines.

5.3.3 Multiple Uses

Even if an estimate can be made of the quantity of a particular resource collected, a further step is needed to understand the different uses to which it is put as these may involve different types of value and different substitutes. Even products such as fuelwood that are not marketed locally and appear to have an obvious function may not all be used for home consumption, with some being used for burial ceremonies, gifts and other socially-oriented uses (see Box 11).

BOX 11. HIDDEN USES OF FUELWOOD

In Mare in one group discussion, a flow diagram depicting sources and uses of fuelwood highlighted that amounts collected by women are not an accurate indicator of the amount they actually use for cooking. About half is used for other purposes: 10% as gifts, 15% as bride price payments, and 25% as burial ceremonies. In another group discussion, the division of use was different: 40% for cooking, 20% for gifts, 30% for bride price, and 10% for income. Basing a valuation of fuelwood only on the average amount needed per family may underestimate its actual value to the community. The value of fuelwood in its uses for burial ceremonies, bride price and other gifts needs to be considered as well.

5.3.4 Estimating the Number of Key Resource Users

Participatory methods such as social mapping proved to be a fairly quick way in both Buingim and Mare to identify households using certain types of product. Social mapping was used to estimate the number of new houses built each year as well as a range of other variables such as number of hunters of wild animals, number of households with canoes of different ages, crosscheck income-generating activities, etc. (see Box 12). In some cases this was followed up by individual interviews or visits to some of the households concerned to check the accuracy of the information provided by the mapping exercise but not as extensively as necessary. It appeared to work well for rather visible uses such as construction of a house or acquisition of a new canoe. Information was also provided in the case of Buingim on the age of the canoes held by each household. But there was insufficient time for this mapping exercise to be repeated with another group to check the accuracy of these statements or for extensive cross-checking with individuals to be carried out.

5.3.5 The Reliability of Quantity Data

Even with crosschecking, the accuracy of the answers received is still questionable because of the fundamental difficulties outlined. While group discussions helped community members to think about their usage of a resource over a whole year, estimation of quantity represented the greatest limitation for the application of 'quick' participatory methods. Alternative research methods such as following a sample of community members over a representative time period to observe their resource use or asking them to record resource use in a diary could probably be more accu-

rate in revealing quantities but would be very researcher or villager time intensive and could create bias by influencing the behaviour of community members involved.

BOX 12. ESTIMATING THE DEMAND FOR HOUSES IN MARE

In Mare, a social map was used to estimate housing demand[13] The social map revealed 237 houses in total. It was possible through group discussions to indicate on the map the houses which had been built in the last two years and thus derive a rough estimate of the number of houses built per year. It is important to note that most houses were built to replace worn-out structures and do not, therefore, relate directly to population growth or family changes.[14] Existing stilts or poles last 10 to 30 years, while the rest of the house typically lasts 5 to 7 years. This type of diversity makes calculations of the annual demand for houses that use construction material from the forests complex.

Key housing data:
- 53 houses built in 1995
- 44 houses built in 1996
- 9 houses made of permanent material (not from forest resources)
- 10 houses made partly from permanent, partly from forest material.

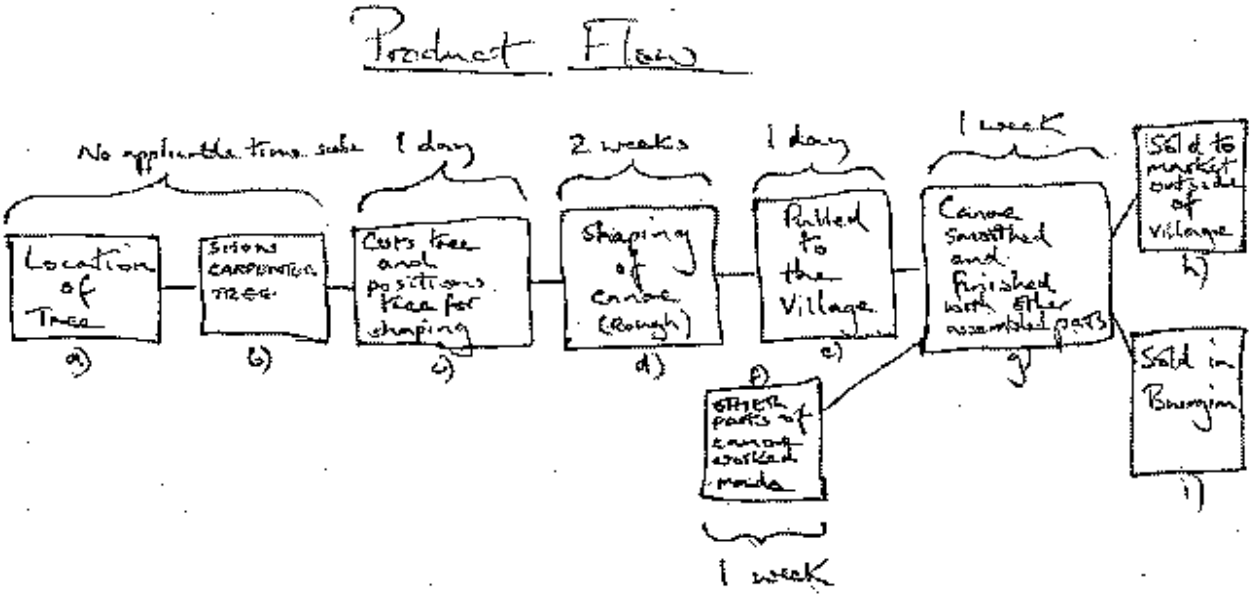
5.4 Costs of Harvesting

The techniques for addressing the cost of harvesting centre on identifying the various steps involved in taking the wild resource from its the natural state in the forest to its processed state where it is consumed within the community or marketed. The techniques most commonly used are product chains and product stories.

Product chains (see Figure 6) are like flow diagrams in that they are drawn as a journey – from the source to the 'market', identifying on the way, which processing steps are taken and which tools or other inputs are used. They help to identify the different stages involved from harvesting to consumption or marketing, and are therefore useful to guide more focused discussions around the costs per stage/input.

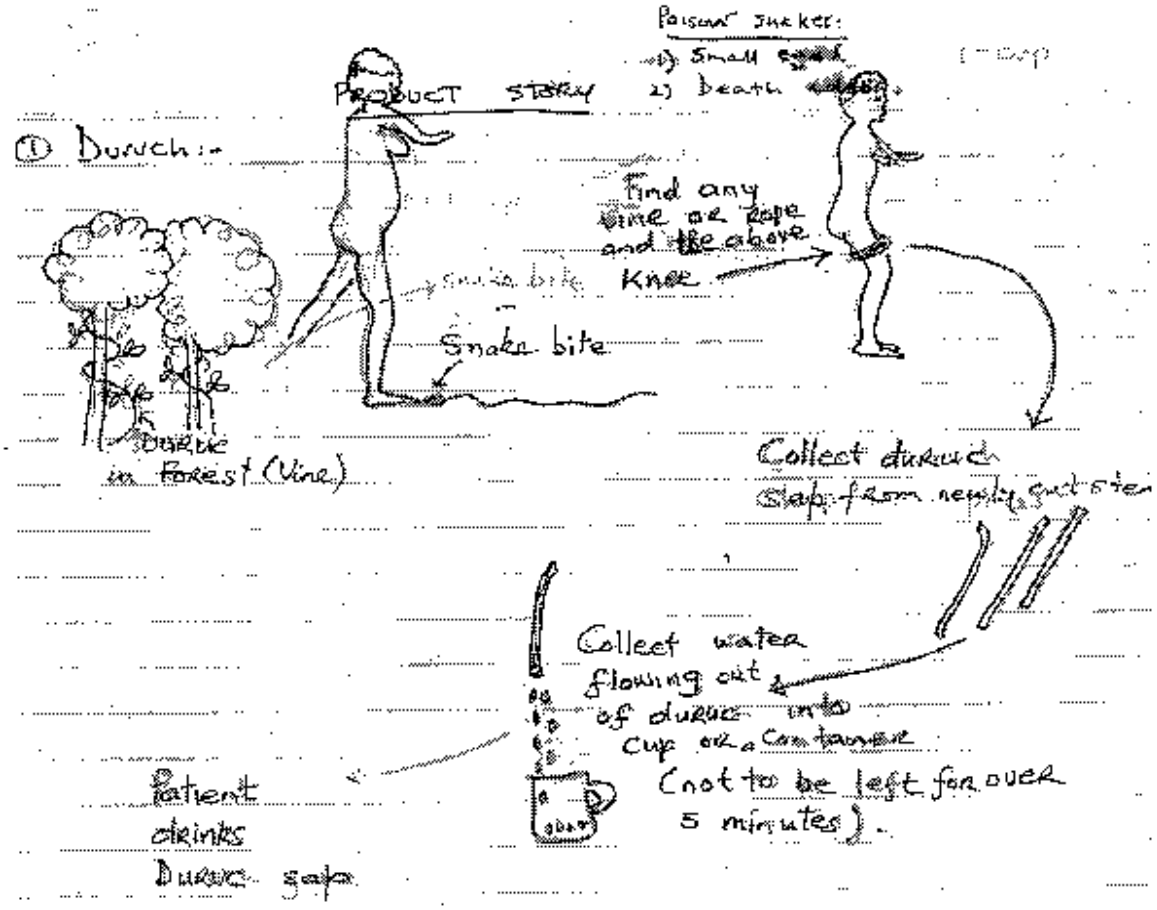
Product stories or transects are similar to 'product chains' but do not require community members to draw diagrams. They are discussions that can occur while people are seated or walking a transect. This may at times be more effective, particularly if the people involved have strong oral traditions and are uncomfortable about drawing.

FIGURE 6. PRODUCT CHAIN FOR CANOES IN BUINGIM



13 This map also served to cross check the data related to total numbers of wild pigs hunted per year, as we were able to identify the number of pig hunters by which annual catches could then be multiplied.
14 Young men typically leave home and build their own as they reach physical maturity (literally 'when their beards grow'). Therefore the number of families – and therefore houses – increases while the population of Mare does not.

FIGURE 7 PRODUCT STORY FOR SNAKE ANTIDOTE IN BUINGIM



5.4.1 Estimating Time Spent on Travel, Harvesting, Processing and Marketing

Travel

The first challenge is to estimate the distances that people have to travel in order to harvest the resource and bring it back to the village. This can vary considerably. In Buingim, products can also be found not just in the primary forest (which is furthest away) but also in the secondary forest and in some cases near the village. In Mare, there were key differences for fuelwood, which can be collected from three main ecosystems:[15] sozamo (bushland), kunai (grassland), and swamp. As the distances and hence collection times vary from one ecosystem to the other, the women then assessed the relative frequency with which they collected fuelwood in the three zones. They used 50 pieces of betel-nut skin to indicate this, resulting in a spread of 50% collection in sozamo, and 25% each for collecting in kunai and swamp.[16] This enabled some refining of the estimate of total collection time for fuelwood.

Another issue is that special journeys are rarely made for specific products. Collection of a product is usually combined with other activities. Thus fuelwood in Buingim is collected in the course of the daily visit made by women to their gardens. In Mare, for example, bandicoots are rarely hunted specifically but usually 'en route' to other tasks. It is not appropriate therefore to use the whole time spent on travelling to and from the harvesting site in the estimation of costs. Using the participatory methods outlined above it is not possible to go beyond a rough estimate of the proportion of harvesting journeys that are single or multi-purpose. For a more precise allocation of travel times to different products and activities, tracking of community members on a systematic basis would be required. Questionnaire-based approaches would come up against the same problem, but would possibly have the advantage of revealing more of the differences between community members in distances travelled and activities undertaken as part of their daily routine.

15 These general resource areas had already emerged through the maps on the first day.
16 Actual values were from discussions with two groups of women, and their estimates rounded off to the nearest 5%.

Harvesting and Processing

The amount of time spent on harvesting can vary considerably for those products for which availability is season-dependent. For example, in Buingim, the women estimated that it takes half the time to fill a net of prawns in the wet season as in the dry season. The amount of time needed per kg of product harvested can also vary depending on the size – thus big trees probably involve less labour per kg of fuelwood than small trees. It proved difficult though in some cases for villagers to recall how much time was required for harvesting and processing, particularly if some time had elapsed since they had last harvested. This meant that it was necessary to restrict the gathering of information to community members who had recently harvested, thus limiting the scope for cross-checking. These difficulties of achieving accurate recall would also be faced by a questionnaire survey. Only observation or recording of community members' activities over an extensive period would resolve this.

5.4.2 Opportunity Cost of Time Spent in Harvesting, Travel, Processing and Marketing

Understanding how people value the time they spend on harvesting and processing products presents considerable challenges in small communities where there is little or no paid labour. One approach is to use a local wage rate as the opportunity cost but this is only appropriate when there is no unemployment or underemployment. In PNG, there is a nationally determined minimum wage rate, which at the time of the workshop was 57 toea[17] per hour. This can provide a basis for estimation of labour costs but its application in Buingim where there is little paid employment proved to be rather questionable. Where other people from the village are brought in to help with a particular activity such as house-building or making a canoe, they are not paid at the minimum wage rate but are paid a nominal amount for food, cigarettes etc. There was a debate amongst the workshop participants as to what was the appropriate cost to use: the minimum wage rate, the rations payment or both combined. Box 13 shows the importance of this assumption for the final valuation outcome in the case of housing materials. Some workshop participants argued that the rations payment was the appropriate rate as the people involved, mostly youth, apparently had no other form of occupation. An alternative perspective is that this type of labour input appears to be given for free or at very low cost but creates obligations to reciprocate so that there may be hidden costs.

The opportunity cost is also affected when part of the activity is turned into a ceremonial process. Should this time be considered as labour with the same opportunity cost as other parts of the process, or is it leisure with little or no opportunity cost (see also Box 8: Canoes in Buingim)?

An alternative approach is to estimate the returns to labour from harvesting and processing a wild resource. This avoids the need to assign a cost to the amount of labour involved but the result to be meaningful has to be compared with returns from other activities in the village. As so little is marketed in Buingim, valid comparisons can be hard to find.

BOX 13. HOUSING MATERIALS IN BUINGIM

Product Chain The first stage is to select the site and determine the layout of the house. The owner to be then locates the materials needed to build the house. These are generally located in the primary forest though from local knowledge a builder can identify isolated specimens of preferred trees in the secondary forest area thus reducing the distance over which the wood is carried. The advantage of wood from primary forest is that it lasts longer. The next task is to select and fell the species used for posts bearers, framing and rafters. They are debarked and left to dry out in the forest. After the wood has dried out, it is carried to the site. For the posts, up to 15 carriers are required, for the rest up to 8. The timber walling is shaped by axe in the forest before being carried to the site. The timber is stored on the site and further storage takes place. Construction begins when the owner-to-be has secured sufficient helpers. The post holes are dug, and posts squared. The group then proceeds to bearers, framing and rafters. The roof, which is made from sago leaves on a bamboo frame, and the floor, which is made from limbun, are 'contracted' to other groups to prepare. The band of helpers continues until the roof and floor are in place. The walls are made by a variety of methods. Previously, walls were made from woven sago leaves. This has been gradually replaced by timber shaped by hand with an axe. In turn this is now being superseded by a chain-saw operator in the village. This reduces the time necessary but costs around K200 per tree. The next stage is to complete the home with windows, doors, steps and iron/steel hinges and padlocks. This is normally done by the owner. The final stage is a feast to allow occupation of the new home at which the pastor will bless the house. The Loya members,[18] the helpers, families and friends are invited.

17 There are 100 toea in a Kina.

18 The main governing body of Buingim is called the Loya committee.

Costs
Tools: An axe, saw, hammer and file are required. Taking into account their average life span their depreciated cost is K15. Materials: Apart from wood, nails (18 kg @ K3/kg and fittings (bolts and hinges) costing K20 are required. This gives a total of K74.

Labour
Labour requirements are as follows:

Time Spent (days)	Posts	Wall	Floor	Roof	Frame
Travelling	5	3	1	2	3
Cutting/Trimming	6	3	1	1	2
Skinning/Shaping	1	7	4	4	2
Carrying	8	10	5	5	5
Construction	3	7	4	3	40
Total	24	30	15	15	52
Grand total	136				

The only payment made to the workers is food rations costing K70. In addition, about K100 will be spent on the feast of inauguration. If instead the minimum wage rate of K0.57/hour was used to estimate the opportunity cost of labour, the total would come to K620.

The total financial cost of building a house is therefore K88+ K70+K100 = K258. In opportunity cost terms it could be as high as K88+K620+K100 = K808

Price Houses are not bought and sold in the village but villagers that are permanently employed outside Buingim can get a house constructed in the village for K150-200, which barely covers the cost of the non-wood materials and rations. As a substitute a basic type of house (Habitat) built under a Government scheme is taken. These cost K3,600 of which two thirds is for the zinc roofing. As this type of roofing is not used in Buingim, it is excluded from the cost of the 'Habitat' house and the cost of a sago roof comparable to that used in Buingim is added. This gives K1,200 + K200 = K1,400.

Quantity The social mapping and questionnaires suggested that on average 18 houses had been built in the past year in the village. While it is not known whether this would increase in the future, it gives some indication of the extent of house-building.

Value of the Wild Resource An upper estimate (using labour costs based on food rations) of the value to the community of the tree species used for house-building in their wild state can be made:
V = (1,400-258)*18 = K20,556 per year, or K1,142 per house

A lower estimate can be derived using the labour costs based on the minimum wage rate:
V = (1,400-808)*18 = K10,656 per year, or K592 per house.

Returns to labour work out at K9-9.6 per day (depending on whether the inaugural feast is included in costs), well in excess of that for canoe-building.

Issues
This appears to be the most valuable use of forest resources for Buingim village of the products selected but the assumptions made about the cost of labour and the price of the nearest substitute have a marked impact on the resulting value.

5.5 Costing of Tools and Equipment

It is generally not difficult to derive a price for tools and similar inputs even in communities like Buingim and Mare, as these are among the few products that villagers buy in a formal market. Prices quoted by community members were fairly consistent. The difficulty is in estimating how long tools will last before they need replacing and understanding the range of activities that they are used for. In most of the cases analysed it was found that because tools like axes and bush knives are used for so many purposes the costs involved for harvesting a particular forest product are minimal.

Thus in Mare, a process chain of fuelwood developed with two groups of women (see Figure 6, which represents the common points from these two discussions) showed that besides labour costs (walking, chopping, ring barking, splitting, bundling), direct costs are incurred to acquire an axe and some rope. However, the discussions revealed that these last for a long time and are used in other activities so the costs were assumed to be negligible. Similarly in Buingim, one canoe carpenter was found to be using tools passed on from his father or acquired second-hand (see Box 8). There are some exceptions to this such as nails and bullets. In Mare, the cost of bullets needed to be calculated per pig, as this is a costly input (see Box 14).

BOX 14. WILD PIG HUNTING IN MARE

Pigs are hunted by men in groups of about 7 (but up to 10) with many dogs or sometimes alone. Women follow later to help process and carry back the kill. The data relates to two sets of group interviews, mainly with men, unless otherwise stated. Hunting takes place in three seasons: men hunt in large groups in the wet season, in smaller groups in the changing season, and on an individual basis in the dry season.

Quantity Quantity was most crucial to establish as prices and costs were calculated on a per pig rate. It was difficult to establish, as men hunt alone or in groups and there are three distinct seasons with varying rates. Hence quantities were calculated to the number of pigs caught per hunter per season.

	Wet season	Changing season	Dry season
No of hunters in a group	7	4	1
Pigs caught per group	21	6	1
Pigs caught per hunter	3	1.5	1
Number of hunters (see below)	54	54	54
Hunting trips per season per person	4	4	4
Total hunting trips (converted to solo trips)	216	216	216
Total pigs caught/season	648	324	216

Product Chain and Costs of Production

The process starts with the purchase of a gun and the making of a spear (4 to 8 hours for a spear that lasts about 3 years), after which comes travel to the hunting grounds. Groups stay away for up to 3 days, while a solo trip is one full day. With four sites, a roundtrip travel time[19] was calculated of 7.8 hours per hunter to kill 21 pigs in total, or about 2.5 hours per pig. A hunting time is assumed of 1.5 days of 10 hours, or 15 hours, although the hunters could not give an estimate as they said this varies too much. The kill is carried to the hunting camp and processed usually at the site (but sometimes at home). Time is spent cutting the pig (30 minutes), collecting firewood and bamboo (30 minutes), making a cooking/smoking bed (30 minutes). The fur is burnt off it is cut, cooked and carried home. In all, after the kill, processing takes 1.5 hours per pig.

Total time involved = 7*(7.8 +15+1.5 hours) = 170 hours for 21 pigs, or 8.1 hours per pig = about K4.60/pig (with labour rate at K0.57/hr). Note: This calculation is for the wet season. Time spent per pig increases in other seasons, as hunting is in smaller groups and pigs are more scarce, hence fewer pigs are caught per hour of effort.

Pig hunting requires a home-made spear (local wood with scarp metal blades) that is held together with wire @ K5 (for 2 to 3 spears), so about K2 per spear which lasts 3 years. Shotguns are also used @ K500-600, are bought by the group, and last 6 years, or K100 per year, plus a gun licence for K60 per year. This is K162 per year for gun and spear use, or K0.14 per pig. Bullets cost K40 for a box of 24 (K1.7 apiece) or K3 if bought loose. About 3 bullets are needed per pig, on average, so assuming a box is bought, about K5. A knife is used in preparation which costs K5-8 and lasts up to 10 years, hence is a negligible cost. Costs incurred on 'tools' are therefore K5.14/per pig.

Price The market price is steady: a wild dead, quartered pig with fur burnt off fetches K100.
Value of the wild resource A rough estimate of the value of wild pigs for Mare can be derived:

V = (K100 – (K5.14 +K4.60)) * 1,188 pigs = about K107,230

19 This was done in four steps: rank of the quantity collected per site, frequency of visits, round trip per travel time, and then a weighted average travel time per site to give an average round trip travel time.

Issues

How many days, bullets, hunters and pigs? The question of how much time is spent hunting was discussed at length but a clear estimate was not given. Hunting time is the single largest factor in determining the costs (also see marketing below). Hence if a hunting time is taken of 10, instead of 15 hours, then costs are reduced to about K4.10 per pig. However, this only changes the estimate by about K500 to about K107,820 per year. More significant is the number of bullets per pig. One group estimated 2.5 bullets per pig instead of the conservative 3 bullets used above. This reduces costs per pig by K0.85 per pig, hence increasing overall pig-related forest value by about K10,000 – to about K108,240. Most significant by far was the question of how many hunters are active in Mare. An assumption was made that 25% of adult males want, and are able, to hunt. Based on the census data of 1,232 and assuming that two thirds are children, this leaves 214 adult males, of which 54 are estimated to be hunters. This is probably on the high side. During the social map discussion, 32 hunters (individuals with guns and dogs) were identified. This would reduce by about 40% the total quantity of pigs hunted. This raises the issue of understanding which are the most influential variables in the valuation, and focusing efforts on ensuring that these are as accurate as possible.

Extent of marketing

Like the case of fish in Mare, the answers as to how many pigs are marketed differed considerably. One group said that none are marketed, while in the other they said that up to 30% are marketed.

If 40% of pigs caught in the wet season are marketed, and 30% in the changing season, then this means up to 485 pigs are sold per year, fetching K48,500 for the community. But time spent selling and travelling to/from the marketplace would need to be calculated (@3.4 hours per pig, which at K0.57 per hour pushes up the labour costs per pig by roughly K2 in the wet season or in the changing season. Furthermore, costs are incurred in marketing at about K0.66/pig (changing season when only one man markets) to K0.74/pig in the wet season when 3 men market. The effect on total pig value would depend on how many pigs are, indeed, marketed.

5.6 Interpreting the Estimates of the Value of Wild Products

The attempts to value the selected functions and products raised numerous questions about the assumptions that need to be made en route and the degree to which the estimates were representative. However, the general impression from the preliminary estimates made is that some of the values are high, e.g., for building materials, wild pigs and fish at least in relation to a notional annual wage based on a minimum wage rate. But in order to interpret these values it is necessary to have a valid basis for comparison. This requires an estimation of the returns to the community from an alternative land use, such as logging. This was outside the scope of the present investigation, as it would depend on the terms of the concession arrangement with the logging operator and the commercial characteristics of the timber resource in the case study communities. Similarly, an assessment focusing on returns to labour from harvesting and processing forest-related products rather than value would need estimates of the return from other productive activities in the community, such as agriculture.

Furthermore, some of the products examined, such as the *garamut* drum, do not lend themselves well to quantitative valuation of this type. Not only are they not generally marketed but also they are produced only very rarely in the village, as they last for years. Even if a price could be assigned to the *garamut*, the value of the wild resources from which it is made would work out at zero in years when there is no production. Yet the Buingim community selected the *garamut* as one of their priority products, highlighting its cultural uses (Box 15).

The assumption that extraction levels are within sustainable yield limits is also problematic. If some resources are being depleted, it will not be possible to maintain current extraction levels. The total values of the forest resources used by the community in the future could be less than the snapshot values estimated by the research teams. Conversely if some resources can sustain an increase in exploitation, the total value to the community may be higher in the future. Assessment of the sustainability of current patterns of resource use in relation to the community's resource base is therefore important. The following section examines the attempts made in Buingim and Mare to assess trends in resource use and availability.

BOX 15. THE GARAMUT DRUM IN BUINGIM

Garamut drums are wooden drums that are used for ceremonial purposes and to give messages to the community. They are an important part of the culture in Buingim. The garamut is used with set rhythms or beats to convey different messages, such as announcing meetings or church services or the death of a villager.

Product Chain and Costs Two species are used: a preferred species called *amin*, which is found only in the primary forest and *butuc* (*Beech calophyllum*). The tree is selected by the carpenters and the initial carving and shaping is done in the forest. The *garamut* is then pulled to the village with a certain amount of ceremony after which some final polishing and shaping takes place.

The tools needed are as follows:
Axe (K10-15)
Adze (K20-30)
Pipe (K10 (to dig out the inside of the drum))

As these tools last several years and are used for many other purposes their cost in this case can be considered negligible.

Labour: Two men can make a *garamut* in a week and a half. To this must be added the labour involved in pulling the canoe to the village, which involves food rations costing K50-K100. The latter would be a minimum estimate of the labour costs involved. If instead, the labour of the carpenters were costed at the minimum wage rate (K4.50) per day the cost would increase to:
2*7.5*4.5 + 75 = K142.5

Price *Garamuts* are primarily for local use and are not usually sold in the villages. But the group believed that price would range from K250 to K500 depending on the size although it was not clear whether this was based on any specific transaction that had taken place in the past.

Quantity There are currently five *garamuts* in Buingim. Given their longevity (15-20 years at least) and the nature of their use, i.e., for communal rather than individual purposes, it is unlikely that there will be a significant production of garamuts in the near future – although two had been made in the previous year.

Value of the Wild Resource The *garamut* was selected by the people of Buingim as a key product because of its spiritual significance, yet it is unlikely that it will be made on a regular basis each year. The direct use value for the community of the species used for *garamuts* therefore appears to be negligible if estimated in the standard way on the basis of price, cost and quantities used. The significance attributed to *garamuts* in the ranking indicates that cultural values are not captured very well by this type of approach.

6 SUSTAINABILITY AND CONTROL OF RESOURCE USE

6.1 Perceptions of Resource Availability

A rigorous assessment of the sustainability of resource use would require a comprehensive ecological inventory of current resources and modelling of their populations over time, based on indicators such as extraction rates, growth in the human population, climate, etc.. This is inevitably time-consuming and expensive. Some indication of changing levels of resource quantity and quality can be obtained through participatory methods, which elicit from the community how they perceive changes in resource use and availability over time. Critical incident analysis, and historical matrices or trend analysis, can give a sense of rising or falling availability and/or quality, but are insufficiently accurate for quantitative analysis.

Critical event analysis is a focused discussion that aims to capture the main events in the area being investigated, and how these have affected the research topic. In the case of the Hidden Harvest work, the discussion would likely be with older resource users, and would focus on key environmental shifts, or external events that affected resources, such as logging, damming of a river, etc. The purpose is to build up a picture of the main events that have changed resource quality or quantity, and therefore use. Discussions can probe questions such as 'who was/is affected?', 'are these shifts permanent or temporary?', 'which changes have been positive and which negative, for people and for resources?', etc..

Historical matrices or *Trend analysis* (see Table 7) is based on a more focused discussion than critical event analysis and conveys perceptions about changes related to specific resources. Large eras are identified and the availability, prevalence, etc., of each resource being discussed is tracked per time block. By way of this kind of relative ranking, relative trends are revealed, indicating what has changed most. Also by projecting the discussion into the future, debate is provoked about what people want to see in terms of their future land use. Making visible the changes that have occurred can lead to a discussion about why this has happened, and in what ways negative trends can be reversed. Sometimes, enough information exists to anchor the relative ranking with some absolute data.

The question of sustainability was not discussed in much detail in either Buingim or Mare, nor was there time to assess trends using biophysical data. Time only allowed for discussions with villagers about how they perceived changes in resource use and availability over time.

In Buingim, timelines/participatory trend analysis was constructed with a group composed of women and youth and another consisting of two elders. Both groups indicated concerns over increasing human population and declining availability of resources. Habitats had been destroyed with the clearing of primary forests for gardens while extraction rates had increased with population growth and with the introduction of Western style technology such as guns. This applied not just to products from the forest but also marine products. While this approach was not able to give precise numerical estimates, it at least highlighted the areas of concern and indicated that the greatest perceived threat to sustainability of resource use in the community was not so much the introduction of logging but population growth. It suggests that current patterns of resource use cannot be maintained. Thus it would be inappropriate to simply extrapolate into the future values estimated on the basis of current quantities extracted.

TABLE 7. TIME-LINE OF PRODUCTS AND TRENDS IN BUINGIM VILLAGE (ELDERS)

Products	1953	1963	1973	1983	1996
Fish	20	20	16	10	10
Pig	20	20	6	5	2
Population*[20]	20	20	10	5	3
Mumut (bandicoot)	20	20	6	5	2

In Mare, rather than attempt timelines, the workshop participants opted for discussions about people's perceptions of the future of their lands. The somewhat contradictory nature of the responses suggests that more probing was necessary to iron out some of the inconsistencies. People appeared to be less concerned about the future of their natural resources even though there were some indications that people are having to travel greater distances to harvest wild

20 Trend is estimated in reverse. Whereas for the wildlife, participants were asked to score on the basis of abundance, for population they were asked to score on the basis of good changes that had happened.

resources or to hunt. A group of men said that in the early 1970s, wild pigs were still occasionally seen within the village area, raiding gardens, etc.. Today they have moved out and the closest reasonable hunting grounds are at 2.5 hours walking distance. But, as harvesting is only carried out for immediate satisfaction of family needs and wants, villagers believe that their resource use is sustainable. While this is in part a perception issue, Mare has large tracts of land and its villagers have perhaps less need to worry in the short term.

There were also some differences in opinion about the impact of the recently initiated logging activities. Some women mentioned that fuelwood is much less abundant now, attributable they say, to population increase and the current commercial logging activities by PNG Forest Products. But logging has occurred only selectively and so far few complaints of environmental impacts of the logging have been registered. In one discussion, when the issue was raised of potential downstream effects of logging, one village leader looked surprised and remarked that it might be interesting to think a bit more about that. But it had not occurred to him to do so as yet. Overall, there does not seem to be a group of citizens sufficiently concerned to challenge the logging company and the practice by some clans of selling logging concessions. Whether this lack of concern is a rational response to the situation, in that logging is only affecting a small proportion of community lands, or a reflection of lack of information about the impacts of logging, did not emerge from the discussions.

6.2 Control of Key Products

To understand trends in resource use and to make sense of the estimates that emerge from the valuation calculations, it is important to examine the decision-making related to resource management. How are resources distributed within the community and what type of measures or rules are in place to prevent overexploitation or to control access?

Useful methods are historical discussions to explore how decision-making has changed over time, social maps and Venn diagrams to understand community institutions and their linkages.

Social maps (see Figure 8) are maps that indicate the geographic distribution of socio-economic aspects. For example, it can be important to know who is better- or worse-off in a community to ensure that all groups are consulted in fieldwork or to focus on a particular group. The map shows each household, and onthat are relevant variables are identified . In the case of Hidden Harvest work, these variables can be helpful to identify key holders of specialised knowledge or the numbers of households.

Venn, or institutional, diagrams (see Figure 9) help to understand which formal and informal groups, or key individuals, play a role in the community. They also help to discuss how important these are to the people. A circle in the centre represents the community itself. After discussing which groups or key individuals exist, the group depicts the importance of each by the size of a circle. The bigger the circle they choose or make, the more important it is. Then the circles are placed in and around the community. The closer the circles are placed to each other, the more contact they are considered to have. Check that distance between the circles represents the degree of contact, and not geographical distance. As the diagram develops, they may identify more groups. The discussion can focus on areas of cooperation, possible conflicts or existing gaps. It is also useful to ask about groups that used to exist and ones that are new.

In Buingim, a Venn diagram drawn by village elders showed how the most influential decision-making group is a relatively new one set up by the community in the late 1970s to replace the traditional clan structure. The 'Loya' committee made up of church leaders, local government representatives and village elders has a central influence over the social, economic and political life of the community. Moreover, it has assumed the responsibility of the Clan leaders in matters relating to land use and harvesting of marine and terrestrial products. It is noticeable that clan leaders do not appear at all in the Venn diagram (Figure 9). This has perhaps simplified decision-making on managing the resources of the community. Thus the Loya has prohibited the clearing of the community's remaining primary forest for gardens so that resources can be available for house building, canoes and drums. The implication is that the community has assigned considerable importance to its primary forest resource. It has been prepared to impose some restrictions on agriculture by limiting it to secondary forest areas even though this may result in lower productivity. Whether it can continue to do this as population grows will be a key issue.

In Mare, techniques such as Venn diagrams and tenure maps revealed considerable complexity in the rules on land use and in community organisation. A tenure map drawn by five women and two men (see Figure 10) shows the different sacred sites and places they go to extract resources for their daily life. It revealed that there are no restrictions

FIGURE 8. SOCIAL MAP OF MARE

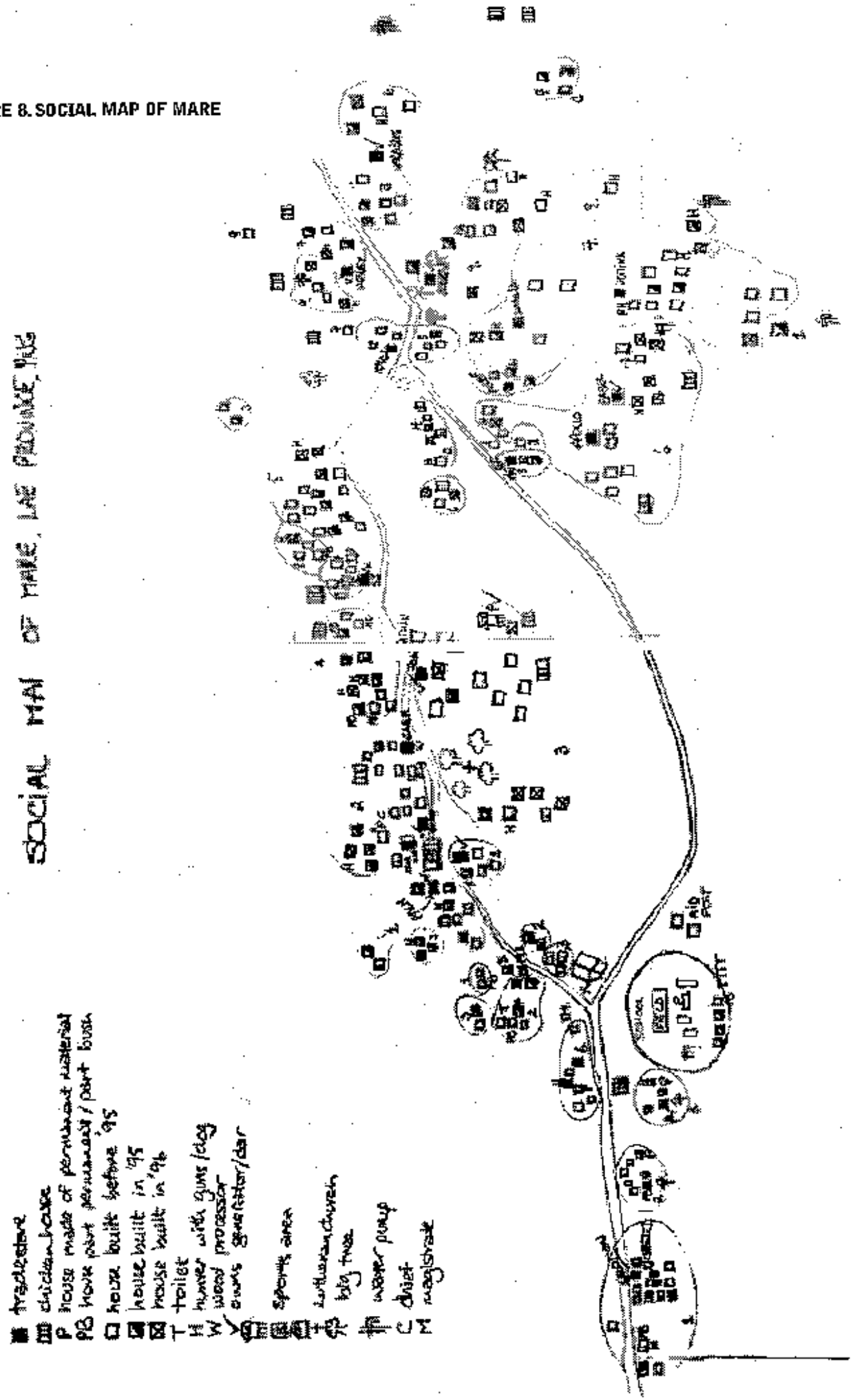
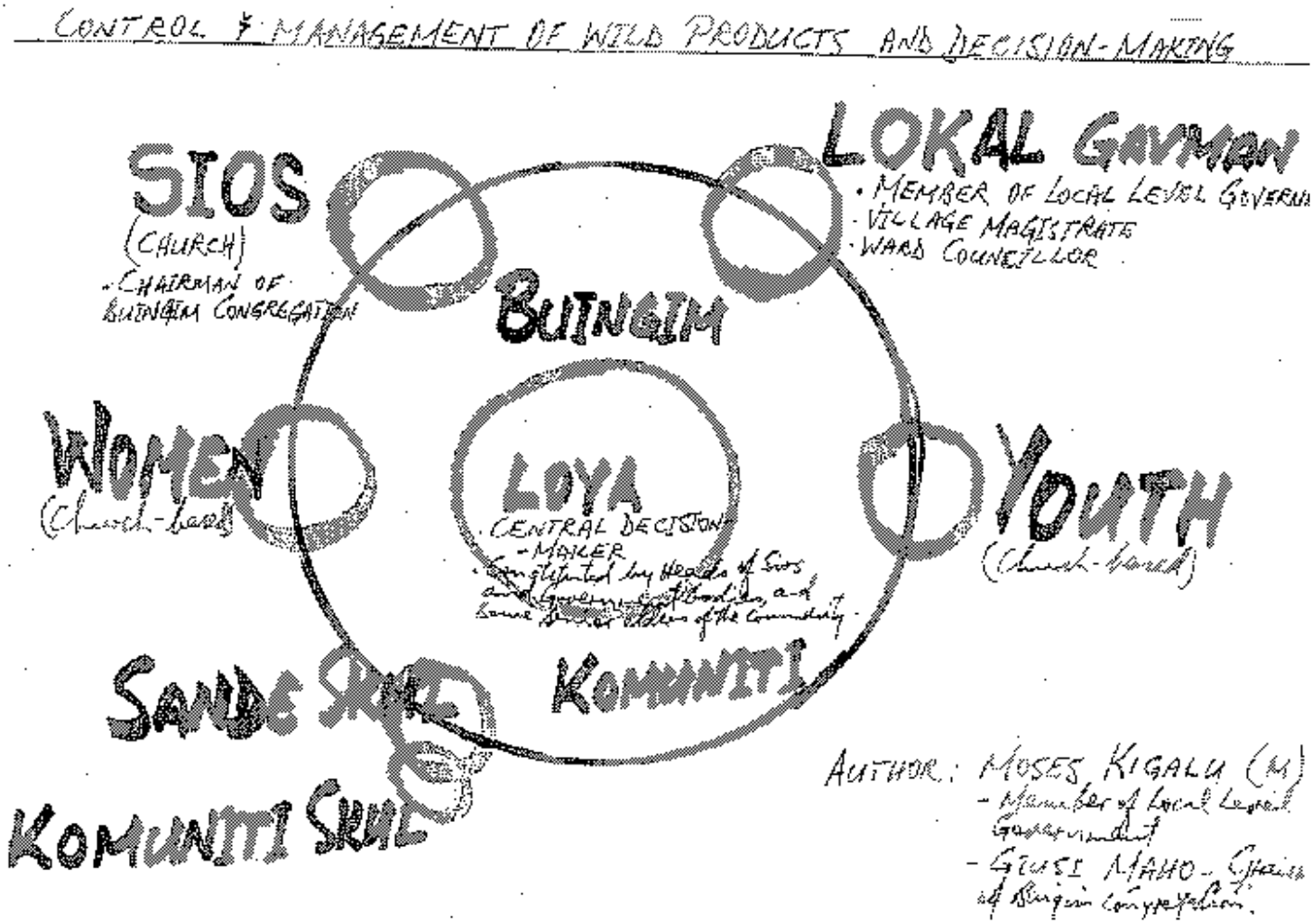


FIGURE 9. VENN DIAGRAM OF BUINGIM



on harvesting resources anywhere but the sacred places. Only ritual ornaments which can be used by magic men are harvested there.

Yet Mare's nine clans all own and have usufruct rights to different proportions of the three basic land types in Mare: forested land, swamp, and kunai grassland as indicated in Table 8. However the village currently only uses forest land that belongs to six clans. Land belonging to the remaining three clans is reserved because of its distance from the village. If major development on the land that will affect the majority of the people and large parts of the land are under consideration, decisions regarding land use are made by the clan leaders.[21] Otherwise, people in the village are free to use any clan land for gardening, hunting, etc., without notifying clan elders. But four clans highlighted below in the table have sold logging concessions thus affecting these rights. This is creating new economic imbalances and social divisions in the community. Some are gaining a high income – while downstream effects will impact on everyone. The implications of destruction of the forest area for the other clan members, in terms of soil erosion, reduced hunting, degradation of water quality and quantity, etc., have not been discussed as yet but are issues simmering below the surface. Creating awareness in the community of the potential loss that the forest represents, and the cost of replacing these functions with bought products, is being pursued by some of the participants of the case study.

A Venn diagram helped to discuss the question of who exerts control over forest resource use in Mare. Perhaps somewhat surprisingly, PNG Forest Products is considered not influential as it only affects a small part of the land and only four clans at that, while local level government is considered very influential. The diagram also revealed a complex community organisation structure with several committees to look at different issues such as finance and boundaries as well as the traditional clan-based system.

21 Clan leaders hold power based on consensus of community opinion, formed by how they function within the community, e.g., leadership, power, ability to speak for the people, family lineage. There are no form of elections or limits on the length of service.

FIGURE 10. TENURE MAP OF MARE

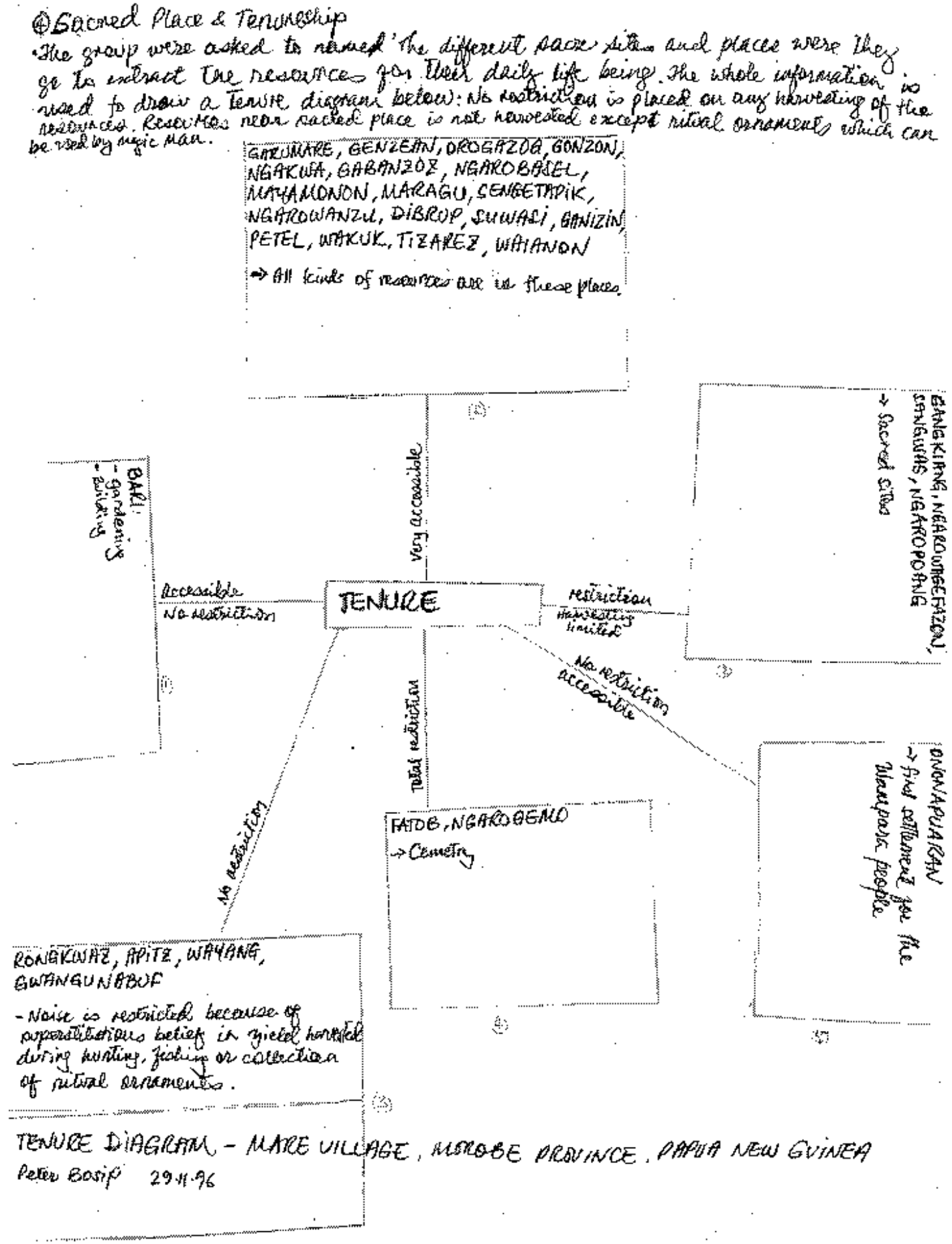


TABLE 8. CLAN LANDS IN MARE

Clan Names (in bold if logging is taking place)	Local Land Names	Relative land area (from largest to smallest)	Percentage (estimated)[22] of forest cover	Percentage (estimated) of kunai grass cover	Percentage (estimated) of swamp
Montar	Ungung	1	55	30	15
Jeanganzon	Miamonon	2	30	30	40
Ngasab	**Kafak**	**3**	**35**	**45**	**20**
Moswarang	**Mpofan**	**4**	**70**	**0**	**30**
Owangropon	**Lamintazog**	**5**	**90**	**0**	**10**
Mporenan	**Zibawi**	**6**	**60**	**0**	**40**
Chuwaif	land not used	n.a.	70	30	0
Orogrenan	land not used	n.a.	70	30	0
Felef	land not used	n.a.	65	20	15

22 Estimate provided by 12 village elders.

7 CONCLUSIONS

Given these methodological challenges, what then, is the contribution of a more participatory approach to resource valuation? This last section discusses some of the larger questions that emerged after the application of the Hidden Harvest approach in Buingim and Mare, as they pertain to standard approaches to valuation and to policy debates in PNG.

7.1 Effectiveness of the Participatory Methods Employed

In the limited time available, the participatory techniques that centred on a more qualitative style of working appeared to be the most effective e.g.: mapping and ranking and Venn diagrams. They worked well in showing the wide range of wild forest resources that are used by the community or have some type of value. They were also useful for showing the relative importance assigned to different types of value. This was particularly important for indirect use values and non-use values as in some cases these were given higher ranks than some of the basic direct uses such as firewood. Participatory methods, when used in gender- or age-differentiated groups, were also effective in showing some gender-based differences and in some cases age-based differences in the importance assigned to different types of resources. It is possible however, that the differences identified may also reflect the fact that the researchers in the distinct sub-groups approached these techniques in different ways, some emphasising forest functions more, others concentrating more on products or uses. With more time, or with improved co-ordination between researchers/facilitators, such distortions could have largely been avoided.

Another potential avenue for improvement would be in extending the analysis of difference. Other divisions within the community besides gender and age, such as household size, status, or availability of livelihood options, may be relevant to perceptions of natural resources. With more time, further focus groups could have been formed on this basis and differing perspectives probed.

Participatory methods also worked well in starting to reveal the decision-making structure for control of access to forest resources, and the possible sources of pressure. Very different rules on access were identified in Buingim and Mare. Understanding the more detailed complexity of local institutions for forest resource use and management would, though, have required more anthropological forms of field research, and therefore more time.

What appeared to work less well was the attempt to derive accurate estimates of monetary values for a selection of key use values or products. While an obvious problem is the lack of market price information on which to draw, other difficulties presented themselves during the fieldwork. These included relying on community members to assess from memory the quantity of resources used locally, and to estimate the amount of time used in harvesting and processing (which were largely based on personal capacities for the tasks and thus the personal experience of the degree of difficulty of the tasks). Assigning a cost to time spent was also not straightforward. But it is important to ask whether these difficulties were primarily a reflection of the use of participatory methods – or would have occurred irrespective of methodology? Did they stem instead from the characteristics of the communities where they were being applied, or the fact that this was a training exercise with limited scope for cross-checking, dealing with inconsistencies and following up missing data?

Clearly, the characteristics of the community relating to integration into the market and the fact that some of the products were for subsistence use influenced the ease with which estimates could be generated. In Mare, given its greater access to the market, it was generally easier to assign costs to labour and obtain reliable price information than in Buingim. But in both villages, assessing quantities extracted proved very difficult. Few villagers count the number of pigs they kill in a year,[23] nor do they count out the number of minutes it takes them, on average to kill a small/medium/large size pig, nor do they count the number of prawns they catch at each haul, nor the number of trees they need to (re)build a house, nor the average weight of a bundle of fuelwood, etc.. These are, of course, types of information that are presumably not of interest to them in their daily lives and become relevant only when outside interests start inquiring (see also Shanley and Gaia, 2000).

This raises the question of whether more conventional research methods such as surveys or diaries would have been more effective in tackling these problems. The limitations of questionnaire surveys have been discussed in detail by many, such as the various non-sampling errors that can occur (c.f., IIED, 1997; Chambers, 1992, 1997; Gill, 1993).

23 Though in Mare, one proud hunter had strung up the jaws of his entire year's catch of pigs in front of his house, greatly facilitating the team's task.

Indeed, a growing number of comparative cases indicate that PRA for local-level analysis and planning yields results that are largely verified by subsequent formal surveys (Gill, 1993; Chambers, 1992; Inglis, 1990, 1991; Rocheleau et al., 1998). In the case of Buingim and Mare, it seems unlikely that villagers if confronted with a questionnaire survey would have recalled any more precisely for example, the number of pigs hunted per year, or the time taken to collect firewood. Other methods such as observing villagers over a representative time period, or asking them to record quantities collected and time spent in a diary could elicit this information. Nevertheless, this would require considerable time and may involve other biases as the impact of having an observer could alter resource use behaviour. On the other hand, group discussion has the advantage of allowing villagers to challenge or refine the estimates of time spent or quantities collected made by other members of the group. Whether this happens depends on the nature of the group and the skills of the facilitator. This highlights a strength of the participatory approach – while estimates produced may not be very precise, there is more scope for discussion and hence more qualitative understanding of the reasons behind the results.

This accords with the conclusions of a recent study (Davies, Richards and Cavendish, 1999) which compares participatory and conventional economic research methods in the analysis of Ilala palm use in Zimbabwe. The authors conclude that participatory methods produce less reliable estimates than household surveys but have the advantage of yielding good qualitative information and facilitating discussions with and between different stakeholders.

The advantage of a survey over participatory methods is that, if it covers a sufficient proportion of the population, it can permit more quantitative and extensive analysis of difference. This was also a conclusion of the Zimbabwe study mentioned above. Participatory methods through group discussion produce a single estimate based on the consensus of the group involved. The extent to which differences within the community will be revealed will depend on how the various groups are selected. As mentioned previously, it is fairly straightforward to select groups (or ask groups to form) along gender and age divisions. A survey will produce numerous individual values and the representative estimate will be derived statistically, for example, the arithmetic mean. Depending on the questions asked in the survey, representative estimates can be derived statistically for different categories of the community, not only categories based on gender and age, but also those based on a range of other variables such as number of family members, *wealth, activities, size of land plots, etc.. In theory, PRA methods could be used with groups divided* according to these categories, but it would require considerable knowledge about the community to identify the people who would fit within each category. A survey though, has the added advantage that it can enable correlation of a number of these variables, for example it can reveal resource use patterns of women, who are in a particular age group and in a particular wealth category. Whether such detailed analysis would be useful in practice, or whether analysing differences based on gender and age that are readily revealed by PRA methods would be sufficient, depends on the purpose of the analysis. This will be discussed in Section 7.3.

Some of the problems encountered would have been resolved if more time had been available for cross-checking and triangulation, to enable dealing with obvious inconsistencies. This requires working with different groups, using different methods to elicit the same information e.g., group-based methods and individual interviews. Considerable skill is also required in applying participatory methods, in particular in facilitating group discussions, balancing the need to probe for checking inconsistencies in the information given, with the need to avoid asking leading questions and exerting undue influence over the discussion. In a training exercise such problems are difficult to avoid. From the results produced and the various queries associated with them, it is clear that more time on triangulation would have been highly beneficial. Being proficient in participatory research techniques before applying them under such research conditions as experienced by trainees in Mare and Buingim is highly recommended. It is likely that accuracy of findings will increase with proficiency in participatory research techniques.

The exercise that proved most problematic was the use of timelines and trend analysis to understand changes in resource use and availability. These are challenging methods to apply as they require considerable probing to produce estimates and perceptions. Moreover, the difficulties encountered in the valuation methods of asking about amounts collected and time spent are compounded by the need to ask about what happened in the past. As for examining sustainability in the future, this is clearly an area where an ecological assessment of resources available is needed to complement the community discussion.

7.2 Lessons Learned

One of the drawbacks of the approach adopted was the decision to concentrate on wild resources in line with the overall objective of the Hidden Harvest programme, and in particular on wild forest resources, in line with current

policy debates in PNG. This had the advantage of focusing the analysis in the time available, but in the case of Buingim, where marine fishing is so important, limiting the analysis to forest resources proved inappropriate to the community's current patterns of resource use. In both communities, the distinctions between wild and non-wild could also be rather blurred, for example sago, identified by a number of groups as a priority resource, can be both wild and cultivated. A broader-ranging approach which looked at resource use, in general, without making sometimes arbitrary distinctions between forest-based and non-forest resources and between wild resources and cultivated ones, might have worked better (though even more time would have been required).

This highlights a key conflict between the two methodological approaches, PRA and valuation, which is difficult to resolve. The participatory approach follows community priorities and remains open-ended, while for economic valuation it is necessary to focus from the outset in order to make the task manageable. While the resource mapping conducted initially covered all types of resources, the way these maps were subsequently used was understandably influenced by the key research design decision to focus on wild forest resources. Similarly, given the wide range of products and functions identified it was not possible to attempt estimation of all values. Therefore, decisions were needed early on about the products that would be studied in more detail. Although the selection of products for valuation was made by community members in active discussions, the range from which to choose had already been externally determined, i.e., resources that were both wild and forest-related. This is not necessarily a problem – it simply leads to the conclusion that PRA-based valuation of the 'hidden harvest' is perhaps more appropriate in situations where prior work with community members has already identified this focus as important.

A second lesson is that the resulting monetary values of priority products are not likely to be very meaningful to policymakers and in particular to the community without some analysis of returns from alternative land uses. The wide range of wild resources and uses of such resources, identified in the two communities suggests that it is worthwhile to assess their value. But such values would be more useful if they could be compared with the value of products derived from an alternative land use such as permanent clearance for agriculture.[24] Such comparisons were outside the scope of the fieldwork exercise but with more time there is no reason why they could not be done except that it may be difficult to find activities involving marketed products. It would also be necessary to consider how returns from different land uses would change over time. However, assuming that alternative land uses could be costed, there would still be the issue of reliance on a selection of products or values. If the combined value of these proved to exceed the returns from the alternative land use (with due concern for comparison over comparable time frames and choice of discount rate etc.), then this would not be a problem. If they proved to be less, then there would be the issue of the value of all the other uses not costed out. A full comparison would be difficult without some parallel assessment of indirect use values using biophysical data. It would be necessary to complement this comparison with other more qualitative techniques such as ranking.

A conclusion from this is that it would be better to address more comprehensively the community priorities in relation to land and resource use. This would mean looking at all types of resources in the community and not just wild forest resources and giving more emphasis initially to qualitative methods such as mapping, ranking and scoring. Thus, participatory methods would be used to identify the various livelihood needs of the community, food, shelter, clothing, healthcare, etc., and the ways they meet these needs, whether through harvesting natural resources from the primary forest, harvesting marine products, planting gardens, buying products with cash income from sale of other products, etc.. This could then lead to a qualitative assessment of the relative importance to the community of the different resource areas. The importance of the various goods and services derived by the community from the forest resources could thus be assessed in relation to those derived from other natural resources and other livelihood options. In the course of this process, aspects that needed more quantification could be identified and at this point more quantitative methods could be employed. In the case of Buingim, for example, such an approach could potentially prove more useful to the community in its decisions over prohibiting the establishment of gardens in primary forest, than quantitative but partial estimates of a limited range of wild forest resources.

7.3 The Contribution of Participatory Approaches

The question that has driven the Hidden Harvest studies is how the value of wild resources at the local level can be of use to policy action and local resource management. In this report we have focused on the potential contribution

24 This approach was taken by Peters, Gentry and Mendelsohn (1989) in their study of Mishana in the Peruvian Amazon. They compared returns (discounted over an infinite time horizon) from non-timber forest product (NTFPs) harvesting, conventional logging and sustainable forest management (timber and NTFPs) in one hectare of land, and concluded that the latter option would give the highest return.

of participatory approaches to local level valuation. The estimates of the value of certain wild resources produced in the course of this training exercise could have been made more reliable if there had been more time for cross-checking and validation. Nevertheless, they would still not meet standard criteria of statistical representativeness. Can participatory approaches still be useful and if so, how? Much depends on the purpose of the local-level assessment of forest values whether it is to influence policy at the national or regional level, or rather to inform community decisions on resource management.

If local resource values are required to inform policy-making at regional or national level, for example, in relation to forest policy, then statistical rigour is likely to be emphasised more than local understanding of resource use and contribution to the research process. In such cases, a household survey or other method such as diaries may be considered necessary. However, participatory methods can play an important complementary role. They can be used in an initial scoping exercise to aid questionnaire design, for example through an understanding of how different groups of men and women, youth and elders perceive and use resources. The mapping and prioritisation exercise in Buingim and Mare showed just how important such differences can be. The community mapping and prioritisation of resources, the identification of product chains, the examination of resource trends over time and the characterisation of decision-making structure can all feed into the survey questionnaire design and make it more locally appropriate. As stressed by Davies, Richards and Cavendish, (1999), a combination of participatory methods and more conventional research methods can also be useful for triangulation purposes. This emphasis on the importance and acceptance of the need for methodological complementarity, as strongly emerges from all Hidden Harvest cases and not just this PNG case study, has been echoed by others in recent years (IIED 1997, Guijt et al., 2000).

If the aim of the local-level valuation is to inform decision-making by community members, then participatory methods are critical for stimulating debate about resource values. The resulting values may not meet the highest of standards of statistical rigour or may be more qualitative in nature, but they take on meaning for community members by the very fact of having emerged from local discussions. What is needed in this case is an iterative approach to application of participatory methods. The initial assessments of values of selected products need to be presented to the community who can then challenge or confirm the assumptions made about priority ranking of products, quantities harvested, closeness of substitutes, time spent and value of time. Estimates then need to be modified to take account of the community response and worked through again with the community to gauge the reaction.

The attempts made to value selected products in Buingim and Mare showed up the assumptions that inevitably have to be made in the valuation of natural resources, regardless of whether participatory methods or statistically representative surveys are used. The advantage of an iterative participatory approach is that the assumptions can be made through a consensual process rather than an 'expert judgement' approach applied by external researchers. In the time available for this exercise, it was not possible to do this to any great extent. However, the discussions on prioritisation of resources in Buingim, where rankings in group discussions were subsequently modified in a community-wide discussion, showed the importance of allowing community members the opportunity to reflect on their priorities.

A third application for local-level valuation is also possible, whereby the values generated for local decision-making in the second scenario outlined above are also fed into national policy debates on natural resource management. This ideal outcome for Hidden Harvest has proven an elusive challenge so far. It would imply a more comprehensive and rigorous local valuation process, with iterative cycles of community validation, and the findings would need to be channelled into relevant policy forums. Both processes would require skilled facilitation and considerable resources. Nevertheless, this could be worthwhile as a way of bringing local perspectives on forest value into the national arena.

In conclusion, participatory methods have an important contribution to make to valuation of natural resources, both as a complement to more conventional approaches such as household surveys and in their own right as a tool to inform local decision-making. As a complementary tool, they can lay the groundwork for other methods, providing the basic information about the community necessary for research design. They can also provide a means for cross-checking of research findings and ground-truthing. Their strength in comparison with more conventional methods is that they can permit more community involvement in the discussion of research priorities, the formulation and challenging of assumptions and the interpretation of findings. For this involvement to be effective, participatory methods for assessing values of natural resources need to be applied on an iterative basis to allow for community feedback and subsequent reformulation.

8 REFERENCES

Barbier, E.B., 1992. *Economics for the Wilds in Swanson*, T.M. and Barbier, E.B. (eds.): *Economics for the Wilds: Wildlife, Wildlands, Diversity and Development.* Earthscan, London, pp15-33.

Bishop, J. and Scoones, I. (eds.), 1994. *Beer and Baskets: The Economics of Women's Livelihoods in Nganiland, Botswana.* Sustainable Agriculture Research Series, Vol.3, No.1. Sustainable Agriculture Programme, IIED, London.

Chambers, R., 1992. *Rural appraisal: rapid, relaxed and participatory.* IDS Discussion Paper 311. IDS, Brighton.

Chambers, R., 1997. *Whose Reality Counts? Putting the First Last.* IT Publications, London.

Cornwall, A., 1996. *"Towards Participatory Practice: Participatory Rural Appraisal (PRA) and the Participatory Process"*, in: Koning, K. de and Martin, M. (eds): *Participatory Research in Health: Issues and Experiences.* Zed Books, London, pp.94-103

Davies, J., Richards, M. and Cavendish, W., 1999. *Beyond the limits of PRA? A comparison of participatory and conventional economic research methods in the analysis of Ilala palm use in south-eastern Zimbabwe.* Overseas Development Institute, London.

Filer, C. with Sekhran, N., 1998. *Loggers, donors and resource owners. Policy that works for forests and people.* Series no 2: Papua New Guinea. National Research Institute, Port Moresby and IIED, London.

Gill, G., 1993. *OK, the Data's Lousy But It's All We've Got: Being a Critique of* ***Conventional*** *Methods.* IIED Gatekeeper Series, n. 38, 1993.

Godoy, R., Lubowski, R. and Markandya, A., 1993. *A Method for the Economic Valuation of Non-timber Tropical Forest Products.* Economic Botany 47 (3) July-September 1993 p220-233.

Guijt, I., 1994. *Local Level Assessment of the Economic Importance of Wild Resources in the Amazon, Para, Brazil.* Unpublished internal trip report. Sustainable Agriculture Programme, IIED, London.

Guijt, I., 1997. *Valuing wild plants with economics and participatory methods: an overview of the Hidden Harvest methodology.* In: *Plants for Food and Medicine.* Etkin N., Harris, D.R., Hather, J. G., Houghton, P.J. and Prendergast, H.D.V. (eds.). Royal Botanic Gardens, Kew.

Guijt,I, Berdegue, J. and Loevinsohn, M. (eds.), 2000. *Proceedings of the Concerted Action/ISNAR workshop 'DEEPENING THE BASIS OF RURAL RESOURCE MANAGEMENT'.* The Hague, February 2000.

Guijt, I. And Hinchcliffe, F. (eds.) 1998 *Participatory Valuation of Wild resources: an overview of the Hidden Harvest methodology* IIED: London

Guijt, I. and van Veldhuizen, L., 1998. *Participation and Sustainable Agriculture: Comparing Experiences with PRA and PTD.* Drylands Issues Paper 79. IIED, London.

Guijt, I., Hinchcliffe, F. and Melnyk, M., 1995. *The Hidden Harvest: The value of wild resources in agricultural systems.* A project summary. IIED, London.

Hot Springs Working Group. 1995. *Local-level economic valuation of savannah woodland resources: village cases from Zimbabwe.* Sustainable Agriculture Programme Research Series 3 (2). Sustainable Agriculture Programme, IIED, London.

IIED, 1997a. *Valuing The Hidden Harvest: Methodological Approaches For Local Level Economic Analysis Of Wild Resources.* IIED, London.

IIED/HNWCP, 1997. *Local level assessment of the economic importance of wild resources in the Hadejia-Nguru wetlands, Nigeria.* Sustainable Agriculture Programme Research Series, 3(3). IIED, London.

IIED, 1997b. PLA Notes 28: *Special Issue on Methodological Complementarity.* IIED, London.

Inglis, A., 1990. *Harvesting Local Forestry Knowledge: A Field Test and Evaluation of Rapid Rural Appraisal Techniques for Social Forestry Project Analysis*. A dissertation presented for the degree of Master of Science, University of Edinburgh, 1990.

Inglis, A.S., 1991. *Harvesting local forestry knowledge: a comparison on RRA and conventional surveys*. RRA Notes 12. Sustainable Agriculture Programme, IIED.

Mayers, J., Peutalo, B. and Kaul Shah, M. (eds), 1994. *Adapting Tools for Local Forest Management: Report of an Introductory Workshop on Participatory Rural Appraisal for Community-Led Forest Management in Papua New Guinea*. IIED, London.

Peters, C.M., Gentry, A.H, and Mendelsohn, R.O., 1989. *Valuation of an Amazonian Rainforest*. Nature Vol 339, 29 June p655-656.

Rocheleau, D., Ross, L., Morrobel, J. and Hernandez R., 1998. *Gendered Landscapes, Gendered Lives in Zambrana-Chacuey, Dominican Republic*. In: *The Myth of Community: Gender issues in participatory development*. Guijt, I. and Kaul Shah, M. (eds). Intermediate Technology Publications, London.

Scoones, I., Melnyk, M. and Pretty, J. N., 1992. *The Hidden Harvest: Wild foods and agricultural systems. A literature review and annotated bibliography*. IIED, London.

Shanley, P., Galvão, J. and Luz, L., 1997. *Limits and strengths of local participation: a case study in eastern Amazonia*. PLA Notes 28: 64-67. Sustainable Agriculture Programme, IIED. UK.

Shanley, P. and Gaia G.R., 2000. *Break Barriers, Increase Impact: Equitable generation and dissemination of natural resource information in the Brazilian Amazon*. Proceedings of the Workshop on 'Deepening Decision Making in Rural Resource Management', EU Concerted Action and ISNAR, February 2000, The Hague.

ANNEX 1. WORKSHOP PARTICIPANTS

Raeng Asunu	Independent
Lawong Balun	Bulolo Forestry College
Peter Bosip	Conservation Melanesia
Olo Gebia	Wau Ecology Institute
Maryanne Grieg-Gran **	International Institute for Environment and Development, London
Irene Guijt **	International Institute for Environment and Development, London (now freelance consultant and PhD student, the Netherlands)
Stuart Hocking	Pacific Heritage Foundation
Nigel Inu Papua	New Guinea Forest Authority
Anne Kadam-Borney	Christensen Research Institute
Matrus Kamung	World Wildlife Fund
Valerie Kondang	East Sepik Council of Women
Samuel Krimbu	Wau Ecology Institute
Aung Kumal	World Wildlife Fund
Cosmas Makamet	Foundation for the People of the South Pacific, PNG
Alphonse Malipu *	University of Papua New Guinea
Steven Nasa	Kamiali Integrated Conservation and Development Project
Thomas Nen	National Research Institute
Tomas Paka	Foundation for the People of the South Pacific, PNG
Basil Peutalo *	South Pacific Indigenous Community Empowerment Consultancies
David Samson	Pacific Heritage Foundation
Gao Seka	Kamiali Integrated Conservation and Development Project
Graham Steele	Business Enterprises Support Team
Kate Sullivan	Maisin Integrated Conservation and Development Project (via United States Peace Corps)
Kerry Sullivan	Maisin Integrated Conservation and Development Project (via United States Peace Corps)
Luke Tigil	Business Enterprises Support Team
Jonathan Topom	resident of Mare
Josephine Tupan	Ambunti District Council of Women
Arthur Williams	Local Environment Foundation
Joash Yambut	Oro Conservation Project
Sasa Zibe Kokino	Village Development Trust

* *resource people*
** *facilitators*

ANNEX 2: FIELD DATA RECORDS FOR DERIVED DEMAND VALUATION

The following list of questions guided the fieldwork process.

What forest resources are there?

What is used?

Which wild forest products are most important?

Which of these products are marketed?
How much is collected?
How much is consumed locally?
How much is sold?
At what price?
    What factors influence price? – seasonal variation, local variation, taxes/subsidies

Do non-marketed goods have marketed substitutes?
Which ones are most preferred?
What is the price of the preferred marketed substitute?

How much does it cost to harvest?
What is the cost of the tools required?
How much time is required? – for extraction and travel

How much does it cost to process?
What is the cost of the tools required?
How much time is required?

How much does it cost to market?
Where are the products marketed?
How are they transported?
How much does the transport cost?
    time
    fuel
    vehicle/boat

What is the opportunity cost of time spent?
what is the local wage rate?

Distribution of use and control of resources
Who benefits from the use of forest resources?
Which groups are most involved in market sales?
Who controls the use of resources?
Are certain forest products particularly important for certain groups?

How sustainable is resource use?
Are resources being depleted?
How would this affect value?

The format below helped ensure that all data related to the key wild resource-based products were obtained and recorded.

FIELD NOTES
(attached to copy of diagram/survey results)

WHERE?

WHEN?

WHAT?

METHOD USED

PARTICIPANTS

TEAM MEMBERS

PROCESS

CONTENT
Note any quantitative information the villagers provide in the data table below.

1. What forest resources are being used and for whom are they important?

2. Describe the process of collection, processing, transport, marketing/barter? What inputs/tools are used that have a price? (fill price/cost in table and specify unit!)

3. How sustainable is the use of forest products? (include how it is being managed)

	Resource/ product X	Resource /product Y	Resource /product Z	Resource /product ETC
amount harvested per trip				
number of trips per year (high/low season)				
number of harvesters (full- or part-time)				
labour time on travel and collection				
labour time on processing				
labour time on marketing				
capital costs harvest (tools, useful life)				
capital costs process (tools, useful life)				
capital costs marketing (tools, useful life)				
price (high/low season; local/ regional market)				
LIST OTHER VARIABLES AS REQUIRED				

ANNEX 3. WORKSHOP PROGRAMME NOVEMBER 20-30, 1996, LAE

Workshop Training

The workshop was conducted over 12 days in November 1996, and involved classroom training/discussions and fieldwork in two rural communities in Morobe Province. Participants represented a range of disciplines and came from government, academic institutions, and NGOs (see Annex 1). They all face many forest issues in their work (see Box A3:1), and thus were keen to learn how to value resources better. Despite great effort to secure a minimum number of economists, only three participants had some economics training and experience. By comparison, many had some experience of PRA methods albeit not in the context of quantitative and focused research, such as the Hidden Harvest study.

BOX A3:1. FOREST ISSUES FACED BY PARTICIPANTS

slash and burn (with kunai grass take over)
loggers: identifying the good and bad companies
landowners – tenure issues and managing of landowner-held companies
threat from mining
water resource degradation
concentration on 'fashionable' species
lack of information on alternative forest uses
lack of knowledge on legal rights
lack of participation of community in forest decision-making
over-harvesting of forest resources
inadequate monitoring of changing resources

The limited economic background of most participants greatly affected the preparations and the fieldwork process, and therefore what could be expected of the research results. The findings were partial and, of course, approximate. This is, nevertheless, a very realistic scenario in many contexts where natural resource-related economic information is required. The question then is whether this type of valuation approach, with its emphasis on local involvement and more locally accessible methods, can still be useful even though the results obtained lack statistical rigour and do not cover the full range of values.

Building on prior Hidden Harvest training events, the facilitators[25] opted to structure the classroom preparations in a way that explicitly linked economic ideas with participatory research methods. Previous training events had been divided into two parts: the first half focusing on economic valuation techniques, the second on PRA methods. It had been assumed that the link between the two parts would be established by participants themselves, as they prepared for the fieldwork. However, some participants had found this difficult.

In the PNG workshop, each session started with discussion of economic concepts and was immediately followed by discussion (and often practice) of relevant participatory methods to support the economic analysis, thus making the link between the two methodological areas more explicit.

Topics covered in the three days of preparation for the fieldwork included (see Annex 3):

- types of value – direct use, indirect use, non-use;
- principles of valuation – focusing on direct-use values;
- Approach for marketed products;
- Alternative approaches where products are not marketed;
- Control and distribution of resources;
- Sustainability of resource use.

Classroom-based exercises were carried out to familiarise participants with all the participatory research methods identified as useful for local-level valuation (see Table 3 in the main text) and to give them the opportunity to apply

25 Maryanne Grieg-Gran and Irene Guijt, of IIED.

such methods to obtain economic data. The exercises were based on issues and questions faced by participants, such as marketing of tapa cloth articles, changes in resource availability in home villages, *pandanus* leaf production, participants' preferences for substitute products, etc..

While the basic economic approach to estimation of direct-use values is relatively simple, discussion focused on the great difficulty in obtaining accurate estimates for each of the values. Great emphasis was placed on encouraging participants to appreciate the considerable variation in resource use that exists, such as men's versus women's use, variations of product use during the year and from one year to the next, and the importance of understanding this variation for the valuation exercise. The importance of seeking such variation in data through probing questions was considered paramount for the fieldwork. As many participants had a background in qualitative research and community development processes, various simulation calculations were undertaken to familiarise participants with the essentially quantitative emphasis of much of the fieldwork.

Given that ensuring the quality of data was inevitably going to be problematic (due to the very topic of wild resources, see Section 1.1, and the collection of data from groups rather than random surveys of individuals or households), ways were discussed to ensure that data collected through participatory research methods would be as representative as possible. These included cross-checking with other sources of information or with results from other group exercises and recording details on the characteristics of the groups and/or the informants.

The Fieldwork Process

After the preparation, participants divided into two groups and conducted fieldwork in two communities over 3 to 4 days.[26]

The aim of the fieldwork was to provide an opportunity for participants to understand the role that each of the questions played, test possible research methods, and get a feel for some of the issues and challenges likely to be encountered in local level valuation studies. The intention was not to conduct a rigorous, comprehensive valuation of total forest resources. This would not have been practical in the time available and given the minimal knowledge of most participants related to economic valuation.

Many discussions were held in each community, during which much use was made of diagramming methods (for example, see Box A3:2) and efforts were made to ensure data had a minimal quality by triangulation. In Mare, workshop participants did this by trying to confirm data from three independent sources, using a table to keep track (see Table A3:1). While this was not possible for all data, continual questioning of whether quantity had been confirmed with other sources proved useful to challenge participants' findings and to use emerging contradictions to improve the methodological application (see Sections 4 and 5).

BOX A3:2. RANGE OF DISCUSSION/DIAGRAMMING METHODS USED BY MARE-BASED TEAM

resource use village walks (3 x)	product chain (3 x for key timbers; 1 x fuelwood)
resource maps (5 x; youth, women, men, mixed)	ranking of fuelwood types (2 x)
ranking of forest functions (5 x)	historical discussions (2 x)
matrix scoring (1 x of forest product uses)	Venn diagram (2 x)
flow diagrams (2 x wild animals; 3 x for key timbers; 2 x fuelwood sources/uses)	interviews with key resource users' (4 x)
pie diagrams (2x wild animals; 2 x fuelwood sources/uses)	social map (3 x)
seasonal calendars (2 x, wild animals)	substitute product matrices (2 x)

26 More time was, of course, desirable, but funds did not permit this.

TABLE A3:1. FORMAT USED TO TRACK SOURCE OF DATA (IN MARE)

Item	interview date	# people/ active in discussion	# men/women	# key resource users
price of resource A				
source 1	....	5/2	5/0	1
source 2	....	1	0/1	1
source 3	....	etc.	etc.	etc.
distance to resource A				
source 1				
source 2				
source 3				
time to harvest resource A				
source 1				
source 2				
source 3				
ETC.				

After the fieldwork, the workshop was rounded off by a second classroom-based session. During the last 2 days, participants compiled, calculated and presented their findings and discussed issues arising from the fieldwork. These and other field notes are the basis for the findings reported in Sections 4 and 5.

The Workshop Programme

Wednesday, November 20 (afternoon only)

- Introductions: facilitators, resource people, participants
- Forest Issues at Work: buzz groups, feedback
- What kind of calculations related to resources do you do? buzz groups/feedback
- Participants' expectations, workshop objectives, house rules
- History of Hidden Harvest research
- Evening in: video on Participatory Rural Appraisal

Thursday November 21

- Participation and Economics?
- What is the best forest land use option? plenary brainstorm
- Comparing Options: explanation, buzz groups, feedback
- Types of Values, with forest examples
- Forest Values: exercise (highlight different perceptions of value)
- Participatory mapping: focus on key forest resource areas and products, in gender-disaggregated groups
- Total vs. Partial valuation: explanation, focus on relevance of partial valuation
- Exercise to prioritise key products
- Valuation of Direct Use Values: explanation/equation
- How to Value Marketed Products: exercise in groups of 4 to calculate basic data
- How to Value Marketed Products : groups to formulate fieldwork questions
- Example from Peruvian Amazon: can participatory exercises improve data?
- Valuation via Substitutes
- Identify substitutes of key products, plus extent to which preferred
- Valuation via Barter Exchange,with beginning of group work on Substitutes and Barter to formulate fieldwork questions and sequence
- Evening: presentation of basic information about fieldwork sites and process

Friday, November 22

- Ranking: move from direct-use to existence values
- Matrix scoring of key products for existence values
- Summary of initial concepts/valuation approaches, then focus on sub-questions
- Understanding seasonality (seasonal calendars)

- Prices of products: What influences prices other than seasons (plenary brainstorm)?
- Collection and Processing Issues
- Product chain exercise and feedback
- Transport and Marketing Issues
- Flow diagrams for markets: example, exercise, feedback
- Communication issues and exercises
- Evening: team formation exercise; 'what would you do if...?' exercise; team contract

Saturday, November 23
- Distribution of Use and Control
- Sustainability of Resource Use (trends analysis; critical events; historical matrix scoring), including scarcity of inputs
- Preparing for the Field: what basic questions are to be asked? Preparation in field teams (linking questions to methods)
- Ensuring validity of information, including documentation of information
- Final logistics
- Move to villages

Sunday, November 23 to Wednesday, November 26
- Fieldwork

Thursday November 27 to Saturday, November 29
- Sorting out field notes
- Debriefing on methodology
- Calculations based on field data
- Finalising documentation
- Evaluation

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Sustainable Agriculture and Rural Livelihoods and Environmental Economics Programmes

The Sustainable Agriculture and Rural Livelihoods (SARL) Programme of the International Institute for Environment and Development (IIED) works to develop more effective and equitable forms of agriculture and natural resource management. The SARL Programme helps different interest groups to understand trade-offs relating to their livelihood strategies, identify common ground, and negotiate pathways to positive actions that support rural regeneration.

The SARL Programme plays the role of 'facilitator' and 'intermediary' by:

- engaging in collaborative research with partner organisations on the range of livelihood opportunities and the policy and institutional contexts and instruments necessary for them to be effective;
- synthesizing and disseminating an array of material to inform and influence the work of policy makers and practitioners, and the people who inform and influence these groups;
- developing innovative methodologies that cross the boundaries of the natural and social sciences and foster real and participatory approaches and that promote social inclusion and greater participation.

The Environmental Economics Programme (EEP) seeks to identify and promote practical means of bringing environmental values into the marketplace, in ways that benefit poor people and countries. This includes evaluating the economic consequences of environmental change, finding ways to internalise environmental values in public policy and market behaviour, and to ensure that environmental protection is both cost-effective and pro-poor. EEP applies economic methods to a range of sectors and issues. Particular emphasis is placed on capacity strengthening through collaborative research and networking with individuals and organisations in the South.

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