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The Hidden Harvest: The Role of Wild Foods in Agricultural Systems **Local-Level Assessment of the Economic Importance of Wild Resources in the Hadejia-Nguru Wetlands, Nigeria**

Compiled by IIED and HNWCP

1997

LOCAL-LEVEL ASSESSMENT OF THE ECONOMIC IMPORTANCE OF WILD RESOURCES IN THE HADEJIA-NGURU WETLANDS, NIGERIA

Report compiled by the participants and resource people in the IIED/HNWCP Hidden Harvest Case Study:

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Hidden Harvest Project

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Collaborative Research in the Economics of Environment and Development (CREED)
Environmental Economics Programme and the Sustainable Agriculture Programme
International Institute for Environment and Development (IIED), London, UK; and
Hadejia-Nguru Wetlands Conservation Project (HNWCP), Nguru, Yobe State, Nigeria

This document reports on a field study co-ordinated by the International Institute for Environment and Development (IIED), London, UK, and the Hadejia-Nguru Wetlands Conservation Project (HNWCP), Nguru, Yobe State, Nigeria.

The case study is a project under the Collaborative Research in the Economics of Environment and Development (CREED) Programme, a joint initiative of the IIED and the Institute for Environmental Studies (IES), Vrije Universiteit, Amsterdam, the Netherlands. Initial support for CREED is provided by the Netherlands Ministry of Foreign Affairs, Directorate General for Development Co-operation (DGIS).

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The case study is one in a series of similar studies of IIED's *Hidden Harvest* project, a collaborative research project co-ordinated by the Sustainable Agriculture Programme and the Environmental Economics Programme at IIED. The project aims to develop approaches to local level economic assessment, using a combination of Participatory Rural Appraisal (PRA) and environmental economics. Case studies make use of various elements of these techniques to examine the importance of wild resources for rural people's livelihoods.

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NOTE ABOUT CURRENCY

The currency quoted in the report is Nigerian Naira (N). In most cases, US dollar equivalents are also provided. The parallel market rate in Kano at the time of the study (July 1995) was US$1.00 = N80.

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1. INTRODUCTION

1.1 Objectives of the Study

The Hadejia-Nguru Wetlands play a major role in the regional economy of northern Nigeria. Recent attempts have been made to value the production of most of the major sub-systems of the Hadejia-Jama'are floodplain, *i.e.* irrigated farming, flood and rainfed agriculture, fisheries, and livestock (Barbier *et al.*, 1991; ICRA, 1992; Hollis *et al.*, 1993). However, there is little information on the economic importance of wild resources, other than fish, harvested from the floodplain.

This report documents a field study undertaken in the Hadejia-Nguru Wetlands in northern Nigeria as part of the *Hidden Harvest* research project. The *Hidden Harvest* project combines research support and institutional collaboration to assess the role of wild foods in agricultural systems (IIED, 1995). An earlier review revealed that little is known about the value of these resources, which are often excluded from economic analyses of natural resource systems, as well as official statistics (Scoones *et al.*, 1992). Subsequent phases of the project have developed methods for investigating and measuring the economic value and importance of wild resources and have been complemented by a series of case studies assessing the economic value of wild resources in specific communities in Asia, Africa and Latin America[1]. Ultimately, the Hidden Harvest project aims to clarify and develop policy options for national and international planners, researchers and donor agencies. Most of the case studies have also included a training element to enable local researchers and communities to present the true value of their resources to policy makers and other external groups.

The specific objectives of this short study were twofold. First, the project sought to strengthen the capacity of local organisations working in the Hadejia-Nguru Wetlands in conducting resource valuation at a community level. The project consisted primarily of a training workshop lasting three weeks in July 1995 and involving 13 participants from a range of conservation, development and academic organisations (see Appendix A). Through the workshop and its associated field study, the participants undertook the second objective: to assess the economic importance of the major wild resources harvested from within the Wetlands using participatory appraisal techniques. This new information should be useful for planning activities in the floodplain region and for identifying areas requiring further investigation.

The report consists of four chapters plus numerous appendices. This introductory chapter describes the objectives of the study, the *Hidden Harvest* project and the principal organisations involved in the study. It also provides some background to issues of wild resource use in the region and gives an overview of the methodology used and the research questions addressed. The second and third chapters provide detailed results from the two villages studied. The structure of both chapters is similar and follows the progression of inquiry within the villages, consisting of an initial appraisal followed by a more focused appraisal concentrating on some specific wild resources. Each concludes with a synthesis of the main findings on the economic importance of wild resources in each village and a synthesis of the important training issues which emerged from the appraisals of each village. Lastly, Chapter 4 provides a more general synthesis of the role of wild resources in the

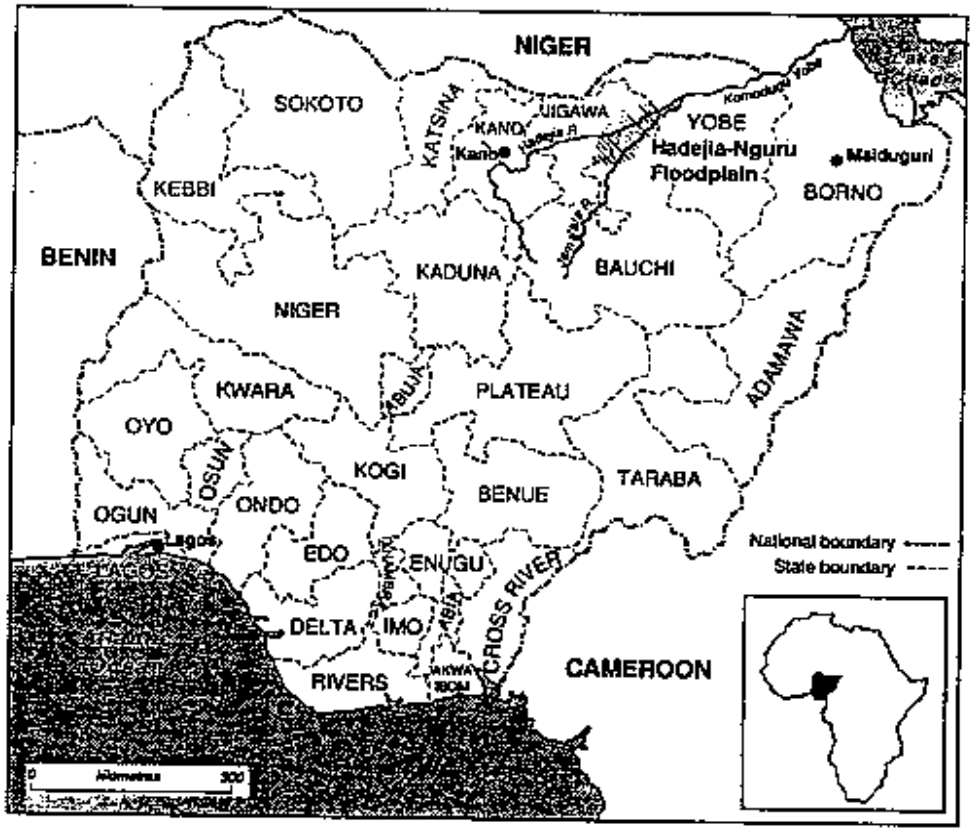
[1] The purpose of the case studies is to test and improve on techniques and methodologies developed through the project. Case studies have been conducted with collaborating partners in a variety of countries: Zimbabwe (Hot Springs Working Group 1995); Botswana (Bishop and Scoones 1994); Brazil and Papua New Guinea (both reports forthcoming). The project has also liaised with other field studies examining similar issues.

economy of the Wetlands. In addition, this final chapter offers some conclusions on the methodology employed in the study while some preliminary reflections on the workshop's achievements in terms of capacity strengthening can be found in Appendix F.

1.2 The Hadejia-Nguru Wetlands

The Hadejia-Nguru Wetlands is an extensive area of floodplain located in the north-eastern sudano-sahelian zone of Nigeria, between latitudes 12 and 13 North, and longitudes 10 and 11 East (see Figure 1.1). It is approximately 3,500 square kilometres in expanse, and is situated where two rivers (River Hadejia and River Jama'are) flow through a fossil dune field before converging and draining into Lake Chad.

Figure 1.1 Location of the Hadejia-Nguru Wetlands



Source: Hollis *et al.* (1993)

Based on natural annual flooding, the Wetlands perform a number of economic and ecological functions which are of critical national significance. From an economic perspective, an estimated over one million inhabitants are supported by the Wetlands in an otherwise sparsely populated region (Adams 1993). These people produce large quantities of rice, groundnuts, vegetables, cowpea and wheat, which are marketed in other parts of the country. The financial benefits of major agricultural outputs in the Wetlands have been estimated as approximately N6 billion (US$75

million; Barbier *et al.* 1993[2]). Over 250,000 head of cattle are reared in the area, supporting a cattle trade with an annual turnover of over N400 million (US$5 million).

The role of wild resources in rural economies includes a range of household uses and income-generating activities. An annual catch of over 6,000 metric tonnes of fish with a market value of N480 million (US$6 million; Barbier *et al.* 1993) is supported by the Wetlands. Other wild resources are also harvested for use within the household as sources of foods, medicines, cosmetics or materials for provision of shelter. Wild resources also provide valuable inputs for other livelihood and income-generating activities, such as fodder for livestock and materials for farming or fishing.

The economic role played by wild resources is often of strategic importance as wild resources may provide the only options for the rural poor to fall back on in times of stress. Wild rice, for example, is eaten at times of general hunger resulting from crop failures due to drought or some other causes. And many plant sources are used as sweeteners or condiments in regular diets, but especially at times of scarcity of conventional sources of these food components. Nor can the role of wild foods in supplying vitamins and minerals to ensure better balanced diets be underestimated. Wild foods are thus important elements in achieving food security in the Wetlands.

Ecologically, the Wetlands may serve as a natural barrier to the process of desertification and play a major role in the recharge of groundwater in the Komadugu-Yobe Basin.[3] In addition, the Wetlands harbour large numbers of diverse species of wildlife, particularly Palaearctic and Afrotropical migrant water birds.

Recently, climatic vagaries and the construction and inefficient operation of large dams and other irrigation schemes upstream have greatly reduced the extent of annual flooding in the Wetlands. This directly undermines the economic and ecological functions of the Wetlands and is creating concern among downstream water users. Other proposed upstream water development projects would further impair the economic and ecological stability of the Wetlands in particular, and the whole Komadugu-Yobe Basin in general.

The Hadejia-Nguru Wetlands Conservation Project (HNWCP) was established in 1987 as a partnership between the governments of Borno, Yobe, Bauchi, Jigawa and Kano States, the Nigerian Conservation Foundation and the Royal Society for the Protection of Birds. The main focus then was the protection of palaearctic and afrotropical migrant water birds. Under the management of the World Conservation Union (IUCN) since 1990, HNWCP has been concerned with a broader mandate - the maintenance of the economic and ecological functions of the Komadugu-Yobe Basin ecosystem by canvassing for support and co-operation from various parties to ensure regular flooding of the Wetlands.

HNWCP recognises that, due to an incomplete understanding of the economic and ecological significance of the Wetlands, planners have implemented development strategies in the Komadugu-Yobe Basin which are not sustainable. Consequently, the project concentrates now on catalysing decision-makers to plan and implement a sustainable management strategy for the Basin. As a prerequisite to this catalytic role, the project undertakes studies in the areas of hydrology, ecology

[2] The US$ amount was estimated by Barbier *et al.* (1993) for 1989-90 and then converted to Naira using the 1995 exchange rate (N80/US$).

[3] The concept of desertification is difficult to define and there is considerable disagreement among scientists concerning its nature and extent.

and economy in order to gain greater insights into the importance of the Wetlands. These studies also provide a scientific basis for proposals for the sustainable management of resources in the Wetlands.

In addition, HNWCP undertakes a number of demonstration projects to explore and demonstrate potential improvements in productivity of the livelihood systems in the floodplain resulting in both increased incomes and conservation benefits. These projects, in the areas of community agroforestry, *fadama* rice cultivation, donkey traction, beekeeping and fuel-efficient woodstoves, also serve to provide an enhanced presence for HNWCP amongst wetlands communities.

1.3 Valuing Wild Resources

This study complements HNWCP's work of promoting the sustainable management of the flooding regime. By valuing wild resources, the study would enable HNWCP to draw attention to their crucial role in the livelihoods of the Wetlands. An innovative approach to the valuation of wild resources of the Wetlands was at the core of the study for three reasons:

- The goal of combining the project's research objective with the strengthening of local capacity in resource valuation;
- The lack of previous experience and guidelines for valuing wild resources, a constraint at the centre of the *Hidden Harvest* project; and
- Lack of documented knowledge about wild resource use in the Hadejia-Nguru Wetlands.

This section examines how these factors have shaped the process of the study and helped determine the methodological approach used to value wild resource in the Hadejia-Nguru Wetlands.

The training and research objectives were met with a study workshop (a summary of the workshop programme and process is provided in Appendix F). The workshop brought together a local team with experience and knowledge of the Hadejia Nguru Wetlands and a combination of skills chosen to complement the study's research objectives (a list of participants is provided in Appendix A). The workshop was designed to provide a forum for introducing the team to the new skills which would form the basis of the valuation methodology: participatory research techniques and economic analysis. The first phase of the workshop centred on introducing these skills and the concepts which they embodied. These are summarised in Box 1.1 and 1.2.

The lack of documented experience of wild resource valuation which inspired the *Hidden Harvest* project, provides the primary question for this study: what are the values of wild resources in the Hadejia-Nguru Wetlands? However, within the framework of the basic research objective (to assess the economic importance of the major wild resources harvested from within the Wetlands), the workshop was designed to allow the team to use their local knowledge to formulate a series of research questions which would guide the appraisals in the two communities. While the initial phase of the workshop provided an opportunity for the team to agree on the research questions, the corresponding research techniques used to answer the questions were revised throughout the study. Table 1.1 provides a summary of both research questions and techniques.

Box 1.1: Participatory Research Techniques

- The importance of **indigenous technical knowledge** is central to participatory research. Participatory researchers share local people's concerns about how they survive. This common interest enables outsiders to work with local people and listen to them explain how they survive. Participatory research tools are designed to facilitate such interactions through overcoming communications barriers such as literacy, language and superiority.

- Different groups and individuals within communities face different opportunities and constraints. Participatory research emphasises the need to **recognise and understand this diversity.** Participatory research triangulates both research tools and informants in order to gain a full understanding.

- The wider environment from which livelihoods are earned helps to explain the opportunities and constraints which face individuals. Participatory research aims to **understand the context** of survival mechanisms and to know to what extent research findings may be transferable.

Box 1.2: Economic Analysis

- **The economic aim of the majority centres on the survival of their household.** This is determined by the household's production. Household production is subject to opportunities such as the availability of natural resources or the proximity of a market, and constraints such as water availability or a lack of household resources (*e.g.* labour and capital). The value of household production will determine how well they survive.

- **Households consist of individuals who contribute to household survival through their productive and reproductive activities.** Individuals may be subject to different constraints (and/or opportunities) which are reflected in the value of their individual production.

- **As household decisions are made rationally,** understanding how households and their members interact with the constraints and opportunities presented to them by their environment will provide a basis for understanding how communities will react to a similar environment.

Both the research and training objectives of the study were also partly designed to contribute to the understanding and knowledge of wild resource use in the Hadejia-Nguru Wetlands. It is anticipated that the research findings within this report will be available to a wide body of practitioners, policy makers and future researchers interested in the Wetlands. The training of a team capable and interested in understanding wild resource use should also encourage further understanding of these issues through their future work

Methodology

The lack of existing information and practical constraints in gathering information on wild resource use also affects the choice of valuation methodology. Others have proposed a simple economic model of value equal to price minus costs, including non-financial costs (Godoy, Lubowski and Markandya 1993). This basic concept of value is linked to both conventional accounting frameworks, as in the case of cost-benefit analysis, and to more complex models of household production. The prices used in this net economic value approach can be varied, depending on the boundary of the analysis: farmgate, some wider administrative or economic region, or the

whole country. Many studies, including this one, simply calculate gross financial values, or revenues (for example, de Beer and McDermott 1989), which, in any case, is a necessary stage in determining net economic value.

Table 1.1 Research Questions and Research Techniques

Research Questions	Research Techniques
What are the resources? Where are they? What is their relative abundance?	Participatory mapping, transect walks, existing knowledge of the research team
Which resources are important to which groups in the community?	Transect walks, wealth ranking, semi-structured interviews
What are the resources used for?	Semi-structured interviews, process charts
What is the process chain of the resource? Is it processed? Is it consumed locally? Is it traded? Who is involved?	Process charts, semi-structured interview, existing knowledge of the research team
How is the utilisation of the resource controlled? Who maintains authority over the resource? Who has access to the resource?	Semi-structured interviews, secondary information
What is the seasonality of harvest and use?	Seasonal calendars, existing knowledge of research team, secondary information
What is the economic importance of the resource? What is its market value? What other economic roles does it have?	Market survey, investigations of costs and earnings, pie charts using stone piles techniques, seasonal calendars, semi-structured interviews
What are the other values of the resource?	Semi-structured interviews, existing knowledge of research team
How and why is resource use changing?	Historical matrices, semi-structured interviews, timelines, existing knowledge of the research team.

With wild resources, even relatively straightforward information, such as quantities collected, processed or sold, is not readily available. Collecting such data is generally a time-consuming task due to the high degree of geographic variability in the types and quantities of resources collected. Where wild resources are used exclusively for subsistence, price estimation may also present difficulties, although market prices of commercialised substitutes are often used.

But the largest difficulty in estimating the economic value of wild resources concerns the opportunity cost of labour, which is usually the most significant input to the harvesting process. Studies tend to make very simple assumptions about this parameter, often with apparently little justification, even though it has a considerable effect on the resulting value. Looking for one value for the opportunity cost of labour is clearly too much of a simplification. The seasonality of production activities and the opportunistic nature of many harvesting activities mean that this value may vary quite widely, even within one community.

An alternative, followed here, is to calculate the returns to labour devoted to harvesting and processing various wild resources.[4] The returns to labour are simply the revenues less any relevant fixed or variable costs per unit of time devoted to the activity. Fixed costs, such as equipment necessary for harvesting, can be depreciated over the lifetime of the item, although for the resources examined in this study, the fixed costs were in all cases negligible. Following this approach, the *Hidden Harvest* case study undertaken in Botswana analyses the incentives facing women in their choice to harvest either wild or cultivated palm leaves, which are then woven into baskets and other crafts (Bishop and Scoones, 1994). Returns to labour reflect not only the value of the resource but also various institutional factors.

Two other aspects of the financial or economic values generated by a natural resource are crucial for understanding its importance to livelihoods: when the benefit is enjoyed and by whom. Certain sources of food or income may be highly valued because they are available before the harvest when last year's stocks or revenues are running low. These seasonal changes in values will be reflected in rises and falls in prices where levels of commercialisation are higher.

On the other hand, distributional issues will not be reflected in market prices. A modest source of income for more disadvantaged groups is considerably different from a similar amount earned by better-off community members with more diverse income-earning opportunities. The sophisticated technique of distributional weights have been developed for comparing the income earned by different groups in the context of project appraisal, but where basic price and quantity data is often lacking, such methods are too ambitious. The simpler alternative is to highlight to which groups income or rents accrue, as is done here.

1.4 Village Selection

The study focused on two villages in the Wetlands, Adiani and Gwaiyo.[5] The villages were selected on the basis of a number of criteria including general location within the Wetlands, distance from main roads and markets, type of natural environment, ethnic groups present and size. The aim was to choose two villages which had some differences but which would still allow some comparisons, as well as contrasts, to be made.

Adiani is located on the Hadejia River system while Gwaiyo is further east on the Katagum/Jama'are River system. One resulting difference is that the villages' economies are oriented towards different market towns. Goods generally flow into Adiani from the western side of the Wetlands with Nguru being the major market town. On the other hand, Gwaiyo's exports and imports tend to go through the towns of Gashua and Jakusko on the eastern side of the Wetlands.

The two villages also differ in size with Adiani being much larger than Gwaiyo. The villages have somewhat different ethnic compositions, as well. The main group in Adiani are the Mangawas and in Gwaiyo, the Bede. While reliant on fishing as a main economic activity, both villages are located close to major forested areas which provide an important harvest of wild resources.

[4] Although typically measured in terms of time, labour used in resource harvesting and processing should ideally measure effort (for example, with caloric units). But collecting such information is very time-consuming and can only be done in the context of a long-term study.

[5] Gwaiyo is often also spelt 'Gwayo'.

Given the extent of diversity within the Wetlands, it was not be possible to select two villages which would provide a representative sample of the entire Wetlands population, even if this were an objective of the village selection. Thus, it is not wise to attempt much aggregation of results presented here across the entire Wetlands area. The practical constraints of time and resources and the use of participatory techniques meant that representative sampling was not attempted.

2. ADIANI

2.1 Introduction

Adiani is a large village with an estimated population of 4500-7000. The village is located on the flood plain of the River Hadejia which rises in the Jos plateau to the south, and eventually joins the Jama'are river to form the Yobe River near Gashua 70km east of Adiani. The village is south of Nguru and can be reached by boat during the flood (30 minutes from Nguru) or by unpaved road during the dry season (one hour from Nguru). The village falls under the jurisdiction of Krikasama Local Government Area in Jigawa State.

The village is headed by the *Bulama*, who is from the Mangawa ethnic group. The largest ethnic group in the village, the Mangawas speak a dialect of Kanuri known as Manga. However most of the men and the young people also speak Hausa.

There are approximately 1000 households in the village, which is divided into 18 wards, each consisting of between 40 and 80 households and headed by a ward head, *mai unguwa*. The dominant religion in Adiani is Islam and in many households, the young and/or married women spend much of their time working in the home.[6]

The *Bulama* noted that the flood waters of 1945 shifted the river channel closer to the village which has since experienced more extensive and frequent flooding. The village has grown since the drought and famine of the early 1970s. The community experienced a spurt of development in the 1980s when a primary school, market and Friday mosque (*jumat*) were built. Since 1987, when a bore hole was sunk, there have been few major developments in Adiani.

This chapter reports on the study visit made to Adiani over the course of 10 days in July 1995. The study was conducted in two phases, the first concentrated on learning about the wide variety of wild resources utilised by the community and the second phase focused on three specific resources. The chapter is structured in the same way, with section 2.1 presenting the findings from the initial appraisal and section 2.2 presenting the results of the focused appraisal of the economic importance of doum palm, potash and wild foods in Adiani. The chapter closes with a synthesis of the main findings in section 2.3.

2.2 Initial Appraisal

The initial field appraisal, conducted over four days, aimed to investigate the role of wild resources in livelihoods in Adiani and to identify key wild resources. To achieve this aim, research questions were formulated and two were used to guide the initial field appraisal (see section 3.3). These were:

- "What are the resources, where are they and what is their relative abundance?"
- "Who uses which resources and how?"

[6] In most Manga villages, women are not in purdah and so participate in the cultivation of crops. However, Adiani is somewhat different in comparison to other Manga areas since fishing is a relatively more important activity here.

2.2.1 What are the wild resources?

In order to identify the different wild resources, two transect walks were conducted with four members of the village community, each with one elder and one youth as guides (Figures 2.1 and 2.2). The transects covered a diversity of land uses and land tenure arrangements around Adiani. These ranged from the forest reserve which has been gazetted by the State Government where no cultivation is permitted, to the productive farmlands of the floodplain which are owned by individuals in the community. Both transects and the discussions along the way revealed a large number of wild resources on private, state and common land which are exploited by the community. The villagers which accompanied each walk described the uses of each resource and explained how many wild resources have multiple uses.

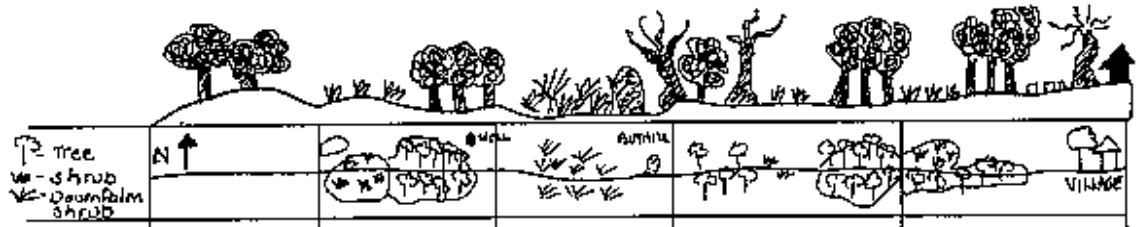
In addition, maps of the village area were drawn by a group of elders and a group of youth. The elders' map indicates the location of vegetative wild resources around the village, a potash collection site to the west of the village and the river channels to the west and south of the village (Figure 2.3). The map drawn by a group of the village youths highlights the location of the water and vegetative resources (Figure 2.4). Both maps indicate the widespread availability of wild resources throughout the village and the village land and both highlight the importance of the resources provided by the River Hadejia and associated streams and vegetative resources, in particular certain species of tree and shrub. From the maps it appears that wild vegetative and water resources are relatively more abundant than the soil resources such as clay and potash which occur only in small pockets.

2.2.2 Who uses which resources and how?

The combination of maps and transects revealed detailed information on the wild resources which are important to village livelihoods. This has been combined with the team's observations to develop an inventory of wild resources and their uses which is provided in Appendix D. The inventory lists a large number of wild resources (76), divided into three major groups: vegetative, soil and water resources. Most of the resources listed are trees, shrubs or grasses and the inventory shows that many of these have multi-purpose uses. These were classified into ten major use groups: animal feed, human food, medicines, spiritual medicines, fuel, construction, crafts, cultural uses, pesticides and fertilisers, and industrial uses.

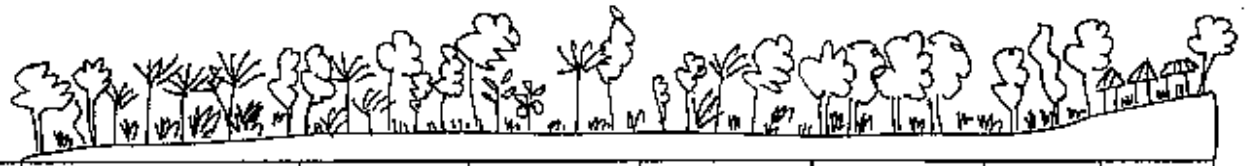
In investigating which resources are important to whom, it was first necessary to identify different groups within the village community. After discussions with community members, several different groupings were identified. These included the young men, the elderly men and the elderly women. Other groups were identified on the basis of occupation and these included farmers, fishermen and traders. At the initial stage, semi-structured interviews with representatives from each of the age/gender and occupational groups were used to discover how different wild resources are used by different groups. The results of these discussions are presented in Table 2.1.

Figure 2.1 **Transect Walk, Adiani Village**
Drawn from discussions with an elderly and a young man, July 7th 1995



Land use	Forest	Irrigated orchard, irrigated vegetable farms	Forest	Orchard, forest	Forest reserve, farmland, doum palm plantation, settlement
Soil and land type	Sandy loam, fadama	Sandy loam, fadama	Sandy loam, flood plain	Sandy loam	Sandy loam
Vegetation type	Dense savanna	Dense savanna	Sparse savanna	Dense savanna	Dense savanna
Tenure	Communal	Individual	Communal	Individual (orchard), Communal (forest)	Individual (farmland), Communal (forest)
Resources	Wild trees (eg kuka, adua, doum palm) and wild grasses (eg yadia.) Some cultivated crops.	Cultivated vegetables, maize, rice. Some wild trees (eg magariya	Wild trees and shrubs (eg kuka, doum palm)	Cultivated fruit trees (eg mango, guava), wild trees (eg adua, doum palm)	Wild trees (eg doum palm, dinya, kuka, tsamia,), wild grasses (eg bahama), honey and some cultivated crops

Figure 2.2 **Transect Walk through the Forest Reserve to Adiani Village**
Drawn from discussions with the *Wakili*, (the *Bulama*'s assistant) and a young man, July 7th 1995



Land use	Forest reserve	Forest reserve	Forest reserve	Forest reserve	Forest reserve	Forest reserve	Settle-ment
Soil type	Clay, potash	Alluvium , sandy	Black, potash	Sandy	Sandy	Black	Sandy
Vegetation composition	Many doum palm	-	-	-	Many neem	-	-
Vegetation type	Doum palm, rumbu, kakgo, Jana gadiwa, karaya, karkara, karamga	Sizi, tamzuwu, doum palm	Calatropis, kalgo, doum palm, jana gadiwa	Doum palm, kalgo, gawo	Gawo, kalgo, doum palm, rumbu, neem	Kalgo, neem, doum palm,	Neem, dinya

Figure 2.3 **Village Resource Map, Adiani**
Redrawn from the *Bulama* and elders' map, July 8th 1995

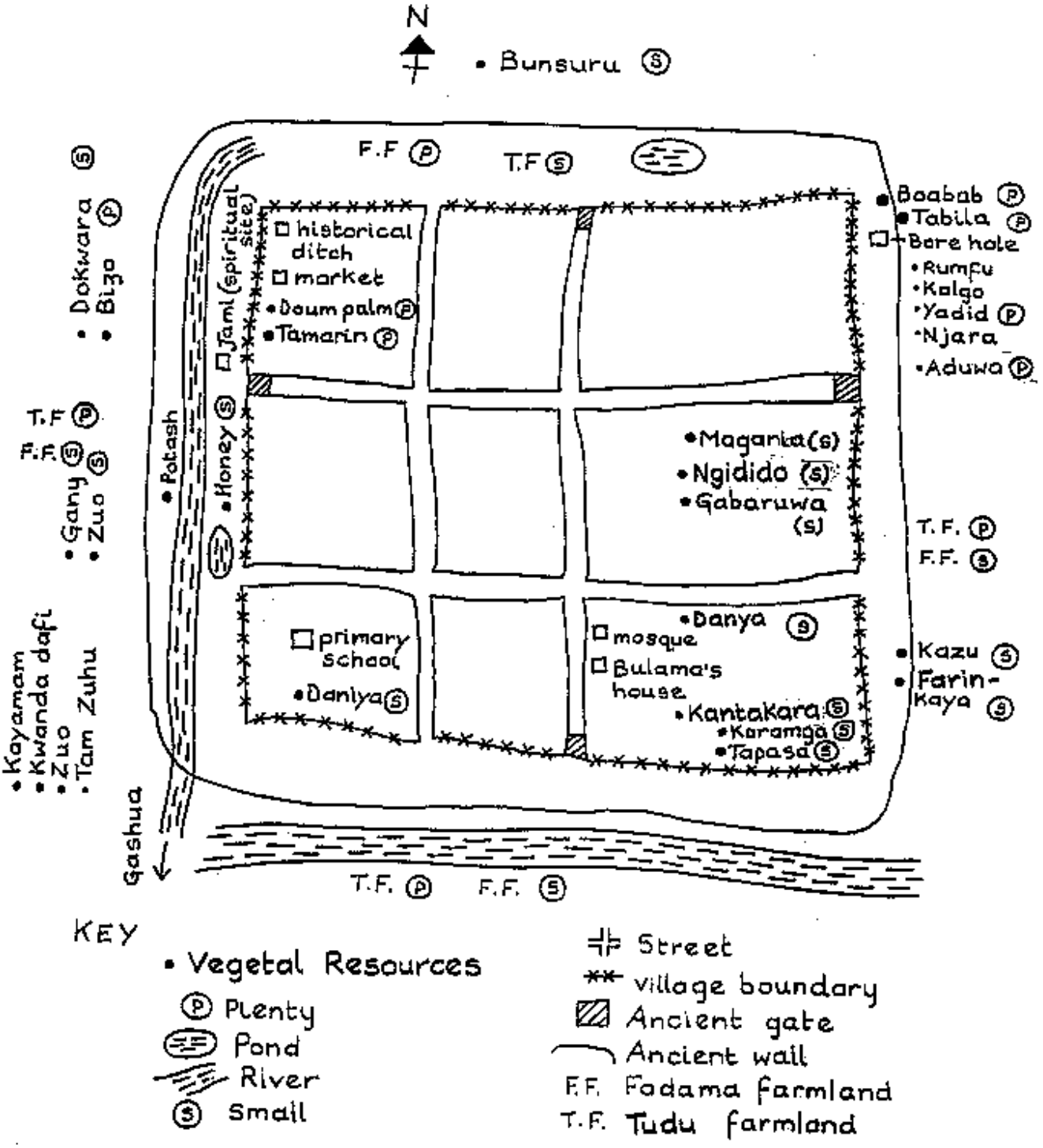
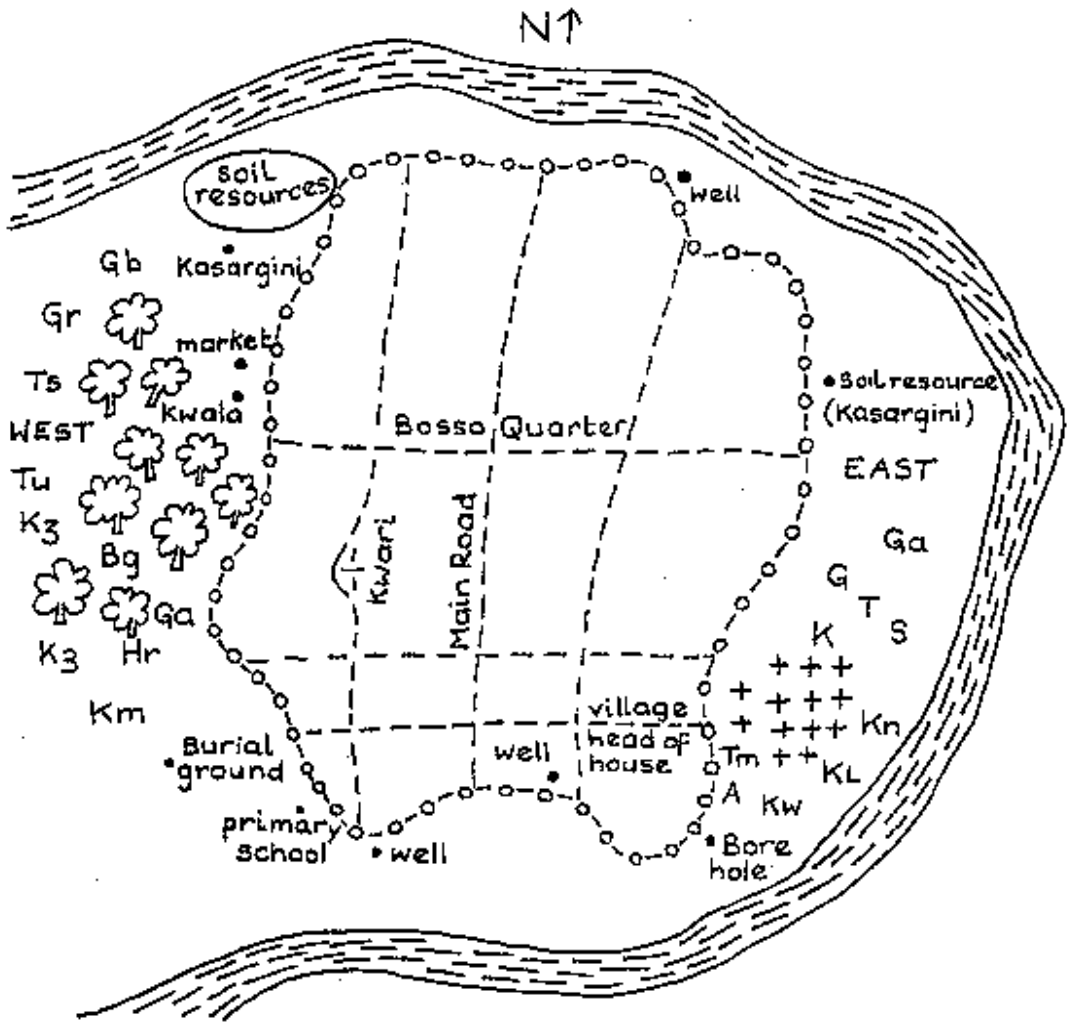


Figure 2.4 **Village Resource Map, Adiani**
Redrawn from the village youths' map, July 8th 1995



Resources

Gr = Goruba	Km = Kuma	-o-o = Former boundary between settlement and farmlands
Ts = Tsamiya	Kz = Kazu	
Tu = Tauna	K = KuKa	
Gb = Gabaruwa	A = Adua	
Kz = Kazulu	Kl = Kalgo	- - - = Streets
Hr = H	T = Tabila	
Bg = Burgum	S = Shabara	
Ga = Ganu	G = Gawo	
Kw = Kawi	Kn = Kurna	
Tm = Tatmu		

= Forest Reserve

= Abandoned farmlands = waterresources

Table 2.1 summarises how young men, older men and women use the different groups of wild resources available in Adiani. The table shows that certain resources are important to particular groups, for example, water resources such as fish are important to men's livelihoods; soil resources such as clay and potash provide women with income; and both women and men are involved in trading wild resources. Importantly, the table shows differences in how men and women utilise wild vegetative resources. In particular, it is only women who collect wild vegetables directly for food.

At a later stage of the field appraisal, wealth ranking was conducted and used to identify different groups according to their socio-economic status. This provided a basis for selecting informants for more detailed discussions on how different socio-economic groups used wild resources (see Appendix E).

2.3 Focused Appraisal

The second phase of the study in Adiani was the focused appraisal. The initial appraisal was followed by an interim period, when time was taken to review what had been learnt so far, in particular, the great number of wild resources that played an important role in the livelihoods in Adiani. The team then decided to concentrate on income generation opportunities and the food provided by wild resources. Within these use groups, it was decided to focus on doum palm and potash as income generating resources and to focus on four of the many wild foods that are eaten in Adiani. The structure of this section reflects the foci of the study. The two income generating resources are considered in sections 2.2.1 and 2.2.2. The wild foods are examined in section 2.2.3. Within each section, the focused appraisal follows the sequence of research questions identified in section 3.3.

2.3.1 Doum palm

Doum palm (*Hyphaene thebaica*) was identified during the transect walk as an important wild resource (see Figures 2.1 and 2.2). Doum palm meets many different domestic needs and provides a source of income to groups of many ages and both genders within the village and the maps in Figures 2.3 and 2.4 show that there are doum palms within easy access of the village. Doum palm is an important wild resource throughout the Wetlands area where its products are traded in both processed and unprocessed forms. Although the tree can grow in semi-arid areas, it attains its maximum growth in wetlands and oases (Maydell, 1986).

Who depends on doum palm?
A combination of techniques was used to investigate the importance of doum palm to different groups within the village. These included general discussions with community members throughout the study, observations by the team and semi-structured interviews with representatives of different occupational groups (*e.g.* farmers, traders) and the different socio-economic groups identified in the wealth ranking.

The team asked the head of Margadu Zaila ward to nominate one person from each of the socio-economic groups as described in a wealth ranking (see Appendix E). Using the pile-of-stones technique and *goruba* (doum palm fruit) shells, each of these individuals illustrated the proportions of their income and food obtained from various sources. Their proportions were converted into the pie charts illustrated in Figure 2.5.

Table 2.1 Use of Wild Resources by Various Groups in Adiani

INFORMANTS	VEGETATIVE RESOURCES									WATER RESOURCES		SOIL RESOURCES	
	Fodder Uses	Food	Medicine	Fuel-wood	Construction	Agro-chemical	Industrial	Craft	Culture	Income	Locally Consumed	Income	Locally Consumed
ELDERLY MALE	+		+	+	+	+	+	+		+	+		+
MALE YOUTH	+			+	+	+	+	+		+	+	+	+
WOMEN		+		+					+		+	+	+

The two households from the highest and lower-middle groups depended on wild resources for a significant proportion of their annual food, and of the wild plants which they use as food, doum palm constitutes an important part, especially for the household from the highest group (see pie charts in Figure 2.5 [a], [b], [g] and [h]). Selling various doum palm products constituted the major source of income for this household, although it was not mentioned as a source of income by the other household heads in Margadu Zaila ward.

The next stage was to make an estimate of numbers: how many people in Adiani were dependent on particular wild resources as a source of income? The team discussed the issue in a small group with three youths and one elderly man, who illustrated, again using the pile-of-stones technique, the proportion of individuals in the community relying on income from various wild resources (after farming). The results are displayed in the histogram in Figure 2.6. Out of the 4,500 people living in Adiani, approximately 1,500 are dependent on income earned from the specific wild resources about which the team had asked: income from selling potash; selling doum palm leaves and products; selling *kuka*, *yadia*, *aduwa* and *ngididó* fruits and leaves. Figure 2.6 shows that approximately 150 people depend on collection and selling doum palm products in Adiani.

Harvesting doum palm

A process chart was constructed with a group of doum palm traders to discuss the inputs needed and the destination of the products (Figure 2.7). The pile-of-stones technique was then used to examine the importance of different doum palm products as sources of income for two doum palm traders in Zoriwo Awombe ward, and with a group of young men, to investigate the proportion of doum palm fronds[7] which are processed before sale. The results of these discussions are illustrated in Figure 2.8 and Figure 2.9.

Both the pie charts and the process chart constructed by the doum palm traders show the wide range of doum palm products which are collected, processed and sold by the Adiani community. As can be seen from the diagrams in Figures 2.8 and 2.9, the traders said that the collection and selling of the leaves and fruits, with no processing, are their major sources of income. This was confirmed by the discussions with the group of men who constructed a pie chart demonstrating that over half of the doum palm fronds collected by the community are sold outside the market with no further processing (see Figure 2.9). Of the remaining doum palm leaves which are processed by the villagers, approximately half of these are woven into mats and then sold outside the village.

Access to doum palm

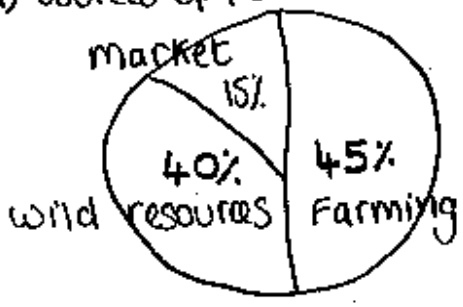
The access to and control of the doum palm resources around Adiani was discussed with the *Bulama* and the traders from Zoriwo Awombe ward in separate interviews. Both discussions revealed that access to doum palm trees varies according to the ownership of the land on which they were growing. The doum palms in the forest reserve are subject to certain controls: while anyone may harvest the leaves or fruit from the trees, felling of the stems is prohibited. In contrast, where a doum palm is growing on a farmer's field, he has control over it. Generally anyone, both outsiders and villagers, will be allowed to harvest the fruits or leaves, however the farmer's permission is required to fell the stem.

[7] Fronds are the leaf-like parts of the doum palm tree.

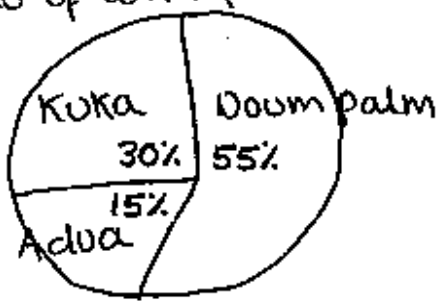
Figure 2.5 **Sources of Food and Income in Margadu Zaila Ward**
Drawn from the findings of discussions with heads of household from the middle, lower-middle groups, Adiani, July 15th 1995

'Rich' household

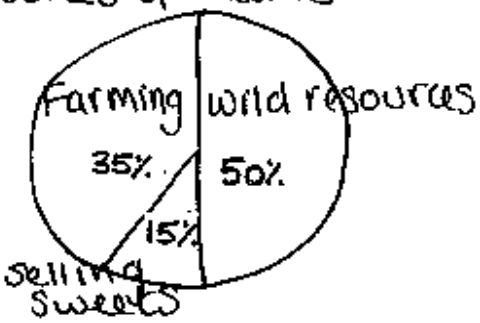
a) sources of food



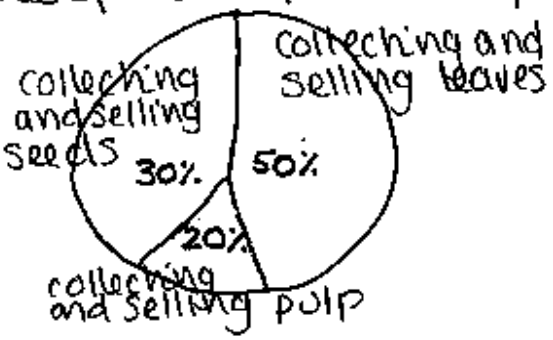
b) sources of wild food



c) sources of income

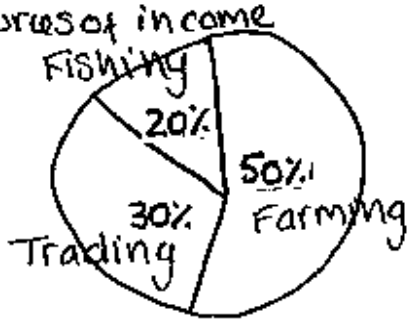


d) sources of income from doum palm



'Richest' household

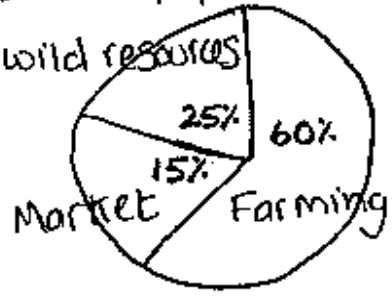
e) sources of income



f) sources of food

'Poor' household

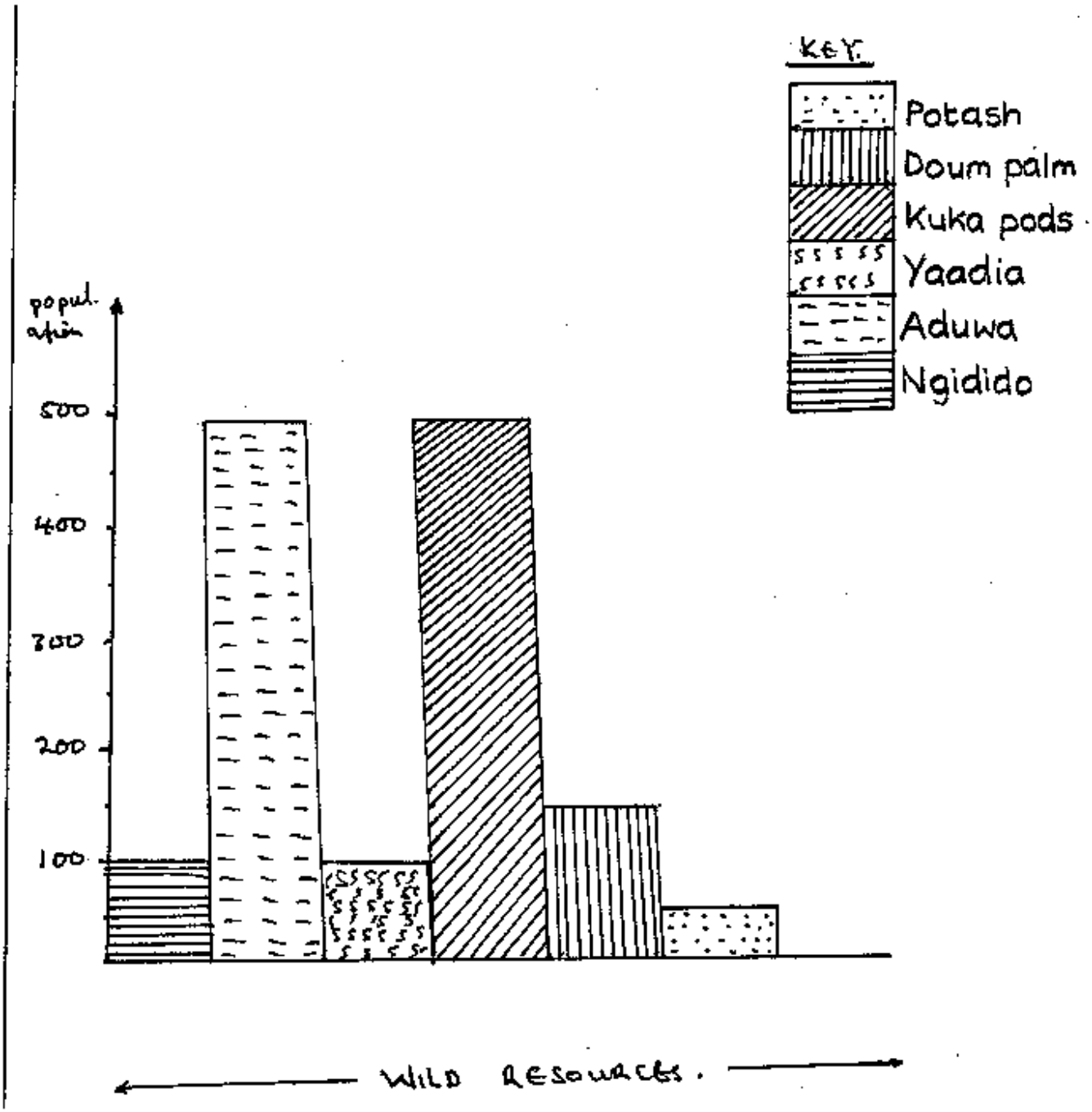
g) sources of food



h) sources of wild food

i) sources of income

Figure 2.6 **Dependence on Wild Resources as a Source of Income**
The results of scoring with a men's discussion group in Bosso and Zoriwo Awombe Wards, Adiani, July 19th 1995.



Seasonality of doum palm

A combination of semi-structured interviews and seasonal calendars was used with a discussion group of young men in Zoriwo Awombe ward to investigate the seasonality of doum palm products and variation in the quantities and prices from season to season. The young men identified four seasons, the rainy season, *Damuna*, the harvest season, *Kaka*, the dry season, *Rani* and the season of approaching rains, *Bazara* (see Appendix B). The seasonal calendars revealed that doum palm products are harvested and used throughout the year, although certain parts of the doum palm are more important at different times of the year (Figure 2.10). The collection of the leaves, *kaba*, peaks during the harvest and dry seasons, whereas the collection of the fruits, *goruba*, peaks during the dry season and the season of approaching rain.

In 1994, the HNWCP monitored the amounts and prices of doum palm fronds collected and marketed from six locations in the Wetlands area. One of these was Margadu, a smaller village a short distance to the north of Adiani. The average earnings of the doum palm collectors operating from Margadu have been calculated on a monthly basis and are presented in Table 2.2. As in Adiani, fewer fronds are collected during the rains. However, unlike in Adiani, the peak season for frond collection in Margadu was during the season of approaching rains. This discrepancy may be explained by the different timing of the rainfall and floods between 1994 and 1995.

The seasonal calendars of prices for fronds show an increase when their harvests are at a minimum and presumably when the leaves and fruits are scarce. The same pattern is demonstrated by the price per bundle figures for Margadu which peak during the rains when collection of fronds was at a minimum.

Economic importance of doum palm

In attempting to understand the economic value of doum palm, the team decided to focus on doum palm leaves. The reasons for this were three-fold. Firstly, the villagers had explained that the leaves were the most important doum palm product in terms of the income generated. Secondly, the large number of different doum palm products made it sensible to narrow the focus and thirdly, the availability of existing data on earnings from doum palm fronds in neighbouring Margadu would allow comparisons to be made.

The seasonal calendars of doum palm production were used as the basis for estimating key economic values for the collection of doum palm leaves and the processing of them into mats (see Figure 2.10). The returns to the time spent collecting doum palm leaves were calculated on the basis that one person could collect a big bundle of leaves during one day in the peak season and a small bundle of leaves during the low season. As the price for a big bundle is N200 during the peak season and the price for a small bundle is N200 during the low season, the returns to labour are roughly constant throughout the year. As the cost of the capital inputs are so low in comparison to the income earned, these have not been included. The resulting estimate of the returns to a day spent collecting doum palm leaves is N200 (US$2.50).

Rapid inflation and fluctuating real rates of exchange make it difficult to make an accurate comparison with the earnings from doum palm fronds in Margadu in 1994. Although earnings in Naira increased over the course of 1994, their value in US$ decreased. However, the mean daily earnings of an individual collector from Margadu in 1994 was US$2.15. This suggests

Figure 2.7 **Processes in Collecting and Harvesting Doum Palm**
Redrawn from diagrams by doum palm traders, Zoriwo Awombe Ward, Adiani, July 17th 1995

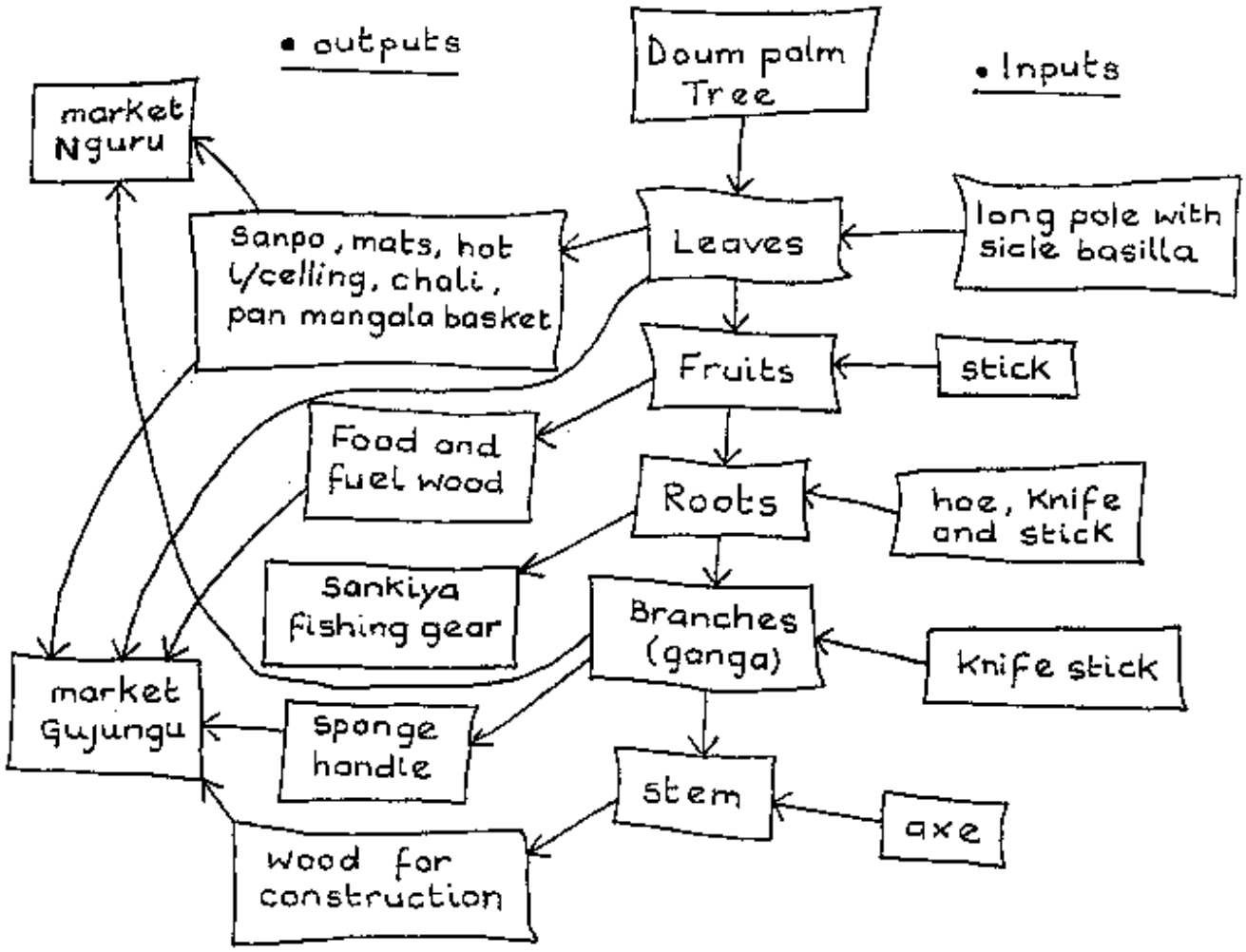


Figure 2.8 **Doum Palm Income**
Redrawn from diagrams by doum palm traders, Zoriwo Awombe Ward, Adiani, July 17th 1995

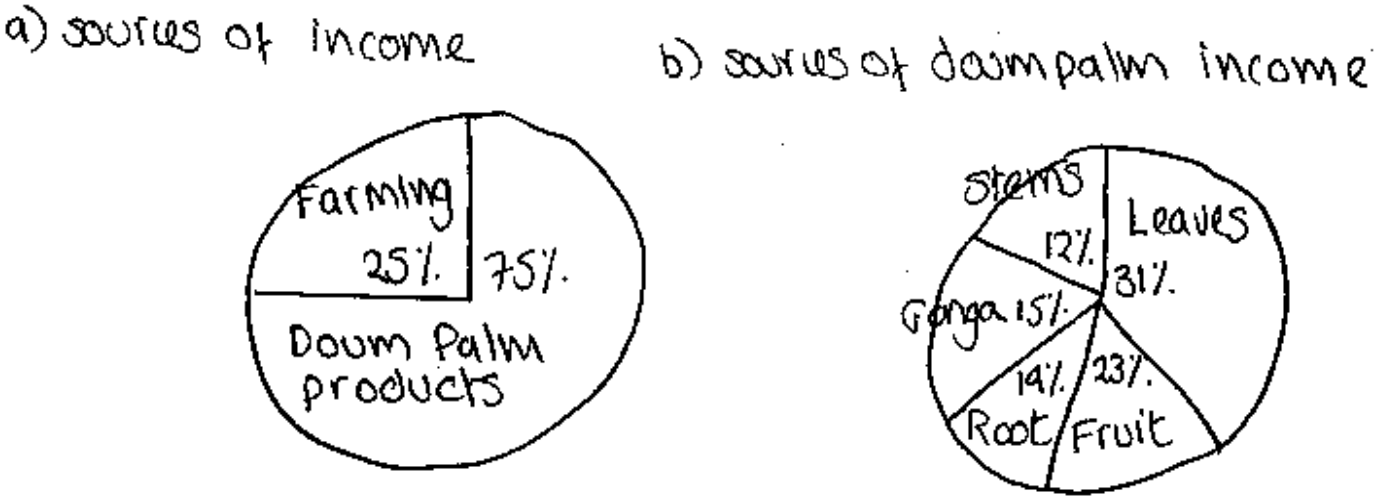


Figure 2.9 **Doum Palm Processing and Sale**
Redrawn from diagrams by young men, Zoriwo Awombe Ward, Adiani, July 17th 1995

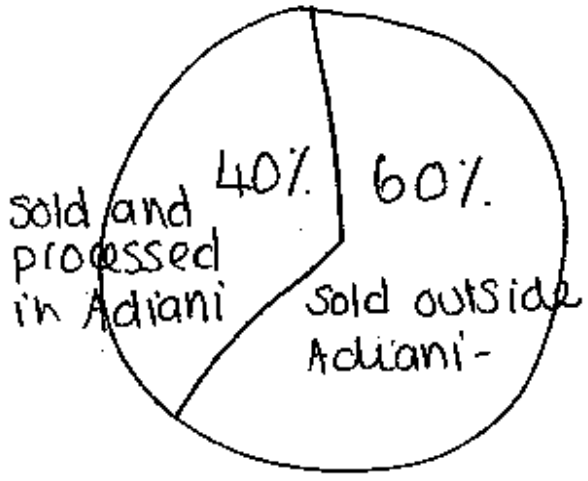


Table 2.2 Earnings from Collecting Doum Palm Fronds, Margadu Village 1994

SEASON	Month	Mean price per bundles collected (Naira) [1]	Mean no. bundles per collector per day[1]	Mean earnings per collector (Naira)	Approx. exchange rate (Naira/US$) [2]	Approx. mean earnings per collector per day (US$)
Rani, dry season	Jan	50	1.9	95	46	2.07
	Feb	50	2	100	45	2.22
	Mar	50	2.3	115	46	2.50
Bazara, approach-ing rain	Apr	50	2.7	135	48	2.81
	May	50	2.7	135	48	2.81
	Jun	51	2.2	112	50	2.26
Damuna, rains	Jul	54	1.8	97	78	1.24
	Aug	67	1.6	107	58	1.84
	Sep	70	1.9	133	68	1.96
Kaka, harvest	Oct	88	1.8	158	68	2.32
	Nov	91	1.9	173	68	2.54
	Dec	51	1.6	82	68	1.21

Notes: 1. The size of bundles collected varies from village to village throughout the Wetlands.
2. Based on the parallel market rate in Kano

Source: HNWCP data, 1994

that the Adiani estimate of US$2.50 daily doum palm returns is a realistic figure. Both figures for daily returns to labour are considerably higher than the daily agricultural wage rate, which ranges from between N50 to N70 (US$0.63 to US$0.88) depending on the season.

Figure 2.6 shows that the community estimated that there are approximately 150 doum palm collector-traders, or people that depended on doum palm for a source of income. Figure 2.10 shows that doum palm collection is seasonal and at a peak for 6 months of the year. If it is assumed that the 150 trader-collectors collect 5 bundles of doum palm leaves a week during this peak period, then over the course of the 6 months, they will have collected 150 (collectors) x 5 (bundles/week) x 26 (weeks), which totals 19,500 bundles in the peak season. The doum palm traders explained that during these seasons, the bundles collected are large, although the price fetched for them is lower - N200 per bundle. This gives a market value for the doum palm collected during the harvest and dry seasons, of N3.9 million (see Table 2.3).

Table 2.3 shows the calculations of the value of doum palm fronds collected throughout the year. It is estimated that combined, the annual market value of doum palms fronds collected in the peak season and in the low season is about N6 million (US$73,000) in Adiani. Figure 2.9 shows that of all the doum palm leaves collected in Adiani, approximately 60% are traded outside the village in the markets at Nguru and Jajimaji. The doum palm traders said that they receive a better price per bundle in these markets - N300 for a large bundle during the peak season and N300 for a small bundle during the low season. If 60% of the bundles collected in Adiani are sold outside the village, then their annual market value at the market level is estimated to be N5.7 million (US$71,000; see Table 2.4).

These estimates are likely to be low as firstly, they assume that the 150 trader-collectors are the only collectors of doum palm and secondly, they assume that they collect for 5 days a week during the peak period and only 2.5 during the low period[8]. If collectors in Adiani collected fronds seven days a week all year around, then the annual market value of the fronds collected in Adiani would be N10.8 million (US$135,000).

A wide variety of products are made from doum palm leaves. These include mats of different sizes and designs as well as ropes, fans, thatched roofs, baskets and calabash covers. Mat weaving was discussed with several village women who explained that it took them a total of 28 hours to weave an average N80 mat. This was approximately four hours a day for a week. The inputs needed for weaving mats are virtually nil, unless the mat is to be made from dyed palm fronds, in which case, the dyes have to be bought from the market and cost about N5 per colour per mat. Although the estimate that approximately 40% of all doum palm leaves processed included a range of products, these calculations have been performed on the assumption that if processed, doum palm leaves are woven into a medium-sized, plain mat (see Figure 2.9). Hence, no input costs are considered. This results in a return to labour of N3 (US$0.04) per hour which is very low in comparison to the returns for collecting the leaves or the returns for agricultural labour. However, as women can weave mats while they are cooking or child-minding, and others who are too weak to farm or collect leaves can weave mats from home, the very low returns may be worthwhile.

The assumption that the 40% of doum palm fronds processed in Adiani are woven into plain N80 mats enables an estimate of the market value of the processed doum palm products in Adiani (see Table 2.5). It is estimated that the annual value of the mats woven in Adiani is about N6 million (US$74,000). Table 2.6 shows another estimate of annual marketed value of mats in Adiani. This is based on the estimate that each of the 1,000 households in Adiani produces two to three mats a month and gives an annual market value of about N2 to N3 million (US$24,000 to US$36,000), which is comparable with the first estimate (*i.e.* in the same order of magnitude) and suggests that the annual value of mat production may lie in the range about N3 to N6 million (US$36,000 to US$74,000).

[8]These estimates from Adiani appear low in comparison to the 1.6 to 2.7 bundles collected per *day* from Margadu in 1994. However, bundle sizes do vary and, as shown above, the daily earnings from Margadu and Adiani are comparable.

Figure 2.10 **Seasonal Calendar of Doum Palm Products, Quantities and Prices**
Drawn following discussions and analysis with two elders and a group of 5 young men, Adiani, July 17th and 18th 1995

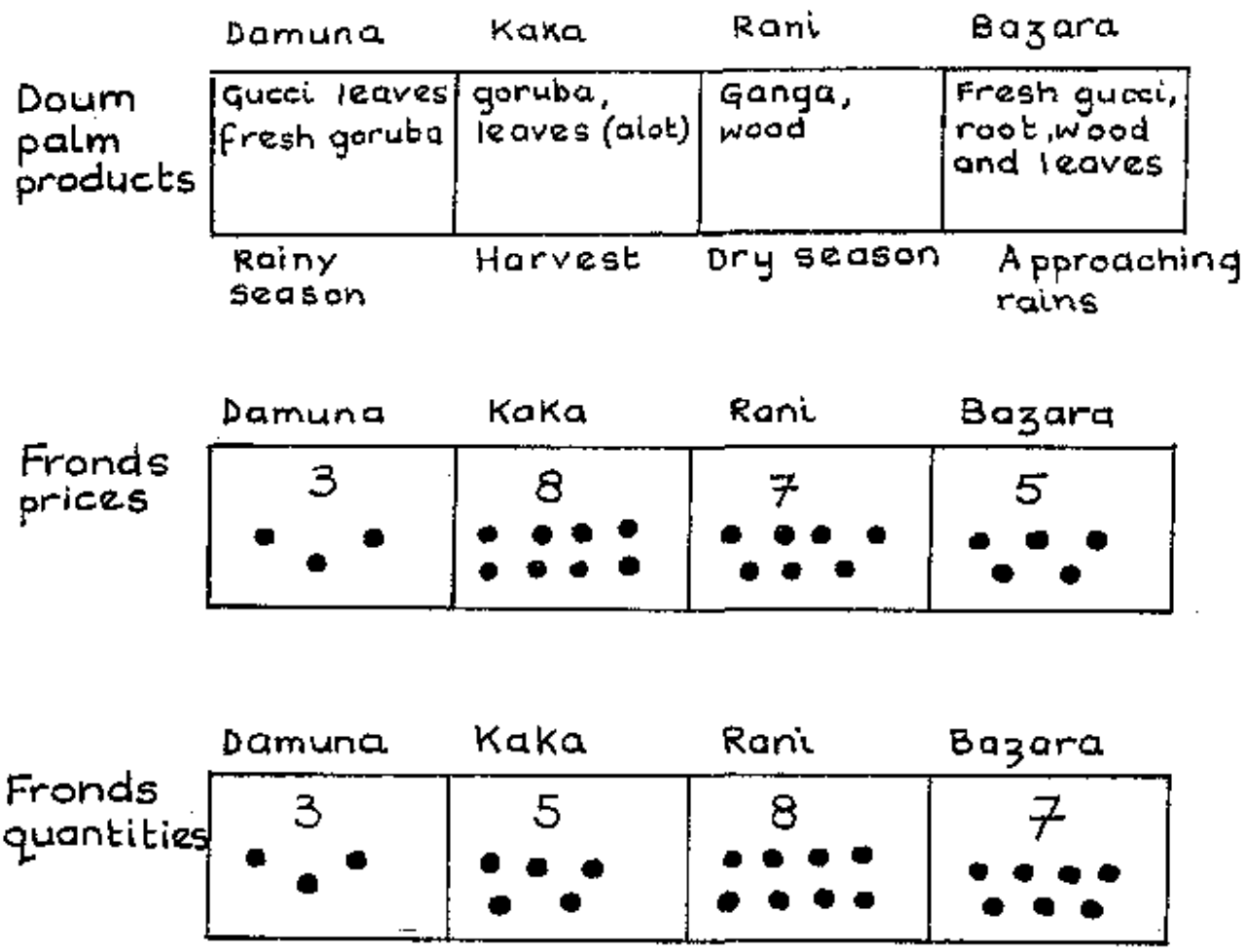


Table 2.3 Estimation of the Market Value of Doum Palm Leaves in Adiani

	Peak collection period	Low collection period
No. of doum palm collector-traders	150	150
Size of bundles collected	large	small
Average no of bundles collected per week	5	2.5
No. of weeks	26	26
No. of bundles collected	19,500	9,750
Price of large bundle in Adiani (Naira)	200	300
Price of small bundle in Adiani (Naira)	150	200
Market value of bundles collected (Naira) (using large bundle price for the peak collection period and the small bundle price for the low collection period)	3,900,000	1,950,000
ANNUAL MARKET VALUE OF DOUM PALM FRONDS COLLECTED IN ADIANI (Naira)		5,850,000

(Note: the peak collection period is *Kaka*, harvest, and *Rani*, dry season, the low collection period is *Bazara*, approaching rains, and *Damuna*, the rains.)

Table 2.4 Estimation of the Market Value of Doum Palm Leaves at External Market Level*

	Peak collection period	Low collection period
No of bundles collected (from Table 2.3)	19,500	9,750
Size of bundles	large	small
Proportion of bundles traded outside Adiani	60%	60%
Number of bundles traded	11,700	5,850
Price of large bundle in external market (Naira)	300	400
Price of small bundle in external market (Naira)	150	300
Market value of bundles traded outside Adiani (Naira) (using large bundle price for the peak collection period and the small bundle price for the low collection period)	3,510,000	1,755,000
ANNUAL MARKET VALUE OF DOUM PALM FRONDS SOLD FROM ADIANI (Naira)		5,265,000

* *i.e.* market outside of Adiani at which fronds are sold to commercial traders

(Note: the peak collection period is *Kaka*, harvest, and *Rani*, dry season, the low collection period is *Bazara*, approaching rains, and *Damuna*, the rains.)

Table 2.5 Estimation of Annual Market Value of Doum Palm Mat-making in Adiani

	Peak collection period	Low collection season
No. of bundles collected	19,500	9,750
Size of bundles	large	small
No. of leaves in a bundle	600	300
Proportion of bundles processed within the village	40%	40%
No. of leaves that are processed in Adiani	4,680,000	2,340,000
No. of mats that could be made @ 95 leaves to a medium sized plain mat	49,264	24,632
Price of medium sized plain mat (Naira)	80	80
Market value of mats made in Adiani	3,941,000	1,971,000
ANNUAL MARKET VALUE OF MATS WOVEN FROM DOUM PALM FRONDS IN ADIANI (Naira)		5,912,000

Table 2.6 Estimation of Annual Market Value of Doum Palm Mat-making in Adiani

		Method of estimation
No. of households in Adiani	1,000	*Estimate using knowledge of average households per ward and the no. of words in Adiani (see Appendix E and Figure 2.6)*
No. of mat makers in each household	2	*Estimated on the basis that the team saw children making mats all over the village at all times of day and nearly all of the married women interviewed made mats*
No. of mats made in a year by each household	24 - 36	*Estimated on the basis that it takes a married woman one week to weave a mat, it is assumed that she would make between 1 and 2 mats a month, and that the children could make 1 mat a month.*
Total number of mats made in Adiani each year	24,000-36,000	*No of households in Adiani (1,000) multiplied by the no. of mats made in a year (24-36)*
ANNUAL MARKET VALUE OF MATS MADE IN ADIANI (Naira)		1,920,000 - 2,880,000

Other values of doum palm

Semi-structured interviews with a range of villagers revealed that in addition to the important economic values of its many products, doum palm also has important medicinal, cultural and ecological values.

Medicinal: It is believed that the bark from dried doum palm fruits, *biri*, helps to remove thorns from the body. After the *biri* has been eaten, the thorn is said to come out of the skin by itself.

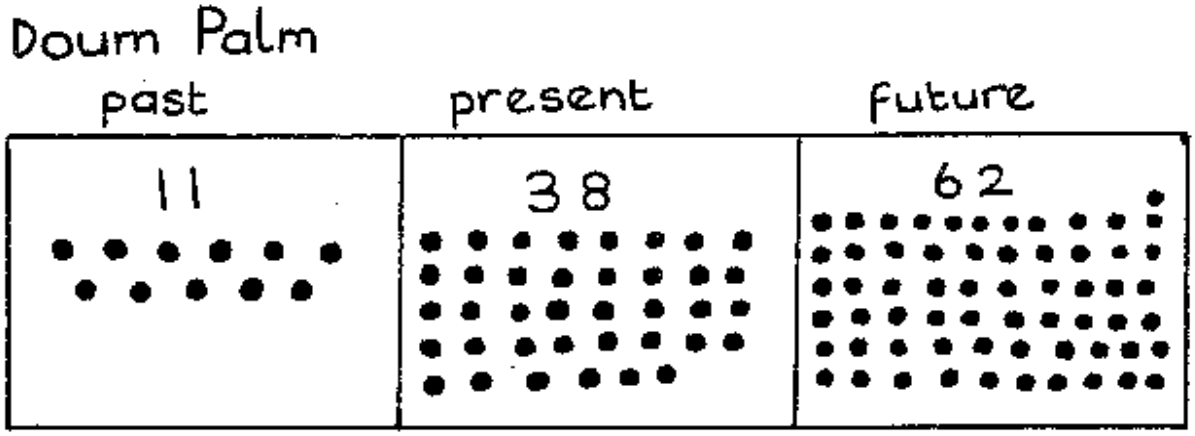
Cultural: *Wainan biri* is made from the bark of the doum palm fruit and is processed with millet. This food is served during naming ceremonies and is given as alms to the poor.

Ecological: Many farmers are beginning to plant doum palm stands at their farm boundaries as they provide both effective and productive barriers.

Changes in availability of doum palm

The change in the abundance of doum palm was discussed with an elderly forest guard and explored using a historical matrix (see Figure 2.11). The matrix shows that there used to be very few doum palm trees around the village. In the past, doum palm fruits were brought from other villages, especially Margadu to the north of Adiani. Presently, there are more doum palms around the village and the forest guard attributed this to the coming of the flood to the village, as it was from that time that the doum palms began to grow in the wild. In the future, the matrix shows that forest guard believed that there would be many more doum palm trees. He explained that in addition to the fact that farmers were planting doum palm as farm boundaries, he had noticed quite a bit of spontaneous growth around existing trees in the forest reserve and the other uncultivated areas around the village.

Figure 2.11 **Historical Matrix of Doum Palm Abundance, Adiani**
Drawn following discussions and analysis with a ward head and an elder, July 19th 1995



2.3.2 Potash

Potash was chosen as one of the wild resources for the focused appraisal because of the important role it plays in the northern parts of Yobe State. There are many people involved in potash trading, collecting it from more remote areas of Yobe State and trading it in the main market towns of Gashua, Nguru, Geidam and Jajimaji. Some is bought for local consumption, the greater part is sold on to the cities further south where it is used as an industrial raw material. Potash was identified as one of the wild resources utilised by the Adiani community during the transect walk to the west of

the village, where small potash patches are located (see Figure 2.2). The elders' resource map of Adiani also identified potash patches to the west of the village (see Figure 2.3).

Who depends on potash?
Detailed discussions were held with the elderly women who accounted for most of the potash collection in Adiani. These revealed that it is mainly the old women in the lowest group in each ward that depend on potash collection as a source of income. Separate interviews with the potash collectors revealed that there are often only themselves and one other collector in each ward. The histogram of wild resource dependence also indicated that potash collection provides a source of income for only a small number of people, 50 people or 1% of the village population (see Figure 2.6). This figure is roughly comparable with the 36 potash collectors estimated on the basis of two collectors in each of 18 wards within Adiani.

Access to potash
There are no rules or any authority governing the access to and collection of potash around Adiani. Everybody has the opportunity to collect potash around the village. Because potash brings such a low level of income, it was explained that only the old women want to collect and sell it. This is quite a different situation from that operating at certain other potash collection sites in northern parts of Yobe state, in particular at the oases of Yusufari Local Government Authority where potash collection is a very lucrative business and in the hands of the local elite who have established ownership of various patches.

Collecting potash
In contrast to more northern parts of Yobe State, in Adiani the women collect potash predominantly for sale within Adiani, where it is used for a variety of domestic purposes. These include using it as a soup ingredient; as a medicine for stomach upsets; as a detergent for washing clothes; as an animal food supplement to encourage them to eat more; and as an ingredient in a special porridge for mothers who have just given birth. The potash collectors explained that there were few steps in the process of collecting potash. They walk to the site, sweep up the potash with a broom, sieve it and bring it home in a calabash. Once it is at home, it is stored in a clay pot for domestic use and/or sale. The potash is either packaged into N2 plastic bags and hawked around the village or is sold by the saucer-full on demand to callers.

Seasonality of potash
Potash collection is highly seasonal. The potash sites are revealed as the flood recedes and exist for approximately two months during the dry season. The collection activities come to an end when the Fulani cattle arrive to graze on the flood plain. The action of the cattle feet churns up the potash and prevents any further collection until after the flood, the following year.

Economic importance of potash
The numbers and prices for the different aspects of collection and sale of potash were roughly comparable between each woman and are used here to estimate certain economic values, notably, the market value of the potash sold within the village and the returns to the time spent collecting potash.

From the discussions with the women, it was learned that about four big clay pots of potash are collected each year. It was estimated that each pot contained 30 standard *mudu* measures of potash. The women explained that they could sell a *mudu* of potash for N10 and that this price was constant all year even though it was collected for two months a year. This means that each woman earns

approximately 4 x 30 x 10 Naira from potash each year. This is a total of N1,200 per collector. The market value of the potash sold by all 50 collectors in Adiani in a year can be estimated at 1,200 x 50 Naira, giving a total market value in Adiani of N60,000 (US$750).

The tools involved in potash collection include a broom for sweeping it on the ground, a sieve for cleaning it and a calabash for bringing it home. The team used their knowledge of the prices of these items in local markets and cost them at N5 for the broom; N20 for the sieve; and N20 for the calabash. This totalled N45 in fixed costs per year. Subtracting these costs from the yearly sales of N1,200 leaves an annual profit of N1155.

The women rely only on their own effort to collect the potash. They explained that during the two months of potash collection, they collect potash for roughly eight hours a day, four days a week. In the two-month potash season, a collector will spend approximately 4 x 4 x 2 (=32) days collecting.

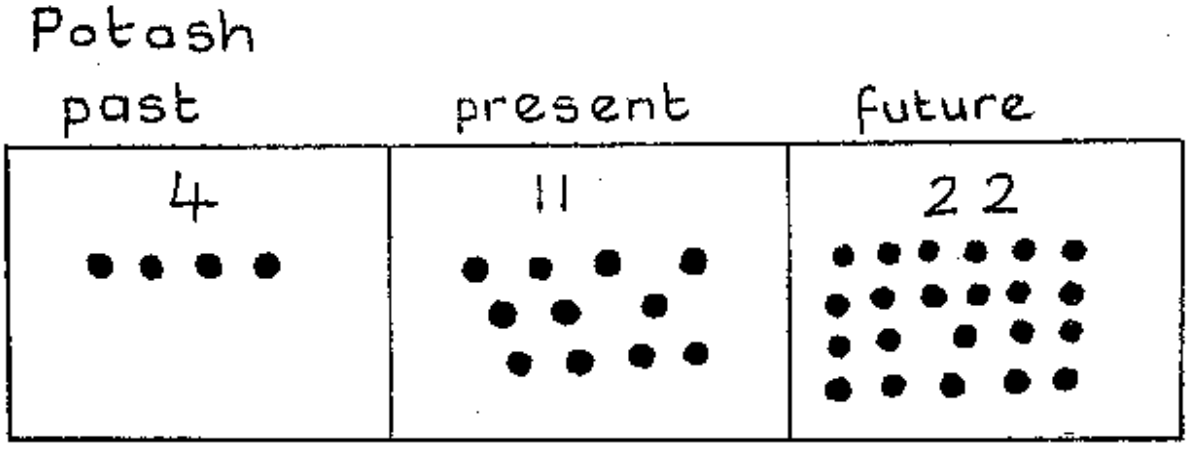
Dividing the yearly profit of N1155 by the 32 days spent collecting potash gives an estimate of returns to collecting potash. These are approximately N36 (US$0.45) per day, which is better than the N24 to be earned from eight hours of weaving mats estimated above and is just comparable to the N50-70 earned for a five hour day of hired labour.

Although the value of potash to Adiani as a whole may be low, the fact that it provides a source of income to some of the poorest people in the village is important. Furthermore, as potash can be stored without risk of spoilage, it can provide the collectors with a small but steady source of cash all year around, if enough potash is collected during the two months when it is available.

Other values of potash

Other values of potash were discussed with the women. One woman mentioned that it could be used as a spiritual medicine, however she did not elaborate. The ecological value of potash is uncertain. At the collection sites where the potash emerges from the soil, no vegetation grows. Whether this is exacerbated or ameliorated by frequent collection of the layer of potash covering the soil was not discovered.

Figure 2.12 **Historical Matrix of Potash Abundance, Adiani**
Drawn following discussions with a ward head and an elder, July 19th 1995



Change in availability of potash

The change in the abundance of potash was discussed with two elderly men, one of whom was a ward head. The historical matrix in Figure 2.12 shows how the availability of potash has increased and how the community believes that it will increase further in the future. This is attributed to the increasing areas of flooding around Adiani in recent years. This may lead to there being less area available for cultivation or for the spontaneous growth of other species.

2.3.3 Wild Foods

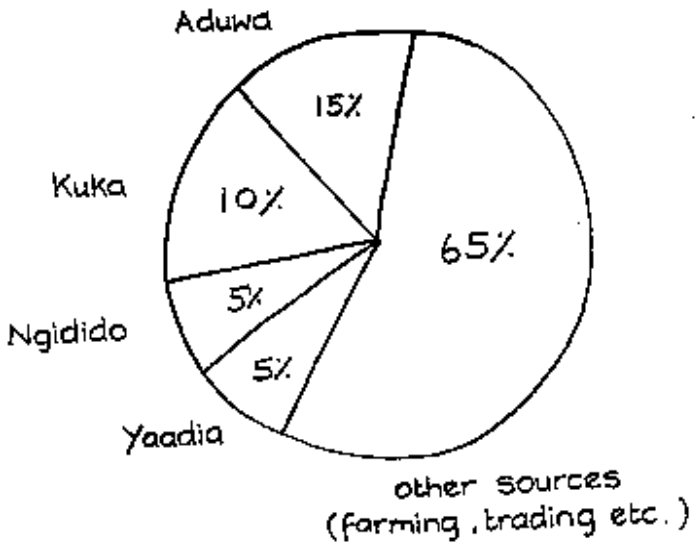
A variety of wild food resources were identified during the transect walks at the beginning of the initial field appraisal (see Figures 2.1 & 2.2). For the purpose of the focused appraisal, four major wild food resources were considered. These include *aduwa* (*Balanites aegyptiaca*), *kuka* (*adansonia digitata*), *ngidido* (*Crateva adansonii*) and *yadia* (*Leptadenia hastata*). *Aduwa* and *kuka* are well known sources of food and are widely traded throughout northern Nigeria, whereas *ngidido* and *yadia* are less well known and tend to be eaten in times of stress. *Aduwa*, *kuka* and *ngidido* are trees while *yadia* is a herb. Stands of each of these plants are found in and around Adiani as can be seen from both the transects and the resource maps that were conducted during the initial field appraisal (see Figures 2.1 to 2.4).

Who depends on wild foods?

The pie charts in Figure 2.5 provide much insight into how wild foods are useful to the different socio-economic groups within the community and show that wild resources are an important source of food in households from both the middle and lower-middle groups. Even the highest household head said that although he does not collect wild resources, he buys them from the market to eat. In addition to the discussions and analysis that initiated these diagrams, further semi-structured interviews were held with a group of young men from Kallari ward which focused on the four wild foods of the focused appraisal and examined the proportion of income earned from the different wild foods. Figure 2.13 shows the importance of the four wild foods as a source of over a third of the young men's income.

Figure 2.13 Income from Wild Food

Drawn following discussions and analysis with young men, Kallari ward, Adiani, July 18th 1995



Harvesting wild foods

Aduwa seeds are mainly collected and traded by women, the seeds are processed by chewing the fruits and cracking the nuts to get at the seeds. The seeds are then boiled, and in some cases, coloured to attract buyers. The seeds are used both for local consumption and for marketing outside of the village. The process chart in Figure 2.14 shows that the trading of *aduwa* seeds is just one of the products from the *aduwa* tree.

Ngidido leaves are removed from the tree using a machete, they are then carried home using calabashes and/or sacks. The leaves are either cooked for home consumption or taken to the market fresh for sale. The process chart in Figure 2.15 shows that occasionally cooked *ngidido* is sold in the market, however neither cooked or fresh *ngidido* leaves are sold very often because there is an abundance of *ngidido* trees in the village.

Both the leaves and the fruits of the *kuka* tree are processed and sold in the market. The process chart in Figure 2.16 shows that sticks and machetes are used to harvest the fruits. The leaves are picked by hand. Both the fruits and the leaves are carried home in sacks where they are processed, mainly by women. The fruits are used to make porridge and ice cream. The leaves are dried in the sun and ground into powder for sale. Some of the leaf powder is sold in the village and some is traded in outside markets.

Yadia fruits and leaves are harvested with an axe and are carried home in a sack (see Figure 2.17). The leaves will be cooked and added to soup. Some of this will be eaten by the household and some will be sold both within and outside the village. *Yadia* fruits are eaten raw by children.

Access to wild food

As with doum palm, there is no authority governing the collection of the fruits or leaves of any of the four wild food trees in any part of the village land, whether on farm land, uncultivated land or reserve land. The trees in the government-owned forest reserve are subject to certain controls: while anyone may harvest the leaves or fruit from the trees, felling of the stems is prohibited. As with doum palm, where a wild food tree is growing on a farmer's field, he has control over it. Generally anyone, both outsiders and villagers, is allowed to harvest the fruits or leaves, however the permission is required to fell the stem.

Seasonality of wild food

A discussion group of old women identified three seasons, the rainy season from approximately June to October, the cold season from November to February and the hot season from March to May. Their calendar shows that they rely entirely on wild foods during the hot season. This is the hardest time of year, as the community waits for the rains and the farming season to start (see Figure 2.18). The calendar shows that at this time of year the women eat *ngidido*, *yadia* and *tafasa* leaves and *aduwa* and *goruba* fruits.

A group of young men identified four seasons, the rainy season, *Damana*, the harvest season, *Kaka*, the dry season, *Rani* and the season of approaching rains, *Bazara*. The calendars discussed revealed that the majority of the wild leaves are harvested approaching and/or during the rainy season, and fruits tend to be harvested later in the year at the end of the rainy season (see Figure 2.19).

Figure 2.14 **Processing *Aduwa* Seeds**
Redrawn from a diagram by Mallam Kundu Zalari, Bosso ward, Adiani, July 17th 1995

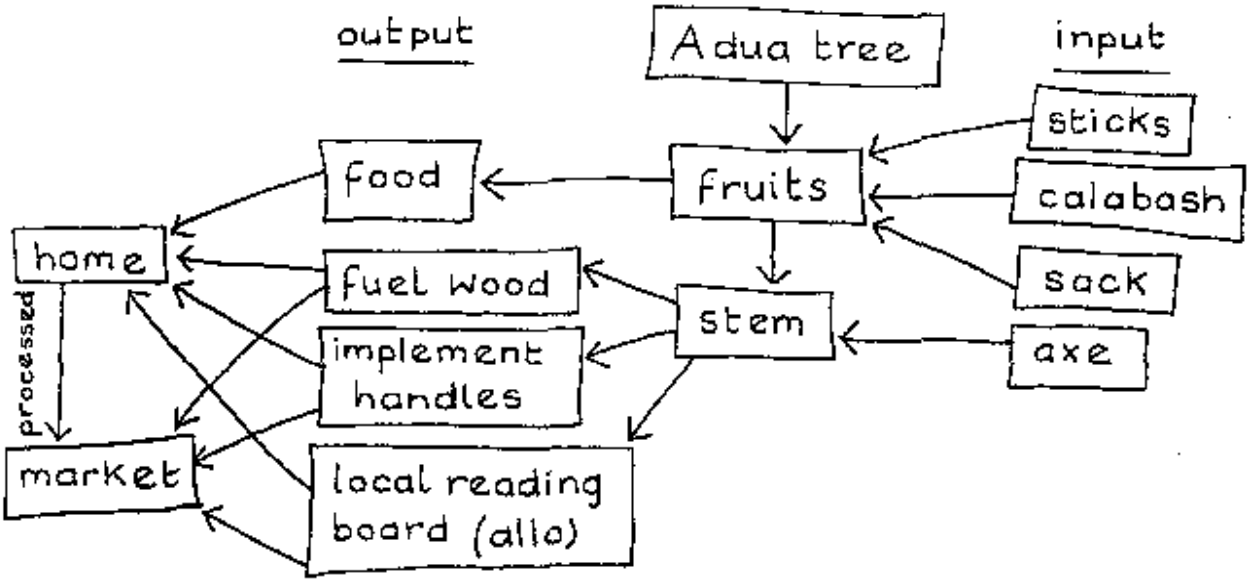


Figure 2.15 **Processing *Ngidido* Leaves**
Redrawn from a diagram by a key informant, Bosso ward, Adiani, July 17th 1995

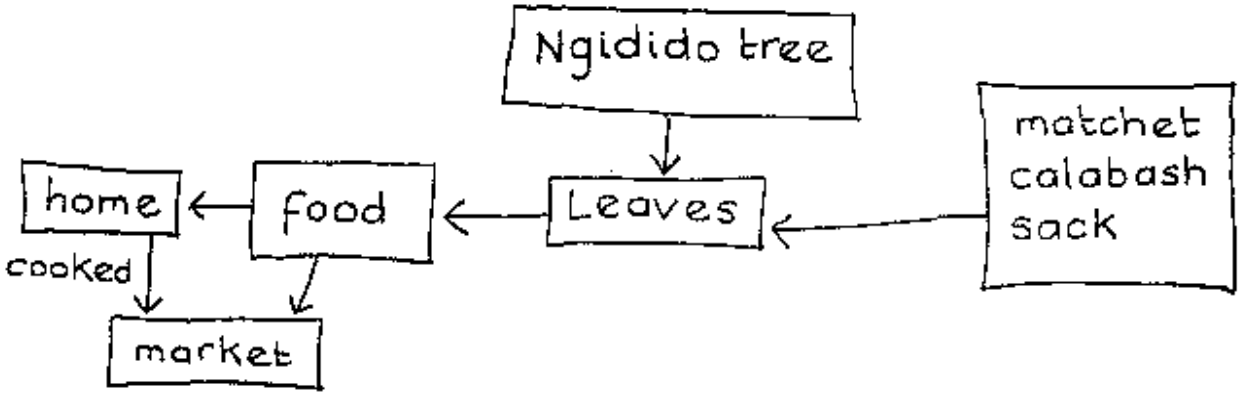


Figure 2.16 **Processing *Kuka* Fruits and Leaves**
Redrawn from a diagram by a key informant, Bosso ward, Adiani, July 17th 1995

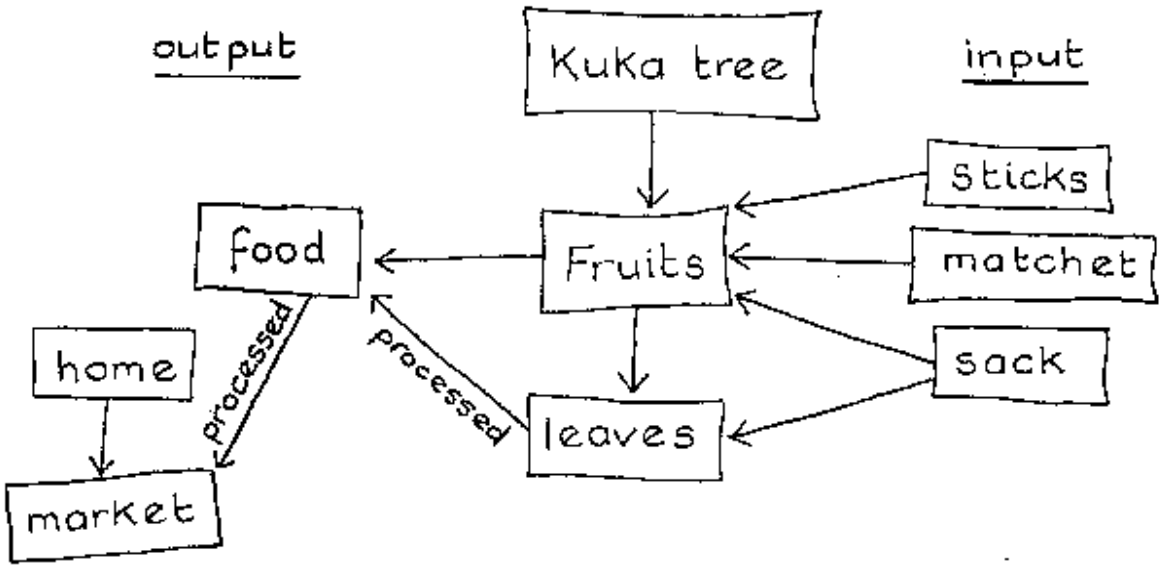


Figure 2.17 **Processing *Yadia* Leaves**
Redrawn from a diagram by a key informant, Bosso ward, Adiani, July 17th 1995

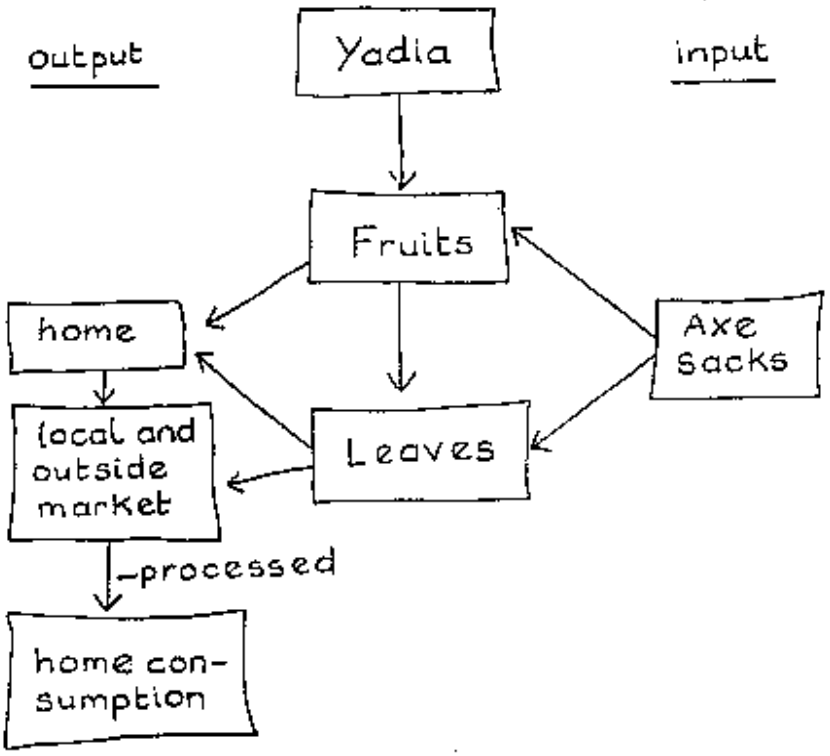


Figure 2.18 **Seasonal Sources of Food**
Drawn following discussions and analysis with elderly women, Nasardi ward, Adiani, July 10th 1995

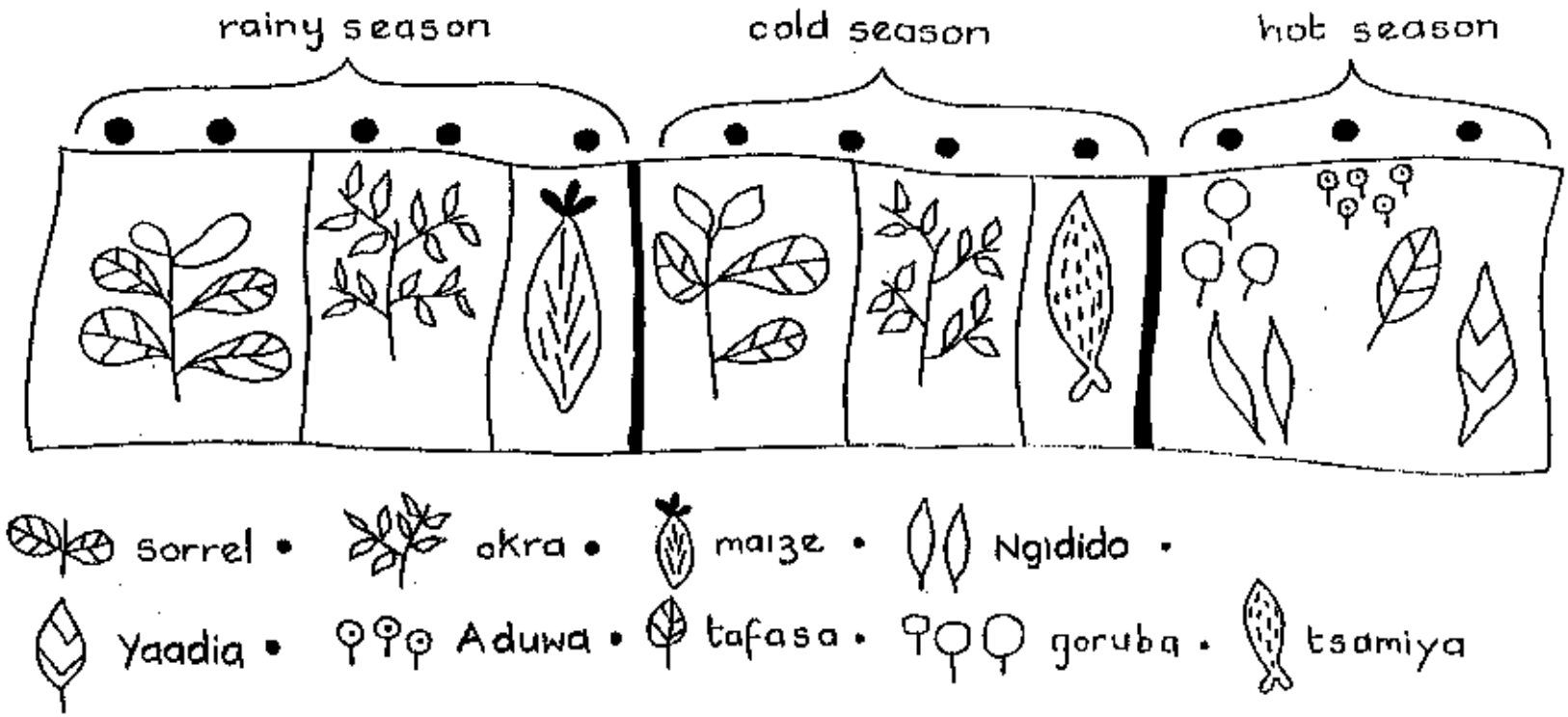
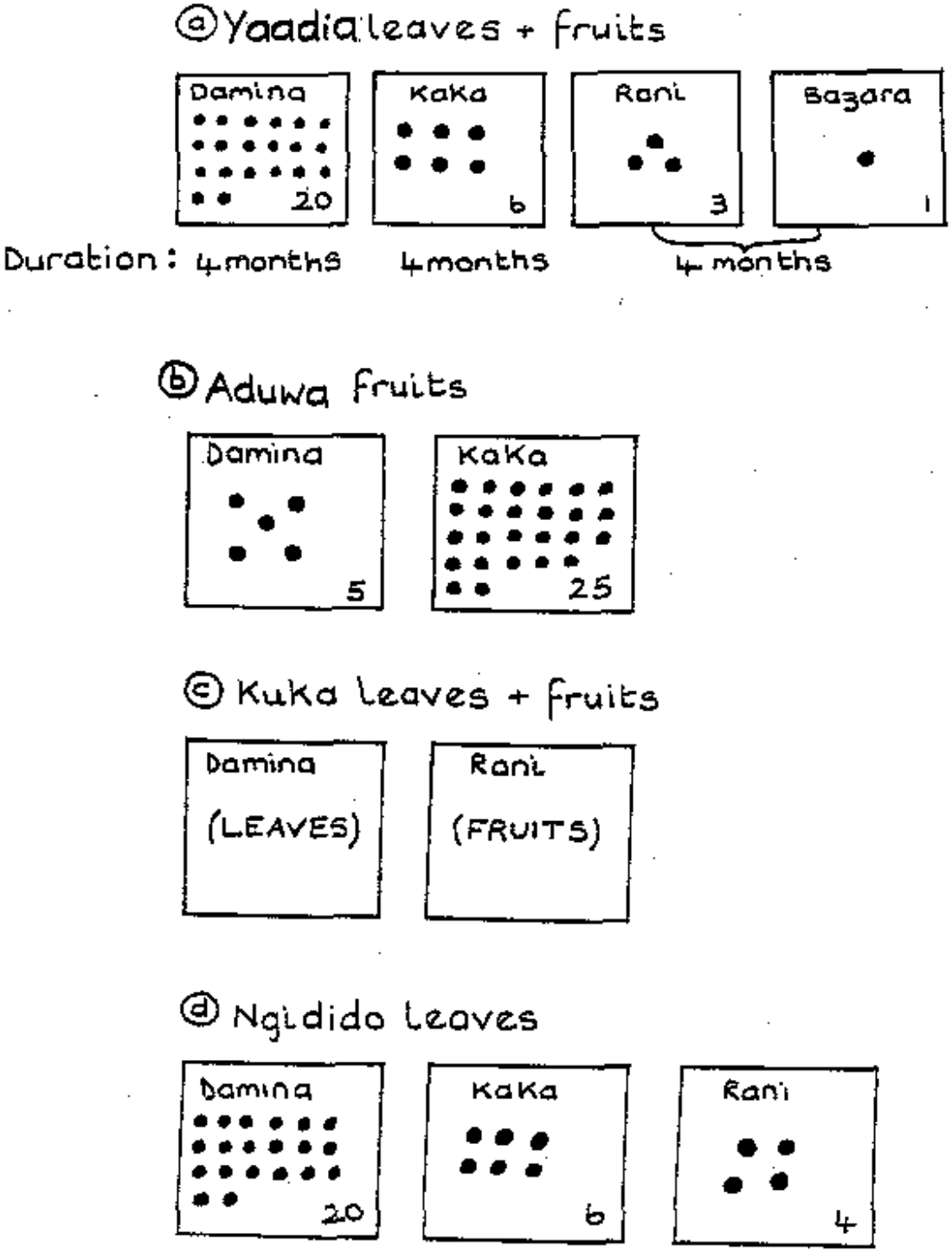


Figure 2.19 **Seasonality of Wild Food**
Drawn following discussions and analysis with two men, Kallari ward, Adiani, July 18th 1995



Economic importance of wild foods

The seasonal calendars of wild food use and availability illustrate the crucially important role of wild foods just before and during the rainy season (see Figures 2.18 and 2.19). Approaching the rains and the rainy season itself are the hardest times of year for both men and women; food stocks are low and there is lots of farming work to be done. The calendars show how wild leaves play a crucial role in the community's diet at this time of year and how the seasonality of wild food sources complements that of cultivated food sources which are harvested and most abundant in the seasons when wild foods are not available. The seasonal calendar of the price of doum palm fruit shows how this peaks during the rainy season, *Damuna*, and although this information was not collected for the four wild foods that are focused on here, it is very likely that their value also peaks during this time of year (see Figure 2.9).

As discussed above, not only do wild foods constitute part of the diet of almost the entire community, their collection and sale also provides a source of income for an important minority within the village. The pie charts in Figure 2.5, [c] & [d] show that for some households the sales of wild foods provide an important source of income. Income from the sale of wild foods was examined in detail by the young men in Kallari ward. The pie chart which they constructed shows that sales of the four wild foods account for an important portion of their annual income, around two-fifths (see Figure 2.13). The remainder of their income is earned from farming and trading. Each of the four wild foods provides a roughly equal proportion of the annual income, although income from sales of *aduwa* is slightly higher.

Aduwa, yadia, kuka and *ngidido* are among the most important sources of wild foods and are eaten by nearly everyone the team spoke to. Both the leaves and the fruit from *aduwa* and *kuka* are traded on a large scale and approximately 1,000 people in Adiani depend on *aduwa* and *kuka* sales as a source of cash income. *Yadia* and *ngidido* are not traded as frequently, but are still sold, particularly by women, with approximately 200 people depending on this as a source of cash.

Other values of wild foods

Other values of the four wild foods were sought during a semi-structured interview with a young man. He explained that *ngidido* leaves are used as a medicine for colds and for yellow fever. *Ngidido, kuka* and *aduwa* are all eaten for their spiritual as well as food values. *Yadia* is used to cure *chiwon rana*, sunstroke. Being trees, *ngidido, kuka* and *aduwa* also have important ecological values in the environment. For example, they can provide wind breaks, their shade is pleasant to sit under, and they can conserve soil moisture.

Changes in availability of wild foods

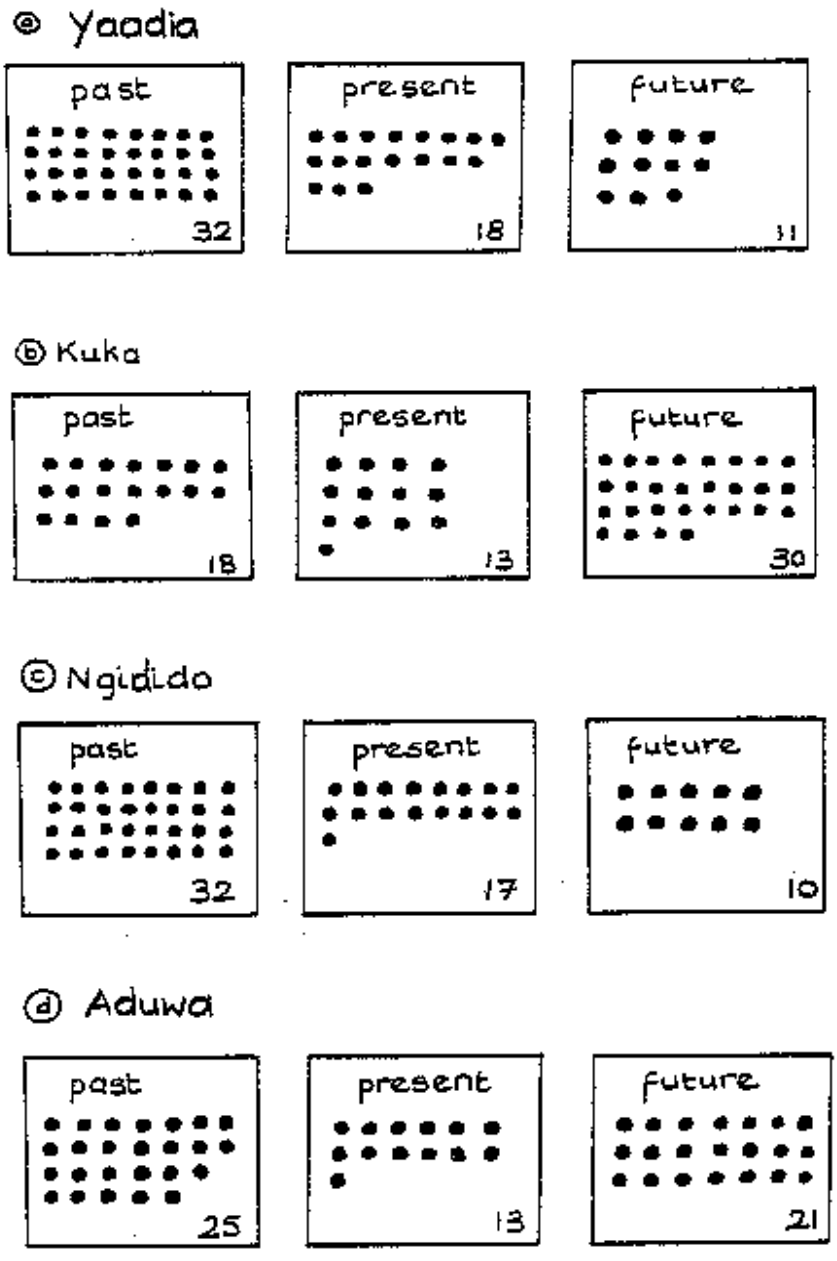
The historical matrix for *yadia* shows that the density of *yadia* stands around the village has decreased in recent years (see Figure 2.20). The young male informants were optimistic that it would decrease further as the village expanded and houses were built over the land where the *yadia* was growing. As *yadia* was seen as an inferior food, the men saw no need to conserve it.

The historical matrices for *kuka* and *aduwa* trees shows that they used to be more abundant in the past and that the men were optimistic that they would be more abundant in the future (see Figure 2.20). They said that as the village had expanded in size, these trees had been cleared. However, the men believed that as their economic value had increased and as the community became more aware of their ecological values, the trees would increase in number around the village. A re-planting effort is already underway in the forest reserve.

Like that for *yadia*, the historical matrix for *ngidido* shows that the men believed that the numbers of this tree would decrease as the village expanded over the coming years (see Figure 2.20). They did not attach any economic value to *ngidido* and did not see a need to conserve it.

Overall, the historical matrices demonstrate the changing nature of the various wild resources in Adiani. All four wild food trees have decreased in abundance over the past thirty years; however, the young men were keen on planting more *kuka* and *aduwa* because of their perceived economic importance. Although these young men did not attach any economic importance to *ngidido* and *yadia*, it is important to note that the appraisal revealed that it was mainly the women and children who collected and processed these foods. It would have been interesting to compare the young men's opinions with those of women.

Figure 2.20 **Historical Matrix of Wild Foods, Adiani**
Drawn following discussions and analysis with a group of young men, July 19th 1995



2.4 Summary

2.4.1 Research Findings

Initial Appraisal
The initial appraisal identified a wide range of wild resources of economic value to the Adiani community. A total of 76 different wild resources are listed in Appendix D. These resources are categorised into three groups, vegetative resources, water resources and soil resources. Many of these wild resources provide an important source of food and/or income for the community and often have other, multi-purpose uses.

Doum Palm
Doum palm provides a source of food and income to many different groups within the community including children, housewives, the elderly, the handicapped and full-time doum palm traders. Almost every part of the doum palm tree, from the roots to the shells of the fruit, is utilised in some way.

The appraisal of doum palm focused on income generation from the sales and processing of the doum palm fronds. The returns to collecting fronds and selling them in their raw state are relatively high; the study estimated them to be approximately N200 (US$2.50) per day, which is comparable with similar estimates from a neighbouring village in 1994. These returns are much higher than the waged agricultural labour rate of between N50 and N70 (US$0.63-0.88) per day and than the returns from weaving mats from doum palm fronds which are only N3 (US$0.04) per hour. However, mat weaving requires little strength or mobility and can be done from home and often while doing other tasks such as child-minding or cooking. It is estimated that the market value of the doum palm fronds sold in their raw state and the processed mats sold within and outside the village totals approximately N10 million (US$125,000) in a year.

Access to doum palm fronds is open to everyone in the community and to outsiders. The availability of doum palm has increased over the past 30 years. The community associates this with increased flooding and their planting of doum palm seedlings, indicating that doum palm is not exclusively a 'wild' species.

Potash
The appraisal of potash collection focused on income generation from the sales of potash within the village. Potash is not found in commercial quantities in Adiani. A small number, 50, of very poor, elderly women collect and sell potash for a source of income. Potash is used as a cooking ingredient or medicine by most households in the community.

The old women collect potash for two months a year and store it over the year. It is estimated that the market value of the potash collected and sold within the village totals N60,000 (US$750) annually. Returns to potash collection were estimated at N36 (US$0.45) per day during the two month collection season. These returns compare very favourably with the returns to mat weaving, another occupation open to women and the elderly, although unlike mat weaving, potash collection requires mobility.

Access to the village potash collection sites is open to everyone able to travel to the sites, although the villagers explained that it is only the old women who are interested in the low returns it offers. The availability of potash has increased over the past 30 years. The potash collection season occurs

directly after the flood waters recede and is highly flood dependent. The community associate the increase in potash with the increased flooding.

Wild Sources of Food

The appraisal of wild sources of food focused on the food from three trees, *aduwa*, *kuka* and *ngidido*, and one herb, *yadia*. Access to the wild foods around the village is open to everyone and they are used in the diet of nearly everybody in the community. Richer households and men will buy wild foods from the market while poorer households and women collect wild foods themselves. The peak harvest for the four wild foods, in particular their leaves, is during the rainy season. The wild foods provide an important complement to cultivated foods which are least available during this time.

The collection and sale of wild foods provides a source of income for more than a quarter of the village population. There are significant gender divisions in the collection of wild foods. Men tend to collect to sell outside the village and women tend to collect to eat and sell within the village. For example, *aduwa* fruits and *kuka* leaves and fruits are traded in significant quantities outside of the village, mainly by men. *Ngidido* and *yadia* are rarely sold outside of the village and their collection, processing and sale is the preserve of women and children.

The availability of wild food trees and plants around the village has decreased in the past 30 years. The two young men interviewed believed the numbers of *kuka* and *aduwa* would increase through the planting efforts of the community, whereas the abundance of *Ngidido* and *yadia* would decrease as these were not highly valued and only important during droughts and famine. Women's attitudes towards these foods were unfortunately not revealed.

3. GWAIYO

3.1 Introduction

Gwaiyo is a medium-sized village located south of Gorgoram and west of Girgir (a town on the Gashua-Potiskum road) towards the eastern side of Hadejia-Nguru Wetlands.[9] The route to Gwaiyo comprises between 20 and 30 km of dirt tracks from the main metalled road depending on the extent and timing of the rains. Gwaiyo's main nearby markets are at Jakusko, to the southeast along the Gashua-Potiskum road, and at Gashua. A forest reserve is located about 5 km north of the village providing an important source of various tree products.

Fishing and related industries comprise the main economic activities in Gwaiyo but most people also undertake some farming activities. People in the community regularly mention the decline in income from fisheries due to the decrease in the annual flood over the last 20-30 years. Many water bodies, including the *Makintala* water channel, a tributary of the Jama'are (also known as Katagum) River and the main source of sustenance of the village, have dried up resulting in very low fish catches. An attempt to widen the water channel between Jabaru and Majadi was made about 25 years ago in order to increase the flow of water into Gwaiyo, but this did not improve the situation.

Gwaiyo is headed by a *Bulama* and is divided into five wards. The population, which is probably about 1,200, is primarily from the Bede ethnic group who constitute the original settlers in the Wetlands. There are also some Hausa immigrants integrated into the community. The village, which has a primary school and small dispensary, has been the target for a number of development initiatives through the NEAZDP programme, including construction of a borehole and water delivery system.

This chapter assesses the economic importance of selected wild resources in Gwaiyo. Section 3.1 covers the initial appraisal in which the team identified the important wild resources used by the village, together with some general socio-economic characteristics. This was then followed by a more focused appraisal, as described in section 3.2, on three wild resources, doum palm (*hyphaene thebaica*), firewood and fruits and leaves from wild trees. Doum palm and firewood were selected because of their importance in generating income and so their household uses were not studied in much more detail. Lastly, section 3.3 summarises the findings.

3.2 Initial Appraisal

The initial appraisal addressed the following questions, which are addressed respectively in sections 3.1.1 and 3.1.2:

- What are the wild resources and where are they found?
- Who uses wild resources and how?

[9] Gwaiyo is often also spelt 'Gwayo'.

5.2.1 What are the Wild Resources?

This question was investigated by drawing maps and walking transects with two groups of informants from the village, one with young men and the other with older men (the older men's transect appears in Figure 3.3). Resource maps were drawn separately by a group of male elders and a group of women from the Bulama's household (Figures 3.1 and 3.2).

The maps and transects produced a long list of wild resources, some of which are available on farmlands and others in the surrounding mixed woodlands. The village derives its name from the previously abundant stands of the *gawo* tree (*Acacia albida*). Some of these trees are still found on the farmlands and closer to the village. In addition, the transect illustrates the spatial distribution of the resources in relation to land use and tenure. A mosaic of *tapkis* (seasonally inundated depression) as well as *fadamas* (seasonal water body), *tudu* (upland used for rainfed farming) and *fako* (hard pan or barren patch of soil) lands in and out of cultivation, with or without isolated trees and mixed woodlands was identified.

As Gwaiyo is a fishing community, it was not surprising that all informants, including women, identified water or fish as the most important resource. Women not in purdah actively engage in fishing while those in purdah fry or smoke fish caught by their husbands which is then sold in the market or to traders.

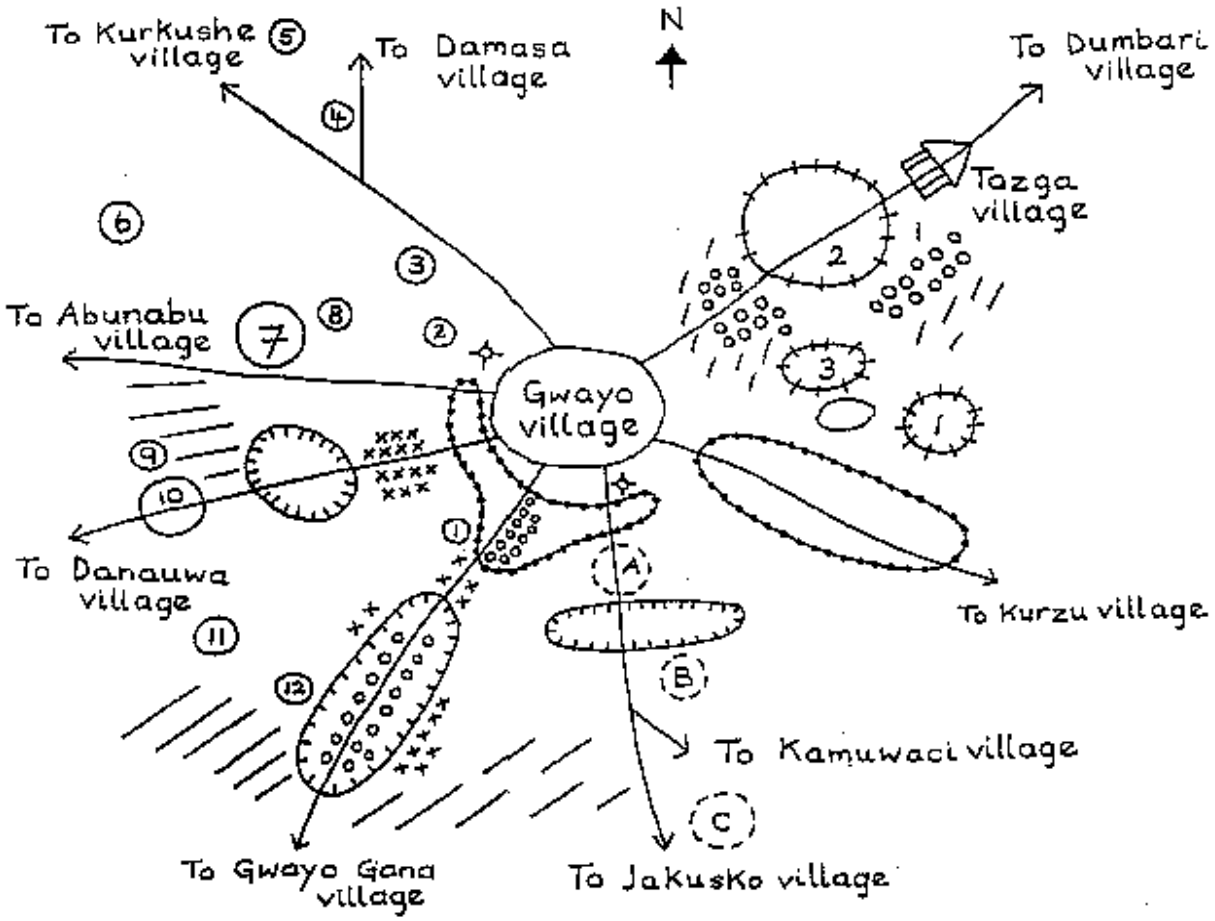
5.2.2 Who Uses Wild Resources and How?

Discussions with three groups of informants, comprised of elderly men, women and young men respectively, led to the listing of the resources they considered most important. The information from the discussions and diagrams was collated into one table showing the uses of resources identified by each of the groups (Table 3.1). The uses are grouped under four broad headings: food, income generation, construction and other uses. Two groups also scored the relative importance of the main wild resources according to various criteria (Figures 3.4 and 3.5).

Not surprisingly, many trees and shrubs are used for multiple purposes. Leaves of most herbaceous species like *yaadia* (*Leptadenia hastata*), *yaakawa* (*Hibiscus sabdariffa*), *tabila* (*Boscia senegalensis*) and *gaasia* are used for food. Leaves and fruits are also sold in small quantities for income generation by the elderly women in the village market. However, when these are out of season, they are brought in for sale by traders from Kano, Jos and Jakusko.

A principal concern identified by all groups is the return of flooded water channels to get the previously lucrative economy from fishing back. All groups of informants also expressed a desire for the government to do something about the Fulani and commercial fuelwood gatherers who they alleged to be damaging Gwaiyo's woodlands, forests and farms. The elders and youth said that they have stopped paddy rice farming, due not only to insufficient flood waters, but also to the Fulani who drive their animals into their fields to graze. The youth and the women blame the Fulani for collecting gum and allowing their animals to graze on wild okra in the bush and forests. In addition, the Fulani are alleged to have deprived the communities of a once lucrative honey business by cutting down tree branches.

Figure 3.1 **Resource Map of Gwaiyo Village**
Redrawn from a map by a group of male elders, 8 July 1995



- Pool (1) names
  1. Amda
  2. Dakunanu
  3. Taligagwayo
  4. Tanama
  5. Dakrin
  6. Tagarda
  7. Tudum
  8. Miyanako
  9. Ngatiga
  10. Mantara
  11. Tambagare
  12. Durudi

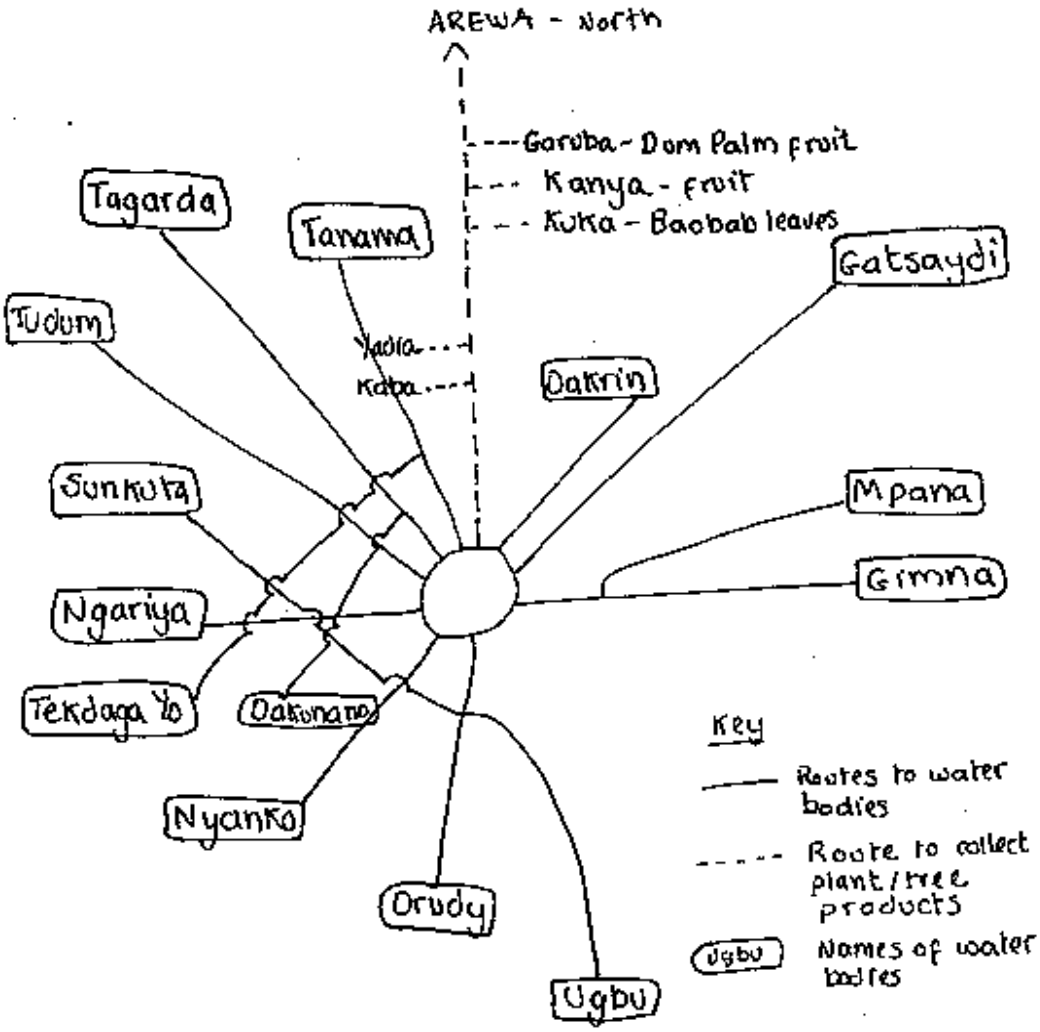
- Tapkis (lowland depressions)
  (A) names
  A • Takajadi
  B • Madabuk
  C • Buu

Cemetery
Grazing land
Croplands, (cowpea, millet, sorghum, okra)

Gum arabic trees
Acacia seyal
Piliostigma reticulatum
Kaba

Fadama (seasonal water holes
(1) names
1. Fadamanfara (fishing)
2. Not named (fishing, rice farming, cassava farming)
3. Cassava farm.

Figure 3.2 **Women's Route Map**
Redrawn from a map by a group of women in Bulama's household, Gwaiyo, 8 July 1995



Women's route map: the directions travelled to collect wild resources around Gwaiyo village, Jakusko LGA, Yobe State, July 1995 (women in Gwaiyo's Bulama's House)

Figure 3.3 **Transect Walk along Gwaiyo-Jakusko Road**
Drawn from a walk and discussion with two male elders, Gwaiyo, 7 July 1995

Land Type	*Tudu*	*Tapki* Depression	*Tudu*	*Fako*	*Marsh*	*Fako*	*Tudu*	*Tudu*	Depression	*Tudu*
Land Use	Cropland (staples)	-	Cropland (vegetables)	-	Grazing	-	Grazing	Cropland	Watering point	Cemetery
Soil Type	Sandy Loam	Alluvium	Sandy Loam	Hardpan	Alluvium	Hardpan	Loam	Sandy Loam	Clay	Sandy Loam
Vegetation	Farmland	Mixed woodland	Farmland	-	Grass	-	Grass	Farmland	-	Woodland
Land Tenure	Individual	Community	Individual	Community	Community	Commu-nity	Communa-ily	Individual	Community	Community
Resources	Sorghum Millet Cowpea	Fuelwood Grass Browse Fruits Bushmeat	Okra	Grass	Grass	-	Grass	Sorghum Millet *Gawo Kuka*	Water Clay	*Gawo* Cultural/ spiritual place

Table 3.1 **Uses of Wild Resources in Gwaiyo**
Collated from discussions and other matrix diagrams
(see Appendix C for scientific names of species)

Wild Resources	Uses				Age Group Elders (E) Youth (Y)	Gender (M/F)
	Food[1]	Income Generation	Construction	Other Uses[2]		
Kuka	+	+			E	F
Bagaruwa			+	+	E, Y	M
Aduwa	+	+	+	+	E, Y	M, F
Magariya	+	+	+	+	E, Y	M, F
Yaadia	+	+		+	E	F
Tabila	+	+			E	F
Sabara				+	E	M
Goruba	+	+	+	+	E, Y	M, F
Tsamiya	+	+		+	E	M, F
Dakwara	+	+	+	+	E, Y	M
Dinya	+	+			E	F
Dandun	+				E	F
Kanya	+	+			E	F
Yaakuwa	+	+		+	E, Y	M, F
Gamba grass			+		E, Y	M
Aleeho	+			+	E	F
Gawo		+			E	F
Ngididó	+				E	F
Kubewa	+	+			E	F
Zogalla	+				E	F
Gaasia	+				E	F
Anjiri	+	+			E	F

Notes
1. Fruits and leaves
2. Browse, fodder, medicines, etc.

Figure 3.4 **Matrix Scoring of Trees and their Uses**
Redrawn from a diagram by a group of male elders, Gwaiyo, 8 July 1995

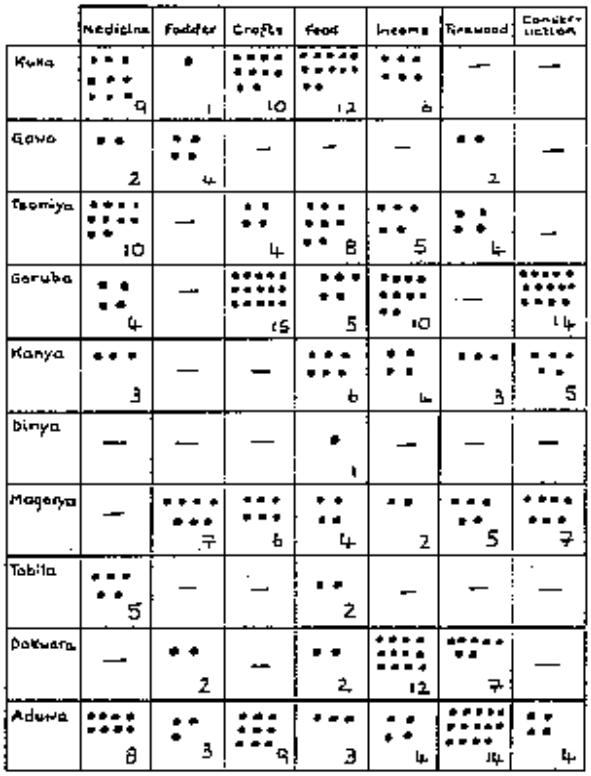
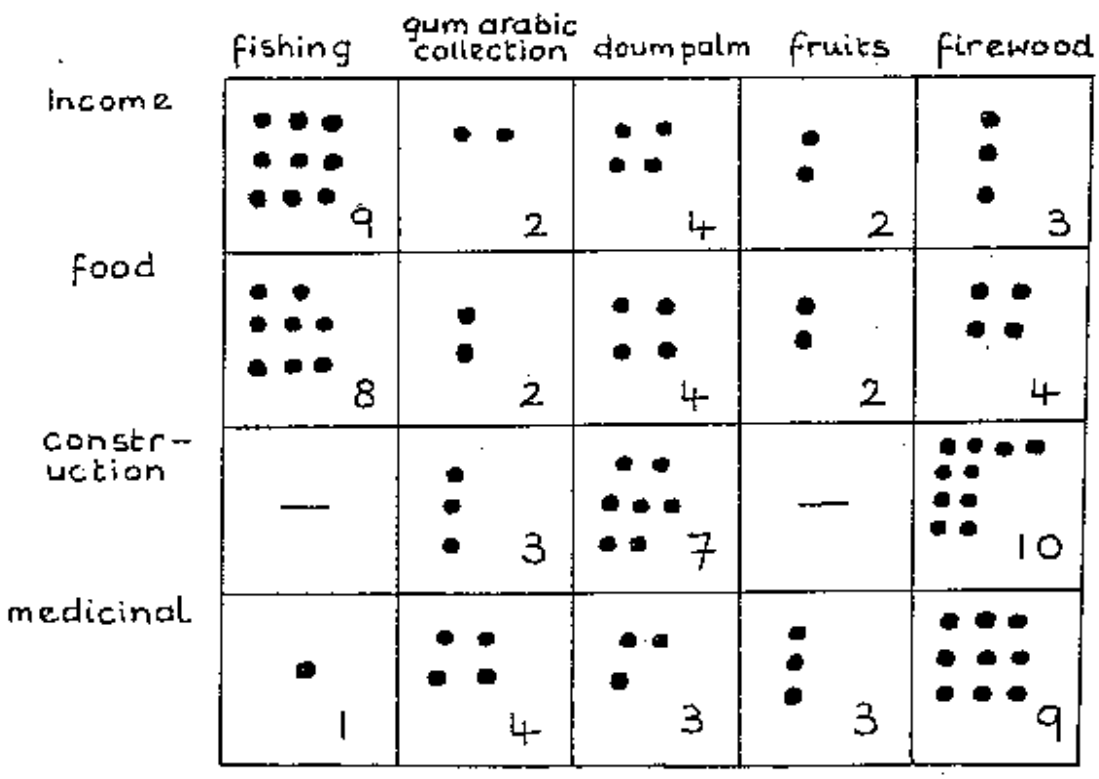


Figure 3.5 **Matrix Scoring of Wild Resources and their Uses**
Redrawn from a diagram by group of male youths, Gwaiyo, 10 July 1995



The collection of leaves and fruits for food and for small-scale income generation is done by the elderly women in the village. Collection and sale of wild resources for medicines is done exclusively by elderly women and men. For income generation, the youth engage in the collection and sale of firewood and *kaba* (fronds of doum palm; *Hyphaene thebaica*), and fishing.

3.3 Focused Appraisal

The initial appraisal identified an extensive list of wild resources used by the people of Gwaiyo, of which fish is the most important. But many other wild resources, especially various trees, shrubs and herbs, were also identified as playing an important role in people's livelihoods.

For the second stage of the fieldwork, the Gwaiyo team decided to focus on wild food resources, primarily fruits and leaves from wild trees and plants, and two wild resources which are important for generating monetary income, doum palm and firewood. For each resource, the team sought to answer all of the specific research questions set out in Table 1.1. Information relevant to some of the questions had been discovered during the initial appraisal. Most of the remaining gaps were addressed using PRA techniques, although a market survey was also undertaken to collect some additional quantitative information on prices and quantities. The following three sections deal with each of the three resources with the discussion in each case organised according to the issues contained in the list of research questions. In some cases, the issues from two questions are combined, usually because the information for both was revealed by means of one technique.

3.3.1 Doum Palm

Location of doum palm trees
The village mapping and transect undertaken with the village youth during the initial appraisal indicated that doum palm trees were scattered around the village with higher concentration on the north and western part of the village. The informants characterised doum palm as a relatively abundant resource in the area.

Who depends on doum palm?
Through discussions and matrix scoring exercises conducted during the initial appraisal, elderly men and women identified doum palm as an important resource. These groups use doum palm both for household purposes and for generating income, by selling either the fronds or processed products such as mats. The elders use doum palm to make mats, ropes, hats, donkey baskets, calabash carriers and the most widely used fishing gear, *sankiya*. The fronds are collected and sold at Gwaiyo market to people from other villages in the area which do not have as abundant a supply. Fishing gear made from doum palm roots and fronds is used primarily by the maker and then sold one or two years later to people from other villages. During their matrix scoring activity, the youth also identified doum palm as an important resource (see Figure 3.5). For example, doum palm is scored second to fishing on income generation, second in terms of construction and second again in food supply.

Harvesting and Processing

A process chain diagram drawn by an informant was used for exploring the stages involved in harvesting and selling doum palm fronds (see Figure 3.6). Fronds are harvested using a sharp knife. An individual collects about 5-7 bundles per week which can be sold for between N30-N50 per bundle depending on their size and their quality. As indicated in the process chart, cut fronds are dried before bundling, sometimes according to size or quality. Some of the fronds are sold within the village for making products, such as mats. Bundles of fronds sold in the market are destined primarily for neighbouring villages where the supply of doum palm is not as great. Interestingly, some finished doum palm products are brought to Gwaiyo from other villages, confirming the observation that few processed frond products are made and sold within the village.

Access to doum palm

Semi-structured interviews held separately with elderly men and women revealed that frond collection for household use is not restricted among members of the community. However, if outsiders come to collect fronds, they are required to pay a levy of N20 per week when they take the fronds to market. This levy is collected by officials of the Jakusko Local Government, and was confirmed during an interview with the forest guards stationed in Gwaiyo. It is not clear to what extent this levy is enforced or avoided.

Seasonality of doum palm

A group of male youths discussed the seasonality of their main income earning activities by drawing a calendar (Figure 3.7). Collection of doum palm fronds, for use both within the village as well as for sale, is related to the rains, the need to devote labour to other activities, and the need for doum palm products as inputs to other important economic activities, especially fishing. Collection of doum palm is undertaken towards the end of the dry season (April to June), the end of the rainy season (September-October) and the (crop) harvesting season (October through December). Doum palm harvesting is particularly important towards the end of the dry season when there are few other demands on people's time. Little is then collected during the peak of the rains (July and August) due to the amount of work on farm as well as the inaccessibility of many areas as a result of the rains. Collection increases again towards the end of the rains as there is a demand for rope made from doum palm during the peak of the fishing season. The rope, which is used to tie boxes and cartons of fish, is made by older people who do not participate as much in harvesting of crops. The opportunity cost of their time during the harvest season is therefore not as high as it is for younger people.

Economic importance of doum palm

A market survey of vendors of doum palm products was undertaken in Gwaiyo on the village market day. The survey concentrated on all doum palm products in order to investigate the extent to which other doum palm products are actually traded in Gwaiyo and whether they are produced in the village or are imported as some earlier discussions seemed to indicate.

The survey confirmed that almost all of these products were brought to the Gwaiyo market from other villages (Table 3.2). Few fronds were being sold in the market, as it was not the season for collecting and selling fronds. Discussions with one trader revealed, though, that fronds were being purchased at a price of N50 per bundle and that the quantity brought to the market varied a lot from week to week. However, according to the trader, the price exhibited little seasonal variation in Gwaiyo.

Figure 3.6 **Process Chain for Doum Palm Fronds**
Redrawn from a diagram by an older man from the higher socio-economic group, Gwaiyo, 17 July 1995

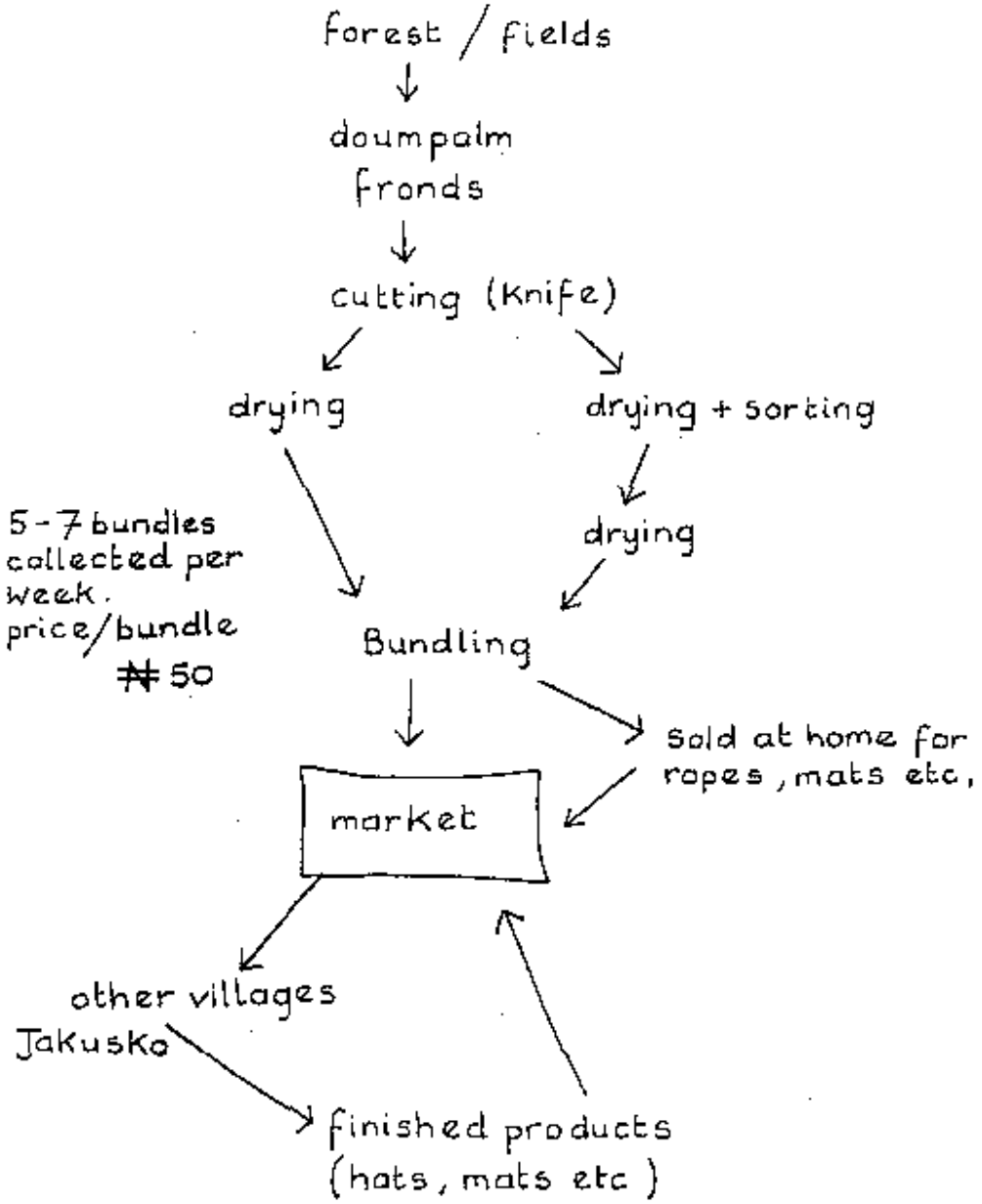


Figure 3.7 **Seasonal Calendar of Income Generating Activities for Youth**
Redrawn from a diagram by a group of male youths, Gwaiyo, 17 July 1995

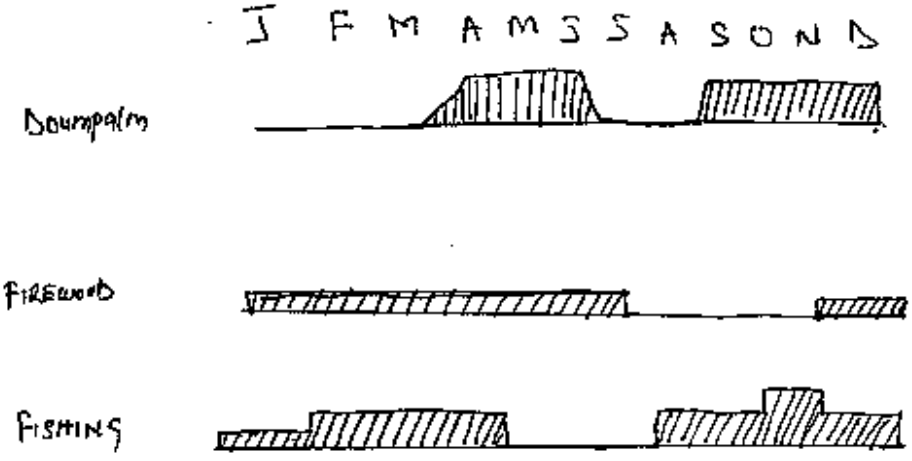


Table 3.2 **Results of the Doum Palm Market Survey**
Gwaiyo Market, 14 July 1995

Product	Price	Quantity sold per market day	Origin (nearby village)
Mat - plain Mat - coloured	N60 - N70 N70 - N80	10-20	Katagum
Faifai - plain *Faifai* - coloured (calabash cover)	N30 - N50	4 - 6	Gamawa
Gammo (calabash carrier)	N15 - N20	5 - 6	Gamawa
Sponge	N1 - N2	30 - 60	Gamawa
Bundle of *kaba* (leaves)	N50 (varies in size)	varies a lot	Gwaiyo
Hat	N60 - N100	5 - 8	Shuwariu
Mangala (Donkey basket)	N80 - N100	4 - 6	Shuwariu
Rope	N5 (length unknown)	many	Shuwariu
Broom	N2 - N3	few	Shuwariu

Returns to Labour and Market Value

Based on the information collected so far it is possible to make some preliminary estimates of the financial returns to labour from doum palm collection and of the market value of doum palm fronds sold in Gwaiyo (Table 3.3). Returns to labour from doum palm collection are estimated at about N30 per hour (about N200 per day) which is very high when one considers that hiring labour to weed a farm costs about N50-N70 for a five to seven hour workday (about N10-N14 per hour depending on the nature of the work and the capability of the worker). These figures are essentially identical to the results from Adiani.

Table 3.3 Returns to Labour from Doum Palm Collection
(based on interviews with several informants)

Price per bundle	N50
Quantity collected	2 bundles
Time required	3 hours
Total revenue	N100
Equipment costs (knife)	negligible
Returns to labour	N30 per hour or N200 per day

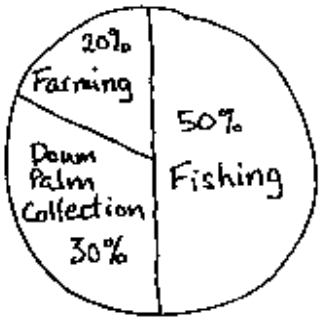
Assuming that one collector may sell about 5-7 bundles per week, the market value of the income to each collector is N250-N350 per week. If a collector sold this amount each week for seven months of the year, or 28 weeks (using information from the seasonal calendar), then the annual revenue per collector would be N7,000-N9,800. Reliable estimates of the number of people involved in doum palm collection and trade in Gwaiyo were not obtained. One of the traders in the market said that he purchases between 20 and 45 bundles each week in the village which amounts to between N1,000 and N2,250 in total market value for that trader. Assuming that quantity was brought throughout the 28 weeks of the year that doum palm is in season, this would result in about N28,000-N63,000 worth of bundles per year for that trader. But the average number of traders serving Gwaiyo village is not known at all so it is difficult to estimate the value in the whole village.

Contribution to Income

Discussions were held separately with a number of informants on their sources of income. The resulting pile-of-stones diagrams are represented in the pie charts in Figure 3.8. The results reveal some similarities as well as some differences, highlighting the varying importance of doum palm collection as a source of income for members of the community. Doum palm provides an important source of income for only one of the informants, a member of the higher socio-economic group (about 30 per cent of his income, second only to fishing which accounts for about 50 per cent). This individual emphasised that the income earned from doum palm harvesting and sale is essential at the end of the dry season for those whose food stocks have

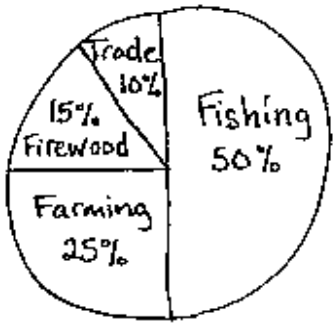
Figure 3.8 **Pie Charts Representing Sources of Income and Expenditure**
Drawn from discussions and piles-of-stones illustrations by various informants, Gwaiyo

[a] Elderly man - 'rich' group



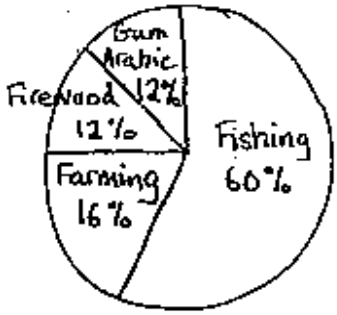
Sources of Income

[b] Elderly man - 'rich' group



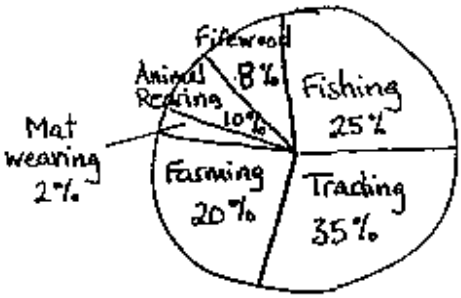
Sources of Income

[c] Younger man - 'rich' group



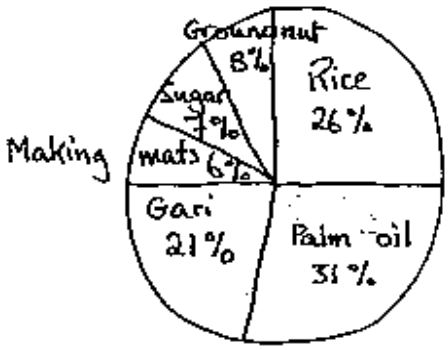
Sources of Income

[d] Elderly man - 'richest' group



Sources of Income

[e] Young woman



Sources of Income from trading various commodities

[f] - same as [e]

Expenditure of Income from trade

been depleted. Thus, for some people, doum palm plays an important role in maintaining security of income towards the end of the dry season.

The team was not able to determine the number of people involved in doum palm collection, but various informants said that the majority of the elderly men and women collected it as a source of income. This does not appear to be supported by the three pie charts drawn by elderly men, only one of which identifies doum palm as an important source of income. It may be that individuals from the lower and middle groups are more dependent on doum palm, as mentioned by some people.

Although the processing and sale of doum palm products does not seem to be a major source of income for the village, certain groups within the village depend on these activities, in particular mat making. Income from making mats accounts for about 5 per cent of the income of a young woman and also of an elderly man from the highest group (Figure 3.8). The woman, though, does not collect the fronds herself, perhaps because she has young children, but instead purchases fronds from Fulani who bring them to the market. Discussions during the initial appraisal with a group of women in purdah, who are also not able to collect fronds, indicated that weaving mats is their main source of income. They estimated that there are about 20 households in the village that are home to women in purdah.

Other values of doum palm
A discussion with a group of elders on the various uses of several trees revealed a number of other values, or benefits, associated with doum palm: on farmlands, doum palm helps to keep the soil cool, thereby increasing the yield of cultivated crops (ecological value); the root of the doum palm is used to prepare a drink which eases pain and bleeding in women following childbirth (medicinal value); and during times of serious drought and consequent shortage of fodder, cattle are fed doum palm fronds (economic security).

Changes in availability
Wild resources are generally seen to be declining in abundance compared to 20-25 years ago, as revealed by discussions held separately with a group of male elders and a group of male youths. However, neither group feels that doum palm is under as much threat, despite the variety of economic uses of doum palm and its ecological value as a resource. Indeed, many in the group claimed that doum palm had not really declined in abundance as compared to the past. Some said, though, that doum palm might become scarcer in the future due to increasing numbers of outsiders coming to harvest the resource. This probably reflects the fact that people in the Wetlands know how to cultivate doum palm and it also appears to be a fairly hardy species, able to withstand some decrease in flooding.

3.3.2 Firewood

Location of firewood and who depends on it
During one of the transects, male youths indicated that firewood could be found in the floodplain area near the village as a result of more erratic flooding in recent years. The nearby forest was also identified during initial discussions and mapping sessions as an important source of firewood. While many people in the village collect firewood for their own use, firewood collection and sale was described as an important source of income generation for young men, older men and older women. People from these three groups sell firewood within the village but the youth also sell firewood to traders who come from nearby markets.

Seasonality of Collection

The seasonal calendar drawn by a group of male youths indicates that the young men collect and sell firewood from November to July (see Figure 3.7). Many young men devote much more time to this activity in December and January when there are fewer types of work available. As with doum palm, firewood is not very accessible during the wet season. Firewood can be transported back to the village by three different methods: on one's head, by donkey or by an ox-driven cart. The amount of firewood transported in one load varies according to the means of transport and thus so do the prices of each load. The young men sell firewood either within the village or to traders from the nearby towns of Jakusko and Gashua, with roughly similar proportions of firewood being sold to traders from Jakusko, Gashua and within Gwaiyo.

Access to firewood

A semi-structured interview was held with two forest guards, stationed in Gwaiyo as of this year, to find out what legal restrictions existed on the use of forest resources in the reserve and to what extent these were being enforced. The main responsibilities of the guards, who are employed by the Chad Basin National Park, are to prevent the felling of trees and hunting of birds and other animals. They are responsible for an area incorporating four villages: Gwaiyo, Dumbari, Kurkushe and Gorgoram. Local government authorities in Gashua and Jakusko issue licences valid for six months to fuelwood gatherers at a cost of N200 but rarely come to check on the situation in the field.

The guards claimed that during the time they had been posted to Gwaiyo, felling of trees, which is illegal, had been reduced greatly. The guards also listed a number of constraints and problems they face in their work, such as lack of both transport and weapons for self-protection or as a means of enforcement.

But given the extent to which people from various groups in Gwaiyo consider harvesting of firewood and felling of trees to be excessive, the licensing and regulation system may not be having much effect on controlling or managing the use of resources in the forest. The cost of licences seems quite low and there is little monitoring of harvesting activities. In addition, the village of Gwaiyo does not seem to have the means or authority at the moment to manage use of the forest resources by various groups. Rather, they view this as the responsibility of the government. The villagers repeatedly complain about the outsiders and Fulanis depleting their forest resources, and the forest guards may have a greater effect on the harvesting and felling activities of the villagers than on commercial firewood collectors from other regions or Fulani. The team managed to have a short discussion with one Fulani man who claimed that the Fulani do not cut down trees. It is therefore still not clear exactly who is placing the most pressure on the forest resources, although commercial fuelwood traders who come from outside are probably playing a major role.

Economic importance of firewood

A survey of firewood vendors in the village was carried out to determine the species, prices and quantities of firewood sold. Firewood is not sold in the village market but by individuals at their homes. Women tend to sell the wood within their compounds while men sell

Table 3.4 Firewood Harvesting Information from Vendor Survey and Discussions with Male Youths, Gwaiyo

Method of Transport	No. of Informants	Price	Frequency	Species[1]	Capital Costs[2]
Carry on shoulder or head (sometimes using calabash)	- 2 (women) - group of male youths	N20-N40 per load usually sold in small handfuls	Wet season: - 1x/day (women) Dry season: - 2x/day (women) - 3x/day (young men)	danya farin kaya magariya aduwa	None
Donkey (carries 4-5 bundles)	- 4 older men - group of male youths (same as above)	From N50 (dry season) to N100 (wet season) per donkey load	Wet season: -varied from 1x/week to 2x/day Dry season: - up to 3x/day	giyaya aduwa magariya farin kaya tsamiya kanya	Donkey costs N5,000
Cart (*amalanke* - carries 5-8 bundles)	-1 older man - group of male youths (same as above)	N100-N200 per cart depending on whether sold all at once or in small amounts	Wet season: -1x/day Dry season: - up to 4x/day	giyaya	Oxen and Cart costs N50,000

Notes

1. This list of species represents the species identified during the survey and other discussions. It is not meant to be exhaustive, nor does it represent the only species transported by each method.
2. This excludes the capital costs of an axe which is always necessary for firewood collection. An axe only costs about N50 and will last up to 10 years with regular maintenance. Given the number of times it is used and their general availability, this minimal cost is not incorporated into the table or the calculations.

it on the street outside their homes. Some vendors who have carts deliver firewood to clients' homes. The survey concentrated on those selling firewood from their homes.[10] Given the large number of people selling firewood, a number of vendors were selected by a team assistant hired in the village. The results of the survey are summarised in Table 3.4 together with similar information gathered from discussions and other diagrams with a group of male youths.

Some tentative calculations were made to estimate the returns to labour for collecting and selling firewood as illustrated in Table 3.5. Allowing for recognised shortcomings in the calculations (see especially note (f) to Table 3.5), the returns to labour should be seen as very rough estimates. To the extent that the figures are reliable, they do indicate that someone can generate a much higher return to their time if they can manage to have access to major capital items, such as a donkey or ox and cart. While the return to a day's labour gathering and transporting firewood by hand is in the same range as the daily wage for agricultural labour, returns to time spent collecting firewood with a donkey are about three times as high and with a cart, about eight times as high.

The pie charts in Figure 3.8 on sources of income provide some indication of the relative importance of firewood collection and sale as a source of income generation. The informant from the highest group allocated 8 per cent of his income to selling firewood which he purchases from collectors. For the youth from the higher group, firewood collection provides approximately a similar proportion of his income, 12 per cent, while the informant from the lower household group was not strong enough to engage in firewood collection.

Discussions with various women in the village indicated that firewood collection and sale was an important source of income for many of them. They tend to transport firewood on their heads or shoulders and hence the volume is less than for those men who have capital assets such as donkeys or carts. Such women sell their firewood exclusively within the village, usually to other women. The pie chart of expenditure of income in Figure 3.8 for a young woman shows that she spends about 30 per cent of her income on purchasing firewood. One reason she may purchase firewood, as opposed to collect it, is the fact that she has three young children.

With the information obtained, it is not possible to calculate the total market value of firewood that is collected and sold in Gwaiyo.[11] But further information on the total market value of firewood collection and sale within the village would probably not be all that useful in any case. Barbier, Adams and Kimmage (1993) estimated the total annual financial and economic benefits from three production activities, agriculture, fishing and firewood, in the Wetlands for a one year period over 1989-1990. They calculated that the total market value of firewood was

[10] The study period did not coincide with the time of year when young men undertake more extensive collection and selling of firewood.

[11] The young men estimated how often a person *could* collect firewood during the year, if this were a full-time activity (see Table 3.4). But the team did not obtain an estimate of how many people are involved in the activity either for sale within the village or outside of the village.

Table 3.5 Returns to Firewood Collection During the Dry Season, Gwaiyo

Based on information from vendor survey and discussions with male youths (see Table 3.4)

Method of Transport	Price per Load	Frequency in Dry Season		Annual Revenue	Capital Depreciation per year	Returns to Labour per day
	(a)	times per day (b)	days per season (c)	(d) = (a) * (b) * (c)	(e)	(f) = [(d) - (e)] / (c)
Carry	N20	3	96	N5,760	nil	N60
Donkey	N50 - N75	3	96	N14,400 - N21,600	N500	N145 - N220
Ox-Driven Cart	N100 - N150	4	96	N38,400 - N57,600	N5,000	N350 - N550

Notes

Many figures are rounded for simplicity.

(a) *Average or range of dry season price from Table 3.4*

(b) Maximum feasible according to group of male youths

(c) Calculated by male youths as maximum potential based on 6 working days in week, 4 weeks per month and a 4-month dry season when harvesting is undertaken

(d) Maximum *potential* revenue if done full time

(e) Based on purchase costs of capital items in Table 3.4 spread evenly over a 10-year working life (as provided by informants). For someone who carries the firewood back to the village, there are no capital costs. An axe is required but the cost is minimal. An axe costing N50 will last 10 years with a new handle being necessary every year or two. Given the number of times the axe can be used in a year, the imputed cost for each time the axe is used is taken to be negligible. This is also indicated by the fact that the axe is a very common implement, *accessible in price to just about anybody.*

(f) Maximum *potential* returns to a day's work devoted to firewood collection during dry season. For donkey and ox-driven cart the returns are likely to be overestimated given that reliable information was not obtained on the recurrent costs of feeding and maintaining the draught animals which are probably quite significant. But the figures may be considered as underestimated for a separate reason. The capital depreciation is calculated with the somewhat unrealistic assumption that the donkey or cart and oxen are only used for firewood during the four month season identified by the youths. In reality, these items will be used year-round and for a number of activities. So in this regard, the capital costs have perhaps been overestimated.

about 2.5 per cent of that of agriculture, and less than 30 per cent of that for fish for the entire Wetlands area.

The value generated from the sale of firewood to outside traders is likely to be concentrated among certain villages in the Wetlands that are situated closer than others to both roads and forested areas and reserves. For example, Kimmage and Adams (1990) conducted some surveys in villages which are quite active in firewood trade along the Nguru-Gashua road of firewood collection and sale. The situation of these study villages is similar to Gwaiyo in that the villages are located about 3-5 km from the major firewood source areas. However, they are all much closer to the major market towns and the highway, so the scale of firewood trade is probably higher than in Gwaiyo. Kimmage and Adams estimated that each village was selling about 15 tonnes of firewood per year with a value of approximately N20,000 (US$200) for transport to other markets.[12]

In such villages, firewood sale to outsiders might play a larger role in the local economy than the aggregate figures indicate. But in the case of Gwaiyo, the information on various individuals' sources of income (see above) did not demonstrate a heavy dependency across a number of groups on the sale of firewood to outsiders. Certainly the young men are engaged in this activity. However, much of the income generated from commercial firewood collection in the nearby forest goes to outside traders and the labourers they bring in to collect firewood for them.

Other values of trees used for firewood

During the initial appraisal, a group of male elders produced a matrix scoring of the main wild tree species in the area and their various uses (Figure 3.4), indicating that certain species which are valued for firewood are also valued for other uses. A similar matrix done by youths shows that trees which are used for firewood are also highly valued for their construction and medicinal uses (Figure 3.5).

A separate group of elders drew another matrix scoring on the uses of various individual tree species yielding some similar results as the earlier matrix (Table 3.6). For example, *aduwa* was again identified as the most valued species for fuelwood. However, the range of species included in the two matrices is not the same, meaning that the two tables should be seen as complementary, not comparable, particularly since the later matrix also included medicinal values of trees which generated much discussion. Discussions with a young man also revealed a number of other uses, or benefits, attributed to tree species used for firewood, including use for burial (cultural value), shade, vantage point for protecting farm from pests, medicinal uses, and as a nesting place for birds whose eggs could be collected for eating.

[12] The estimate was N1,530 in 1989-90 when the exchange rate was N7.5/US$. The effective exchange rate at the time of this study was N80/US$. The 1989-90 estimate was converted to 1995 Naira terms assuming that the value of firewood in dollars was constant (assuming average US$ inflation of 3 per cent per year). This approach also assumes implicitly that the price of firewood relative to other goods, *i.e.* its relative scarcity, had not changed.

Table 3.6 **Matrix Scoring of Uses of Trees**
Drawn by a group of 5-10 male elders, Gwaiyo, 18 July 1995
(see Appendix C for scientific names of species)

	Tsamiya	Madachi	Aduwa	Magariya	Kanya	Dinya	Giyaya
Fodder	5	3	10	15	1	2	4
Firewood	2	-	17	12	6	-	3
Construction	-	-	-	10	10	-	20
Medicine	6	12	3	7	5	3	4

Changes in Availability

In discussing the changing availability of the village's main resources, the elders clearly associated the declining availability of some of the village's most important resources, such as fish and trees, with the decrease in water availability. The elders drew a matrix in which the major natural resources (or natural resource systems) of Gwaiyo could be scored for relative changes in abundance, value and ease of harvesting (Table 3.7). The availability of firewood has declined in recent years (since around the time of independence) and the elders expect that this will continue. In Table 3.7, this is reflected also by an increase in the value of firewood and a decrease in the ease of harvesting. In particular, people say they have to go much further now to collect firewood (between 3 and 5 km) than in the past. The elders blamed the decline in firewood availability on a number of reasons. The lack of river flood during recent times is seen as leading to the disappearance of trees. The elders also indicated that large numbers of trees were being felled by outsiders who transport and sell the firewood in distant towns and cities. The elders also alleged that Fulani often cut down branches for fodder in such a way that the tree is damaged.

During an earlier discussion with a different group of elders on uses of trees (Table 3.6), a number of individual tree species were listed as now being scarce. In particular, *gwandar daji* (*Annona senegalensis*), *tsada* (*Ximenia americana*), *tabila* (*Boscia senegalensis*) and *dargaza* (*Grewia bicolor*) have become quite scarce during the last 10-15 years and some claim that these species are no longer present in the area of Gwaiyo. *Madachi* (*Khaya senegalensis*) and *kanya* were identified as having become more scarce as well, though not to the extent of the other species. This group of elders attributed this increasing scarcity to the same reasons as the other group of elders.

Table 3.7 **Changes in the Availability of Resources**
Redrawn from a diagram by a group of male elders, Gwaiyo, 11 July 1995

Resource/Activity	Abundance			Value			Ease of Harvesting		
	Past	Present	Future	Past	Present	Future	Past	Present	Future
Fishing	+++	+	?	+	+++	?	Distance +++	+	?
							Equipment Required +	+++	?
Firewood	+++	++	+	+	++	+++	+++	++	+
Other Wild Resources (gum, browse, leaves, medicine, construction)	+++	++	+	+	++	+++	+++	++	+
Grass (thatching, fodder)	+++	+	?	+	++	+++	+++	++	-
Upland Farming	+++	+	?	+	+++	?	+	+++	?
Rice Farming	Unknown	++	?	-	++	+++	-	++	+++
Water	+++	++	+	+++	+	?	+++	++	?

5.3.3 Wild Foods

Location of wild food resources and who depend on them
The initial appraisal identified various wild foods derived from trees and shrubs as being important to the village (listed under Table 3.1). A number of these trees are found only in the nearby forest, including *kanya* (*Diospyros mespiliformis*), *dinya* (*Vitex domana*), *tsada* (*Ximenia americana*), and *lulu danya* (*Spondias monbin*) while many other trees are also found on farmlands, such as, *kuka* (*Adansonia digitata*), *tsaniya* (*Tamarindus indica*), *yaakuwa, magariya* (*Ziziphus mauritiana*) and *aduwa* (*Balanites aegyptiaca*)

Who depends on wild foods
Earlier discussions with a group of elders revealed that wild fruits are more important to the elderly women and children who collect them both for food and as a small source of income. On the other hand, the elders claimed that leaves, which are collected by women, are generally an important source of food for all people in the village. The resources listed by women are included in Table 3.1.

Harvesting and processing of wild foods
An elderly woman developed a process chart explaining the methods of harvesting wild fruits and leaves and showing the flows of the products to the village (Figure 3.9). The chart describes the common sources, either bush, farm or forest, for the list of fruits and leaves identified. The diversity in origin generally confirms what the elders had mentioned earlier; many species are found both in the forest and on farms. The chart also highlights the fact that most of the fruits and leaves are consumed in Gwaiyo with some of them being traded within the village. A smaller amount is bought by traders from the neighbouring towns of Gashua and Jakusko, or is transported there by Fulani. *More detailed information on each of the resources obtained from further probing is provided in* Table 3.8.

Access to wild foods
During a discussion with a group of male elders on control of resources, they indicated that wild fruits and leaves found in the bush have few restrictions on access. The exception for trees found in the forest was *kuka* which comes under the control of the person who encourages productivity of the tree by pruning older branches. On farmlands, *kuka* and *tsaniya* are controlled by the owner of the farm. Other people can collect the leaves and fruits from these trees for home consumption but harvesting for commercial sale must be undertaken in the forest.

Seasonality of wild foods
A seasonal calendar drawn by another elderly woman in her family's compound revealed that most of the leaves are available from some point in the rainy season to around the middle of the 'mid-season'. On the other hand, most of the fruits are harvested later from about the middle of the mid-season *through to the end of the dry season. Kuka leaves are one of the most important since they* are cooked almost every day by each household although dry okra is more important for generating income (Figure 3.10).

Figure 3.9 **Process Chart for Wild Fruits and Leaves**
Redrawn from a diagram by an elderly woman, Gwaiyo, 17 July 1995

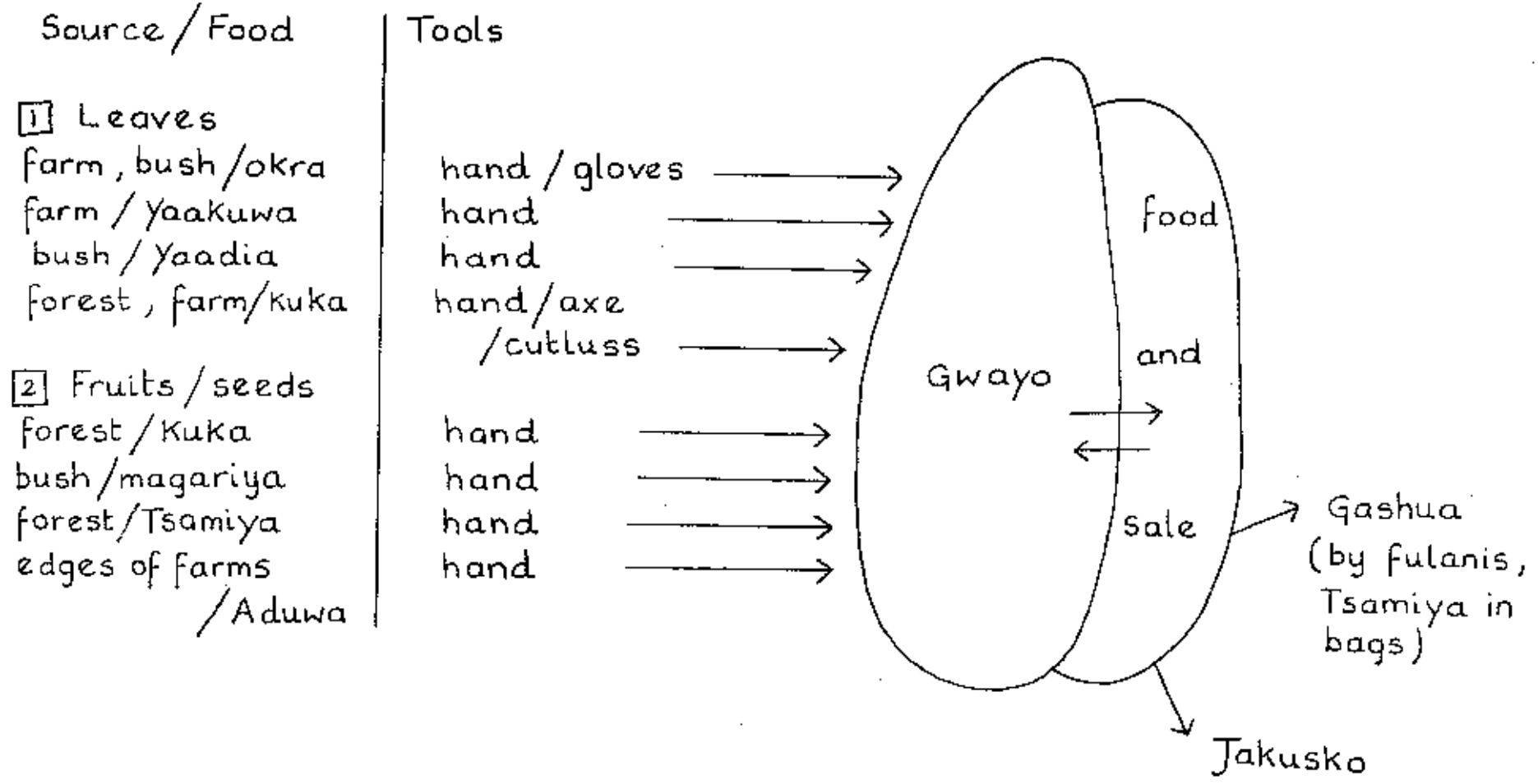


Table 3.8 **Harvesting of Wild Fruits and Leaves, Gwaiyo**
From a discussion with an elderly women, 17 July 1995

Product	Where	How	Amount Harvested	Processing	Price	Scale
Kuka (leaves)	- gathered from forest (3-4 km) & farmlands	- climb tree, cut branch & then pick leaves - need an axe costing about N200 & lasting 10 years	- one tree can be harvested up to 10 times per season resulting in 1-2 bags per season	- leaves are dried for 4-5 days	- dry leaves N5-N10/*mudu* depending on supply - about 40 per cent of harvest is sold (this informant) - money used to purchase other food ingredients	- about 20 elderly women in village are involved in selling
Wild Okra (vegetable)	- forest (5 km) - controlled by Fulani	- picked using gloves (old socks) and knife (which lasts 5 years) - wash hands with potash afterwards	- harvest 2x per season			- about 10 women harvest for home consumption
Yaakuwa (calyx and seed)	- farmlands	- plant is uprooted		- seeds cooked with potash, then fermented for 2 days; dried; pounded into powder for *daddawa* (spice for soup/sauce) - leaves used in soups - calyx used to make drink		
Yaadia (leaves)	- bush and near village	- hand picked	- amount collected varies a lot (abundant)	- used in salads	- N0.50-N1.00 per handful in market	
Tsamiya (fruit)	- bush and forest (5-7 km)	- hand picked by climbing tree	- trees harvested once per season - women harvest as need it; maybe 3 times per season		- N1 per mudu - may sell a bag to Fulani for transport to Gashua	- about 20 elderly women involved

Figure 3.10 **Seasonal Calendar of Wild Fruits and Leaves**
Redrawn from a diagram by an elderly woman from the middle group, Gwaiyo, 17 July 1995

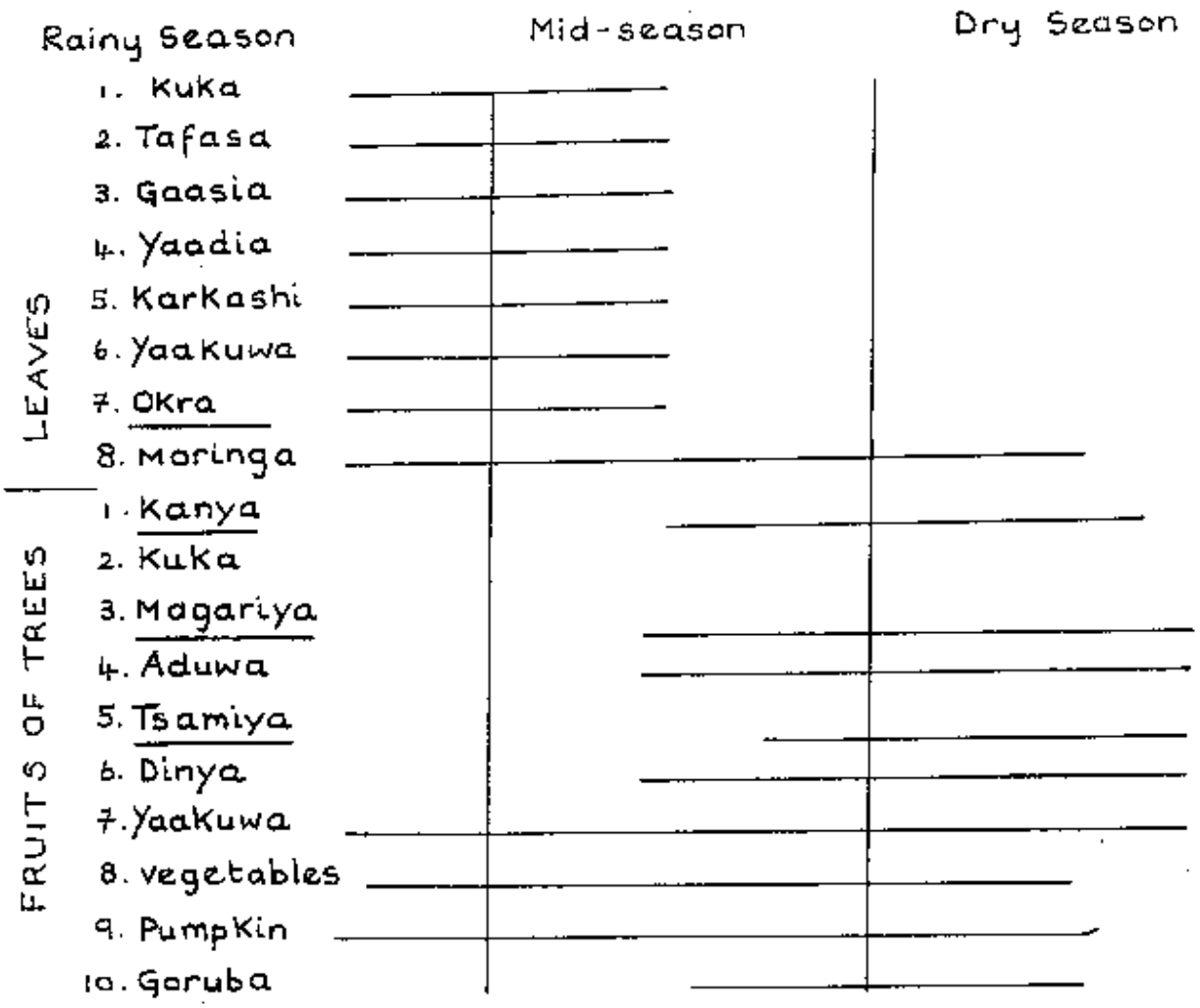
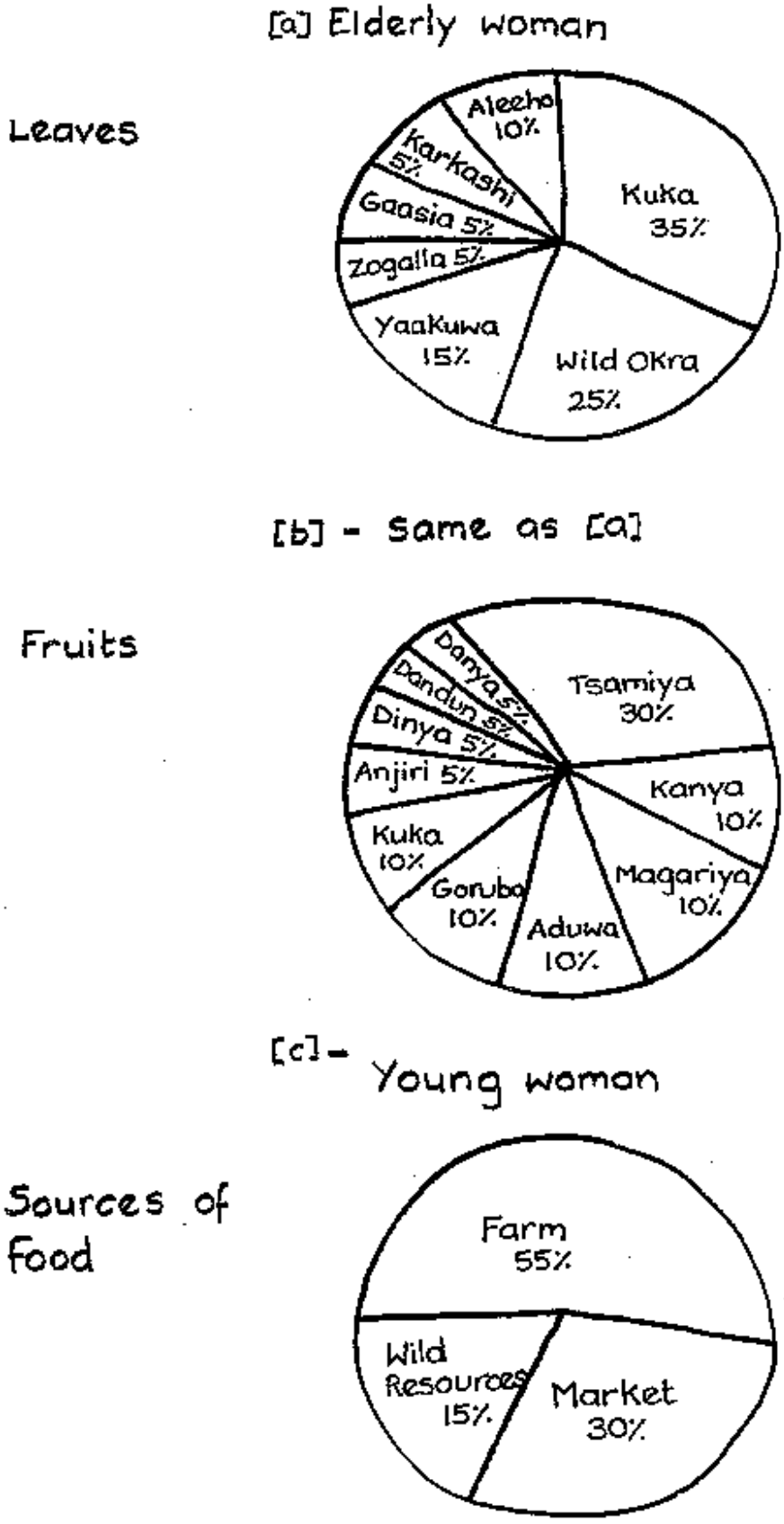


Figure 3.11 **Pie Charts of Sources of Various Leaves, Fruits and Income**
Drawn from piles-of-stones illustrations by an elderly woman from the highest socio-economic group, and a young woman, Gwaiyo, 17 July 1995



Economic importance of wild foods

Information on the relative importance of various fruits and leaves as a source of food was provided in the form of pile-of-stones diagrams by an elderly woman from the highest socio-economic group. The resulting pie diagrams reveal that *kuka* and wild okra (*kubewa; Hibiscus esculentus*) are by far the most important leaves while *tsamiya* constitutes the most important fruit (Figure 3.11[a],[b]). A young woman, who had already allocated her income and expenditure among various sources and items respectively (see Figure 3.8) indicated that about 15-20 per cent of her food comes from wild resources (Figure 3.11[c]). The chart also indicates that the woman purchases a substantial portion of her food; during the discussion, she said that she sends her sister to the market at Gashua to buy foodstuffs which are then resold in Gwaiyo. Thus, she is probably from a fairly well-off household (her husband is a student at a university), suggesting that even households from wealthier socio-economic groups rely on wild resources as a food source.

Other values of wild trees

The elderly woman who described the relative importance of various fruits and leaves also explained other uses for the respective tree species, with emphasis on medicinal benefits. The bark of *kanya* is used for treating snake bites; the leaves of *yaakawa* for treating boils; the bark of *bagaruwa* (*Acacia nilotica*) for stopping bleeding after childbirth; the leaves of *sabara* (*Guirea senegalensis*) for sunstroke; and the leaves of *tabila* are eaten by women during menstruation. In addition, she said that *tabila* is an important food source during times of scarcity.

Changes in availability of wild foods

Earlier discussions and historical matrices drawn by male elders and youths revealed that wild foods were becoming scarcer and this trend was expected to continue in the future (Table 3.7). The group of elders associated this trend with increases in the value of these resources and difficulty of harvesting them. The growing scarcity was also linked to the decline in tree resources in general for the reasons listed in previous sections (for example, commercial cutting of firewood).

5.4 Summary

The initial appraisal identified a long list of wild resources used by the people of Gwaiyo including grasses, herbs, shrubs and trees. These resources provide important sources of food, fodder, raw materials and medicines, and also contribute to income generation. Many wild resources, in particular trees, are used for multiple purposes by the various groups in the village, as well as the pastoralists (Fulani).

People in Gwaiyo expressed concern that most wild resources are decreasing in abundance. The tree-based wild resources, in particular, are declining because of lack of floods combined with increasing demand. The elders said Gwaiyo was formerly surrounded by thick forests with many trees and abundant wildlife while the distance travelled to collect leaves and fruits for food and construction wood used to be shorter. The villagers in Gwaiyo blame the increasing demand on both Fulani and commercial firewood collectors from other regions. The study concentrated on a number of uses of mostly tree-based resources: doum palm and firewood for income generation; and foods from wild fruits and leaves.

Doum Palm

People in Gwaiyo make extensive use of various parts of the doum palm tree for a wide range of products. Some of these products are also important inputs to other economic activities, such as

fishing with the *samkiya* net which is made from the roots of the doum palm tree. The only doum palm product which directly generates a significant amount of income in Gwaiyo through sales are the fronds, as in Adiani.

Both men and women engage in collecting, drying and selling the fronds to traders as a source of income although its importance as a major income source may be limited to lower or middle-income groups. Sufficient information was collected to make some preliminary estimates of the economic returns to the collection and sale of doum palm fronds. Returns to labour were estimated at about N200 (US$2.50) per day which seems very high in comparison to returns to other activities such as the wage for agricultural labour in the village. These high returns can only be explained by a recent surge in demand from commercial traders for doum palm, in addition to the hard physical work and risks involved in harvesting the fronds. It was not possible to assess the scale of this activity within the village although it is probably much smaller than in Adiani which is closer to the main doum palm collection markets. In any case, selling fronds provides an important source of income during the dry season when there are not many other income earning opportunities. While doum palm is currently quite abundant around Gwaiyo and has not yet decreased due to the reduction in flooding, there is a worry among villagers that it may come under increasing pressure in the future due to migrants and other outsiders.

Firewood

Collection and sale of firewood, particularly from the forest to the north of the village, generates a significant amount of income for many groups both within and outside the village. Young men in Gwaiyo collect firewood for sale either within Gwaiyo or to traders who come to Gwaiyo from the nearby towns of Jakusko and Gashua. Returns to labour for collecting and carrying firewood back to Gwaiyo (about N60, or US$0.75, per day) are comparable to the agricultural daily wage rate. With access to a donkey or an ox-driven cart, however, the returns to labour increase dramatically (about N145-N220, or US$1.80-US$2.75, per day with donkey transport; and N350-N550, or US$4.38-US$6.88 per day with ox-driven cart). Prices and returns peak in the wet season, but this activity is most important during the dry season when the forest resources are more accessible and there are not as many other income-earning opportunities.

Collection and sale of firewood within the village also provides an important source of income for a number of elderly men and many women in Gwaiyo. Women generally carry firewood though, as they do not have access to draught animals. Despite the lower returns, and perhaps 'economic visibility', of this activity, it can still provide critical forms of income to the individuals involved.

Commercial firewood collectors/traders also come to collect firewood in the Gwaiyo area and transport it by lorry to distant urban centres such as Kano and Sokoto. Although it is not clear whether local residents or firewood traders from other regions are harvesting the greater quantities, the residents of Gwaiyo place the blame for decreasing availability on the outsiders and the Fulani, and claim that it is the responsibility of the government to manage the forest reserve. A formal system for licensing firewood collectors and monitoring use of forest resources exists but does not seem to be very effective. In addition, lack of flood waters has contributed to a long-term decrease in the abundance of trees providing firewood, although it is not clear whether this has been as important as increases in firewood collection.

Fruits and Leaves

Fruits and leaves from wild trees constitute an important source of food for everyone in the village. In particular, these foods fill important gaps during the dry season and in times of food scarcity. In

addition, they are an important source of income for many elderly women in the village, although the overall scale compared to the village economy is small. While fruits and leaves are traded outside the village (and brought in for sale during the off-season), the majority is consumed within the village. Thus, as a hidden harvest, the scale of foods from wild fruits and leaves is small in monetary terms but their economic importance is probably much higher. This is particularly the case when one considers that they are especially important to certain disadvantaged groups in the community, even for the 'small' income that they generate. Increased harvesting and the lack of flood have led to these resources becoming much scarcer. People in Gwaiyo talk of increased difficulty in harvesting and the need to travel further to collect wild foods.

4 CONCLUSIONS

4.1 Economic Importance of Wild Resources in the Hadejia-Nguru Wetlands

The economies of both Adiani and Gwaiyo depend heavily (though, of course, not exclusively) on the wealth of wild resources available in the floodplain. Fish is the most important of these, as identified by people in both villages, providing both income and food.[13] The initial appraisal also identified a long list of other economically-useful wild resources. As it was not possible to study all of these resources in detail, the study team concentrated on three groups or types of resources in each village.[14] In Adiani, these were income generated from doum palm and potash, and foods from wild fruits and leaves. The focused appraisal in Gwaiyo also examined wild foods and the importance of income from doum palm, particularly from sale of the fronds, as well as firewood.

The nature of the economic importance of these wild resources varies. Many activities based on the harvesting of wild resources provide important sources of income. In the case of doum palm (both villages) and firewood (Gwaiyo), this income is important to a range of groups within the community. In the case of firewood, although the income may not be that large relative to other resources, it is important for older women in Gwaiyo who do not have many income earning opportunities available to them. Similarly, potash provides an important source of income for older and poorer women in Adiani. The consumption of wild resources as a source of food, such as fruits and leaves from a variety of trees and plants, is important for many groups in both villages. However, wild foods are critically important for a number of disadvantaged groups with fewer economic opportunities.

The wealth of wild resources found in the Hadejia-Nguru Wetlands depends directly on the maintenance of annual flooding of the area. If the Wetlands do not remain wet, then most of these valuable resources will eventually cease to be found there, at least not in their current abundance. Indeed, in Gwaiyo, people explained how their general economic prosperity has declined due to reductions in annual flooding during recent decades. This has affected a number of economic activities including fishing, agriculture and livestock rearing. Wild resources have not been spared either. People in Gwaiyo attribute the decline in availability of forest resources, especially wild foods and firewood, at least partly to the reduction in annual flooding.

The situation in Adiani is somewhat different as changes in the water courses in the Wetlands mean that recently, flooding has actually increased in the vicinity of the village, despite overall decreases in

[13] The team decided not to examine this extremely important wild resource since a separate, longer-term study is currently gathering extensive information on the economics and management of fisheries in the Wetlands, using both PRA and conventional research techniques (Traditional Management of Artisanal Fisheries (TMAF) Project, conducted in collaboration by the Centre for Economics and Management of Aquatic Resources (CEMARE) at the University of Portsmouth (UK), the Department of Biological Sciences, University of Maiduguri (Nigeria), and the Federal University of Technology, Yola (Nigeria) and funded by the British Overseas Development Administration (ODA)).

[14] An alternative approach would have been to assess the economic values from all the wild resources found within a given area (*i.e.* sample plots) of the Wetlands, as done in the Zimbabwe Hidden Harvest case study (Hot Springs Working Group, 1995).

the Wetlands. Among other things, this has allowed women in Adiani to collect increased amounts of potash. The contrasting experiences of the two villages indicates the degree of flood dependency of the local economy, including activities related to wild resource use.

Earlier reports have demonstrated that the economic returns to the floodplain as a production system appear to be much more favourable than existing and planned water developments along the river system which divert water from the Wetlands (Barbier, Adams and Kimmage, 1993). This assessment is based primarily on an estimate of the economic value of agriculture and fishing activities in the Wetlands, omitting, for data reasons, other important economic activities such as livestock rearing. The value of the hidden harvest strengthens this argument in favour of maintaining flooding levels in the Wetlands even though this value may not compare in scale as a source of income to fishing, agriculture or livestock rearing. Wild resource production systems are an integral part of the Wetlands economy with linkages to other activities, such as fishing and agriculture, as a source of income for disadvantaged groups, and as source of goods and materials for the wider regional economy.

The increased understanding of the economic importance of wild resources provides useful and timely information with which the HNWCP will be able to reinforce its important policy recommendations on the necessity of maintaining regular flooding of the Wetlands. HNWCP can use these results of this study in its ongoing efforts to lobby for sustainable development of the water resources of the Komadugu-Yobe basin. HNWCP reaches a number of government agencies but its consultative forum of stakeholders (involving all the local government agencies in the Wetlands) is a natural target for dissemination.

4.1.1 Doum Palm

Doum palm is widely used and traded in the Wetlands, providing an important source of food, materials and income for many different groups, including children, housewives, the elderly, the handicapped and full-time doum palm traders. Almost every part of the tree is used. The study concentrated, though, on the sale of dried doum palm fronds. The fronds are harvested throughout the year with the peak times generally occurring at some point during the dry season. Bundles of dry leaves are purchased by traders and sold on to other markets. The fronds have some industrial uses as roofing material and there is a booming trade exporting fronds to as far away as Kano. The fronds are also used locally to make a variety of household products (mats, baskets, etc.)

The annual market value of the trade in raw fronds and processed mats in Adiani is estimated as approximately N10 million (US$125,000).[15] This result is comparable to estimates obtained from some survey work done during 1994 for five villages in the Wetlands by HNWCP[16] and, if accurate, indicates that Adiani is a major frond selling village. In addition, Adiani also sells a number of processed doum palm products to neighbouring markets.

[15] Note that this excludes other processed doum palm products for which figures were not collected.

[16] Not yet published; see section 2.3.1.

In contrast, the scale of frond trading seems lower in Gwaiyo. Although Gwaiyo is much smaller than Adiani, differences in proximity to markets probably account for this difference in doum palm sales. Adiani is located much closer to the main markets of Nguru and markets along the Nguru-Gashua road, such as Jajimaji, which are major doum palm markets (see Figure 3.1). Bundles of fronds are brought there by traders from villages within the Wetlands to be purchased by traders from large urban centres, such as Kano. On the other hand, Gwaiyo is much further away from the same markets. Fronds from Gwaiyo are sold to markets on the eastern side of the Wetlands and Gwaiyo actually imports a number of processed doum palm products from neighbouring villages.

Information from Adiani indicated that the returns to labour from collecting and selling fronds, N200 (US$2.50) per day, was much higher than for processing (*e.g.* N3, US$0.04, per hour for weaving mats), reflecting the different nature of these activities. Weaving of doum palm products is not physically straining and can be done at home at the same time as other tasks. This latter activity is therefore important for those who spend more time at home, such as mothers with young children, women in purdah, and elderly men. Collection and sale of fronds is an important economic activity for both older men and women.

Doum palm does not appear to be under serious threat. Neither village reported a decrease in availability of the resource. Indeed, discussions with various groups in Adiani revealed that the resource has increased in abundance during the last 30 years, due to the increased incidence of flooding in the vicinity of the village. Some people in Adiani now plant doum palm seedlings as farm boundaries. This indicates that the high economic value of this 'semi-wild' resource is encouraging its cultivation. In contrast, villagers from Gwaiyo did not mention a decline in availability of doum palm, despite the substantial decrease in flooding in their area. A possible explanation is that although the greater abundance of doum palm depends on the existence of flooding in the Wetlands, the species is quite drought-resistant (Maydell, 1986) and might endure for a long time, though not permanently, in areas where annual flooding has decreased consistently.

4.1.2 Potash

Potash is traded in large quantities in the market towns of the Wetlands such as Gashua and Nguru, where it is sold as an industrial raw material first to wholesalers and then to traders from the southern parts of the country. Potash was used in both the villages which participated in the study. Potash is not traded on a commercial basis, rather it is collected and used in small quantities. It is used as a cooking ingredient and stomach medicine in most households. It is also used as an appetite stimulant for livestock.

The study focused on potash collection as a source of income in Adiani where there are a small number of collectors, approximately 50, who collect potash for two months a year, store it and earn a small income from occasional sales within the village throughout the year.

Potash is dependent on the flood, it appears at the soil surface just after the floodwaters have receded. As flooding has been more extensive in Adiani in recent years, potash collection has increased.

Notwithstanding the small number of collectors in Adiani, potash has an important economic role in the Wetlands because it provides a relatively favourable return for some of the poorest and weakest people in the community, elderly women. Access to potash is free and few external inputs are required. Although it is easy for anyone to start collecting potash, the low returns seem attractive only to old women.

4.1.3 Firewood

As the primary source of energy for most households, firewood plays an important economic role in the Wetlands. A large amount of the firewood harvested is destined for subsistence use. But there is also a very active trade which supplies firewood from the Wetlands to towns and cities further away.

The study concentrated on the collection and sale of firewood as an income earning activity in Gwaiyo. Within Gwaiyo, a variety of people rely on the collection and sale of firewood as a source of income. Practically all of these people appear to be selling firewood only within the village, and not to traders serving outside markets. Both young and older men collect firewood by means of donkey, ox-driven carts or carrying the firewood back to the village themselves. Many older women also collect and sell firewood in the village, although they appear to rely exclusively on carrying the wood as a means of transport.

The returns to labour for collecting and selling firewood vary according to the means of transport used. Carrying the firewood produces returns approximately equal to the agricultural daily wage rate (N60, US$0.75, per day). A greater quantity of wood can be transported by donkey or ox-drawn cart, yielding much higher returns for those with the capacity to invest in such capital items. While the income earned by women through the sale of firewood thus tends to be lower than that earned by men, the proportion of income derived from this activity can still be higher for a number of women than for men.

The market value of firewood trade in the Wetlands may be much lower than the value of agricultural or fishing production (Barbier, Adams and Kimmage, 1993), but the resource is valuable enough to be the focus of conflict between various groups in the Wetlands. Villagers in Gwaiyo claim that Fulani and outside traders, who supply markets as far away as Kano, are rapidly depleting the forest resources in the vicinity of the village, thus adding to the effects of reduced flooding on the availability of forest resources. Despite the posting by the Lake Chad Basin National Park authorities of four forest guards in Gwaiyo to monitor forest use, the village would like more to be done by the government to ensure that they can continue to benefit from the local forest resources.

4.1.4 Wild Foods

Wild resources provide a wide range of foods to the communities of the Wetlands including protein (fish and bush-meat), flavourings and food ingredients (potash), and vitamins and sugar (bees, vegetative resources, fruits and leaves). The study focused on the wild foods obtained from fruits and leaves. These food sources are critically important as they contribute to the diet of nearly everyone in Adiani and Gwaiyo, men, women, the young and the old, the poor and the rich. Some

collect wild fruits and leaves for their household, and some will buy them from the market. Access to the fruits and leaves of most trees is free and the external inputs necessary to harvest them are few and not expensive.

The collection and marketing of wild fruits and leaves is highly seasonal and is determined both by supply and demand. The seasonal nature of wild food resources complements the seasonality of cultivated sources of food in both villages. Wild foods are particularly important during the rainy, cultivation season, when food stores are at their lowest. The fruiting and shooting of the wild tree, shrub or herb can determine when the wild food is available and many of the wild foods used come into season during the rains or just afterwards.

4.2 Methodological Issues

As stated in Chapter 1, the *Hidden Harvest* project seeks to develop appropriate methodologies for assessing the value of wild resources at the local level. This study centred on the use of PRA research tools which were the focus of the workshop's training component. These were used successfully, promoting a high level of participation by the two village communities in the research, and as a result, the generation of better quality information. The use of PRA research tools led to an exploratory understanding of the economic role of wild resources in local livelihoods. Some conventional methods of research were used to a smaller extent but provided a useful complement to the PRA techniques used.

The concept of economic value has two dimensions: a *qualitative* one which provides an understanding of the importance of wild resources to the productive and reproductive activities of different groups within a community at different stages of their lives and in different seasons; and one which provides *quantitative* summaries of key aspects of these activities. This study has sought and revealed both dimensions and, in contrast to the commonly perceived trade-off between 'participatory but qualitative' and 'conventional and quantitative' research methods, found that it was possible to include participatory findings in conventional analyses. While the qualitative understanding which participatory research techniques can provide for a range of issues is now relatively well known, its use to derive quantitative values is less appreciated.

Indeed, the concept of relative values underlies many participatory research tools. For example, seasonal calendars were used to investigate fluctuations in the demand and supply of wild resources and the opportunity costs of household resources at different times of year; wealth ranking was used to provide a socio-economic stratification of the study communities; and pie charts were used to examine sources of income and food. The relative values and the limited absolute values revealed by the research were utilised in conventional methods of analysis to estimate absolute, quantitative values from the participatory research findings. The calculations in Chapters 2 and 3 are examples of how information gathered from the participatory research has been used to derive values for returns to labour spent on harvesting and processing three wild resources and to estimate their market

values. And there is probably quite a bit of scope left for further innovation in the use of participatory techniques to generate quantitative information.[17]

Nonetheless, success in quantifying these values was varied. For example, there is greater detail and also a higher level of confidence in the values estimated for doum palm harvesting and processing. But this arises primarily from the amount of time devoted to investigating various resources, and the nature of some of the resources (for instance, the large variety of wild foods exploited and the diverse groups involved means that, as a topic of investigation, these resources require proportionately more effort than doum palm) rather than from inadequacies of the PRA techniques. Variability in the detail and dependability of the results also reflects the trade-off between the study's dual objectives of training and research (see Appendix F).

Thus the studies in Adiani and Gwaiyo highlighted the potential of PRA tools to investigate a wide range of issues and the ability of PRA tools to gather both qualitative and quantitative information. Previous *Hidden Harvest* case studies have also used questionnaire-based surveys to generate more detailed quantitative information. The insights and illustrative values revealed through participatory research can act as a powerful complement to a sample survey in both technical and practical ways. Technically, the insights can help refine theoretical models driving conventional research and, in addition, the level of variation revealed through participatory research can help determine an appropriate sample size. Practically, the conducive rapport with study communities facilitated by participatory research can improve the quality of interaction, and thus information, between communities and outsiders in subsequent work, such as a survey.

The use of sample surveys is also a faster approach to aggregating information across a wider area. As this study decided not to use conventional surveys, the generality of its results are limited to the two villages and other similar villages in the Wetlands. Given the high degree of social, economic and ecological diversity in the area, it is not possible to derive estimates of the aggregate values given the information gathered so far. It would have been necessary to sample a number of villages in order to achieve that goal which was clearly beyond the resources of this study. For this reason, the possible use of household surveys within the two villages did not seem that useful. But this decision also reflects the personal interests of members of the study team who wanted to concentrate on participatory methods, perhaps highlighting a conflict between the philosophy of conventional research methods and that of participatory approaches. After all, at least part of the rationale for using participatory research is so that those being researched can participate as stakeholders in the analysis.

In this respect, it should be remembered that the questions which guided the research with Adiani and Gwaiyo were identified by the workshop without community involvement. Consequently, at this stage, the studies have involved more participatory learning than participatory action. But the high level of community participation in the research indicates the relevance of the topic. If and when the communities are able to use the results of their village studies, the investigative process will become less 'extractive' and more 'facilitative'.

[17] Of course, quantitative data should only be gathered where it is actually needed as otherwise it is all too easy to develop an obsession with quantitative information and to assign it a false degree of superiority in comparison with qualitative information.

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APPENDIX B: GLOSSARY OF GENERAL LOCAL TERMS AND ACRONYMS

Amalanke	Cart
Bazara	Season of approaching rains, March/April to June
Bede/Bade	An ethnic group
Biri	Staple food
Bulama	Village head
Burkutu	Locally brewed millet beer
Calabash	Gourd used as container
Chiwon rana	Sunstroke
Daddawa	Spice for soup or sauce
Damuna	Season of rains and agriculture, June to September/October
Emir	Regional leader
Fadama	Seasonal water body
Faifai	*Calabash* cover/lid
Fako	Hard pan, barren patch of soil
Fulani	An ethnic group
Goruba	Doum palm (fruit
Hakimi	District head
Hausa	An ethnic group
HNWCP	Hadejia-Nguru Wetlands Conservation Project
Kaba	Doum palm leaves/fronds
Kaka	Season of harvest, October to November/December
Kanuri	An ethnic group
Lamido	Regional *Fulani* leader
LGA	Local Government Area
Magaji	Member of Emirate Council
Mai unguwa	Ward head
Mangala	Donkey basket
Mangawa	An ethnic group
Mudu	Basin used for measuring; size will depend on what is being measured; food stuffs are usually measured in a 1 litre *mudu*
Masakwa	Dry-season cereal
Naira	Nigerian currency unit
NEAZDP	North East Arid Zone Development Programme
Purdah	System in some Muslim communities of keeping women from the sight of men or strangers
Rani	Dry season, December to March
Sankiya	A large type of fishing net
Seasons	See *Bazara*, *Damuna*, *Kaka* and *Rani*
Tapki	Seasonally inundated depression
Tudu	Upland used for rainfed farming
Tuwo	Cooked staple
Wakili	Assistant to village head

APPENDIX C: GLOSSARY OF BOTANICAL TERMS

Hausa Name	Botanical Name
Aduwa	*Balanites aegyptiaca*
Aleeho	*Amaranthus*
Anjiri, Hojeri	*Capparis tomentosa; Capparis decidua*
Bagaruwa; Gabaruwa	*Acacia nilotica*
Bagayi	*Cadaba farinosa, Capparis corymbosa*
Baure	*Ficus gnaphalocarpa*
Dabino	*Phoenix dactylifera*
Dakwara	*Acacia senegal; Acacia laeta*
Danya	*Sclerocarya birrea*
Dargaza	*Grewia bicolor*
Dashi	*Commiphora africana*
Dinya	*Vitex domana*
Dirga; Jirga; Shishi	*Bauhima rufescens*
Dorowa	*Parkia biglobosa; Parkia clappertoniana*
Dundu	*Dichrostachys cinerea*
Farin kaya	*Acacia seyal*
Farin bagaruwa	*Acacia sieberiana*
Gamba Grass	*Andropogon gayanus*
Gamji	*Ficus platyphylla*
Gaasia	*Gynandropsis gynandra*
Gawo	*Acacia albida (Faidherbia albida)*
Giyayya	*Mitragyna inermis*
Goruba	*Hyphaene thebaica* (Doum palm)
Gwandar daji	*Annona senegalensis*
Jiji	*Cyperus sp*
Kaba	*Hyphaene thebaica* fronds
Kalgo; Kargo	*Piliostigma reticulatum*
Kalumbo; Namijin yaadia	*Leptadenia pyrotechnica*
Kandili	*Acacia tortilis*
Kanya	*Diospyros mespiliformis*
Kari	*Hyphaene thebaica* root
Karya	*Adenium obesum*
Kasari; Gatsari	*Albizia chevalieri*
Kantakara	*Combretum glutinosum*
Kiriya	*Prosopis africana*
Kubewa	*Hibiscus esculentus*
Kuka	*Adansonia digitata*
Kukuki	*Sterculia setigera*
Lulu danya	*Spondias monbin*

Hausa Name	Botanical Name
Madachi	*Khaya senegalensis*
Magarian kura	*Ziziphus mucronata*
Magariya	*Ziziphus mauritiana*
Marike	*Anogeissus leiocarpus*
Ngididó	*Crateva adansonii*
Rimi	*Ceiba pentandra*
Runfu	*Cassia singueana*
Sabara; Shabara	*Guirea senegalensis*
Sarkakya	*Acacia ataxacantha*
Tabila, Bultu, Anza	*Boscia senegalensis*
Tafasa	*Cassia tora*
Taramnya	*Combretum sp.*
Tsada; Saada; Dandum (K[1])	*Ximenia americana*
Tsamiya	*Tamanrindus indica*
Tumfafia	*Calotropis procera*
Yaadia	*Leptadenia hastata (Leptadania lancifolia)*
Yaakuwa	*Hibiscus sabdariffa*
Zogalla gandi	*Moringa oleifera*
Zuwo	*Celtis integrifolia*

1. K = Kanuri

APPENDIX D: USES OF WILD RESOURCES AND PRODUCTS, ADIANI

	RESOURCES & PRODUCTS	FEED	FOOD	MEDICINE	SPIRITUAL	FUEL	CONSTRUCTION	CRAFT	CULTURAL	AGRO-CHEMICAL	INDUSTRIAL
1	NANLE (LEAVES)							+			
2	BAHAMA GRASS (WHOLE SHRUB)	+									
3	FARIN KAYA (GUM)										+
4	KADU (STEM)							+			
5	KATSARI (STEM)	+			+						
6	YAADIA (LEAVES)		+								
7	IDON ZAKARA (WHOLE SHRUB)				+						
8	GADANA (WHOLE SHRUB)	+									
9	BURUM KIYO (WHOLE SHRUB)	+									
10	YAKUNAN KWADO (LEAVES & CAMBIUM)		+					+			
11	ACACIA ALBIDA (FRUIT & STEMS)	+									
12	RUMBU (LEAVES)			+							
13	YARYAD (WHOLE SHRUB)	+									
14	LALO (LEAVES)		+								

	RESOURCES & PRODUCTS	FEED	FOOD	MEDICINE	SPIRITUAL	FUEL	CONSTRUCTION	CRAFT	CULTURAL	AGRO-CHEMICAL	INDUSTRIAL
15	JI JI (RHIZOME)							+			
16	GUDE (LEAVES)	+									
17	DAMA (LEAVES)				+						
18	WATER MELON (FRUITS)	+	+								
19	GASIA (LEAVES)			+							
20	ZOGALE (LEAVES)		+								
21	CALOTROPIS (STICKS & LEAVES)						+	+			
22	MAZAMFALI (LEAVES & ROOTS)				+						
23	KALGO (ROOTS, BARK/LEAVES)	+	+			+		+			
24	COWDUNOS (LEAVES)				+						
25	MANRIO (LEAVES)	+	+								
26	KANSHIN GOBA (LEAVES)	+		+							
27	MAGARIA (LEAVES, STEMS & FRUIT)	+	+	+							
28	KUKA (LEAVES,FRUITS& CAMBIUM)		+					+			
29	JIMA (GRASS)						+				

	RESOURCES & PRODUCTS	FEED	FOOD	MEDICINE	SPIRITUAL	FUEL	CONSTRUCTION	CRAFT	CULTURAL	AGRO-CHEMICAL	INDUSTRIAL
30	KAI DA JINI (LEAVES & STEMS)			+				+			
31	GABARUWA (LEAVES, STEMS & FRUITS)	+					+				
32	KAKKARA (LEAVES & GUM)				+	+					
33	TAPASA (LEAVES)		+								
34	NEEM (LEAVES, FRUITS & STEM)		+	+		+	+				
35	DOUM PALM (LEAVES, FRUIT & STEM)		+	+		+					
36	JARHUN (FRUITS & STEM)		+					+			
37	ACACIA SENEGAL (GUM, STICK & BARK)					+		+			
38	DAZURO (STEM)			+							
39	GANU (STEM)		+								
40	DUNDU (FRUITS & STEM)			+	+		+				
41	TABILA (FRUITS & LEAVES)		+								
42	Aduwa (FRUITS, LEAVES & STEM		+			+		+			
43	AZAMAN (ROOT)			+							
44	KISKA TAKANDA										

	RESOURCES & PRODUCTS	FEED	FOOD	MEDICINE	SPIRITUAL	FUEL	CONSTRUCTION	CRAFT	CULTURAL	AGRO-CHEMICAL	INDUSTRIAL
	(LEAVES)										
45	ITACE DA NONO (STEM)						+				
46	NGAA (LEAVES)	+									
47	ANOLOTICA (LEAVES)	+									
48	GIYAYYA (ROOT & STICK)			+		+	+				
49	SHIRINYA KIRINNYA (LEAVES)	+									
50	TSINTSIYAN MAZA (STEM)						+				
51	BAGARUWAN KAR (LEAVES)			+							
52	MATSATSAGI (LEAVES & BARK)	+				+		+			
53	ALBASAN KWADO (ROOT)			+							
54	HANKUFA (LEAVES)			+							
55	MAGARYAN KURA (FRUIT)	+									
56	MIRIK (LEAVES)				+						
57	DINYA (FRUITS & LEAVES)		+								
58	DALA DUNOWA (FLOWERS)									+	
59	DASHI (STEM & CHARCOAL)			+			+				
60	KATAKKARA			+			+				

	RESOURCES & PRODUCTS	FEED	FOOD	MEDICINE	SPIRITUAL	FUEL	CONSTRUCTION	CRAFT	CULTURAL	AGRO-CHEMICAL	INDUSTRIAL
	(BARK & STEM)										
61	DAKWARA (GUM)										+
62	BADO (FRUITS)		+								
63	BAYA (SEEDS)		+								
64	BUNSURUN FAGE (LEAVES)				+						
65	NGIDIDO (LEAVES)		+								
66	DANIYA (FRUITS & LEAVES)	+	+								
67	KANYA (FRUITS)	+	+								
68	SHINKAFAL FALKO (GRAINS)		+								
69	ZUWO (LEAVES)	+									
70	GANU (FRUITS & LEAVES)	+									
71	FAMZUWU (LEAVES & STEM)	+									
72	NGIJIGA	+									
73	FISH		+								
74	HONEY BEE		+								
75	POTASH	+	+	+					+		
76	CLAY							+			

Note: See Appendix D for a glossary of botanical names

APPENDIX E: WEALTH RANKING IN ADIANI

Wealth ranking was conducted with the Adiani and Gwaiyo communities in order to gain an understanding of the differences between socio-economic groups within the village and to learn about important determinants of well-being and poverty in the village. It is important to point out that discussions with informants focused more on the relative well-being of the different households within the ward, and not absolute measures of wealth or how much money each individual had. The results of the wealth ranking were also used later on to guide the selection of a series of interviews to discuss the different extent to which wealthier and poorer households use wild resources, both as a source of food and a source of income.

Adiani

To carry out the wealth ranking, three wards were chosen by the *Bulama*, to represent the 18 wards in the village. These were the Kuka Zaila ward, the Margadu Zaila ward and the Nasardi ward. The process followed in each ward was broadly similar. The team discussed the concept of well-being in Hausa and/or Kanuri with each ward head and his elders. Each household name was written on a separate card and the cards given to the villagers to compare. The elders categorised the households into different socio-economic groups in each ward. In two of the wards, the cards were then shuffled and the ranking conducted with other groups within the ward, for example women and young men. In Nasardi ward where the *Bulama* was the ward head, he was unwilling for his views to be compared with anyone else's, so the ranking of that ward represents the opinion of the *Bulama* and elders only. The results of the wealth ranking in each ward are presented in Tables E.1, E.2 and E.3.

The wealth ranking from Margadu Zaila and Kuka Zaila wards revealed similar determinants of well-being including access to farming resources, such as mechanised traction, hired labour and land, cattle, large families and the ability to assist others. At the other end of the spectrum, the households in the lowest groups had little or no farmland, were dependent on hiring their labour and reliant on alms from richer households. The wealth ranking conducted by the *Bulama* in Nasardi ward revealed differences in his opinion of what determined better-off households. An additional important determinant of well-being in Nasardi ward was the influence of the household head in decision-making within the village. The poorest had no say in village decisions at all.

Between one-third and two-thirds of households in the three wards were considered to be among either the lower middle or lowest groups. In all three wards, the households in the lowest groups tended to be very small, and often headed by the very elderly who were too frail to farm. Overall, the results of the wealth ranking suggest that there is a significant proportion of households existing in poverty without either the access to farming resources or the ability to farm.

Table E.1 **Wealth Ranking in Margadu Zaila Ward**
Elderly men, young men and elderly women, Adiani, July 14th 1995

Group	Number of households	Characteristics of Households
Highest socio-economic stratum	17	People in this category can feed themselves year round; they produce a surplus; most of the men have been to Saudi Arabia for pilgrimage; they have large families; practice mechanised or semi-mechanised farming and earn an income from leasing their agricultural machinery; and possess livestock. The traders of the village are in this group.
Middle	24	People in this category can feed themselves year round but do not produce a surplus; a few practice mechanised farming with hired machinery.
Lower-middle	32	People in this category do not produce enough food to feed themselves year round; they live from hand to mouth; they constitute the major source of hired labour in the village.
Lowest	8	Most people that fall in this category are dependent on either the richest or the rich to feed them; most are old and weak.

Table E.2 **Wealth Ranking in Kuka Zaila Ward**
Elderly and young men, Adiani, July 14th 1995

Group	Number of households	Characteristics of Households
Highest socio-economic stratum	11	Both the elderly and youth agreed that this group have large farmlands, can afford mechanised farming and can hire labour. They own many cattle and small ruminants. Most of them are traders and have large families. They decide on all matters in the ward.
Middle	9	It was also agreed that this group are second to the rich in terms of farmland and livestock; they can afford mechanised farming to some extent; they produce enough food for the year and produce enough surplus to sell.
Lowest	13	This group has small or no farm land. They are the labourers and earn the least income in the ward.

Table E.3 **Wealth Ranking in Nasardi Ward**
The *Bulama* and elders, Adiani, July 14th 1995

Group	Number of households	Characteristics of Households
Highest socio-economic stratum	11	This group have all life's essentials, livestock, ample farmland; they can afford to hire labour and practice mechanised farming. Their consent is always sought in determining the crucial issues of the ward.
Middle	27	This group closely follow the rich group in terms of farmland and livestock. They can afford a smaller degree of farm mechanisation. They do not have enough capital for business.
Lowest	21	This group has the least in the ward: they cannot afford mechanised farming; they are used as labourers; they have small or no farmland; they have no cattle although some may have a small number of small ruminants and/or poultry; they fetch firewood from the bush. They have no say in village affairs.

Gwaiyo
Two out of the five wards in Gwaiyo were selected for wealth-ranking. The process followed was similar to that in Adiani except the households from the two wards were combined together. The informants were two young men and one elder. The total of 79 households in the two wards, Karin Afso and Karin Asi, were grouped together since the informants were familiar with all households.

The wealth ranking exercise resulted in the identification of four socio-economic groups: the low, middle, higher and highest (Table E.4). The numerical distribution of households in each socio-economic group is also indicated. The criteria used by the informants were similar and reflect the amount of land cultivated, the relative self-sufficiency of the households in terms of food and the extent to which the households support others.

Most of the households in the two selected wards fall into the middle group while only about a third of them can be classified as in the higher socio-economic group. These households tend to supplement their farming income with other activities such as fishing, trading and/or animal rearing. The lower and middle groups may often include households whose members are very old and/or disabled, meaning that it is difficult for them to make a living even from farming or fishing.

Table E.4 **Wealth Ranking in Karin Afso and Karin Asi wards, Gwaiyo**
Two young men and one elder, July 14th 1995

Socio-economic Group	Number of Households (Total = 79)	Description of Criteria
Lower	21	Households which can barely feed themselves and often require assistance from others
Middle	33	Households which generally have enough to feed themselves but little surplus
Higher	17	Households which can cultivate a lot of land and have surplus income/food for dependants
Highest	8	Households which have animals, cultivate large amounts of lands and have many others dependent on them

APPENDIX F: THE WORKSHOP

F.1 Workshop Process

The study of the hidden harvest from the Hadejia-Nguru Wetlands was conducted during a three-week workshop in July 1995. The objectives of the workshop were two-fold, firstly to assess the economic role of wild resources to the communities of the Wetlands and secondly, to strengthen the capacity of a group of professionals working in the Hadejia-Nguru Wetlands to conduct resource valuation within local communities, using participatory research methods.

The workshop was structured around five phases which alternated between office-based training, research planning and reviews, and village-based practice, experience and learning. Table F.1 outlines the processes followed during each phase of the workshop.

While it will take some time following the study to assess to what extent capacity has been strengthened, initial indications, including the various forms of evaluation undertaken (identification and subsequent review of expectations; general concluding discussion about success of workshop; and forms completed by participants both at the end of the workshop and six months later), point to a number of ways in which the capacity of individuals to undertake local level resource valuation was strengthened. Specifically, the participants gained

- initial exposure, experience and understanding in using PRA techniques, including both the confidence and desire to use them again;
- increased understanding of economic concepts and means of assessing the economic importance of resources;
- experience in working as a research team, pursuing a common goal or question; and
- interest and understanding of the role of wild resources in local livelihoods.

The collaborating organisations hope that participants will initiate further studies on the economic importance of wild resources in the Wetlands, either individually or collectively (depending on the availability of funding).

In addition to strengthening research capacity, the participants from organisations involved in undertaking extension activities in the Wetlands expect to see improvements in their work as a result of these skills and experience gained through the study. Thus, the PRA techniques and economic tools learned can be applied to contribute to the improved identification and formulation of interventions by organisations working with communities in the Wetlands.

F.2 Lessons

Working towards the dual objectives of training and research during the course of the workshop provided a wealth of experience both for the participants and the resource people. Key lessons have been distilled from this experience, which it is hoped will be useful to future workshops, in particular those which combine training with research.

Table F.1 Summary of the Workshop Process

	Workshop Objective: Assessing the role of wild resources	Workshop Objective: Capacity Strengthening
Phase 1: Introduction **4.5 days**	• Presentation of 'Hidden Harvest' concept • Discussion and identification of research questions • Selection of research techniques	• Introduction to economic concepts • Introduction to PRA concepts and techniques; presentation of examples of research using PRA techniques; class exercises to practise techniques
Phase 2: Initial Appraisal **3.5 days**	• Established rapport with the communities • Identified a range of wild resources, their uses and users	• Practised communication skills and building rapport • Used PRA techniques in 'real life' situations • Learnt from mistakes and how to cope with new and awkward situations • Practised/learnt how to undertake team research work
Phase 3: Interim Review **2.5 days**	• Reviewed initial appraisal - discuss and analysed which resources are important and why • Selected specific wild resources for focused appraisal • Identified relevant information from initial appraisal • Planned how to answer research questions	• Reviewed lessons learned; benefit from team experiences • Gained experience writing up findings • Developed analytical skills • Developed research planning skills
Phase 4: Focused Appraisal **5 days**	• Built rapport with communities • Used combination of PRA and economic techniques to investigate research questions • Constant review of research questions • Presentation of interim findings to community	• Developed communication skills; utilised wide range of PRA techniques; opportunity to practice the lessons learned from the initial appraisal • Gained experience with PRA • Learned about economic values; gain experience collecting price & quantity data.
Phase 5: Closing Review **2.5 days**	• Collated and analysed information; answer research questions; calculated economic values; report writing. • Agreed on follow-up procedure • Evaluated research objectives	• Reviewed experiences with new skills • Developed analytical skills; learnt how to calculate economic values; gain experience in report writing • Considered how new skills can be used in future • Evaluated workshop

- The dual objectives of training and research are complementary in the important sense that the training provides a forum for the team to develop a common understanding of the research. They also involve a trade-off in the decision-making within the group. As achieving the training objective required a fair amount of learning-by-doing, a certain level of error was helpful to the

learning process. The research objective, however, required a balance between the benefits of learning from mistakes and the research imperative to undertake the highest quality investigation possible within the time constraints of the study. To a certain extent, the balance favoured the training objective.

- The workshop provided a forum for learning on many fronts. The *Hidden Harvest* concept involves PRA, economics, local knowledge and customs, and conducting research from the inception of the research questions through to their analysis. The planning of future workshops which aim to achieve training and research would benefit from devoting the emphasis of training not only to PRA concepts and methods, but also to research procedures and to other more specific issues as required, for example, economics in this case.

- Sequencing and timing proved of critical importance to the research and training aspects of the workshop and to the team. Careful sequencing allows preparation of each research tool, subsequent learning about the findings and process of each tool, review and 'logical' progression to the next tool. Until the team feel confident about the research and the research tools, they can be unwilling to adapt and review the plan, and sequencing can become rigid. Future training and study workshops could provide more encouragement to participants to review the sequencing of their study on an ongoing basis, eg. at the end of each day. This would re-enforce the flexible nature of participatory research.

- Although, the majority of the team were familiar with both the languages of the Wetlands and the protocol that is expected when strangers visit village communities, the need to use the new skills learnt put strain on the communications between the team and the community during the initial appraisal. This manifested itself during 'start-up' of each new research technique as the team were trying to build up their confidence. In general, after clarification of the objectives of each technique and encouragement from the trainers, the team were more confident and communications with the community became more forthcoming. This delay should be incorporated into workshop planning.

- The team did became increasingly confident throughout the focused appraisal and enjoyed using their new communication skills with the communities. Overall this was very positive, although there were certain drawbacks at the final analysis stage of the workshop: the team had become overconfident in the accuracy of their findings. Those members of the team with some experience of quantitative analysis tended to ignore the 'rough and ready' nature of the quantitative findings of the focused appraisal and became engrossed in complex calculations which gave some of the study findings an appearance of detailed precision. The time constraints at the end of the workshop meant that there was little time to go through each team member's analysis with them and re-emphasise the issues of spurious accuracy and optimal ignorance. This issue clearly needs to be given adequate attention throughout such a workshop.

- The timing of the workshop was tight and involved squeezing much work into short days. This had both benefits and costs. The benefits included achieving a considerable amount in a short space of time. The costs were the time and energy that were involved in the initial training and the village based appraisals. Focusing on fewer wild resources could have left more time available for analysis and review which would have contributed to both research and capacity strengthening objectives. The team were however keen to examine the a wide range of resources and the resource persons judged this to be a case where learning would take place from group decisions and their subsequent assessment.

APPENDIX G: REFERENCES

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