

# Sustainable Development: A case study of the natural resource use of Yelwa Village, Nigeria

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## List of abbreviations

SD	sustainable development
WCED	World commission on environment and development
MDGs	millennium development goals
UN	united nations
DSD	Division for sustainable development
UNPD	United nations population division
TEK	Traditional ecological knowledge
CPR	Common property resource
PPR	Private property resource
NGO	Non-government organization
WCED	World commission on environment and development
CBC	Community based conservation
CBNRM	Community based natural resource management
EKC	Environmental Kuznet's curve
SL	Sustainable livelihoods
GPS	Global positioning system
NCF	Nigerian conservation foundation
UCHEC	University of Canterbury human ethics committee
NMFP	Nigerian montane forest project
SFF	Small farms first

### List of quoted informants

<b>Code name</b>	<b>Gender</b>	<b>Approximate age</b>
K22	Female	20-30
H32	Male	40-50
E58	Male	50-60
Y91	Male	55-65
R62	Male	55-65
N15	Male	60-70
S48	Male	35-45
G87	Male	30-40
O74	Female	30-40
C57	Male	25-35
U81	Male	20-30

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## **Abstract**

The world today faces many challenges. Reducing poverty and protecting the environment are prominent amongst these challenges, and consequently both are high on priority lists for many national, international, governmental and non-governmental organizations. Since the 1980s there has been an increasing awareness that environmental protection must not fly in the face of social justice, especially in developing countries, and that a system can only truly achieve sustainability if it is socially just and economically sound, as well as environmentally secure. Likewise poverty reduction at the cost of the environment is worthless in the long term. This has given rise to much more holistic approaches to both conservation and poverty reduction policies and brought the rights of communities living in or near protected areas into the international focus. However, whether it is possible to conserve biodiversity and protect habitats successfully without undermining the livelihoods of local communities, or whether it is possible to offer development aid to an impoverished region without jeopardizing their local environment, is a question which has not been resolved.

This study approaches this debate by examining the relationship between the livelihoods and natural resources of a rural village adjacent to a forest reserve on the Mambilla Highlands in Nigeria. A mixture of qualitative and quantitative techniques were employed during five months spent living on location to develop a picture of the situation as it currently exists, the environmental effects of development in the village to date, and the effects of these environmental changes on people's livelihoods.

Based on this research this thesis concludes that development in a region certainly increases the vulnerability of the environment. However, rather than concluding that this makes development and environmental protection conflicting agendas, this thesis argues that this period of vulnerability presents opportunities to develop true sustainability, as effective sustainable practices can develop from the experience of resource depletion. Additionally, examples of how knowledge sharing and dialogue between western scientists and indigenous communities has the potential to facilitate and accelerate this process are discussed.



## **Acknowledgements**

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I would, of course, like to thank my supervisors, Nicole Gombay and Hazel Chapman for their guidance in this project. For financial assistance I would like to thank the Laura J. Clad trust for their funding, and the Nigerian Montane Forest Project (NMFP) for contributing many vital resources while I was living in Yelwa. I would also like to acknowledge Andrew Barnes, Delyse Campbell, Dayo Osinubi and Charles Nsor (fellow students conducting ecology research in the Ngel Nyaki forest reserve near Yelwa and part of the NMFP) for much needed perspective on problems encountered during fieldwork. My most heartfelt thanks, however, go to my partner, Martin Korndoerfer, for still being with me despite the horrible person I turn into under stress, and for his unfailing support and belief in me throughout the thesis writing process.

# 1. Introduction

*“There is a sufficiency in the world for man's need but not for man's greed.”* Mahatma  
Gandhi

For the foreseeable future the species of *Homo sapiens sapiens* is restricted to the planet earth, and the earth predominantly constitutes a closed ecosystem. It receives only solar radiation and the occasional piece of space debris from outside. All other resources are finite in supply. From this limited pool of resources all individuals, both future and present, must draw (Solow, 1974, Braungart et al., 2007). In the world today the amount of resources consumed by individuals from different regions varies extensively: a small percent of nations over a small period of time are consuming a disproportionately large percent of the world's resources (Wackernagel et al., 1999, Shiva, 2000, Rees, 1992, Kendall and Pimentel, 1994).

A rapidly increasing global population exacerbates the problem of environmentally unsustainable consumption. At the onset of the 18<sup>th</sup> century the global population is estimated to have been around 800 million, while today the world holds in excess of six billion people, and by 2050, even assuming a general decrease in the global fertility rate, the population is estimated to reach nine billion. If the current population growth rate remained constant the global population in 2050 would be 13 billion. In 2004 95% of population growth was in developing countries. By 2050 all population growth is expected to be in developing countries, while the developed world goes into population

decline (United Nations Population Division, 2005).

This phenomenal population growth as well as the growth of consumerism and industrialism has put many natural resources under severe strain. Without delving into debate about the intrinsic value of species diversity, human life and the quality of human life is unequivocally intertwined with both the resources available on earth and the general health of the planet. This is true for humanity in general, but for people living subsistence lifestyles in rural areas of developing countries the effect of depleted and damaged natural resources is direct and unbuffered by protective institutions (such as the export of contaminants, import of goods, insurances and social security systems). Therefore the consequences of unsustainable living can be immediate and powerful.

Costenza *et al.* (1998), estimated the value of the services<sup>1</sup> that ecosystems provide for all of humanity to be in excess of 33 trillion US dollars in value (at the time of their study the economic global net productivity was 18 trillion US dollars). Some of these services are more applicable at a local level (such as waste treatment and nutrient cycling). However, for other ecosystem services there is no greater benefit to those living in proximity to the ecosystem which provides the service than to those living elsewhere on the planet (for example atmospheric regulation). Many natural resources of the 'old world' have already been consumed or converted to other purposes. For example most of Europe's forested areas have already been converted to agriculture. This historical

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<sup>1</sup> Such as the regulation of atmospheric systems, the hydrological cycle and stabilizing the chemical composition of the atmosphere as well as water purification, nutrient cycling and waste treatment

use has facilitated the 'developed nations'<sup>2</sup> becoming 'developed' today, while the forests that have continued to exist in undeveloped regions of the world have provided ecosystem services (such as atmospheric regulation) that have essentially enabled the western world to 'have their cake and eat it too'.

To be fair, at the time of European expansion the *global* environmental consequences (for example global climate change) of practices such as deforestation were not known, and since the 19<sup>th</sup> and 20<sup>th</sup> centuries many European countries have annually achieved more reforestation than deforestation (Mather, 2001). However, the undeveloped world is still paying the environmental bill for the lifestyle of the developed by providing agricultural and other natural resources (such as minerals and oil) to support the consumption of the western world (Shiva, 2000, Rees, 1992). Thus the developed countries are able to convert their now-redundant farmlands back into forests, and abstain from highly polluting activities such as manufacturing and mining while still enjoying the consumables that require these environmentally damaging processes.

The social injustices incurred in the current resource use and access system mean that the majority of natural resource wealth is skimmed off by developed nations, while the

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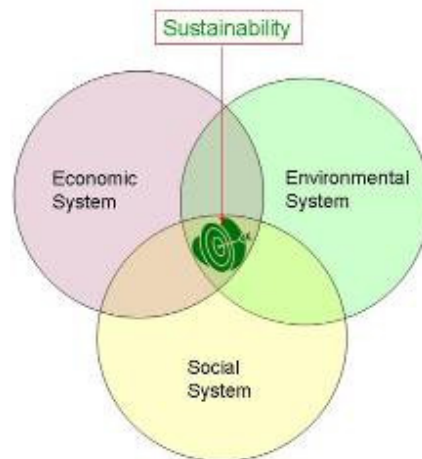
<sup>2</sup> As will be discussed further in section 2.2 The terms 'developed', 'undeveloped' and 'developing' are politically loaded terms, In this thesis 'developed' is henceforth used to mean industrialized, likewise undeveloped to mean unindustrialized.

majority of these resources are extracted in developing countries. This leaves the developing nations with the double burden of degraded local environments and poverty. In addition, it is predicted that global climate change will have a stronger effect on the world's poorer countries (as a result of both their geographical location and lack of national reactive ability<sup>3</sup>) (Mendelsohn et al., 2006). Ironically enough, environmental conservation efforts have commonly exacerbated the burden of poor rural communities by restricting their access to the very resources they are dependent on, or by limiting their ability to take the steps needed to lift themselves out of poverty (Salafsky and Wollenberg, 2000). Conversely, development in a region often leads to increasing pressure on natural resources (Scholte, 2003). Thus in many instances global efforts to address environmental concerns have been in conflict with efforts to reduce social problems such as poverty. Both poverty alleviation and environmental protection are highly topical issues in the industrialized world (Rogin, 2006). While historically they have been considered in isolation, there is a growing awareness that they are inter-related issues. The concept of sustainable development (SD), which integrates environmental protection and poverty alleviation has arisen to replace environmental protection and poverty alleviation enacted in isolation from each other.

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<sup>3</sup> National reactive ability includes national emergency and disaster management policies, governmental subsidies, disaster warning systems and public education. An example of the difference in the magnitude of a disaster that national reactive ability can make is to compare the effects of Hurricane Katrina in New Orleans (in the United States of America) verses Cyclone Nargis in Myanmar.

2005 marked the beginning of the United Nations Decade of Education for Sustainable Development (2005-2014), and, schools, businesses, governments and government organizations the world over are reviewing their existing policies and developing new policies to make themselves more sustainable, but what is sustainability? The *word* 'sustainability' simply means the capacity to endure, however the *term* 'sustainability' has come to mean much more than that. Frequently 'sustainability' is used in lieu of the more descriptive term 'sustainable development', although it is also used to refer to sustainability of a specific system, for example 'environmental sustainability' or 'economic sustainability'. The concept 'sustainable development' includes three of these subcategories of sustainability within it: social, environmental and economic (as depicted below in Figure 1). It aims to *"meet the needs of the present without compromising the ability of future generations to meet their own needs"* (WCED, 1987 p.8) in respect to all three of these systems.



**Figure 1 The sustainability framework**

The philosophy of 'sustainable development' therefore holds that it is impossible to achieve sustainable environmental protection while ignoring economic viability and social justice, and likewise a socially and economically equitable system is only sustainable when it is also environmentally sound. Throughout this thesis, when the word 'sustainability' is used without reference to a specific system; it is this holistic definition of the term which is intended. When using this holistic definition to review the current global situation it is apparent that the current status quo is unsustainable. Environmentally, all across the world anthropogenic environmental degradation abounds outside of isolated areas of environmental protection, as well as the highly publicized issue of rising atmospheric CO<sub>2</sub> and climate change (Weart, 2003, Leiserowitz, 2007). In the words of the poet Robert Lynd:

*There is nothing in which the birds differ more from man than the way in which they can build and yet leave a landscape as it was before.*

Economically and socially the situation does not look much better. The unsustainability of the current economic system has been demonstrated by the recent advent of a global financial crisis (Lash, 2009). Neither can the world be considered socially just (and therefore sustainable), when over three billion people live on less than USD2.50/day, and (20%) of the world's population own 80% of the world's financial assets (World Bank, 2008). While the dollars-per-day measure of poverty has received considerable

criticism<sup>4</sup> (Reddy and Pogge, 2003, Chambers, 1995), this disparity demonstrates that the world cannot be considered socially just. Thus, as well as striving to achieve environmental and economic sustainability out of an interest in self-preservation, the collective sense of social responsibility of the developed nations has resulted in initiatives aimed at addressing social justice issues and lending assistance to the developing world. The first of the Millennium Development Goals (MDGs): to eradicate extreme poverty and hunger, is a clear statement of these intentions.

Another of the MDGs is to ensure environmental sustainability (UNDP). As discussed previously, however, historically strategies aimed to promote development were often environmentally destructive (Oats, 1999). Environmental protection, likewise, has also frequently been enacted in such a way that it perpetuated social injustices and undermined the economic assets of the world's poor (Siurua, 2006, Brandon and Redford, 1998). An example of this is the 'fortress conservation' model which relies on the creation of protected areas<sup>5</sup>. This visually descriptive term describes the type of conservation project where humans are excluded from areas of land which are set aside for the protection of nature. In developing countries this frequently involves the forced relocation of communities from their homes and deprives them of their livelihoods. Thus, according to the three-fold definition of sustainable development, many environmental protection initiatives cannot be considered sustainable, and neither can strategies that

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<sup>4</sup> More holistic means of understanding poverty are discussed in section 2.3

<sup>5</sup> This is discussed further in Chapter 2



promote human wellbeing at the expense of the environment. It is from the recognition of this problem that combined approaches to conservation and development, such as sustainable development, have arisen. The United Nations (UN) department of economic and social affairs (division for sustainable development) website describes sustainable development thus:

*Sustainable development requires the integration of its economic, environmental and social components at all levels. This is facilitated by continuous dialogue and action in global partnership, focusing on key sustainable development issues (DSD, 2009).*

As well advocating a holistic, three-fold approach to sustainability, this definition brings in a new aspect of sustainable development: the importance of dialogue and partnership in addressing development issues. This concept of cooperation and dialogue is central to this thesis, as I began it with an interest in the relationship between poor rural communities and western environmentalism.

Stereotypes like the 'noble savage' (which portrayed indigenous communities as natural conservationists) conflict with others such as the 'wastrel' stereotype (which typecasts indigenous communities as environmental vandals who will destroy their own environment unless prevented) (Berkes, 1999) compete in the psyche of both popular and academic western opinion. Conservation and development initiatives are influenced by this subconscious stereotyping, and in order to enter into effective partnership with local communities and have coherent dialogue (as is stated as necessary in the UN

definition of sustainable development) these stereotypes need to be overcome and a new way of thinking developed to replace them. I began my investigation into this issue by focusing on rural livelihoods and the relationship between a rural village in Nigeria<sup>6</sup> and its natural resources by means of a case study. Three key questions guided the research process:

1. Are livelihoods in this village directly dependant on natural resources?
2. If so, are these resources threatened by human use?
3. How would people's lives be affected if the natural resources identified were no longer available?

I found that people did indeed rely on natural resources to meet many of their needs, many of these resources were threatened, and there were numerous significant ways in which people's lives would be affected by their loss. What I also found was that the nature of the relationship between the community and their environment was in rapid transition and constant flux. This constant adjustment is the result of social, economic and environmental changes to which the community is continuously adapting. This process is incredibly complex and a full exploration of its dynamics is outside the scope of this thesis. However, there are two transitions of fundamental importance to this research. The first is from a natural resource dependant subsistence community to an

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<sup>6</sup> Nigeria is a country with an extremely high population growth, poor infrastructure, conflict over resources and many other issues typical of developing countries.

industrialized community where reliance on natural resources is less apparent. The second transition is from a small population living at low density to a large, fast-growing population, living at a high (and continually increasing) density.

During this transition the environment, social and economic wellbeing of the community are particularly vulnerable (as this thesis later demonstrates). However, this time of change also presents an ideal opportunity to employ the strategies of dialogue and partnership that are advocated in a sustainable development approach, as the community experiments with adapting traditional livelihood strategies to new circumstances, and outside knowledge is being sought and incorporated into these livelihood strategies.

### **1.1. The study site**

Nigeria's population growth is extreme, even by the standards of developing countries. In 2005 Nigeria's overall population density was 151 people/km<sup>2</sup>, with 140,000,000 inhabitants in total (UNPD, 2009). According to the UN Population Assessment, between 1950 and 2050 the Nigerian population will have undergone a 10-fold increase (Fischer *et al.*, 1997). Thus Nigeria is undergoing many issues as a result of this high and rapidly growing population. The Mambilla<sup>7</sup> plateau region of Nigeria, where this case study is situated, is a particularly desirable location for both agriculture and raising cattle because of its cool climate, high rainfall, and the absence of tsetse fly (which is

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<sup>7</sup> Alternatively spelled Mambila

responsible for trypanosomiasis in cattle) (Frantz, 1981, Hurault, 1998). Thus it has received even higher population growth than the Nigerian average. This region is the highest in Nigeria, with the average altitude around 1600 metres (Hurault, 1998). The original inhabitants of the region are the Mambilla people, a group of tribes which share a common language base, although each tribe has a unique dialect. The Mambilla people have traditionally been subsistence farmers. Most of the plateau is hilly, and thus from evidence of terracing (necessary for farming steep slopes) on hillsides of the plateau it has been estimated that prior to the 19th century the Mambilla population of the plateau ranged from 150 inhabitants/ km<sup>2</sup> in the most uneven regions to 250 inhabitants/ km<sup>2</sup> in the more suitable areas bringing the total population of the plateau to close to one million people. Throughout the 19th century, however, numerous slave raids were conducted in the region by the Fulani (a North-African tribe of pastoralists) and thus by 1930<sup>8</sup>the indigenous population of the plateau was reduced to approximately 10 000 in total, due to both the raids themselves and venereal diseases that were introduced into the community as a result of the raids (Hurault, 1998).

From 1908 until the end of the First World War Germany occupied the region and consequently the slave raids were stopped (although venereal diseases continued to spread). Following the First World War the German administration of the region ended and the British took over the role. At this stage several population censuses were conducted, the most accurate of which is deemed to be from 1930. This reported the

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<sup>8</sup> The date of the first approximately accurate population census undertaken in the region

population to be just 16201 people in total, with 42% of the population children under the age of 18, (which suggests that the population was already growing). This is approximately 1/50 of the estimated population one century earlier. From the 1930s throughout the remainder of the 20th century the population continued to grow, most significantly through the immigration of other ethnic groups (including the previously mentioned Fulani as well as other agricultural tribes such as the Kaka and Tigong). Because of this the population of the Plateau is ethnically highly diverse, and people will therefore commonly identify primarily as either a member of one of the agricultural tribes (which include the Mambilla, Kaka, Tigong, Tiv, Ndoro, Panso, and Kambu) or a pastoralist (predominantly the Fulani).

Initially peaceful relations with the Fulani were welcomed by the Mambilla and other agricultural tribes, who sold surplus grain to the Fulani and bought milk in return (Rehfish, 1962), however as the population continued to grow (the in-migration of Fulani forming a large part of the overall growth) a land shortage ensued.

The Fulani had access to greater wealth and used this to influence local political decisions regarding land allocation, and soon procured grazing rights to most of the arable land of the plateau. This resulted in the Mambilla and other agricultural tribes suffering from lack of sufficient farmland. When complaints were filed by the members of the Mambilla and other agricultural tribes they were either stopped by doorkeepers or rejected by corrupt tribunals, and, once the pastoralists could prove that they had occupied their farmlands for over 10 years their ownership became valid through national law (Hurault, 1998). Land ownership is still a highly contentious issue on the

Mambilla Plateau, and these inter-tribal tensions have escalated into violence, most recently in 2002, and many people fear that another outburst of violence is imminent.

I undertook research in the village of Yelwa, a small village of mixed ethnic groups, although the two main groups are Mambilla and Kaka. Prior to 1971 this village was known as *Ngel Nyaki*, and was located inside a forest several kilometers from its current location amid grasslands. This relocation was because the forest in which it was located became a protected area<sup>9</sup>. The reserve then continued the name '*Ngel Nyak*', and the new settlement came to be known as '*Yelwa*' which means '*New*' in the common tongue of the region. This relocation was semi-voluntary, as the *Jauro*<sup>10</sup> ordered the move, but only when the government threatened to settle another village at the site which is now Yelwa, and make the *Jauro* of the new village senior in political power to the *Jauro* of Ngel Nyaki. Since then the village has grown from the 16 families who comprised the original settlement to approximately 450 families who now live in Yelwa.

Yelwa was chosen as the site of this research for several reasons. Firstly, its proximity to the reserve and association with projects by various environmental organizations has resulted in rapid development in comparison to other villages in the region. This rapid development meant that changes would be easier to document, as more changes would have transpired within the lifetime of people I could talk to. Secondly, its relocation from

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<sup>9</sup> As discussed previously on page 15 and in chapter 2 to follow.

<sup>10</sup> Village head-man or Chief

within the reserve gave a clear division of its history as well as a common reference point for comparison when talking with informants who otherwise had difficulty recalling home many years ago a particular event transpired. Thirdly, it is an example of a situation where multiple user-groups compete for land use—in this case the indigenous agricultural tribes, the pastoral Fulani, and conservation organizations. And finally because it is relatively close to the Nigerian Montane Forest Project (NMFP) field station from which my husband based his research, which made it possible for me to spend an extended period of time on fieldwork.

## **1.2. Thesis structure**

In chapter 2 I review literature relevant to the issues affecting sustainable development in rural villages in the developing world (such as Yelwa). Chapter three outlines my methodology and methods, including ethical issues, translation issues, and my own research positionality. In chapter 4 I explore common property natural resources in respect to my three central research questions, and begin to demonstrate how, during the transition from traditional to modern society, both the community and the environment are vulnerable, but also that it is only through this experience of vulnerability and resource depletion that it is possible to develop true sustainability. Chapter 5 continues to demonstrate these points as they relate to privately owned resources, and gives examples of opportunities for sustainable development based on dialogue and knowledge sharing. Chapter 6 concludes this thesis by demonstrating how the findings of chapter 4 and 5 relate to community development and environmental

protection work.



## **2. Literature review**

Because of the holistic nature of sustainability it is challenging to impose limits on the scope of literature reviewed. I have therefore developed this chapter around three themes: livelihoods, development and resilience. Understanding the multiple dimensions of poor peoples' livelihoods, how development has affected these livelihoods, and the resilience of both the community and the environment are essential to assessing the sustainability any further development.

### **2.1. Livelihoods**

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. Ellis's definition of livelihoods is commonly referenced. He defines livelihoods as:

*“the assets (natural, physical, human, financial and social capital), the activities and access to these (mediated by institutional and social relations) that together determine the living gained by the individual or household.”* (Ellis, 2000 p.10)

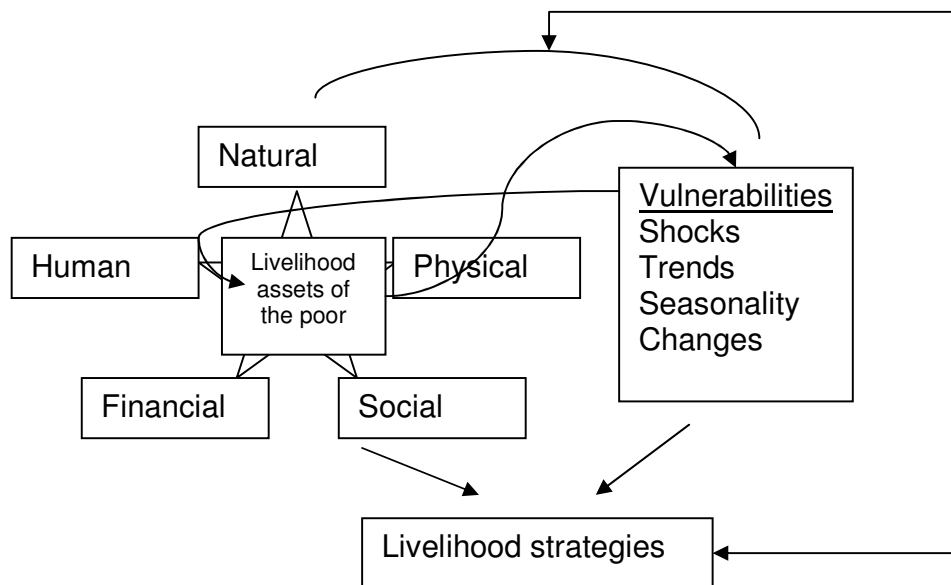
Financial capital is easily defined. It includes cash savings and liquid assets (for example livestock) as well as credit and access to loans. However the differences between physical capital and natural capital, as between human capital and social capital are less intuitive. Natural capital includes physical natural resources (for example forest, water, land) as well as less tangible natural assets such as biodiversity, air quality, and erosion control. Physical capital includes infrastructure that may supplement

these assets, such as fences, roads, and a means of accessing water, as well as other physical resources such as buildings, transportation and technology. Human capital includes skills, knowledge (including traditional ecological knowledge (TEK)), education (formal and informal), health and labor power, while institutions which facilitate co-operation (such as social networks and reciprocity), as well as informal safety nets and access to opportunities are classed as social capital, as the table below demonstrates.

**Table 1 The five types of capital included in the definition of livelihoods (adapted from Adato et al., 2002 p. 9).**

<b>Type of Capital</b>	<b>Example of assets which it includes</b>
<i>Natural capital</i>	Land, water, forests, marine resources, air quality, erosion protection and biodiversity
<i>Physical capital</i>	Transportation, roads, buildings, shelter, water supply and sanitation, energy, technology, and communications systems
<i>Financial capital</i>	Savings (cash as well as liquid assets) and credit (formal and informal)
<i>Human capital</i>	Education, skills, knowledge, health, nutrition, and labor power
<i>Social capital</i>	Networks that increase trust and the ability to work together, access to opportunities, reciprocity, informal safety nets, and membership in organizations

A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (Scoones, 1998, Farrington et al., 1999). The diagram below (Figure 2) depicts the linkages and feedback loops recognized in the sustainable livelihoods (SL) framework. It demonstrates with arrows the feedback loops between vulnerabilities, livelihood assets, and livelihood strategies employed by the poor.



**Figure 2 The Sustainable livelihoods (SL) framework**

The sustainable livelihoods approach has been developed as an attempt to understand the complexities of rural livelihoods, and as a framework for achieving sustainable development in developing regions. It focuses on empowering the poor through promoting their access to assets, and recognizing the diversity of livelihood strategies and paths out of poverty which are employed by the poor. It has been adopted by the majority of international development organizations (including the United Nations (UNDP, 2005)) over the last decade.

As well as employing the SL framework to understanding the importance of natural resources in people's livelihoods, in this thesis I have separated livelihood assets into two categories: *Common Property and Open Access Resources* and *Private Property Resources*. Common Property Resources (CPRs) are resources which benefit a defined group of people collectively, and to which no individual has exclusive rights. They differ from Open Access Resources in that there are social arrangements regulating the preservation, maintenance, and consumption of the resource, although this may extend only as far as restricting outsiders from access to the resource. In Open Access Systems there are no restrictions on resource use. Common Property and Open Access Resources commonly include rivers, watersheds, grazing lands, waste dumping grounds and forests (Pasha, 1992, Jodha, 1986, Ciriacy-Wantrup and Bishop, 1975). Private Property Resources (PPRs) include the resources to which individuals or discrete groups (such as a single household) hold exclusive rights. The importance of CPRs and PPRs will be discussed further in the introduction to each section respectively.

In many developing regions there are several interest groups competing for resources

(both communal and private). Local people rely on products, ecosystem services, and land in their vicinity, and their use constitutes one demand on natural resources. Companies who profit from extractive activities such as mining or logging present another, and conservation projects, (such as habitat protection) may present a third interest group (Salafsky and Wollenberg, 2000). Without an external advocate (such as a developmental or human rights orientated non government organization (NGO), or through an alliance with environmental organizations) local people are generally the most powerless of these groups, with the smallest voice (Khan, 2000, Bardhan, 2006).

Since the 1980s there have been numerous alliances of conservation organizations and indigenous communities around the world (Murombedzi, 1999, Mehta and Kellert, 2002, Western et al., 1994). The agendas of conservationists and local communities have been linked in various ways, but chiefly through identifying the benefits that local people receive from biodiversity and ecological stability (Salafsky and Wollenberg, 2000). What this wave of literature has often failed to acknowledge is that generally these benefits are only relevant for local people if they have access to that biodiversity. For example, where a community uses native forest plants for medicinal purposes, it can be pointed out that protection of these plants is important for the livelihoods of the community, but only if they remain accessible to the community. Yet on the other hand, even fortress conservation may be of immense benefit to a community within the same watershed by protecting the local water supply, as rural communities are generally dependent on locally sourced water (Kisanga, 2005).

The nature of dependence on locally sourced natural resources (such as water) is not

static, however, but changes over time. Development in a region inevitably initiates and accelerates many changes in the nature of a communities livelihoods and their relationship with natural resources.

## **2.2. Development**

The term 'development' is loaded with the ideals of the zeitgeist of the time and culture from which it is used, and has been criticized for its Eurocentric bias (Mestrum, 2003, Brohman, 1995). The concept of sustainable development (SD) now holds more appeal than development, and working towards SD frequently involves the incorporation of traditional ecological knowledge (TEK) from non-European cultures. However, although advocates of 'sustainable development' may seek to incorporate practices based on traditional lifestyles outside of the western paradigm (Kurien, 1998, Berkes et al., 2000, McGregor, 2004), the concept of SD is still grounded in the western worldview (Schech and Haggis, 2000) . So, although theoretically the word 'developed' *can* now be used to mean something other than 'like European cultures', in practice the western concept of 'development', based on western history, still serves as the model for interpreting 'development' globally.

Thus it is no surprise that, as has already been mentioned in the introduction to this literature review, for the greater part of the last century development and environmental protection were seen by aid organizations as conflicting or at best unrelated issues. Humans and nature were seen as competitors and for nature to 'win' humans had to 'loose' and vice versa. For the most part conservation was orchestrated through the

gazetting of large areas of land set aside exclusively for conservation. Local people were prohibited from entering these areas or in many cases evicted. This changed as a new school of thinking developed and became popular around the 1980s, popularized by *Our Common Future*, a report made by the World Commission on Environment and Development (WCED, 1987). The style of conservation that arose from this change in thinking was based on a decentralized organizational system for conservation, and is commonly referred to as 'community based conservation' (CBC) or 'community based natural resource management' (CBNMR). This paradigm focuses on the benefits that rural communities received from biodiversity, and advocates the involvement of the community in conservation management (Roe, 2008, Hutton et al., 2005).

As a result of this change in perception conservation and development began to be seen as two sides of the same issue. Poverty and environmental degradation came to be viewed as self-perpetuating cycles, and through concepts such as the Environmental Kuznet's Curve<sup>11</sup> development was seen as a tool for working towards environmental sustainability, rather than a competing agenda. The World Bank and other developmental organizations thus began to integrate their poverty alleviation and environmental protection programs (WCED, 1987, Bojo and Reddy, 2002). The *Third World Parks Congress* in Bali (1982) concluded that the needs of local people should be integrated into protected area planning (Adams *et al.*, 2004), and strategies with names like "conservation-with-development", "conservation-by-development", and of course,

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<sup>11</sup> Explained in the following paragraph

“sustainable development” began to emerge which reflected the alliance of development with CBC and CBNRM. Many environmentalists now also believe that greater long term success in environmental protection is possible through a united approach to conservation and development issues (Brockington, 2002) (Holt, 2005).

The environmental Kuznet’s curve (EKC) is a model which predicts first an increase and then a decrease in environmental impact resulting from development. In the initial stages of development a sharp increase is forecast based on increasing consumption, followed by a gradual decrease as technology, awareness, and greater environmental expenditure begin to take effect. Subscribers to this belief advocate that any development will eventually result in increased sustainability, and consequently that supporting development is an effective means of achieving environmental protection, or, as Beckerman puts it:

*“the best – and probably the only – way to attain a decent environment in most countries is to become rich” (Beckerman, 1992 p.491)*

While it is relatively easy to demonstrate that development can result in improved local environments, and indeed has already been discussed in chapter 1 in relation to deforestation and reforestation in Europe, it is a stretch to believe that for all countries to ‘become rich’ will lead to improvements in *global* sustainability. Nor does it even appear possible in the current model (the ecological foot-print of the world’s rich minority is 10 times that of the world’s poor majority) (Mestrum, 2003). More recent work on the EKC has mostly concurred in finding that it applies only to short-lived and local pollutants,



while stock pollutants such as CO<sub>2</sub> continue to increase with development (Priour, 2009). Development along the traditional western model may therefore remove local environmental pressures, but it cannot be purported to be the ultimate road to environmental protection. Additionally, many of the world's poorest people (and the world's fastest growing populations (Birdsall, 1980)) live in or near some of the world's most fragile habitats, as poverty forces them onto easily degraded lands (Cruz, 1992). Thus the environmental damage incurred while allowing development to find its own path to sustainable living may very likely be too profound to recover from, and consequently, by the time a sustainable system of living is achieved through development what is left may not be worth sustaining. Thus many ecologists and conservationists remain convinced that integrating conservation results in unacceptable compromises to conservation. Researchers such as Oats (1999) and Wells et al. (1992) have made a strong case for keeping environmental protection and development agendas separate, arguing that there is little evidence of successful conservation when environmental protection has been linked with community development. Others, such as Brandon and Redford (1998), add to this the opinion that environmental protection is too critical to anything but the proven strategy of protected areas to be experimented with. On the other side of that argument, however, is the fact that many poor rural communities depend on natural resources, and thus, regardless of how critical environmental protection work may be, it is socially unjust to deprive communities of the resources on which their livelihoods depend. This issue (the vulnerability of both communities and ecosystems) is discussed further under the topic of *resilience* in section 2.3, however it is clear that between these two perspectives on the

complementarity of conservation and development are many and varied opinions. In short, a wealth of evidence, both theoretical and practical, can be found either to support or ignore development as part of rural environmental sustainability, and there are ample supporters for both sides of the debate. This is succinctly summed up by Sanderson and Redford (2003 p. 389):

*“Achieving the goal of liberating half the world’s poor from their poverty by 2015 will either mark the true beginning of sustainability or the end of biodiversity at the hands of the best-intentioned policies.”*

What this thesis explores is the potential for either ‘true sustainability’ or ‘the end of biodiversity’ to result from development in Yelwa.

### **2.3. Resilience and vulnerability**

As discussed in section 2.2 , the vulnerability of the ecosystems on which many poor communities depend is fundamental to the argument for keeping conservation unimpinged by linkages with development, while the vulnerability (or lack of resilience) of poor communities is central to the argument that conservation must be adapted to take the needs of local communities into account.

The oxford dictionary defines resilience as:

*1. The ability to recoil or spring back into shape after bending, stretching, or being compressed.*

*2. The ability to withstand or recover quickly from difficult conditions*

*(Oxford English Dictionary)*

Species, habitats and ecosystems are discussed in terms of their resilience or their ability to return to their previous state after shocks<sup>12</sup>. Rather than focusing on ‘resilience’ per se, in referring to people’s ability to withstand shocks, the discussion is frequently centred on concepts such as ‘vulnerability’, or ‘vulnerability to poverty’. Although traditionally poverty has been measured in terms of income or consumption criteria, other aspects of poverty have been found to be of equal or greater significance to the people concerned (Farrington et al., 1999, Chambers, 1995). One of the aspects of poverty that the poor themselves have listed as highly important is a sense of insecurity or vulnerability. For those who are not currently ‘in poverty’<sup>13</sup> but who have vulnerable livelihoods, the possibility of descending into poverty in the future is a pressing concern

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<sup>12</sup> This includes a tendency to return to a damaged state despite intense restoration efforts. There is a large body of ecological literature dealing with resilience and ‘alternate stable states’, which is not included here, as it is of marginal relevance to this thesis.

<sup>13</sup> As defined by their income and consumption levels

(Pritchett et al., 2000). Thus, addressing vulnerability to poverty has been advocated as of more value in combating poverty than addressing poverty directly. Livelihoods which are dependant on natural resources and agriculture are highly susceptible to environmental shocks and disasters such as floods and droughts, and human disasters such as the illness, injury, or death of key providers from within a household (Blaikie, 1994). One mechanism of rural communities for coping with this vulnerability is to rely on common property resources (such as forests) as an 'insurance policy' of sorts. The use of natural, common property resources by the poorer members of a community in general, and by the whole community in times of crisis (for example droughts or crop failures) is well documented (Harris and Mohammed, 2003).

This use of non-timber-forest products in this capacity has been viewed positively by many attempting to unite conservation and development objectives. It is assumed that as stakeholders with an interest in conserving the forest, local people will be more active in its protection and less inclined to engage in environmentally damaging activities. Additionally, traditional systems of forest management for sustainable use have come to international interest (Redford *et al.*, 1996).

The other side of this potentially happy marriage of conservation and development is that the ecosystems in which the world's rural poor are living are also themselves extremely vulnerable, and host a disproportionately large number of endangered and endemic species (Kellert, 1985). Specific harvesting of certain forest products can impact on the forest structure (Arnold and Perez, 2001), and if the desired products are themselves endangered, there is a definite conflict of interest. The ability of traditional

management systems to work effectively in non-traditional situations (where there is access to the global market and a growing population) has been questioned (Kellert et al., 2000, Kramer and van Schaik, 1997, Oats, 1999). Holt (2005) counters this, proposing that in order for a society to develop a conservationist attitude it must first experience resource scarcity. In the type of community that Kellert, Krammer, van Schaik and Oats have describe as being compatible with conservation (one which is living at a low density and not experiencing population increase, uses only minimal technology, and practices a subsistence lifestyle) conservationist values are not likely to develop. As changes in demographics, economics, technology and other related factors are inevitable, sustainability based on an absence of exposure to incentives to deplete a resource is not resilient over time and cannot truly be considered sustainable. Holt argues that communities which are currently viewed by 'preservationists'<sup>14</sup> (such as those mentioned above) as the most unsuited for environmental stewardship are in fact the perfect candidates for effective partnership with western conservation biology.

My research concurs with the opinion of Holt. In this thesis I demonstrate the relationship between exposure to resource scarcity and the development of conservation awareness and environmental protection policies. Thus I believe that through effective communication and knowledge sharing, conservation and community development can be effectively partnered to promote the resilience of both the community and the environment. In chapters 4 and 5 I describe ways in which the Yelwa

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<sup>14</sup> Those who advocate complete preservation of natural ecosystems, without any human use.

community is directly dependant on local natural resources. I also discuss both the consequences of depletion of these resources, relevant aspects of the management of these resources and changes in the abundance and management of these resources that have resulted from development to date. This demonstrates the both the importance (to the community) of preserving these resources and ways in which the community has already effectively adapted their use of resources to reflect their changing demographic situation.

### **3. Methodology and methods**

#### **3.1. *Methodology***

In this research I adopted a mixed approach to data collection. I relied principally on qualitative data and personal experiences (both that of my informants and my own), which were interpreted and substantiated through comparison with published literature on similar and related topics. Quantitative data (the specifics of which are discussed in section 3.2) was also collected to build on the qualitative findings, however it remained a secondary focus of my research. This is because poverty, livelihoods, and the traditional ecological knowledge (TEK) of indigenous communities, all of which should form the bases of the dialogue and knowledge sharing called for by a SD approach (as detailed in section 2.3 and chapter 1 respectively) are very much subjectively experienced phenomena, and thus a qualitative approach is of greater relevance in interpreting and understanding these concepts than are quantitative indicators.

Additionally, rapport and trust are very important issues in any research which involves people (Glesne and Peshkin, 1992). Using qualitative methods provided greater opportunity to build trust and rapport than would have been possible if a quantitative focus had been adopted. Using qualitative methods allowed me, as the researcher, to employ open ended interviewing methods. This permitted informants to elaborate on topics that they felt were of particular pertinence to their situation, rather than following the structure of pre-prepared questions and questionnaires based on my own interpretation of the situation. I initiated the quantitative components of my research only

after rapport and trust were established. In this way quantitative data served to further elucidate areas of importance which were identified by informants through the initial qualitative research. This combination of methods served to give a holistic picture of the situation in Yelwa, in accordance with the principles of the SL framework: to understand both the financial activities and assets of people and the context in which these activities and assets exist (Adato et al., 2002).

### **Putting my perspective into perspective**

An understanding of the perspective of the researcher is always helpful in interpreting any scholarly work, particularly if it is qualitative in nature. Like my case study community I grew up in an agricultural community and tropical climate, although in an Australian context. Undeniably there are many cultural, developmental, and industrial differences between my study site of Yelwa, a rural village in Nigeria, and my own home-town in rural Australia. During my stay, however, I also came to appreciate many similarities, and these made me feel a growing connection to the community. These ranged from a pride in one's farm and skill as a farmer and the seasonality of farm work to minor scuffles between neighbors over farm boundaries.

In addition to this I am also a scientist, with a world view molded by a western education and cultural background. Before beginning this research I had never been to Africa, although I had spent time in developing communities in Asia, including rural India and Laos.



### **3.2. Methods**

Before arriving at my study site I reviewed literature extensively but developed only a loose and flexible plan for fieldwork, as due to the isolation of the study site I had no opportunity to conduct a pilot study or otherwise investigate the situation before commencing. My fieldwork was conducted over five months during which I lived in Yelwa village. My arrival (in October) coincided with the last month of the rainy season, and my stay extended until the rains commenced again in February. I chose October to February as the field season because the last months of the dry season are when resources are most likely to be under pressure, and thus dependence on 'natural insurance policies' such as wildcrafted<sup>15</sup> products were likely to be most pronounced (Harris and Mohammed, 2003).

The first month of my stay was dedicated solely to participant observation and attempting to pick up some of the language. Learning the language was more complicated than I had anticipated, as (despite its small population) there are over six different languages in use in Yelwa. The common language of Northern Nigeria (aside from the official language: English, in which proficiency in rural areas is low) is Hausa, and I initially began with this; however it soon became apparent that Fulfulde was more prominent as the common language in Yelwa, and I changed my focus. Even so, different tribes often had different ways of pronouncing their words in Fulfulde, which

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<sup>15</sup> Plants which are harvested from where they are found growing naturally, rather than cultivated for use.

prevented me from recognizing words that I had already learned from in one persons 'accent' when spoken by another person. My progress at learning the language was therefore quite limited, however the community appreciated that I was making an effort, and by the end of my stay I had achieved a level of proficiency that enabled me to carry out all the basic exchanges necessary in a day, such as greetings, commercial exchanges and generic small-talk.

After the first month of participant observation I also included more structured data collection techniques, beginning with recording formal interviews with key members of the community, and eventually included quantitative studies such as mapping the land area and location of people's farms with a hand-held global positioning system (GPS).

As already discussed, the results of this research are divided into two sections: common property resources and private resources. Common property resources which were focused on included water, building materials, firewood, and wildcrafted products. Building and renovations start each year as soon as the rainy season is finished, and thus a lot of construction was being carried out during my stay, which I was able to observe. Data on water was collected through personal experience and through informal interviews and social conversations with other households.

To investigate the extent to which wildcrafted products are used I employed a more structured data collection process, which was supplemented and substantiated by witnessing wildcrafted products in use while living in the village. Structured data collection relating to wildcrafted products was conducted through expeditions where an

informant or group of informants pointed out all materials (although this was mostly plants) for which they had a use which were neither purchased nor farmed. Groups were composed of individuals of the same gender and ethnicity. Initially I started this process asking for volunteers willing to show me their wildcrafting knowledge, but it was soon brought to my attention that the village had (as the result of some prior work by the Nigerian Conservation Foundation (NCF)) a '*chairman of medicinal plants.*' This gentleman then assisted me with organizing groups from each tribe that were willing to share their traditional wildcrafting knowledge with me. The table used to collect this data is included in appendix 1. Fifteen women and 14 men participated in this aspect of research, and for this section I also enlisted the help of a local women to act as a translator, as many of the participants in this aspect of my research did not speak English.

This assistant proved to be a double blessing, acting not just as a translator, but contributing her own TEK. Her local knowledge was invaluable in helping to identify when a plant shown to us by a new group was the same species as one already cataloged, despite changes in the plants' physiologies over the course of changing seasons and throughout different stages of growth.

Investigation of private resources also had both qualitative and quantitative components. The most tangible private resource of importance in Yelwa is farmland. To begin investigations into farmland I arranged volunteers to escort me to and around their farms, the boundaries of which I recorded with a GPS. This data was then overlaid on satellite images of the Yelwa district using *Arc GIS (Ezri)*. As many farms were over an

hour's walk from the village the time spent walking provided an opportunity for discussion of farming practices and other farm related issues which thus resulted in substantial qualitative data. Other private resources were less quantifiable, and included access to finances and employment. Data on these resources was collected through unstructured interviews and informal conversations during my time in the village.

### **3.2.1. Ethical and translation issues**

Ethical approval for this study was granted by the University of Canterbury Human Ethics Committee (UCHEC) with the proviso that the names of informants be withheld. This was unfortunate, as many people were disappointed that they could not be named in the thesis. I have thus chosen to use a randomly generated letter and number combination to identify informants rather than to use pseudonyms as there were a limited number of names in use in the village, and I do not wish to cause offence by attributing the insight of any of my informants to names belonging to unrelated people.

An information sheet and participation agreement which were approved by the UCHEC (included in Appendix 2) were read and translated for those who could not read or were not competent in English by an interpreter. I also prepared a letter of introduction to the village *Jauro* (head-man) (see appendix 3). No translation was necessary for this, as he is fluent in English.

### **3.2.2. My interactions with the community and limitations to data collection**

Soon after arriving I was entreated to teach at the newly established secondary school, and during term time taught an English class three times weekly, and a mathematics class twice each week. Although not done deliberately to be ingratiating, this did serve to integrate me better into Yelwa village life, as well as providing insight into the education system and its place in village life.



**Figure 3 The Yelwa secondary school**

During my time in Yelwa I lived in one room in a compound shared with two other families. Both the men who lived there could speak English, however the children and women who lived there were not proficient in English, and thus my interactions with them were limited. My interaction with women in general was also limited by the smoky environments in which women spend a good deal of their time. Their cooking is usually done in the kitchen (a free standing hut separated from the sleeping rooms), and women

spend much of their time in there, socializing as they prepare food. I found it impossible to participate in this aspect of village socializing regularly as, for me, the smoke from up to three cooking fires in a windowless 2m X 2m enclosure brought on hay fever and unbearably stinging eyes and lungs, and, as men and women have quite different roles in this community, my research into the unique perspectives of women into community livelihoods was more limited than I would have liked.



**Figure 4 My room (left) in Yelwa**

When possible my husband stayed with me in the village, however his own research required him to stay at the Nigerian Montane Forest Project (NMFP) field station, a 40 minute hike away, so after the first month I also began to spend some nights each week at the NMFP field station. This undoubtedly reinforced my association with the NMFP and conservation work, and thus made people more likely to present themselves as environmentally conscious, and less likely to disclose information about practices or behaviors that they were aware were environmentally degrading. Other aspects of my

behavior, such as living in the village and participating in village life (attending church, teaching in the school) worked to counteract this association, and accentuate the differences between my position and that of other ecology-focused researchers who have visited Yelwa. As the following chapters demonstrate, however, awareness and knowledge<sup>16</sup> of the environmental consequences of damaging practices is of more relevance to my research questions and conclusions than the enactment of these practices.

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<sup>16</sup> I wish make clear the difference I intend between the words *awareness* and *knowledge*. As becomes clear in the following chapters, people may, if asked be able to work out the environmental consequences of their actions, but if this *knowledge* is not part of their *awareness* then it does not influence their behavior. The difference I intend from the use of these two words can be easily demonstrated with a familiar example of cognitive dissonance from the developed world: a consumer may, if asked, posses the *knowledge* that the product s/he buys is produced by child labor, using toxic chemicals, or using some other practice to which s/he is ethically opposed, but as s/he goes shopping, this fact does not enter his/her *awareness* and thus does not affect his/her purchasing choice.

## **4. Common property and open access natural resources**

### **4.1. Introduction**

This chapter firstly explains the importance of common property resources (CPRs), then looks at the three research questions<sup>17</sup> as they relate to CPRs. It also demonstrates some of the ways in which the community is constantly undergoing adaptations to its natural resource management. These adaptations are in response to changes from both internal and external forces, as was described in chapter 1 and will be demonstrated in this chapter.

Some common property resources are essential for everyone, and understanding how important they are to peoples' livelihoods is intuitive. Take the example of water. Water is of critical importance to all human life, but quality drinking water and adequate water for washing, cooking and irrigation are all resources that cannot be taken for granted in rural communities in the developing world (Kulshreshtha, 1993). In some regions water has an added importance in people's well-being, as they depend on water-related activities such as fishing and river transport systems for their livelihoods (Scholte, 2003, Smith et al., 2005, Kulshreshtha, 1993).

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<sup>17</sup> As stated in chapter 1: 1) Are livelihoods dependant on local natural resources? 2) Are these resources threatened by human use? 3) How will peoples' lives be affected if aforementioned resources are no longer available?



Building materials in undeveloped rural communities are another resource commonly sourced from the public domain, and include natural materials such as clay, grasses, timber and stone (Baiche et al., 2008, Wienecke, 2001). Most people require access to basic building materials for personal use, and others have incomes based on construction related work such as brick-making.

Community resources also often play a role in personal incomes. Many of the world's poor maintain diversified livelihood strategies in order both to increase their income and reduce their vulnerability (Orr *et al.*, 2009). Wild collection of common property resources is a common method of livelihood supplementation and diversification in rural areas, and products commonly harvested from the wild include timber, food (including hunting), medicine, animal fodder, fibers and other material for tools or ritual purposes. These materials are usually collected in very small quantities per extractor, although cumulatively this can represent a significant amount being extracted from nature (Pandit and Thapa, 2003, Sunderlin et al., 2005, Hecht et al., 1988). Wild resources also provide a final fallback when other business ventures have proved unfruitful, or when personal circumstances or natural disasters have affected farm productivity (McSweeney, 2003, McSweeney, 2005). Thus during years of low farm productivity common property resources can increase in importance, while in successful farm years they may be of relatively small importance in people's livelihoods (Harris and Mohammed, 2003).

Common property resources (CPRs) are arguably very important in the livelihoods of the rural poor, but the sustainability of common property resources is a contentious issue. "The tragedy of the commons", a benchmark article by Garrett Hardin, published in

*Science* in 1968, preceded a wave of research into the respective benefits of private versus public ownership of resources. Hardin proposed that greater *individual* profit would always come from overexploiting a public resource than from personally abstaining from overusing it, as the benefits of use lie with the user, while the costs are shared by all. To illustrate this he used the example of herdsmen and communal grazing lands. For each additional animal that a herder stocks on communal grazing lands the benefit is his alone, while the negative effects of overgrazing are shared between all herders. Thus, Hardin argues, the only rational decision that the herder can make is to add as many animals as possible to the communal rangelands, leading to overgrazing and collapse of the resource. Since the publication of this article there has been substantial development in understanding the importance of property rights in resource management. Research into common property resource management has found that communal access systems *are* an effective and integral part of many societies, and they have become an important consideration in aid work and development planning (Ciriacy-Wantrup and Bishop, 1975, Jodha, 1986, Agrawal, 2001, Berkes et al., 1989). Wade (1987) proposed that the success or failure of a property management system that is not based on private ownership depends on the nature of the resource, the characteristics of the user group, and the internal and external group relations. A key part of understanding common property management systems is awareness of the difference between a common property resource and an open access resource. In a common property resource management system there are rules and enforcement mechanisms which do not apply in open access systems. Thus open access systems are common when the demands on a resource are so far below the supply that no management is

necessary. Alternatively they may arise as the result of a breakdown in the structure of a common property resource management system (for example through loss of traditions) (Holt, 2005, Eggertsson, 2003).

While there is still debate over the merits of private versus communal versus open access management of resources on a case-by-case basis, the viability of common property resource management schemes is well substantiated (Ellis, 2000, Bebbington, 1999, Ellis and Freeman, 2005, Sunderlin et al., 2005, Harris and Mohammed, 2003), and the consequences of development aid without suitable understanding of the institutions which govern the use of these resources can be a serious contributor to their collapse; hence the need for effective communication and knowledge sharing, rather than paternalistic development projects.

An example of how paternalistic aid projects applied without sufficient understanding of the local social and environmental context can have extremely unfortunate results is the Sahelian drought of 1968 to approximately 1973 (by some accounts it is still not over). Although droughts over the Sahel region of West Africa have been occurring periodically since the 18th century, the onset and severity of this episode was undeniably influenced by anthropogenic factors (Wang and Eltahir, 2000). According to Wade (1974) high on the list of these factors is overpopulation of both humans and cattle, an increase made possible through the introduction of modern medicine and particularly through the drilling of bore-holes by donor agencies. In the traditional land management system water was the limiting factor to herd size, and a complex pasture management system based on the amount of time each herder could spend at each watering hole before moving on.

The introduction of new wells changed the limiting factor for herd size from water to pasture, and thus threw the traditional resource management system into chaos. While this factor alone is not responsible for the enormity of the disaster created by the Sahelian drought, it is a clear example of the importance of understanding the dynamics of the resource management system before intervening in it with development projects. While aid organizations are well intentioned, a concept such as that taken from the Hippocratic oath of '*primum non nocere - first, do no harm*' is as relevant to international aid as it is to medicine.

Under each of the resource headings in the sections below I begin with an overview of the importance of the stated common property resource in the lives and livelihoods of the Yelwa community. In the second section under each resource heading I then discuss some of the issues relating to sustainability, development and the future of each specific common property resources.

## **4.2. Water**

### **4.2.1. Water requirements**

#### **Water at home**

The quantity of water required for home use for each household varied with the habits, number and ages of the family members. Based on my observations and informal questioning I found that approximately one 20 litre jerry can full of water is needed daily

for two adults for the purposes of washing<sup>18</sup>, cooking and cleaning. For each child that is added to the family the extra amount of water needed is relatively low, and based on my observations and questions I estimate it to be in the range of several liters only. This is predominantly because bathwater for children is re-used, while for adults too big to fit into a tub the wash-water is lost after the first use. Additionally the amount needed for washing cooking pots and plates is not significantly increased by the extra plates needed for extra children. Thus, according to K22, for a household with 11 children approximately two and a half jerry cans of water were needed daily (50 litres).

During the wet season the run-off from corrugated iron roofs (by those wealthy enough to afford them) is collected for household use and stored in open-topped 44 gallon drums. Those who have thatch roofs collect water in open receptacles arranged around the yard and empty them into the same open style of drum as those with iron roofs. In the dry season during which the rains are insufficient to supply the household needs, water is collected from the following sources: a hand pump newly installed in the village which was sponsored by the Nigerian Montane Forest Project (NMFP); one spring of quality drinking water; and several privately owned wells. Although these wells are privately owned, prior to the installation of the hand pump they were very important to the whole community, and many people made use of them. The spring and the stream

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<sup>18</sup> This includes washing of cookware and bodies, not clothes. Clothes washing obviously also requires water, but as this was done by taking the clothes to the river, rather than water to the house, it is not possible to estimate how much water would be used for this purpose if the river was gone.

which flows from it are quite small, and each time it is disturbed by someone drawing water it takes several minutes for the turbidity to abate. As the whole village needed to draw water every day this meant that there was a considerable wait for water, and people reported getting up during the night and early morning in order to fetch water in order to avoid such a significant wait. Those who have private wells (see Figure 5) complained that they constantly had friends and neighbors asking (or simply going ahead without asking) to draw water from their 'private' wells. In the words of H32, who owned a well in his compound:

*“Before the pump was put in people were lining up all day and into the night to get clean water from the spring. If you needed clean water the best thing was to get up in the middle of the night to get it. Some people had wells in their own houses, but even these would be sucked dry by other people using [the well].”*



**Figure 5 A privately owned well**

### **Water on the farm**

Water is needed during the dry season for farms, and many farms have springs feeding up throughout them which are important as natural irrigation. During the dry season water is carried daily onto a small patch of green vegetables such as cabbage and the spinach-like plants that are the staple for stews and soups. Channels are dug to drain wetlands for farming, but no methods of irrigation other than carrying buckets by hand are used.

### **Water for building**

Water is required at construction sites for building and renovations. All but a few structures in Yelwa were made from mud brick. Some mud brick is made 'on site' or near-by (see Figure 6), and some further away from the intended building site and then transported by vehicle or wheelbarrow to the site. In either case building with mud brick requires significant amounts of water, for both the bricks, mortar, and for compacting the clay floor of houses.



**Figure 6 Mud bricks drying in the sun**

### **Water for fishing**

Small fish caught from the nearby streams are a very important protein source for most people. Beef, goat, sheep, chicken and guinea pigs are available and eaten occasionally, but as the former three needed to be purchased, chickens are more valuable as egg layers, and guinea pigs needed constant feeding most families would only eat them occasionally. Fish require little effort to catch once a fish trap (see Figure 7) has been made, and constitute a much more regular part of stews and soups.





**Figure 7 Two types of fish traps used in Yelwa**

Thus we see that water is a necessity in meeting the basic needs of food (farming and fishing), shelter (building), and common forms of employment (building, fishing and farming) as well as in its basic form washing and drinking.

#### **4.2.2. Sustainability and the future of Yelwa's water resources.**

Regarding water Yelwa has already undergone a process where population growth led to resource depletion. This, however, was resolved through development: the village relied on one small spring for which the population had grown too big, and then the installation of a bore-hole and hand pump resolved this issue. Yet from another angle

development has contributed to the problems with the water supply. Large areas around Yelwa have been planted with *Eucalyptus spp* and to a lesser extent *Pinus spp*, which has been introduced as a fast growing alternative to native forest trees for human use. Studies in various eco-regions around the world, including Sub-Saharan Africa and tropical and montane forest regions in other parts of the world have demonstrated that afforestation of a water catchment area with *Eucalyptus spp* has a negative effect on stream flow and groundwater. Conversely, native forest has a positive correlation with water quantity in a catchment (Lara et al., 2009, Scott and Lesch, 1997, Buytaert et al., 2007, Brown et al., 2005, Kisanga, 2005, Scott et al., 2004).

Scott and Lesch (1997) conducted a long-term study of a highland catchment area afforested with Eucalyptus in South Africa. Three years after planting a statistically significant decrease in stream flow was observed, and nine years after planting streams dried up completely. The forest was cleared after 16 years of growth; however it took a further five years for streams to start flowing again. This delay was presumed to be the result of depletion and desiccation of groundwater reserves, which took time to re-fill before water could begin to flow above-ground again.

In the past there were two streams flowing through Yelwa village: the one which remains, and another flowing into the village from an area where a eucalyptus plantation now stands. Before the plantation was established this stream had been surrounded by native forest, dominated by *Syzygium* species. Soon after the native vegetation was cleared and the aforementioned plantation replaced it (approximately 1981 or 1982) the stream flow began to decrease, and three years after the plantation was established the

stream disappeared altogether. The disappearance of this stream was a source of significant complaint to one of my informants (H32), who was doing extensive renovations to his compound and recalled how, when doing so in the past, he was able to dig a small channel and direct water from the now-vanished stream directly into his building site. He now needs to carry in water from the remaining stream by bucket, and this slows the work considerably.

The spring that remains is surrounded by a thin strip of mixed uncultivated vegetation, which, according to informants, has been incrementally decreasing as the fields around it are expanded. At the time I arrived (the end of the rainy season) the stream was less than 30 cm deep. When I left at the end of the dry season barely a trickle remained. According to one informant on the subject (also *H32*), during his youth (something close to 20 years ago<sup>19</sup>) the stream had been much higher. He estimated that it had been almost mid-thigh high on an adult, and the water much colder than it is now. He was very concerned about the state of the water in the village, and associated it strongly with the clearing of stream-side native vegetation and the planting of Eucalyptus. Despite his convictions he was not able to initiate community action through the village council although he had tried several times, and consequently he was very worried about the

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<sup>19</sup> It came to my attention that the arrival of mosquitoes (and their associated diseases) has also been placed at around 20 years ago. While it is possible climate change, the reduction in stream flow, and arrival of mosquitoes may all be interrelated events the vagueness of people's estimates of how many years ago an event occurred, combined with most people not knowing their own age, mean that these events are quite possibly occurred further apart than they seem.

future of the village in relation to its water supply. Unpublished data on the Ngel Nyaki forest region around Yelwa obtained by M. Korndoerfer confirms that native forest cover has a positive effect on stream flow in this region in comparison to grasslands, and that the positive effect of native forest cover becomes more apparent as the dry season progresses.

What a continually declining water supply would mean for Yelwa is demonstrated by the situation in *Gurugu*, a neighboring village of similar size. After extensive eucalyptus planting around *Gurugu* in the early 1990s the stream on which the village relied for water was decreasing significantly. In 1992 when the road was built rains washed mud from the road construction into the river, accelerating the decrease in water flow, and soon after the stream disappeared altogether. The nearest water supply is now several kilometers away from the village. This necessitates residents taking a vehicle to fill their jerry cans with water, or walking for several hours. Thus, what was originally a free and easily accessible resource has become a major ongoing expense and inconvenience in their daily lives.

In addition to this a new issue relating to water management has arisen in Yelwa: malaria. In the past the Mambilla plateau was reportedly free of mosquitoes, and consequently free of malaria; however, that is no longer the case. One of my informants on the matter tells me that the arrival of mosquitoes happened the same year that the road was sealed, placing the event close to 20 years ago. I spoke with several people who had been diagnosed professionally as having had malaria, as well as many who had self-diagnosed malaria. As previously mentioned the system of water storage used

is open topped vessels collecting run-off from roofs and other large open surfaces. This provides excellent breeding grounds for disease vectors and incubators for water born diseases themselves, which as the climate warms may present increasing problems for Yelwa (Martens et al., 1997, Rogers and Randolph, 2000 and others, Khasnis and Nettleman, 2005). People in the village have noticed that mosquitoes are more prevalent in shaded areas, and they have been associated with trees and shade. People have associated trees with mosquitoes, and as the association between mosquitoes, malaria and trees grows, clearing of trees within the village area and around the stream may accelerate. This is a clear example of where knowledge sharing between western scientists or development workers and local people can assist local people to make informed resource management choices in the face of an environment changing faster than TEK (which is based on accumulated experience), can develop.

### **4.3. *Building and firewood***

Juxtaposed to the issue of the community's water requirements is the community's need for timber for building and firewood. As is the case in many places in Africa eucalyptus was introduced because it is fast growing and hardy, and therefore very effective in providing firewood and building materials. All cooking in Yelwa is done on open fires, and, relative to the rest of Nigeria it is cold on the plateau, thus people also prefer to heat their wash-water. Additionally, on cold evenings people will burn fires for warmth. Consequently there is a very high demand for firewood. A bundle of sticks about the size that a woman's arms can reach around is needed for an average family almost every

day, and almost all of this is eucalyptus.

There are several large government eucalyptus plantations around Yelwa, and it is from these that people collect most of their firewood. Legislation allows people to collect any fallen wood from these forests. Wood for local building is grown in small copses on farms around the village by some, and bought from these people by others who need it.

Building materials in Yelwa vary according to affluence from 100% natural, locally sourced structures (stone and mud foundation, woven grass mats for the floor, unrefined timber rafters, and grass thatch roof) to 100% purchased materials (cement block walls, cement and linoleum floors, machine cut timber rafters, and corrugated iron roofs). Virtually all buildings are mud-brick, with the two recognizable exceptions being one church and the part-time house of a significant government official who originated in Yelwa. Not all mud-brick was local, however. The clay in Yelwa is not ideal for building, and those who can afford it will buy mud-bricks transported from a location further along the road from Yelwa.

There are several species of grass that are preferred for roofs and fences, although the only one I was able to identify the botanical name of is *Hyparrhenia myolnerata*. Currently these grasses are still readily available, but I have been informed that the area which previously provided the main source of grass for all construction purposes no longer provides them. This area is now in private ownership by a commercial dairy company, and the grass no longer grows there. I was told that in the past one would simply go to this site and harvest as much as was needed and return with it, while now

one needs to make several trips and search out sources of the grass.

#### **4.3.1. Sustainability and the future of Yelwa's building materials and firewood.**

We thus see that both timber and water are essential resources needed on a daily basis in the current way of life, yet fulfilling the need for adequate timber has jeopardized the village water supply. Likewise the arrival of a commercial dairy company has created opportunities for non-farm incomes and increased cash flow in the community, but at the cost of resources important for building. As subsistence farming decreases in the community and cash-based incomes increase some of the resources that are lost as a result of development decrease in importance. Those with sufficient cash build with corrugated iron roofs, and thus the grasses for thatching lose importance. However, the transition from a natural resource reliant community to a cash income based community does not happen instantaneously, and the livelihood transition happens at different times for different families. During the transition phases those who are slower to find adaptations to the new status quo, or those deliberately holding on to traditional lifestyles, can be further disadvantaged. The theory of 'poverty traps' (which suggests that environmental degradation leads to poverty which in turn leads to further degradation) is usually applied at a community level (Prakash, 1997, Khan et al., 2009, Mendola, 2007, Carter and Barrett, 2006). However, as development reduces the resources available for the part of a community which has not adapted its livelihood away from a natural resource base a poverty trap arises at a household level. For example: a community exists, (hypothetically) in relative equilibrium until a previously

unavailable opportunity arises, e.g. cash employment in the dairy company mentioned in Yelwa. A certain proportion of the community thus takes advantage of this opportunity and through the money they earn options such as purchasing iron roofing become available to them. Meanwhile, for the remainder of the community the loss of communal resources means that they are required to spend more hours foraging for the resources (in this case roofing and fencing materials) which have become scarce, thus further decreasing their capacity to adapt to the changing social environment.

In some cases the collapse of traditional systems and the partial implementation of a westernized system has led to personal and social disasters (such as the Sahalian drought described in section 4.1). However, up until now, in Yelwa, rather than tragedy there is inconvenience.

#### **4.4. *Wild-crafted products***

The final resource discussed in this section on common property resources is wildcrafted products. As was discussed in the introduction to this chapter (section 4.1) wildcrafted products provide alternative income generation opportunities for the community. In the words of one of my informants (E58):

*“One job cannot be enough; you have to do many small things. Some will have a farm and also sell things, some will do labor, but if you have only one job it is not good.”*

Common sources of alternative incomes include honey, fish, and vegetative matter



gathered from the wild. These resources are also heavily relied on for personal use, as well as constituting an income source.

Many species, particularly food species, were both farmed and wildcrafted. For example wild growing guavas (*Psidium guajava*: tree 3 in the appendices) are very prevalent, and during their fruiting season are an important source of vitamin C and other heat sensitive vitamins, but some people also had plantations of guavas. In cases such as this the plants growing wild were particularly important to families with small or no farms, and in general the poorer members of society. Those who had access to their own orchards or trees found it more convenient to use them, thus those growing on common property were available for those without their own guava trees. Several families also kept 'medicinal gardens' in their compound, with one or two samples of commonly used medicinal plants while other families relied on collecting the same species from the wild. As is already apparent from the example of guavas, many of the wildcrafted species were not native, but farm or garden species which have escaped, or are encouraged to grow in the commons, as well as being farmed. This further blurred the line between wild-crafting and cultivation, but substantiates the importance of common property land.

Over 100 species of plants growing wild have uses recognized by members of the Yelwa community. These uses were predominantly medicinal, but also included foods and cultural uses, as well as materials for building such as the grasses mentioned already in section 4.3. Figure 8 below shows one man's collection of dried medicinal plants, however a full listing of all plants identified, with botanical names (where known) and the ethnic groups using them is included in Appendix 4. Photographs of each plant are

included in appendix 5. Local names are not included in this thesis; firstly because in most cases the local name was simply a description of the plant and where it grew (which in most cases roughly translated to *plant that grows in the bush*) and secondly because where specific names were know, it was never clear which of the numerous local languages they were in.



**Figure 8 Medicinal plants that have been collected in their season, dried and stored for use throughout the rest of the year**

The uses that a plant was put to varied between ethnicity and gender, for example the species *Emilia coccinea* (Herb 6 in the appendices) had uses recognized by eight of the 11 groups interviewed. The details of the uses described for it by group are listed in the table below (Table 2).

**Table 2: Uses of the herb *Emilia coccine* by tribe and gender**

<b>Group</b>	<b>Uses</b>
Mambilla Women	General tonic
Mambilla Men	Topically as an eyewash
Kaka Women	Topically for earache
Kaka Men	1. Topically for earache 2. Internally to treat indigestion
Tigon Women	Anti-inflammatory (it is not clear whether it is ingested or applied topically for this purpose)
Tigon Men	To treat sick animals (sickness unknown)
Fulani Women	Anti-malarial (in men only)
Fulani Men	Mouthwash (in conjunction with another herb) for toothache

Although the specific uses of the herb varied considerably, it is clear that the properties of the herb as recognized by each of the groups are related. For example, this herb appears to be anti-inflammatory, and of particular use as a mucus membrane anti-inflammatory (as evidenced by its use as an eye, ear and mouthwash). It is possible that its use as a tonic (it was described as ‘giving power to the body’ and use in treating malaria are also reflections of anti-inflammatory properties.

During my time in Yelwa it became apparent that all individuals had some knowledge pertaining to the use of traditional medicines and wildcrafted foods. The scope of knowledge varied significantly, however, and is comparable to the differences in knowledge of trained health-care workers and public awareness of basic first aid in western societies.

As consultation with orthodox medically trained personnel, such as doctors, nurses, and

community health workers requires a two hour journey by car, traditional medicines play a particularly important role in the community for those who would otherwise struggle to raise the money needed to reach orthodox medical treatment. As I was told in a discussion about healthcare in Yelwa with a mixed group of adults

*“First you try traditional medicine that you know, then you try somebody else’s medicine, or medicine from the pharmacy<sup>20</sup>, then, if you must, you go to the doctor in Gembu” (Y91)*

and

*“We are poor people. We can’t afford to go to the doctor. We must use traditional medicines.” (R62)*

The heavy reliance of traditional medicines is reflected in the breadth of knowledge of medicinal plants by the community. Of the plants which were identified as in use the vast majority were medicinal. Medicines for people and animals together constituted 77% of plant uses, and medicine for people alone constituted 73%, as can be seen below in Figure 9.

After medicine and food, cultural purposes are the next most common use to which wildcrafted products are reportedly put. This includes traditions such as taking the

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<sup>20</sup> The Yelwa pharmacy was very basic, and most complaints were treated with paracetamol

leaves of a tree known to the Kaka as both Nkan and Gugurt<sup>21</sup> with a chicken to one's prospective parents-in-law as part of a marriage proposal, using the fronds of *Pteridium aquilinum* (Lilies and ferns number 4) tied into wreaths on stakes to protect an unattended farm from thieves, trials of innocence based on the breaking strain of the leaves of a shrub known as *Nsong*<sup>22</sup> (the guilty party must hold one end and pull. If they can break the leaf they are innocent), to providing protection for a person during travel and use in ritual to predict the sex of an unborn baby.

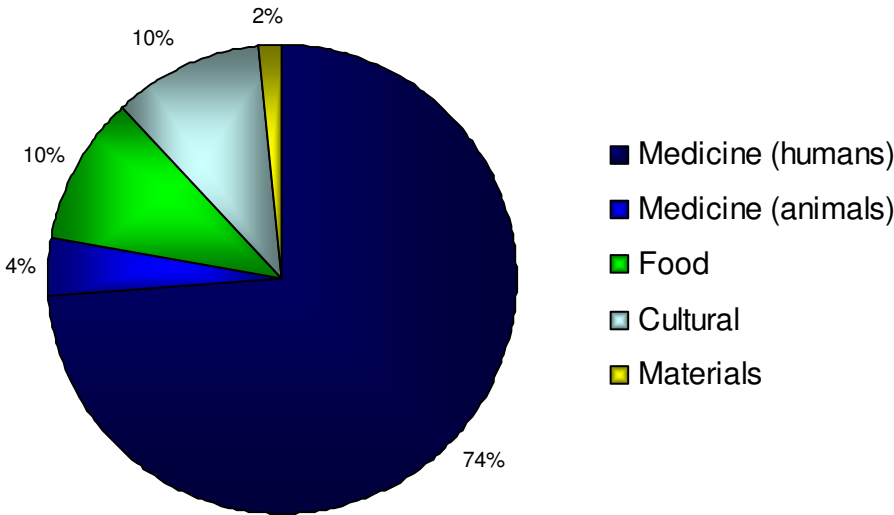
Building and materials was the category for which the lowest number of species were reported to be used. I believe that this is, firstly, a result of people being much more focused on demonstrating their knowledge of medicinal plants and thus forgetting to include plants that they commonly used for building. My observation that nearly all houses had numerous items of furniture manufactured from branches of the palm listed as tree 36, however, only the group of Kaka men showed it to me during data collection strongly supports this assumption. Secondly, most objects constructed from wildcrafted products that I observed in use in the village were constructed from a few key species only. Thus, I believe that the relative paucity of wildcrafted species reported to be used for materials reflects the importance of these key species, rather than demonstrating that materials for craft and building are a relatively unimportant use to which wildcrafted plants are put.

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<sup>21</sup> This plant appears in appendices 4 and 5 as Tree 35. I was not able to discover its botanical name.

<sup>22</sup> Appearing in appendices 4 and 5 as Tree 38

Wildcrafted building materials of particular importance are the grasses including grass 1 (*Hyparrhenia myolnerata*) and grass 4 (species unknown) which are used for fences and roofing, as already mentioned under the section on building materials. Other plants were used for the construction of craft products such as baskets and mats, as well as for rope and other incidentals.



**Figure 9: The uses of wildcrafted plants.**

Aside from personal use in ways described above many of these plants contribute to people’s incomes. Members of the community who are renowned as healers are sought out by others in times of sickness, and receive either a direct exchange for their services, such as cash or goods in payment, or indirect payment, such as prestige,

favors owed to be redeemed at a later date, or greater influence in community decisions.

Other plant materials, such as the flowers of *Aframomum melagreta*<sup>23</sup> (which had a strong peppery taste as well as medicinal value), and another plant locally known as *Gobodo*<sup>24</sup> (which had a consistency much like Okra when made into stews) were commonly sold by women and children at the markets.

Two other resources of commercial value that are collected from communal land are honey and gemstones. There is a strong tradition of honey-harvesting in the region around Yelwa. As mentioned already, the name 'Ngel Nyaki' means "place of the bees" in one of the local languages, and honey from the Mambilla Plateau has a reputation extending into the low-lands. Many people in Yelwa harvest and sell honey. For some it is their main source of income, while for others it is an auxiliary income only. Less commonly gemstones also provide an alternative income source in Yelwa. Sapphires (pictured below in Figure 10), amethyst, and several other semi-precious stones have been found in the region, and during the times in the year when farm work is not required individuals will occasionally go gem fossicking, either on their own farms or on public land. Several times each year a gem trader from Senegal will come to the region and buy what people have found. Some individuals have even taken this a step further and now buy from other villagers and re-sell to the trader.

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<sup>23</sup> Lilies and ferns number 1

<sup>24</sup> Appearing in appendices 4 and 5 as Herb 30



**Figure 10 Sapphires found in the region**

We therefore see wildcrafted products play important and diverse roles in people's livelihoods, contributing to income, nutrition, enjoyment, health, culture and comfort. The next section will explore some of the issues arising pertaining to their availability, sustainability and management.

#### **4.4.1. The future of wild crafting products in Yelwa**

The harvesting of these plants is not regulated in any way, and this is beginning to have consequences. It became clear to me that people were falling into two categories in their attitude to the harvesting of wild plants. Some were self-regulating their extraction: using a knife to par a small patch of bark from a tree trunk, never taking all of the roots from a patch of tubers, leaving enough leaves on herbs for them to recover quickly, and so forth. Others were quite brutal in their harvesting of plants: using hoes to hack deeply into the sapwood of trees when they were removing bark, then stripping it away from as high up the trunk as they could reach right down to the roots, snapping off whole limbs,



needlessly uprooting the whole plants although only a few leaves would be needed, and harvesting all that they could find in an area. Despite my expectations to the contrary, I found no correlation between the number of medicinal plants a person knew, their ethnic heritage, gender or age with a person's approach to sustainable harvesting. Those who were extracting their plant materials carefully were saddened and angered by the damage of others when they saw the evidence of it, but as the collection of wild plants is something most commonly done alone or with immediate family only (for example a mother and her daughters), it seemed that there was no communication on the subject between collectors. One man (N15) with whom I discussed the issue was deeply saddened by the damage done to the plants through people's harvesting. He was very careful in his extraction, but explained to me that this was because he had been "*taught properly*", while others hadn't. It is clear through juxtaposing the careful management N15 and those like him with the careless harvesting of others that there has been a tradition of sustainable use, but that this system is no-longer functioning properly. With this gentleman (N15) I walked for almost an hour to reach a certain tree. When we reached it he was saddened to see that it had been heavily damaged, with large areas of bark missing and broken limbs. Conversely another informant showed me a lone tree that was clinging to life in a bare field, explained that it was a very important tree, and then proceeded to hack deeply into it with a hoe. With another still we came across a vine that my companion hadn't seen in years. She was delighted, but proceeded to carelessly uproot it while ripping off all its leaves to take home.

These examples demonstrate the precarious nature of the transition from traditional

lifestyles to westernized lifestyles (as discussed in section 4.3.1). I see the problem of needlessly destructive harvesting methods as the result of a partial collapse of the traditional knowledge base, as traditional medical knowledge appears to have included a mostly-forgotten code of conduct relating to the harvesting of wild resources, as well as knowledge of the uses of those resources (some of) which remains. The connection with development and availability of pharmaceutical medicine now interferes with the development of a new negative feedback-loop being established in accordance with the theory proposed by Holt (2005), which I discussed in section 2.3; namely that conservation awareness develops out of the experience of resource scarcity. Hurault (1998) has estimated that the Mambilla plateau was densely populated just over a century ago (with over one million people) and then experienced a population crash which reduced its population to approximately 2% of its previous level. In this context, it would make sense that traditions regulating resource extraction were developed during the population high, but became redundant and were discarded during the intermittent years with an extremely low population.

Without the option to seek orthodox medical advice, it is likely that a reduction in available medicinal plants would be a higher concern to a greater number of the community, and there would be social pressures on those who are harvesting them in a destructive way to change their methods. Because Yelwa is in transition from a natural resource based community to a cash economy the importance of traditional medicines in people's lives is reducing in proportion to their income increasing. As developments in the region progress, the importance of traditional medicines continues to decline. Thus I

speculate that people do not see traditional medicines as a resource needed in perpetuity, but rather as a resource that they are almost finished with, and will soon become a part of their history. The more affluent (and generally this also equates to influential) a person is, the less they rely on traditional medicines, and thus those most reliant on them are the less influential members of society. However, the interest of outside organizations such as the Nigerian Conservation Foundation (NCF) and Nigerian Montane Forest Project (NMFP) would appear to have raised the popularity of medicinal plants with the community. The position "*Chairman of Medicinal Plants*" was created as a result of the work being carried out on the subject by the NCF, The man elected to the position is now referred to as '*Chairman*' by all, and comments from him and other members of the committee indicated to me that there is a recognizable power struggle underway. Despite this influx of interest in the topic, the role of the committee and its chairman seems to be only in liaising between the community and outside interests, rather than influencing internal affairs relating to traditional medicines.

Wildcrafted plants are seen to be of greatest importance to the poorer members of the community, and present a means of getting ahead, insurance policies for when they fall behind, and health care in times of illness. However, the collapse of traditional resource management practices appears to have threatened the local populations of many species, in particular trees and other plants which are slow to reproduce. Some members of the community are aware of this problem, and also have the means to counter it, but lack the recognition that would enable them to initiate community-wide changes. This, I believe, is largely due to western medicine eclipsing the importance of

traditional remedies. As western scientists are showing an interest in traditional remedies their value in the esteem of the local community has increased. While this has not yet resulted in the re-establishment of a sustainable harvesting regime, this interest is relatively new (several years at most), and thus I believe that one is quite likely to develop without any direct western intervention (other than respect). Unfortunately the time constraints on this research project do not allow me to follow this process.

The future of honey extraction is already clearly much more secure than for many wildcrafted plant species. Traditional honey extraction involved finding places that the bees had naturally colonized and destroying the hive in order to extract the honey. This was gradually replaced with setting clay pots out and encouraging the bees to colonize them, however the hives in the clay pots were still destroyed to extract the honey. Consequently it had been noticed that bee populations were decreasing, and honey was much harder to get. Recently, however, the NCF introduced the concept of setting out hives which would not need to be destroyed when extracting the honey using an imported hive as a model. The local honey collectors' society has since been experimenting with designs for hives using local materials, and honey-collectors that I spoke to are very happy with the increase in productivity that has resulted. Wood or grass boxes, such as the one pictured below in Figure 11, are now used to attract bees, and the honey can be extracted from these boxes without destroying the hive.



**Figure 11 One of the newly designed hives**

Gem-fossicking and trading appears to have been steady at a low level since its introduction, which was allegedly some time during the mid 1980s. When it was first discovered that there were stones of commercial value many people became exuberantly involved, however of the amethyst, quartz, tourmaline, sapphires and a green stone ( possibly jade, but I was not able to view and identify it), found in the region only sapphires proved to be of sufficient quality to be of commercial interest, and the ratio of work involved in finding to the price they receive has not been enough to generate more than a steady interest during the slow times of the year by a few people.

#### **4.5. Discussion**

Based on these findings we see that the current livelihoods of the people of Yelwa village are strongly tied to Common Property and Open Access Natural Resources, for which they rely on for water, shelter, food, medicine, alternative incomes, cooking and comfort. Development in the region has had both good and bad effects. Positive

outcomes for the whole community include the relative ease of collecting water from the new hand-pump, and negative outcomes for the whole community include the reduction in stream and groundwater flow as a result of the clearing of native forest and planting of *Eucalyptus*. Other effects of development have been good for some and detrimental for others, such as the establishment of a commercial dairy company over the land where grasses for roofing were plentiful, provided opportunities for employment for some, but a loss of resources without recompense for others.

Resource use and availability patterns have shown that water and medicinal plants are particularly vulnerable resources. The formation of a 'committee for medicinal plants' has the potential to develop into an instrument for promoting the sustainable use of these resources, but as yet this has not been the case. As a result of its formation and the associated prestige of membership on the committee, however, the perceived importance of this resource has increased, and this may be the beginning of awareness of a need to use this resource sustainably. Water has no committee to take responsibility for its management, and as the hand pump has provided so much relief to the community, most people are unconcerned about the future of water, however a few individuals are. Although these people have had no success in bringing the issue to the attention of community leaders, this is in accordance with the findings of Holt and supports her hypothesis (2005 p. 201):

*"Conservation awareness arises when people exert use pressure on resources and recognize their potential for overexploitation, conditions concurrent with*

*population growth, adoption of Western technologies, and market production.”*

Holt found that amongst the Huaorani who (due to a low population density and limited technology) originally viewed the forest resources as unlimited an awareness of the finite nature of forest resources is developing. This is mostly focused on the need to protect their resources from outsiders, but one man interviewed clearly indicated an understanding of the effect of their own growing population on resources abundance (Holt, 2005). This is a very similar situation to that in Yelwa, where most people's concern over resource loss is focused on the competition between the (mostly) indigenous agriculturalists and the more recently arrived pastoralists, however forward-thinkers amongst the community are realizing the need to regulate their own use of resources.

Like Holt, I believe that communities in transition are highly suitable candidates for co-operative resource management with conservation organizations. This partnership needs to be embarked on from a well informed position, without unfounded expectations that indigenous people will make natural conservationists. It should be well recognized that indigenous communities and conservation biologist will *both* have things to learn from each other. Through this co-operation lies the best chance of avoiding some of the tragic consequences of development and achieving sustainable conservation. The best example of success through this approach is the new design of hives as a co-operative effort based on the introduction of a concept by the NCF: that hives do not have to be destroyed in order to harvest the honey, and the skills of local craftsmen in adapting this

concept to their own situation.



## 5. Private resources

### 5.1. Introduction

While common property resources have often been the focus of environmental protection initiatives, privately owned resources have frequently been the focus of poverty reduction initiatives (Winters et al., 2009). According to the definition of livelihoods by Ellis (2000) which was adopted in chapter 2, “assets” include the natural, physical, human, financial and social capital available to a household. Agriculture has been viewed as the main economic activity of poor rural households and thus development planning has historically focused on the agricultural assets of the poor (Winters et al., 2009). Due to their decentralized infrastructure, agricultural ministries are well suited to implementing widespread initiatives in rural areas. Additionally agricultural ministries have held clear responsibility for farming-related activities, and thus implementing practices and policies relating to agriculture has been relatively easy (Zeza et al., 2009). Rural non-farm incomes, on the other hand, did not rise to the attention of development planning until the 1980s when the *sustainable livelihoods* (SL) approach to rural poverty reduction first emerged. Even so, farm income still remained the focus of development initiatives until the late 1990s, when the livelihoods approach began to gain popularity and emerged as a dominant theme in rural development discourse (Ellis and Biggs, 2001).

The *small farms first* (SFF) approach to rural development or as Ellis and Biggs (2001 p. 440) descriptively termed it “*agricultural growth based on the small-farm efficiency*

*paradigm*” focused on introducing new technologies, credit or other inputs to improve farm productivity (Zezza et al., 2009, Ellis and Biggs, 2001). The livelihoods approach, on the other hand, looks at the total assets that a household has with which to lift itself out of poverty. The SFF approach and the SL approach are alike in being bottom-up approaches to rural development. These bottom-up approaches are characterized by working directly with the people concerned as opposed to approaches that rely on economy wide changes, and the trickle down effects of those changes such as the idea of *redistribution with growth*<sup>25</sup>, (Chenery et al., 1974). The difference between the SFF approach and the SL approach is that the SFF approach has focused on improving agriculture as the primary means of increasing economic growth and equity, while the livelihoods approach has placed a greater emphasis on income diversification (Zezza et al., 2009). Many non-farm incomes are based on common property resources, and have been discussed already in chapter 4. Private assets which facilitate non-farm incomes are frequently the result of education or opportunities which require physical, financial, social or human capital (or more frequently a combination of several types of capital), and will be discussed later in this chapter in section 5.4. This chapter opens, however, with an exploration of the contribution of farm incomes to the livelihoods of the Yelwa village community. Despite the importance of non-farm incomes to rural livelihoods (a review of literature finds between 40% and 45% of rural incomes to be attributed to non-farm activities) farm products still comprise the largest part of rural livelihoods in Africa

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<sup>25</sup> The principles of redistribution with growth rely on economy wide policies and development applied to foster redistribution of wealth within the economy

(Zeza et al., 2009, Barrett et al., 2001). This chapter will discuss the dynamics of farm incomes in Yelwa, available alternatives to farm based incomes, and the changes that development is making and can make to privately owned resources.

## **5.2. *Land ownership and management***

### **5.2.1. Land rights conflicts**

Available virgin land was quoted by members of the original settlement as one of the main reasons behind the rapid growth of Yelwa village in its early days, immediately after re-settlement from within the forest reserve. Now, however, there is a shortage of land, and many farming families feel that they are making do as best they can with insufficient land at their disposal, while others would like to farm, but are unable to procure any land at all. Even many of those who have land of sufficient area to farm are struggling, because the locations of their farms are often a long walk away from the village (many people's farms are more than a two-hour walk away). The need for more farmland is the source of considerable tension amongst the community, as pastures now owned by Fulani surround the village. Official policy differentiates between grazing rights<sup>26</sup> to land and ownership of land, however, through the judicious use of bribery and political influence the Fulani have been able to convert their grazing rights over pastures into ownership of the land (Nyaro, 2008). To add insult to injury, some of the pastoral

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<sup>26</sup> Grazing rights to land do not permit anything other than grazing one's livestock. It does not include the right to build, cultivate, lease or sell the land.

land has been converted to agriculture for which members of the indigenous tribes are hired as laborers. In other instances land that the indigenous people feel should be their own anyway is sold or leased back to the indigenous tribes by the Fulani.

The complaints of injustice do not stop there, either. I was told by several farmers that there had been a period of time when they had worked on the Fulani farms but then, after the work had been finished, the Fulani property owners refused to pay them the agreed amount. As a result they had to go to the police, which meant that the police officer handling the case was then 'entitled' to half of the money owed to the plaintiffs. This still didn't ensure the worker's compensation, however, because the land owner could simply give the policeman more than half of what was owed in wages, save the rest for himself, and the worker would remain unpaid. This has not been an issue recently, however. The two explanations I was given for this by members of the agricultural community are<sup>27</sup>:

1. The Fulani are not good farmers: if they do not pay people then no-one will farm for them and they will not be able to grow anything themselves.
2. The influence of Fulani with the local government is waning, and the Fulani therefore do not attempt to get away with as much as they did when their influence was stronger.

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<sup>27</sup> I did not attempt to approach any of the Fulani land-owners for their version of these events, as I felt that it would contribute to tensions in the region, and possibly endanger my informants

This dispute over land ownership underlies the ongoing conflict between the Fulani pastoralists and the Mambilla, Kaka and other agriculturist minorities in the region. This conflict sporadically erupts into violence, most recently in 2002, where the death toll (for the region) was allegedly well over 100 people (according to H32, E58, and others) and thousands fled across the boarder into Cameroon (The Insitute for Peace and Conflict Resolution, 2006). During the last months of my stay in Yelwa tensions seemed to be building again, and taxi drivers refused to drive far from the village after dark, fearing attack by Fulani on the open roads. This escalation in tension followed soon after the 'Mambilla dance' passed through the region. The 'Mambilla dance' is a social gathering somewhat like a fete or carnival, which is hosted in turn by each village on the plateau, and entails drumming and dancing from the afternoon until late into the night, as well as prolific sales of baked goods and other foodstuffs. I was told by an influential Mambilla man that the dance is also a powerful social organization tool, and that:

*“the Fulani hate it when they hear we are dancing... they know we are preparing for war” (H32)*

Several months before the dance arrived we heard that 'the dance' was coming. One after another, villages on the plateau hosted the dance, and people from nearby villages would travel to the village hosting it to dance and socialize, but also to discuss management of the plateau and strategy in case of war. After the dance had been hosted by Yelwa it proceeded to more and more distant villages until it passed out of the vicinity and nothing more was heard of it.

### **5.2.2. Coping with the land shortage and conflict**

From the satellite images of the Yelwa district below it can be seen how much of the land area is pasture owned by the Fulani graziers. The first image (Figure 12) shows Yelwa village in the centre, several clumps of eucalypt plantation forests (visible as the darkest areas on the image), circled by a ring of the mid-tones of farmland which in turn is surrounded by pasture. The second image (Figure 13) is of an area about two hours walk from the village and is referred to as the 'Big Forest'. The major enclave of farms within it can be made out, as well as two smaller farms in isolation amongst the trees. The right to farm these areas was granted by the state forestry department in exchange for maintaining firebreaks and fighting fires within the forest. On both figures farms which I was able to walk the perimeters of are demarcated with coloured polygons. All farms of the same colour belong to the same household despite being geographically separated. The farms plotted with parallel lines overlaying the shading are Fulani farms which are worked by members of the agricultural tribes in a share-farming agreement. In this arrangement the produce from the farm is shared equally between the farmer and the land owner, and no payment is made by either party.

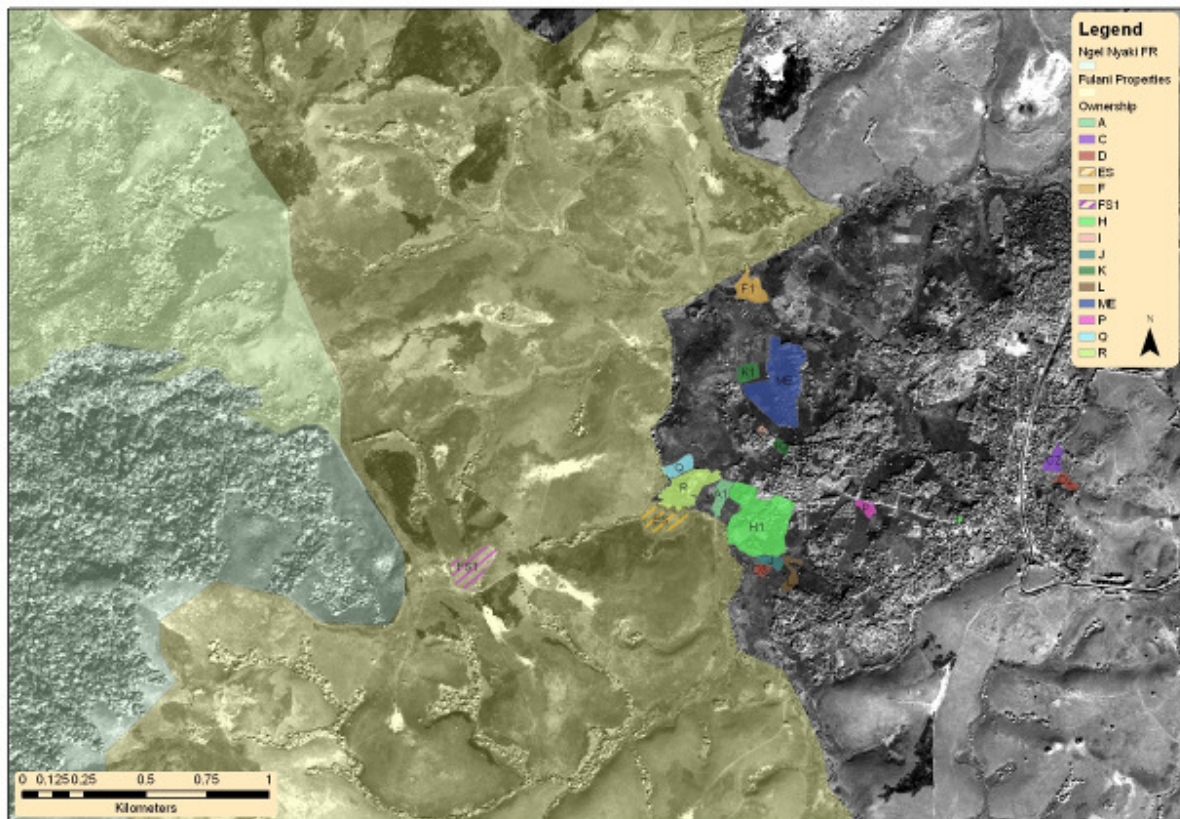


Figure 12 Yelwa village and the surrounding lands (monochrome image). The large areas marked in shades of beige are owned by Fulani (it is clear that the farms on the other side of the village are also pastures owned by Fulani, however I do not know the boundaries of each). The small, coloured polygons are farms owned by members of the agricultural tribes. Small coloured polygons with stripes are farms owned by Fulani and worked by agriculturalists in the share-farming arrangement described above. All farms of the same colour (including those in Figure 13) are owned by the same household (source: Sinclair Knight Merz, 2009).

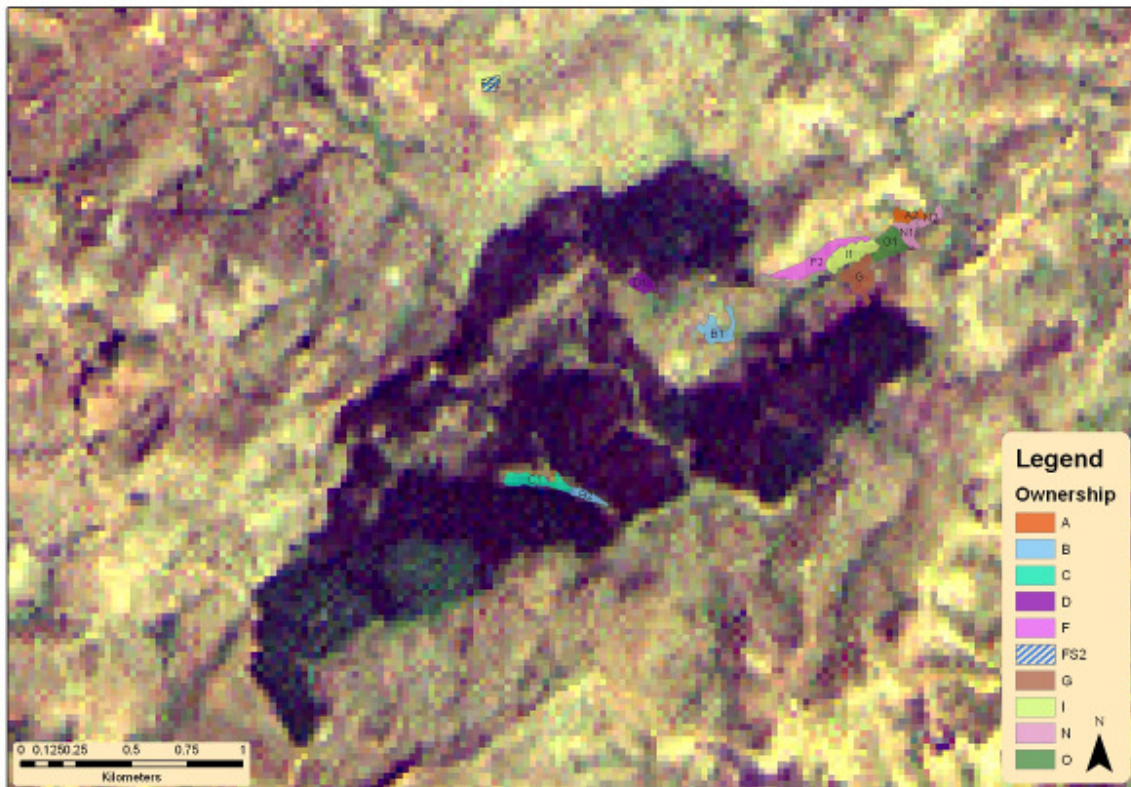


Figure 13<sup>28</sup> The 'Big Forest' and farms within it (true colour image). Please note the small share farm in the top centre of the image (source: Google Earth, accessed 2009).

Because of the shortage of land, currently, the only way to get a farm is to buy it from someone else. In the past all that was required was that the village *Jauro* granted you the right to farm on a piece of vacant land. Several people I spoke to claimed to be saving up to try to buy farmland from neighbors; however no-one I spoke to had an

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<sup>28</sup> Unfortunately available only at a lower resolution than Figure 12, and from observed disparities between the image and the site it is obviously also a much older image, although I was not able to verify the date on which it was taken.



interest in selling any of their land. Several did complain about neighbors encroaching on their borders, and disputed farm boundaries seemed to be a heated issue between some neighbors. Traditionally farm borders were marked using a certain type of grass<sup>29</sup> planted in tussocks along the boundary. In some places this practice continues, but in many there is no designated marker other than one household's work ending and another starting. It is in these cases that there is most contention over one household claiming that another is encroaching on their farm, and vice versa. By far the biggest issue relating to farm land, however, was an overall feeling of resentment from the agriculturalists towards the pastoralists. This situation clearly differs from that observed by Rehfish (1962) who states:

*The Mambila are skilled and enthusiastic farmers, fortunate in having an abundance of fertile land. None of the villages visited were suffering from a shortage of land. The result is that they normally produce a considerable surplus of their two staple crops, maize and guinea corn, except in the few bad years when the rains either come very late or are otherwise inadequate. Some of their surplus grain is sold to the town-dwelling Fulani and Hausa as well as to the nomadic cattle-keeping Fulani. The demand being small, most of the surplus is turned into beer for their own consumption. (Rehfish, 1962 p. 92)*

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<sup>29</sup> Shown in appendices 4 and 5 as 'Grass 5'

This demonstrates the change in the dynamics of inter-tribal relations on the Plateau. In less than half a century land has gone from an abundant resource to a limited and precious commodity and the cause of inter-tribal conflict, over which armed conflict has repeatedly arisen. Not only do pastoralists and agriculturalists come into conflict over land ownership, but, as I will demonstrate in section 5.2.3, there are points of conflict which relate to farm management, as well.

Despite the episodes of violence and inter-tribal tensions described, the situation in Yelwa is far from unique. Inter-tribal tensions over land ownership are widespread across Nigeria, and frequently break into violence. In Yelwa, although there has been violence, it has not been as intense or frequent as it could have been without the (surprisingly) unifying factor of religion. While religion has been an accelerant and instigator of violence in many instances in Nigeria and throughout the world (Falola, 1998, Dawkins, 2006), in Yelwa it serves to form inter-tribal connections. The Fulani are devoutly Muslim, while in many areas of West Africa, the agricultural tribes with whom they are in conflict are Christian. When there are inter-tribal issues of conflict the churches and mosques therefore frequently act as focal institutions for rallying, and preachers have been known to instigate and encourage violence (Blench, 2003). In Yelwa, however, while all the pastoralists are Muslim, only approximately half of the members of the agricultural tribes are Christian and the other half, like the pastoralists, are Muslim. Hence the churches and mosques are unable to preach the justification of one tribal cause over another, which has been an initiator of violence in other areas (Blench, 2003). Additionally, inter-tribal bonds of friendship are formed through religious

fellowship, which acts to curb inter-tribal violence. Despite this, the continuing population growth (and subsequently the increasing need for more farmland) as well as the unresolved grievances of the agricultural tribes mean that violence continues to be a threat. This increased the vulnerability of people's livelihoods by posing a risk to market access (for both sales and purchases), livestock (the importance of which will be discussed further in section 5.3), and the potential to disrupt labor and other human resources (Mwaura and Cliffe, 2004). Unfortunately, the more vulnerable these resources become, the more likely conflict becomes (Herrero, 2006).

An indication of how intensely these threats are experienced by the local population (and how powerless people feel in the face of these threats), is the belief that planting *Justicia spp* around a village will protect it from harm at the hands of soldiers. This pervasion of problems arising from one resource shortage throughout all aspects of livelihoods demonstrates the importance of a holistic approach to poverty reduction.

In the next section on land management more aspects of the conflict between the pastoralists and agriculturalists as it relates to livelihoods in Yewla are discussed, as well as opportunities for co-operation between western scientists and the indigenous community.

### **5.2.3. Land management**

#### **Soil fertility**

As well as land, a farmer needs a means of maintaining soil fertility to keep up crop yields. In many parts of the world this has traditionally been through shifting cultivation

(Kleinman et al., 1995, Uhl et al., 1982, Bundelman and Zander, 1990), although other techniques and combinations of techniques have also been used (Pulido and Bocco, 2003, Hilhorst and Muchena, 2000).

On the mambilla plateau there are several techniques for soil fertility management which are known to have been used historically. These include the use of the fallow crop *Tephrosia purpurea*, known locally as 'yom'. The seeds of this plant are scattered on the farm during the sowing of the last productive crop, grow with the crop, then the *yom* is left to grow when the last harvest is gathered. *Yom* then grows freely on the farm for between two and four years before it is burned or dug into the soil and the farm is replanted with food crops. This technique is highly favored, although its use is currently limited in Yelwa, as many families do not have enough land to enable them to leave any land fallow. Another problem with this method has also arisen with the arrival of the Fulani, and presents another issue over which the two groups (pastoralists and agriculturalists) come into conflict. Cattle greatly favor *Tephrosia purpurea* for browsing, and will go to great lengths to break into fields where it is growing. The words of one of my informants on the subject elucidate this, and also give insight to the power dynamics of the region:

*Cattle think Yom is very delicious, and cows are very stubborn. Even if you build a fence, if the cow wants to eat what is inside the cow will push it down to come in. If you come the next day and see the tracks and follow them back to the herder, the herder will just say it is not his cow. If you wait every night at your farm and see the cow and follow it back to the herder the herder will still say that*

*it was not so. If you keep the cow once you catch it eating on your farm then the herder will accuse you of stealing the cow (S48).*

As a result of this, since the Fulani have been a major presence on the plateau an alternative system of soil fertility management has been developed. In this system a herder will encourage his cows to stay on the farm regularly for a year in which it remains fallow, eating the crop residue and fertilizing the soil with their manure. In return the herder will receive half the produce from the farm the following year. In other instances the crop residue is either annually burnt or dug into the soil while green. Farmers are aware that digging in the green residue gives a much longer lasting improvement to the soil, but the extra work required for this means that most people just burn their crop residue, which still results in a short-lived improvement of the soil. Farms beside rivers require less fertility management than other farms, and thus are particularly desirable. Rivers are known to transport nutrients and fertile soil from their catchment, and also from the pastures surrounding them (where cattle manure adds to the nutrient loading). The nutrients wash down the slopes with the rain and are then transported along the waterways.

High prices largely prevent farmers from using herbicides or pesticides in Yelwa and also restrict synthetic fertilizer use for many households. The price of a bag of fertilizer has been steadily increasing since the re-location of the settlement, when chemical fertilizers were first introduced in the region. At that time a bag of fertilizer allegedly cost around 10 Naira. The same size bag now costs close to 10 000 Naira. As well as the increasing *cost* of fertilizer (which is much higher than inflation alone can explain), the

need for increasing *quantities* of fertilizer input to maintain the same yield puts farmers' budgets under severe strain. In many cases, even though fertilizer input has increased, crop yields are still decreasing. This is widely recognized as a problem by the village as a whole, but no focused action has been taken on it. People have different opinions as to why yields are decreasing. Most believe it is a result of soil fertility loss, however some people blame a disease for affecting productivity, and one man (G87, who has been raised in Yelwa, but now lives elsewhere and visits Yelwa occasionally) is adamant that it is a result of climate change.

While some of these techniques have a history in the region, for the century prior to the resettlement of Yelwa (when the village was still located in the forest) the only soil fertility management practiced was shifting agriculture. Areas of forest were cleared, farmed for several years until fertility began to drop, then the farm would be abandoned and a new area cleared. In many places larger trees were left standing on the farms, thus facilitating the re-growth of the forest over the farm site once it was abandoned. The image below (Figure 14) shows a farm site that was abandoned in 1990 by a family who was able to remain within the reserve for a further 19 years after the resettlement of Yelwa village. It is apparent that the vegetation is shorter than the surrounding forest, but it is clearly recovering well.



**Figure 14 The site of a farm (distinguished by the lower vegetation) within the forest (abandoned in 1990)**

At a low population density this farming technique poses no threat to a forest. Indeed, disturbance is an important rejuvenative process in forest ecosystems (Denslow, 1995). The first conclusion that one might be inclined to draw from this is that the claims<sup>30</sup> of Kramer and van Schaik (1997) quoted in section 2.3 are true; the resource management

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<sup>30</sup> Kramer and van Schaik claim that indigenous communities are suitable as '*conservation allies*' only when they live at low population densities, with limited technology in a subsistence regime.

scheme employed by the community was only sustainable while the population was low, technology was limited, and production was based on subsistence, rather than commercial use. However, what this claim fails to recognize is that, just as communities are not static, their management strategies are not static. This can be readily demonstrated in Yelwa. As discussed in chapter 1, according to Hurault (1998) the plateau was populated at a density of between 150 and 250 people/km<sup>2</sup> approximately one century ago, and this declined to approximately 2% of the original number during a few decades of conflict, after which it has been climbing continuously up to the present day. It is my assumption that methods of maintaining soil fertility such as the use of the shrub *Tephrosia purpurea* developed during the period of high population density, became redundant during the subsequent years of low density, and have now begun to be re-employed as they again become appropriate. During the period of low population density farmers would have reverted to shifting cultivation, as there was no issue of land shortage, and thus once soil was exhausted it could be left for as long as necessary to recover. Now as a result of the land shortage the use of *Yom* (*Tephrosia purpurea*) has been revived, as well as new strategies being developed that are more suited to the current situation, such as co-operating with the Fulani pastoralists to trade crop residue for cow manure. This is congruent with the opinion put forward by Holt (2005), proposing that sustainable use results from the experience of resource limitation.

Another problem that greatly increases the vulnerability of communities in transition is the lack of information when a new technology is introduced. As the next section demonstrates, rubbish disposal is a good example of this.



### **5.3. *Rubbish disposal and livestock***

While at first glance rubbish disposal would appear to be of more relevance to common property than private property issue (as public land is rapidly filling up with refuse) I have, however, decided to include it in this section because the systemized method of rubbish disposal is a matter of more relevance to private property. Local people in general are unaware of the impacts rubbish has on the environment. Therefore rubbish such as plastic bags or wrappers are usually discarded on the spot when they've reached the end of their usefulness. However, when conscientious thought is given to rubbish disposal, the general practice is to bury it in one's own farm or garden. This practice has developed while all waste was comprised of local, compostable materials with beneficial effects on soil composition. Now it is not just a redundant practice, but actively harmful to soil and human health. Plastic bags present impermeable layers within the soil and batteries leach toxic substances into the soil and water, which then affect the health of humans and animals, as well as soil productivity. When rubbish is not buried, it is frequently eaten by livestock resulting in health problems or death and consequently having a profound effect on another vital private resource. Goats are particularly prone to eating plastic bags, and when goats are slaughtered it is not uncommon to find plastic bags clogging their digestive tract.

Like the issue of water security and extraction of medicinal plants, awareness of the implications of rubbish accumulation to the future of the community as well as on personal livelihoods varies between individuals. No-one I spoke to was aware of the

toxicity of batteries (used batteries were a popular suck-toy for children to chew on), but the risk to livestock from plastics was acknowledged to be a problem.

As has been noted in the introduction to this chapter (section 5.1), animals are an important investment and savings management device. If enough cash can be accumulated to buy a pair of goats, and to keep the female goat alive for the time it needs to reproduce, then the savings have paid interest. Chickens and guinea pigs are much less expensive than goats, and chickens have the added bonus of laying eggs, however, both chickens and guinea pigs are much more vulnerable to attack by predators, particularly dogs, than are goats. Cattle are also invested in by farmers, but these require management as they cannot roam around the village as the goats do. The cattle of different farmers are commonly kept together in a single herd, and a Fulani herdsman is paid from the farmers' pooled resources to care for the collective herd. This makes investing in cattle expensive and complicated. Thus goats are a particularly important investment, and the accumulation of garbage has presented a new risk to what has previously been a relatively safe investment. As was mentioned previously in section 5.2.2, violent conflict presents another risk to livestock ownership. The conflict in 2002 began with a mass theft of livestock, which resulted in many of the village men being scattered throughout the area searching for their stolen property, rather than presenting a unified front to withstand attacks.

#### **5.4. *Trades and employment***

So, having presented the problems arising with the traditional privately owned resources

(land and livestock) it is time to explore some of the issues which have arisen as a result of adapting to a cash based asset acquisition system. In discussing the opportunities and constraints of these financial endeavors the important role of social capital in maintaining and developing effective livelihood strategies is also illustrated.

Employment opportunities ranged from permanent employment with companies (such as the dairy company referred to in chapter 4), or organizations (such as the Nigerian Conservation Foundation or Nigerian Montane Forest Project which both employ a large number of people from the village) to casual contracts such as working the farms of the Fulani as described in section 5.2. Casual labor is common for young men, and can be very lucrative, although it is an unreliable income. For example, one man whom I spoke to (A24) (who now holds a permanent position with the NMFP in which he earns 200 Naira a day) claimed that when he was doing casual wood portage labor he earned up to 1600 Naira a day, and between 6000 and 8000 for a week of farm preparation work for the Fulani. Despite earning so much more doing casual labor he had accepted the permanent position because it was much easier work, and was reliable money, although he was still questioning that decision.

Business initiatives (other than those that relied on common property natural resources which have been discussed in chapter 4) included taxi driving, tailoring, weaving, haircutting, shop-keeping, taking photographs for people at events, and repairing shoes. All of these required some amount of capital to get started, and to different extents also required training. Running a taxi required the largest financial investment: a car. Repairing shoes and offering haircuts required relatively little financial outlay, although a

few basic tools were needed. To learn to be a tailor or a weaver requires a large financial outlay not only for the tools (either a sewing machine or a loom) but also for the training. Undertaking training also requires time during which one can't engage in other revenue-generating activities. Thus all non-common property business opportunities are available only to those who are relatively advantaged already, whether through physical assets or social capital<sup>31</sup>. For example, one woman (O74) with whom I spoke had saved the money she earned by selling farm produce for several years to fund half of what was needed to pay for lessons in weaving. She then borrowed the other half needed for lessons from a relative, as well as what was needed to buy the equipment. Her household was then reliant on her husband's earnings while she spent six months training before she could again contribute financially to the household. The taxi driver (C57) whom I interviewed had been loaned the money to purchase the vehicle by his brother. The barber (U81) had been given the tools and room to operate with and in by a relative, and so on.

#### **5.4.1. Importance of social capital**

Non-farm activity is associated with increasing income and wealth in rural Africa, and thus being able to take advantage of opportunities for non-farm income would appear to offer a pathway out of poverty for the rural poor. However, as has been demonstrated, all the business initiatives identified in Yelwa required tools and materials, and most also

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<sup>31</sup> As defined in Table 1, page 25; in this instance referring to friends or relations willing to loan one the money to get started in a business venture, or support one while undergoing training.

required training, and thus remain inaccessible to the poorer and more vulnerable members of the community. This is a problem which has already been widely recognized in developmental literature (Smith et al., 2001, Barrett et al., 2001). Social resources, such as family, are a key resource in overcoming individual poverty, however this places intense pressure on the first person from a poor family whose income rises above the family average, as without a strategy for dealing with supplicants he/she can easily be pulled back into poverty by a flood of demands from relatives. For example, one man (*H32*) who was in this situation had decided to focus his financial assistance on three promising nephews, for whom he was paying all expenses necessary to be trained as mechanics. Thus he only needed to pay for one house for them to stay in together while they studied, as well as one copy of text books and related materials, and one of his wives was able to stay with them in the city and cook and clean for them all together. Once they have completed their studies and established themselves in business they will share his responsibility of providing loans, gifts and other financial support to the rest of the extended family.

## **5.5. Discussion**

This thesis began with the question “what are the livelihoods of the Yelwa village community dependent on?” Investigations confirmed that (as is commonly the case in rural Africa) access to farmland and measures to maintain soil fertility are very important factors for livelihoods in Yelwa village, not just in their own right, but also as a means to enable families to develop alternative livelihood strategies. The questions ‘is this resource at risk’ and ‘how will its unavailability affect people’s livelihoods’ also

yielded clear answers. The answer to the first is that farmland and productivity are already seen as insufficient to meet people's needs. The answer to the second is that if alternative livelihoods cannot be accessed this shortfall will exacerbate inter-tribal tensions with the potential for escalating into violence. Thus this state of affairs will continue to pose an ongoing threat to people's livelihoods as long as it is not resolved.

While many articles adopting a sustainable livelihoods (SL) approach have stressed the importance of non-farm incomes in rural livelihoods it should not be forgotten how important a role agriculture plays in rural communities. While it remains an important part of people's livelihoods its importance should not be underrated in a comprehensive SL approach to rural poverty relief. For example, a comparative study in Uganda recognized that while many of the comparatively wealthier families had non-agricultural incomes such as running shops and bars or restaurants, they had been able to establish themselves because of wealth accumulated through agriculture or animal husbandry (Smith et al., 2001). This appears to be the direction that Yelwa village is taking. Many people with trades and businesses began these enterprises with money earned through farming, and a few through livestock investments. Once established in a business it is common to discontinue farming. Rigg (2006) found education to have a positive correlation with non-agricultural income. Thus education (used here in the broad sense to include trade specific training) may be seen as an answer to relieve the social tensions arising as a result of land shortages. However, for those without adequate financial and/or social capital to begin with, it can be difficult to access the education necessary to start non-farm income generating activities that do not rely on common

property resources. Thus, as the community makes the transition from a small society living in a traditional subsistence mode of production to a larger community with mixed livelihoods those who fall behind slightly at the start of the transition become increasingly disadvantaged as development progresses. This class of disadvantaged poor rely largely on common property resources, and are amongst the most marginalized and least socially influential. As this class grows the demands on common property resources increases, as does the resentment felt towards those seen as oppressors (in this case the Fulani landholders) with the potential to result in violence, thus reducing the resilience of the community as a whole. Microcredit<sup>32</sup> is one option to address this, but it also brings with it many associated risks, and cannot be considered the sole answer. I conclude that facilitating and assisting developments toward sustainable non-farm incomes in the early stages of rural development is the best step forward for preventing and relieving poverty, as well as for environmental protection for Yelwa and villages in similar situations. Because of the close relationship between farm incomes and the opportunity to engage in non-farm incomes, achieving sustainable farm incomes is an effective first step towards sustainable non-farm incomes. Thus a long-sighted, holistic and multidisciplinary approach to rural poverty prevention is necessary.

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<sup>32</sup> Microcredit is the extension of loans to people in poverty who would normally be unable to secure them officially

## **5.6. Conclusions, speculations, opportunities and limitations**

Recognizing the value of common property resources has been an important step in development and poverty literature; however, a holistic approach to poverty should neither neglect nor undervalue privately owned resources (including non-physical resources). The livelihoods framework seeks to recognize both, including commonly overlooked resources such as social capital and regional peace, the importance of which has been demonstrated in sections 5.4.1. and 5.2.1 - 5.2.2 respectively.

The primary intention of this thesis has been to present a picture of the situation in Yelwa as it now stands, coloured in by historic detail relevant to the current situation. This sub-chapter is included, however, to demonstrate some of both the opportunities and the limitations to sustainable development being achieved through global partnership and dialogue (as described in the millennium development goals in chapter 1) in the context of Yelwa village.

### **5.6.1. Microfinance**

Offering Microcredit is a strategy which has been used in an effort to address the inequality of opportunities for the financially and socially poor, who, without the backing of financially successful kin have been unable to obtain the capital necessary to improve their situation. Microcredit was first introduced by *Grameen Bank* in Bangladesh (Morduch, 1999), and has since been replicated in many other areas in both the developing and developed world as a tool with which to address poverty. Academic opinions of the success of microcredit are split. Many studies claim that it is highly



effective in reducing vulnerability, as it enables households to access cash loans to smooth over economic shocks (such as ill health or crop failures) as well as providing the capital necessary for poor people to take advantage of a business opportunity (Littlefield et al., 2003). Another purported advantage of microcredit is that it empowers women. Like many aid initiatives, microcredit programs frequently target women. This is because women are judged by the managing institutions to be more likely to put the needs of the household above personal needs, and because the empowerment of women has been found to have a far-reaching effect on reducing poverty<sup>33</sup> (Armendáriz and Roome, 2008). Whether microcredit actually empowers women has been brought into question, however (Kabeer, 2001, Mahmud, 2003, Isserles, 2003, Cons and Paprocki, 2008). A study by Rahman (1999) found that in the study community, rather than empowering women, microcredit had evolved into yet another method of repressing and dominating women. Ninety percent of loans taken out by women were initiated and used by a male (in most cases the woman's husband), yet the pressure to make repayments and the social stigma if repayments are not made remained with the woman (Rahman, 1999, Cons and Paprocki, 2008). Although microcredit attempts to address economic aspects of gender inequality, without further work on the social and cultural aspects of gender inequalities it is insufficient for making a difference to the status quo. In many societies, because of the social and cultural context, (including the domestic responsibilities and restricted mobility of women) men are better situated to take

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<sup>33</sup> For example through increasing overall education levels, lower child mortality, and lower birth rates.

advantage of business opportunities (Cons and Paprocki, 2008), and thus by targeting women valuable opportunities in poverty reduction are lost.

Aside from gender issues, in numerous instances microcredit has been found to initiate a cycle of debt and poverty. More loans are taken out to meet repayments on existing loans which are fixed in inflexible repayment schedules, and in many cases this leads to an ongoing cycle of indebtedness, as people under-skilled in business management are encouraged to take out loans without the training or support necessary to manage their investments fruitfully (Seibel and Almeyda, 2001, Cons and Paprocki, 2008).

Microcredit is in use already in Yelwa at a small scale. It is currently funded by revenue paid to the women's or men's societies respectively by the societies' members, and then made available to members for loans approved by a committee. I was not able to determine the origin of this system. Zeitlyn (2003) mentions that rotating credit societies were already in place and essential in helping people make larger financial investments such as sewing machines or metal roofing when he began his work with the Mambilla people in 1985, but no mention is made of these societies in earlier work by Rehfish (1962, 1960).

A Nigerian Conservation Foundation representative told me that a major African bank will soon be coming aboard to offer microloans in addition to this, but it is not yet clear whether there will be a gender bias towards female borrowers in this project, when it eventuates. If this should be the case it will undoubtedly have repercussions for the social functioning of the community, as in Yelwa men are much more involved in

businesses while women stick more to hand-crafts and farming (as well as having full responsibility for all domestic tasks), although the division of labor varies between tribes and even households. For example, none of the permanent shops in the village were operated by women, although women frequently sold cooked food and farm produce at the markets, from trays, or from their houses. Although the interpretation of Islam varies greatly between individuals in the community, some of the Islamic households in Yelwa believe that women should not work at all, while amongst the Kambu, men will not farm, but traditionally engage in other business activities while the women have responsibility for the farms. Thus, while microcredit has the potential to be of value in reducing vulnerability and increasing livelihood diversification opportunities in Yelwa, the effects it will have on the community as a whole will have to be considered carefully, including its impact on the self-financed and self-managed loan institutions already in place.

### **5.6.2. Rubbish**

Community education on the toxicity of waste products, as well as knowledge sharing about the various strategies for rubbish disposal that have been implemented in other regions globally would give the community the opportunity to take action that could prevent not only future problems for the community, but also prevent the spread of toxic substances throughout the ecosystem. Theoretically, this is a very simple matter, with clear mutual benefits for conservation and community development. I acknowledge, however, that in practice it is never as simple as offering some ideas, and changing the way things are done, as demonstrated by the pervasion of mis-information and lack of acceptance even on issues to which vast amounts of resources have already been

directed (such as planned parenthood, and HIV/AIDS (Creese et al., 2002, Cleland et al., 2006)). Here (and elsewhere) it is not my intention to present solutions to problems, but merely to illustrate that sustainable development through co-operation and dialogue is possible.

### **5.6.3. Land ownership and management issues**

While crop productivity, poverty prevention and poverty alleviation may not be clear goals of conservation organizations, the effects of impoverished and resentful communities on conservation projects are worth considering. Resistance strategies such as poaching, vandalism and protest make sustaining conservation initiatives without the goodwill of local communities a continuous struggle and consume resources for enforcement and protection. For aid and development organizations the transitional period (from traditional communities to industrialized communities) is a time of opportunity to effectively improve both present livelihoods and environmental, social and economic resilience in developing communities through co-operation. The community is already experimenting with its agricultural practices, and has identified problems with contemporary methods. Knowledge sharing between local farmers and external aid, development or conservation workers with access to a global knowledge base has the potential to offer more effective solutions than leaving the community to 're-invent the wheel' in isolation. For example, it is believed to be the leaves of Yom (*Tephrosia purpurea*) (a leguminous plant) that have the improving effect on soil, yet agricultural science has found that it is a bacterium (*Rhizobium*) which forms nodules on the roots of legumes that is responsible for the majority of nitrogen fixed in the soil, and thus has

the greatest influence on soil rejuvenation (Peoples and Herridge, 1990). Other types of legumes are commonly used throughout many cultures in crop rotation plans (Alvey et al., 2003, Howieson et al., 2000, Hilhorst and Muchena, 2000). With access to this knowledge local farmers may experiment with other legumes less susceptible to damage by cows, or which provide some return themselves. Thereby farmers with too little land to leave a field unproductive for the time required for soil to rejuvenation are enabled to plant a productive crop that at the same time rejuvenates the soil. Although this idea is not new and has been applied successfully in many farming projects, often too little attention is paid to its potential when ICDP plans are designed. Agroforestry is another avenue for potential poverty reduction (through improved crop yields), biodiversity conservation (through planting native tree species and thus providing habitat for native animals), as well as climatic regulation (agroforestry lands have been found to sequester three times as much carbon as either croplands or grasslands) (Sanchez, 2000). The concept of agroforestry is not foreign to the agricultural system of the Yelwa community. When farms were located in the forest useful trees were left standing amidst the area cleared for the crops. Thus, co-operative knowledge sharing between western science and TEK has the potential to be highly successful in meeting developmental and environmental goals through the introduction of key species (of both ecological and anthropological importance) into a wider habitat than that provided by a forest reserve, while simultaneously improving farm productivity.

Co-operative interventions which empower the community through knowledge transfer and allow them the autonomy to integrate new technologies into their farming

techniques as they see fit has much greater potential for improving livelihoods than the introduction of alien techniques or technologies which may not fit into their cultural framework, and thus be rejected (Adato et al., 2002).

Another issue with new technologies is that they frequently involve an ongoing expense, as is the case with synthetic fertilizer. Reliance on synthetic fertilizer for farming not only presents an ongoing (and increasing<sup>34</sup>) expense to farmers of the developing world, but has already been recognized in the western world to be unsustainable (Wood et al., 2006). It is not in the interest of long-term sustainability to force strategies that have been found to be flawed and unsustainable in the western world onto a community in the developing world. Paradoxically, at the same time as this is happening, innovative farmers in industrial countries are turning to traditional ecological knowledge of other cultures to find answers to the many problems that industrialized agriculture has caused in their own countries. Through knowledge sharing, however, western scientists and traditional farmers have the potential to develop ecologically, socially and economically sustainable farming methods.

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<sup>34</sup> Synthetic fertilizers are very energy intensive to produce, thus as global oil prices rise, the cost of manufacturing synthetic fertilizers also increases

## 6. Conclusions

Environmental protection and poverty reduction are both extremely important and urgent global issues. Consequently it is very unfortunate that frequently progress in one of these issues is made at the cost of the other. Opinions on whether this is inevitable remain polarized. My research approached this debate by asking what natural resources the livelihoods of a rural community in the developing world rely on. Based on this research I believe that the transition from a traditional to an industrialized community certainly exacerbates the vulnerability of the environment. This is demonstrated by the abundant population growth of the Yelwa community (from 16 households to 450 in the last 40 years), the prevalence of rubbish, the deforestation of native trees around the stream and the introduction of eucalyptus plantations which have now jeopardized the local water-supply, and soil exhaustion from overly intensive farming. Additionally, as new materials become available direct dependence on local natural resources is reduced, which results in a devaluing of these resources in the eyes of the community, as has been demonstrated in relation to medicinal plants and the grasses needed for thatching in chapter 4. However, rather than concluding that this makes development and environmental protection conflicting agendas, I believe that this period of vulnerability also presents opportunities. Like Holt (2005) found in her research in the Amazon rainforest, I conclude that the experience of resource depletion is central to the

(re)awakening<sup>35</sup> of conservation awareness for the agricultural community of Yelwa village. This is demonstrated through the conclusions that some members of the community are beginning to draw about the need to change aspects of their resource management strategies (for example regarding water, the harvesting of traditional medical plants, the widespread acceptance of building bee-hives and the revival of traditional soil management techniques as well as experimentation with new ones).

The assumption that traditional communities are static entities, and that their potential as 'conservation allies' can be judged based on their functioning during a snapshot in time is unrealistic and unfair. Rather than questioning whether traditional management systems work effectively in non-traditional situations, the question should be: Will the process by which traditional management systems evolved produce a management scheme suitable for the modern context? This then begs us to consider our own position, as our modern resource management philosophy has evolved and adapted via the same mechanism. Thus, whether we answer yes or no to the proposed question, paternalistic interventions cannot be considered appropriate. If we believe that this mechanism is an effective tool for developing 'conservation awareness' then should it not be supported as it develops? This cannot happen when resources are restricted

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<sup>35</sup> I use the term awakening rather than formation, because (as has been discussed throughout) it is apparent that in this case there are traditional management techniques which have lapsed, presumably during the last century while the population density has been low, and that these techniques are now being revived, rather than invented.



externally, rather than the experience of resource scarcity arising as a result of one's (and one's community's) actions. On the other hand, however, if we believe that it does not function, then how can we (western culture) be considered as an appropriate guide, as our own collective 'conservation awareness' has only arisen in the face of environmental catastrophe?

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## 8. Appendices

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### 8.1.1. Codes

#### Purpose Codes

##### **F – Food**

Fs - Food Seasonal (available only in certain seasons)

Fa – Food Annual (available all year)

Ff – Food famine (a food only used in dire need)

##### **M - Medicine**

Mp – Medicine People

Ma – Medicine Animals

##### **B – Building**

Bb –Building

Bm – Making things

##### **C – Cultural**

##### **R - Retail**

#### Description Codes

##### **P - Plant**

Pt- Tree

Ps – Shrub

Pg – Grass

Ph -herb

##### **I – Insect**

##### **O – Other**

#### Part Used Codes

**R –root**

**L –Leaves**

**F- Fibers**

**B – Bark**

**S – Sap**

#### Place Found Codes

**G –Garden**

**V – Village**

**B - Bush**

**F – Forest**

**Ff – Forest fragment**

**P – Beside a path**

## **8.2. Appendix 2: Information sheet and consent form**

### **8.2.1. Information Sheet**

You are invited to participate as a subject in the research project "*Natural Resource use and livelihoods – Yelwa village*"

The aim of this project is to identify what natural resources are needed to support the livelihoods of the residents of Yelwa village and how these resources are managed, in a way that can be demonstrated to official bodies (such as Environmental Non-Government Organizations (NGOs), policy makers, and managers of the Ngel-Nyaki forest reserve).

The things you tell me will be used to generate the data for this report.

You have the right to withdraw from this project at any time, including withdrawal of any information provided.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: the identity of participants will not be made public.

To ensure anonymity and confidentiality, the names of people who participate will be withheld or pseudonyms will be used, and identifying information such as age and social position will be withheld or obscured.

The project is being carried out as a requirement for the degree *Masters in Environmental Science* by Tammy Korndoerfer, under the supervision of Nicole Gombay and Hazel Chapman. Tammy can be contacted directly at Yelwa village whilst in Nigeria, or through the *University of Canterbury Geography Department* after February 2009.

She will be pleased to discuss any concerns you may have about participation in the project. If you have any problems about which you would like to speak directly to one of the project supervisors, Nicole Gombay is contactable through the *University of Canterbury Geography Department*, and Hazel Chapman is contactable through the *University of Canterbury Biology Department*, or through the *Ngel Nyaki Field Station*.

This project has been reviewed and approved by the University of Canterbury Human Ethics Committee.



Contact Details

**University of Canterbury Geography Department**

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**8.2.2. Consent form**

Tammy Korndoerfer  
18 Hazelwood Tce  
Christchurch,  
New Zealand

\_\_\_/\_\_\_/\_\_\_

CONSENT FORM  
Natural Resource Use in Yelwa Village

I have read/ heard and understood the description of the above-named project. On this basis I agree to participate as a subject in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved.

I understand also that I may at any time withdraw from the project, including withdrawal of any information I have provided.

I note that the project has been reviewed and approved by the University of Canterbury Human Ethics Committee.

*NAME (please print):* .....

*Signature:*

*Date:*

### **8.3. Appendix 3: Letter to the Yelwa Head man**

To the Yelwa Village Head, Jauro Saidu  
Dear Jauro, Saidu Bapetel Yelwa

Thank you for the welcome we have received from Yelwa village. This letter is an explanation of what I am doing here.

I will be living in the village for six months (from October until April), although I will have to leave several times for the renewal of my visa. During this time, I am trying to gain an understanding of how this village functions, what the people in this village hope for in the future for this village, how it has changed in the past, and what have been the causes of these changes.

This information will be the basis of my thesis towards the degree, *Masters in Science*, from the University of Canterbury, New Zealand. My supervisors for this project are Dr. Nicole Gombey, from the Department of Geography, University of Canterbury, and Dr. Hazel Chapman, from the Department of Biology, University of Canterbury, who is also the director of the Nigerian Montane Forest Project.

Once written, I would be happy to send a copy of my thesis to Yelwa village, as it may be of use to the village in the future to have this information in a demonstrable format for negotiating with international or national aid organisations, sponsors, developers, or conservation organisations.

If, during my stay, I am behaving in any way which is inappropriate or offensive to your people, please do let me know.

If you wish to speak directly to my supervisors about any aspect of my research, they can be contacted through the following means:

**Nicole Gombey:**

Email Address: [nicole.gombey@canterbury.ac.nz](mailto:nicole.gombey@canterbury.ac.nz)

Phone Number (Geography Department): +64 3 364 2900

**Hazel Chapman:**

Email Address: [hazel.chapman@canterbury.ac.nz](mailto:hazel.chapman@canterbury.ac.nz)

Phone Number (Biology Department): +64 3 364 2500

Should you find it necessary to contact me after I have left Yelwa village, I can be contacted via email at: [timtamtaz@gmail.com](mailto:timtamtaz@gmail.com)

Sincerely,  
Tammy Korndoerfer

**8.4. Appendix 4: Listing of all plants identified, with botanical names (where know) and the ethnic groups using these plants**

**8.4.1. Herbs**

No.	Ethnic Groups Using it														Botanical Name
	Mambilla		Kaka		Fulani		Tigung		Panso		Kambu		Ndoro		
	m	F	m	f	m	f	m	f	m	N/A	m	f	m	f	
1	1	1				1		1	1			1	1		<i>Kalanchoe crenata</i>
2		1				1									
3								1							<i>Amaranthus spinosus</i>
4			1	1	1	1					1				<i>Birdens sp.</i>
5	1		1	1								1			<i>Justicia msularis</i>
6	1	1	1	1	1	1	1	1							<i>Emilia coccinea</i>
7								1				1			<i>Aspilia Africana</i>
8								1							
9								1							
10								1						1	<i>Achrauthes sp</i>
11								1							
12					1	1		1							<i>Aspilia sp.</i>
13								1							
14								1	1			1			<i>Plucaria crispa</i>
15		1						1							<i>Oldenlandia corymbosa</i>
16		1	1									1			<i>Tinthonia diversifolia</i>
17									1						
18								1							<i>Alectra sp.</i>
19								1							
20		1		1	1	1		1			1	1			<i>Erigeron floribundus</i>
21	1			1				1						1	<i>Dissotis sp.</i>
22								1				1	1		<i>Hibiscus cannabilinus</i>

23			1		1	1					1	<i>Aqertum sp.</i>
24										1		
25		1										
26	1	1									1	
27	1	1										
28		1					1					
29										1		
30										1		
31						1				1		
32					1							
33								1				<i>Spilanthes filicaulis</i>
34		1										
35	1	1										
36					1							
37		1	1		1		1				1	
38								1		1	1	<i>Ocimum gratissimum</i>
39	1	1										<i>Satureja sp.</i>
40					1							
41							1					
42							1					
43							1					
44	1		1									
45	1	1	1		1						1	<i>Echinops sp.</i>
46			1		1							<i>Sissotis graminicola</i>
47											1	
48					1							<i>Leonotis sp.</i>
49				1							1	
50	1	1	1	1		1	1	1			1	<i>Triumfetta pentandra</i>
51					1							<i>Kotschya strigosa</i>
52					1							
53					1							
54					1			1				
55										1		
56			1									

## Trees

No.	Ethnic Groups Using it														Botanical Name
	Mambilla		Kaka		Fulani		Tigung		Panso		Kambu		Ndoro		
	m	f	m	f	m	f	m	f	m	N/A	m	f	m	f	
1						1									<i>Persea americana</i>
2								1							
3		1	1												<i>Psidium guajava</i>
4								1							<i>Citrus lemon</i>
5				1			1				1				<i>Mangifera midica</i>
6	1	1	1					1							<i>Birdelia seciosa</i>
7							1								
8							1								
9		1													<i>Psychotria sp.</i>
10														1	<i>Senna sophera</i>
11		1													
12														1	<i>Gossypium arboretum</i>
13	1	1		1								1			<i>Vernonia amygdalina</i>
14		1													
15	1														
16	1														
17	1		1												<i>Psorospermim sp.</i>
18		1	1				1	1				1		1	<i>Ricinus communis</i>
19				1											<i>Eucalyptus sp.</i>
20	1														<i>Albizzia zygia</i>
21		1													<i>Citrus aurantium</i>
22		1													(orange)
23		1													
24		1	1	1		1		1			1				

25		1															<b><i>Piptadeniastrum aficana</i></b>
26					1		1										
27					1												
28					1				1								<b><i>Maesa kamerunensis</i></b>
29					1												
30	1								1								
31		1	1						1								<b><i>Syzygium guineense</i></b>
32					1												
33					1												
34					1												
35			1		1					1							
36			1														
37			1														

8.4.2. Vines

No.	Ethnic Groups Using it														Botanical Name	
	Mambilla		Kaka		Fulani		Tigung		Panso		Kambu		Ndoro			
	m	f	m	f	m	f	m	f	m	N/A	m	f	m	f		
1				1												
2								1								
3				1												
4		1							1	1						
5							1									<b>Clematis sp.</b>
6					1											
7												1				
8	1															
9	1			1												
10	1															
11									1							
12	1															
13		1														
14	1	1														
15		1														<b>Centella sp.</b>
16		1														
17		1														
18	1															
19					1											



8.4.3. Shrubs

No.	Ethnic Groups Using it														Botanical Name	
	Mambilla		Kaka		Fulani		Tigung		Panso		Kambu		Ndoro			
	m	f	m	f	m	f	m	f	m	N/A	m	f	m	f		
1					1									1		
2						1										<i>Datura sp.</i>
3					1											
4		1					1	1						1		<i>Jatropha curcas</i>
5	1															
6							1	1	1							<i>Crotolaria sp.</i>
7	1			1			1	1	1							<i>Triunfetta cordifolia</i>
8					1											<i>Grewia sp.</i>
9							1	1								
10			1													
11	1		1													<i>Tephrosia purpurea</i>

#### 8.4.4. Lilies and Ferns



No.	Ethnic Groups Using it														Botanical Name
	Mambilla		Kaka		Fulani		Tigung		Panso		Kambu		Ndoro		
	<i>m</i>	<i>f</i>	<i>m</i>	<i>f</i>	<i>m</i>	<i>f</i>	<i>m</i>	<i>f</i>	<i>m</i>	N/A	<i>m</i>	<i>f</i>	<i>m</i>	<i>f</i>	
1		1	1	1			1								<i>Aframomum melagreta</i>
2								1	1	1		1			<i>Crynum sp.</i>
3		1												1	<i>Dracaena sp.</i>
4		1			1										<i>Pteridium aquilinum</i>
5	1	1								1					
6				1											

#### 8.4.5. Grasses

No.	Ethnic Groups Using it														Botanical Name
	Mambilla		Kaka		Fulani		Tigung		Panso		Kambu		Ndoro		
	m	f	m	f	m	f	m	f	m	N/A	m	f	m	f	
1					1										<i>Hyparrhenia myolnerata</i>
2							1	1						1	<i>Ergrostis sp.</i>
3	1		1				1	1							<i>Pennisetum sp.</i>
4	1														
5					1										
6											1				<i>Cymbopogon citrates</i>





**8.5. Appendix 5: Photographs of plants**

**8.5.1. Herbs**

No.	Photograph	Botanical Name
1		<i>Kalanchoe crenata</i>
2		

3				<p><i>Amaranthus spinosus</i></p>
4				<p><i>Birdens sp.</i></p>

5	 A photograph showing a dense patch of Justicia msularis in a field. The plants are green with small, light purple flowers scattered throughout.	 A close-up photograph of a single Justicia msularis flower, showing its two-lipped structure and light purple color.	<p><i>Justicia msularis</i></p>
6	 A photograph of Emilia coccinea leaves and a stem with small flowers, laid out on a white surface. The leaves are green and ovate.	 A photograph of Emilia coccinea growing in a field. The plant has a thick, upright stem and large, green, ovate leaves.	<p><i>Emilia coccinea</i></p>

7			<p><i>Aspilia Africana</i></p>
8			
9			

10				<i>Achrauthes sp</i>
11				








12					<p><i>Aspilia sp.</i></p>
13					



14			<i>Plucaria crisper</i>
15			<i>Oldenlandia corymbosa</i>

16				<i>Tinthonia diversifolia</i>
17				

18				<i>Alectra sp.</i>
19				





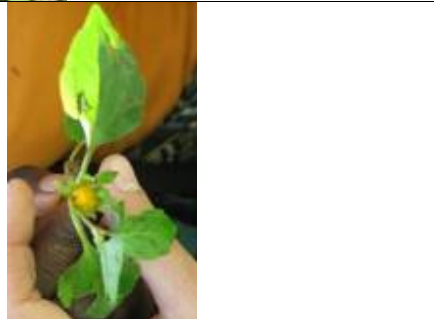
20				<i>Erigeron floribundus</i>
21				<i>Dissotis sp.</i>





22				<i>Hibiscus cannabilinus</i>
23				<i>Aqertum sp.</i>
24				







25					
26					
27					




28					
29					
30					









31					
32					
33					<i>Spilanthes filicaulis</i>

34				
35				
36				




37					
38					<i>Ocimum gratissimum</i>
39					<i>Satureja sp.</i>

40				
41				
42				

43					
44					
45					<i>Echinops sp.</i>

46					<i>Sissotis graminicola</i>
47					

48				<i>Leonotis sp.</i>
49				

50					<i>Triumfetta pentandra</i>
51				<i>Kotschya strigosa</i>	





52				
53				

54				
55				




56				
----	--	--	--	--

8.5.2. Trees

No.	Photograph	Botanical Name
1		<i>Persea Americana</i>
2		




3				<i><b>Psidium guajava</b></i>
4				<i><b>Citrus lemon</b></i>



5			<p><b><i>Mangifera midica</i></b></p>
6		<p><b><i>Birdelia seciosa</i></b></p>	

7				<p><i>*bark from a tree no longer growing locally, but purchased from traders and still in use.</i></p>
8				
9				<p><i>Psychotria sp.</i></p>

10				<i>Senna sophora</i>
11				



12				<b><i>Gossypium arboretum</i></b>
13				<b><i>Vernonia amygdalina</i></b>
14				

15		 A photograph of a tree with a thick, gnarled trunk growing out of a large, grey rock. The tree has several branches with green leaves. In the background, there are rolling hills under a clear blue sky.		
16		 A close-up photograph of a tree branch with green leaves and a small, round, brown object (possibly a fruit or seed) attached to it. A hand is visible on the left side, holding the branch. The background shows a grassy field and a clear blue sky.		

17				<b><i>Psorospermim sp.</i></b>
18				<b><i>Ricinus communis</i></b>

19				<i>Eucalyptus sp.</i>
20				<i>Albizzia zygia</i>

21				<p><i>Citrus aurantium</i></p>	
23					
24					






25				<i>Piptadeniastrum africanum</i>
26				

27				
28				<p><b><i>Maesa kamerunensis</i></b></p>

29				
30				





31				<i>Syzygium guineense</i>
32				





33					
34					
35					

36				
37				







8.5.3. Vines

No.	Photograph	Botanical Name
1		
2		

3				
4				
5				<p><b>Clematis sp.</b></p>

6				
7				
8				
9				



10		 A photograph showing a person's hands holding a large, round, green melon. The person is wearing a pink long-sleeved shirt. The background shows some green foliage.		
11		 A photograph showing a dense field of green plants, likely a vegetable garden or farm. The plants are lush and green, with some small white flowers visible.		
12		 A photograph showing a person's hand holding a plant stem. The hand is wearing a white watch. The plant has green leaves and a reddish-brown stem. The background is a dense field of green plants.		

13					
14					
15					<p><b>Centella sp.</b></p>
16					



17				
18				
19				

8.5.4. Shrubs

No.	Photograph	Botanical Name
1		
2		<i>Datura sp.</i>



3					
4				<i><b>Jatropha curcas</b></i>	
5					

6					<b><i>Crotolaria sp.</i></b>
7				<b><i>Triunfetta cordifolia</i></b>	

8				<i>Grewia sp.</i>
9				

10				
11				<i>Tephrosia purpurea</i>

8.5.5. Lilies and Ferns

No.	Photograph	Botanical Name
1		<i>Aframomum melagreta</i>
2		<i>Crynum sp.</i>

3				<i>Dracaena sp.</i>
4				<i>Pteridium aquilinum</i>



5					
6					

8.5.6. Grasses

No.	Photograph	Botanical Name
1		<i>Hyparrhenia myolnerata</i>
2		<i>Ergrostis sp.</i>

3					<i>Pennisetum sp.</i>
4					

5				
6				<i>Cymbopogon citrates</i>