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Assessing impacts from community conservation interventions around Parc National des Volcans, Rwanda

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Executive Summary
Background

Accepting that park-adjacent communities are integral to the success and sustainability of park management activities is an underlying principal of the Volcanoes National Park conservation strategy. Knowing the socio-economic status of park-adjacent households and communities is essential to design and monitor programmes of work to mitigate the local social and economic costs of conservation and maximize the benefits. Several studies have shown that it is the poorest people around the PNV that are most likely to use it illegally to provide for subsistence needs. It is a reasonable assumption in the case of the PNV that higher levels of poverty (low income) lead to increased dependency on local park resources. However, this does not imply a unitary relationship between household income and forest use. The determinants of forest use or dependency are much more contextually complex.

This study comprised of a comprehensive survey of the current economic and social status of households in the 12 sectors adjacent to the Volcanoes National Park. It employed both a purposively sampled Participatory Rapid Appraisal (9 communities) and a stratified random Sample Household Survey (n=388) to qualitatively and quantitatively explore issues and perceptions of communities and socio-economic groups related to their development status and relationship with the national park. It provides a comprehensive base line of data from which to monitor the impacts of development and conservation programmes with communities in the park impact area, as well as general and specific knowledge to guide future interventions to maximize the household welfare and conservation benefits of interventions.

The current development situation of communities around the PNV is examined in the context of household livelihoods. Issues regarding socio-economic opportunities and constraints as well as resource use are set in the broader context of seasonality, institutions to promote development, to reduce vulnerability, improve food security and generate income. Information is disaggregated by social and geographical factors: wealth groups and proximity to geographical distribution around the park.

Development Context
Resources

In general, the seasonal patterns and effects from a development perspective are uniform in the 12 sectors around the national park. Proximity to the park affects altitude - the closer to the park the higher the altitude - leading to some differences in the state and completion times for agricultural activities.

Land - The historical context of land scarcity is more acutely evident around the PNV. The mean population density of the 12 sectors around the park is 590 people per km^2 - ranging from 314 people per km^2 in Kinigi Sector, the central zone, up to an astonishing 1,028 people per km^2 in Gahunga Sector, in the eastern zone. The mean own reported land holding was 0.55ha, with park-adjacent households having mean holdings of 0.42ha and non-adjacent households a mean of 0.67ha. The mean value is a significant decrease in reported holdings from previous studies conducted in 2005. Respondents' ratings of the quantity and quality of land in their village portray a worsening situation in terms of land availability and land quality if current trends continue. Respondents' predictions for the future are that whilst there is about 31 percent landlessness today, this may increase to 63.61 percent in the next 5 years. There was also a significant decline in the proportion of households who thought that they would have sufficient land to meet basic needs in the future. Many of these issues can at least be met in the short term through adoption of improved technologies and marketing systems, e.g. high yielding crop varieties, fertilizers and pesticides.

Labour – Seasonally, the distinct wet and dry seasons lead to different activity patterns for the household, with distinct differences in intra-household activity budgets. Whilst men's labour was distinctly seasonal, involving crops in the fields, women's labour was constant throughout the year, involving domestic labour that is unchanging on a daily basis. This highlights the critical constraint of targeting women to participate in development activities, as few can afford the time away from home at any time of year without further constraining their full-time tables. There are distinct seasonal peaks and troughs in terms of general labour availability, as key agricultural activities are seasonally dependant; at times there are in fact labour shortages.

Capital – Farming systems are as lean as they possibly can be. There are few farms that have resources to invest in farm improvement or technological development, e.g. working capital is low, without taking on loans.

Obtaining credit to provide working capital in rural areas is difficult, firstly because there are relatively few crediting institutions to the demand, secondly because farmers have little in the way of capital to secure loans. Only 17.5 percent of the respondents recorded having any amount of loan.

Food and income scarcity – Generally, food and cash were reported as most scarce during the period July to November. This corresponds with the main period of cultivation and the "hungry gap", when own stocks of produce are low before the main harvests. Non-park adjacent cells had higher mean scores for cash income availability across the whole year. During the dry seasons, households reported that they were engaged in other off-farm activities, such as casual labour on public construction projects - e.g. HIMO. This provided more off-farm income generating activities to secure cash in addition to cultivating crops. However, cells adjacent to the park reported a higher mean value for income availability in December when harvested crops, such as Irish potatoes and pyrethrum, are sold.

Illegal park use - The hungry gap also corresponds with communities' reported increase in illegal park use. This was reported in all surveyed cells. Surface water and ground water are scarce around the park, more acutely so in the dry season, and some of the only available sources are springs and streams found within the park boundary. Some households also reported that they utilize the park for bush meat, honey, firewood and bamboos. There was an indication that park-adjacent cells utilized the park more than non-park adjacent cells. The proximity to the park played a big role in park use by communities around VNP. Cells located far away from the park utilized it during the dry season mainly for water.

Water - A key issue to be highlighted around the PNV is local access to water for domestic and livestock use. The volcanic geology of the PNV area means that rain water either runs off rapidly as surface water or through fissures into the ground aquifer. Whilst the park authorities often grant permission for local people to access such water sources, this poses a conservation risk. As people access the park, their activities may not be restricted to the collection of water. It is difficult for the park authorities to monitor and control such activities given their limited resources. Attention must be drawn to methods of supplying water to local communities from the permanent water found in the forest or through water harvesting schemes. However, an appropriate environmental impact assessment must be made to evaluate the risks associated with the supply of water from the park.

Livelihoods Opportunities and Constraints

For cells near the park, respondents stressed land availability to be the first challenge affecting their livelihoods. Erosion and soil degradation came next, followed by traders cheating Irish potatoes producers with purchasing price and weights, family planning, water inaccessibility, shortage of and poor quality of roads and bridges. Costly and inaccessibility of agricultural inputs were also stressed as key livelihood problems affecting communities living near the park. Observations clearly showed how frequent reoccurrence of key livelihood problems were embedded within agriculture, animal husbandry and environment categories. This is because communities living near the VNP are highly dependant on agriculture for a living – far more than those living far away from the park.

Respondents living far away from the park considered shortage and poor services of healthcare personnel and facilities to be their first concern. Some of the respondents claimed that health centres were far away and that those near bore a shortage of doctors, nurses, ambulances and actually medicines. Water and family planning were also considered as key problems affecting livelihoods, while erosion and land unavailability followed. The key livelihood problems cited by communities living far away from the park fell into the general category of health.

Income and Poverty

Understanding income sources and levels as well as the differences in income between households can yield important insights for development planning. This is of critical interest in planning conservation interventions with local communities as the poorest park-adjacent households generally pose the highest conservation threat. The mean net annual household income in 2009 was estimated to be approximately US$540 per household. This figure is a little above the national average of around US$500 (MINECOFIN 2009). This is not too different from the mean of US$525 reported by Hatfield and Mallaret-King (2003). Worryingly, this is an indicator that in real terms, considering inflation since 2003, households in this region have not increased mean incomes. Furthermore, the mean proportion of cash realized in the household is just over 40 percent of the total value of

own goods harvested and business transactions. Importantly, this means that more than 50 percent of the total value of goods produced is consumed within the home, indicating a high level of overall subsistence.
The key constituent of household income is from arable agriculture both consumed in the home and sold. Mean net household income from arable agriculture was estimated at US$431 per annum. The largest proportion of household income was derived from arable agriculture (56.62 percent) and business (trade) income (34.8 percent). Livestock provided a low proportion of overall revenue (6.8 percent), followed by NGO & welfare payments (2.02 percent) and Remittances (1.7 percent). Importantly, income is not uniformly distributed between the income groups. The Upper 20% group of the sample captures more than 67 percent of the available total income, with the Lowest 20% of the sample capturing only 0.43 percent of total available income. This shows that there is a very high income inequality between the highest and the lowest income groups - e.g. the highest group has income 157 times greater than the lowest. In income poverty terms, this means that around 80 percent of households in the sample earned less than US$1 per day. Accepting that the poorest households are most likely to engage in illegal activities in the park, community conservation activities must be targeted towards them. However, this shows that although there was no significant difference in terms of exposure to activities between income groups, the lower income groups were less likely to receive tangible benefits from them than higher income groups.

Impacts of Community Conservation Programmes

Under the condition that the highest risk groups of people to the conservation of the national park are the poorest households without land and assets, it is imperative to understand the distributional impacts between income groups of the community conservation (CC) interventions currently being implemented. Whilst the overall benefits of the community conservation programmes were recognised by the park-adjacent communities, the impacts on different classes of household were markedly different. CC Programmes can be differentiated between social infrastructure, income generation and education. A widespread awareness of social infrastructure projects such as community water tanks, clinic and school rehabilitation/support, and the buffalo wall was demonstrated, with a high proportion of direct beneficiaries, likewise for education activities. A lower level of awareness was demonstrated with regard to income generating projects with a corresponding low level of direct beneficiaries. However when it came to assessing the impacts of the different projects, in general those directly impacted by income generating projects scored a higher impact in the household than for social infrastructure or education activities. In terms of distribution of benefits between income groups generally no class activity demonstrated high impacts amongst the poorest households; the highest income households enjoyed a disproportionate share of benefits. This shows that the CC programmes as they are currently being implemented do a poor job of targeting those households posing the highest threat to the conservation of the park.

Conclusions

One cannot escape the fact that successful conservation equals sustainable development. It is difficult to imagine a sustainable future for the residents of the 12 sectors around the park based solely on agriculture, but in the short term at least realizing sustainability must necessarily focus on the resources at hand. This means widespread and profound agricultural transformation. What might it cost to have a significant increase in agricultural output and therefore household income next year? In a simple model, we could consider increasing the per-household return on investment of the 4 lowest quintiles up to the same level as the highest quintile of 3.71. The total investment required would be just under US$14 million, giving a return of just over US$57 million. If we add 40 percent of the investment cost to cover implementation costs (management infrastructure and human and technology capacity development) this gives rise to additional costs of approximately US$5.5 million. The total cost of investment required to substantially 'raise the game' to possibly sustainable levels would therefore be almost US$23 million.

This model implies a number of naïve assumptions about the current capacity to absorb and utilize the investment. From a poverty alleviation perspective, there needs to be a large capital investment in agriculture to promote new technologies and improve productivity to a sustainable level. The lowest three income groups cannot possibly hope to achieve development improvements through loans with commercial rates of interest. Improving agricultural productivity amongst these households will address critical public goods, such as poverty alleviation and food security at local and national levels. From a conservation perspective, if this development is targeted towards the highest conservation risk groups, then it will give them an alternative means of making a

livelihood. Scarce park revenues can then be employed on activities that have direct conservation impacts rather than relying on indirect effects.

Several key conclusions are developed in this report:

Improve food security amongst the poorest.
Efforts to improve agricultural productivity and food storage may significantly improve the welfare of the poorest households. Fundamentally for conservation organisations, this means prioritizing the rural development activities of the poorest households around the VNP.

Develop income generating potential of current and alternative household activities.
Generally, people in this region are some of the poorest in Africa in income terms. Developing the potential of existing activities as well as introducing alternatives is essential. This implies a range of activities from agricultural production improvements aimed at raising efficiency and profit, crop marketing aimed at improving output price at the farm gate, to added value activities such as agro-processing - e.g. potato chips or freeze dried instant potato powder. Alternative activities, such as handicrafts and community tourism are also important, but less likely to provide impact at scale. Poor market access is a critical factor associated with forest dependency.

Ensure adequate provision of credit facilities.
Access to credit to make investments in agricultural or business enterprises needs to be made widely available. Here we need to consider credit as any form of borrowing, not just credit from the banks. The poorest households may need credit on social terms - e.g. revolving funds in a community - or livestock funds - e.g. where a person is given a goat and passes on the first female offspring to another. In the case of cash crop production, pre-financing by the private sector marketing or processing companies could be investigated - e.g. pyrethrum farmers could be supported with a technology package under contract to supply a specified amount and quality of produce to the input supplier. We have to think more broadly than simple bank lending on interest terms when considering poverty alleviation. This is justified in terms of the public interest in achieving certain levels of development.

Supply water to communities around Virunga Volcanoes.
Most of the communities living adjacent to the PNV in Rwanda entered the forest to collect water. This can take up some considerable labour resources that could be better used elsewhere if it was available. In addition, there are significant health issues related to poor water supply around the park - e.g. seasonal typhoid outbreaks in the dry seasons when water is scarce. Currently a UNICEF and MININFRA programme is being implemented in Musanze and Bulera Districts to address rural water access. Such schemes need to be widely replicated throughout.

Community conservation projects need to take place with law enforcement and monitoring.
The increased positive relationship between people and the park in areas where projects have been operating over the past 10 years is a good sign, as seen in a recent experience from Bwindi, Uganda. CC planning should take this into account and also contribute to the support of community-friendly law enforcement activities in parallel with supporting the local communities. Making the links clear as to why policing is important and that in the long term it can benefit people is needed so that they better appreciate the role of park authorities. Importantly, should community conservation efforts include community use or management there is still a pressing need for third party monitoring and enforcement of regulations to ensure sustainable harvesting limits are adhered to.

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1.0 Introduction

1.1 Background

Following recent developments on issues to do with the need to set up an effective monitoring and evaluation of community conservation initiatives between local stakeholders, DFGFI, IGCP and CARE International agreed to embark on a collaborative approach to set up a programme of work to establish social and economic baseline monitoring indicators of the impacts of integrated conservation and development projects (ICDP) initiatives related to conservation efforts around the Parc National des Volcans (PNV), Rwanda. This follows relatively recent large scale surveys to assess social and economic issues related to the management of the PNV. Firstly, a study by Plumptre et al (2004) provided a qualitative baseline of social and economic issues related to park management; secondly, a study by Hatfield and Mallaret King (2003) assessed the economic value of the Virunga and Bwindi protected forests. Whilst these were important entry points to understanding the challenges and key concerns facing forest adjacent communities and suggested ways forward to deal with park people relationships, this approach will be a pilot to specifically establish a long term monitoring programme that can be utilized more widely in the region. As such, it is intended to be flexible, utilizing a selection of participatory and household survey techniques involving the collection of qualitative and quantitative data.

Conservation success depends on how effectively illegal or unsustainable use is controlled. Furthermore, such controls may cut off valuable sources of revenue for many communities. Pearce and Moran (1997) identify that exclusion strategies represent a "moral view", which disinvests local value in biodiversity, taking away its economic value. There are countless examples of conflicts between protected areas and local development priorities, where bureaucratic land protection is not matched by enforcement in the relevant areas - particularly, but not exclusively, in developing countries (Brown 2000; Smith et al. 1993; Stoll-Kleemann 2001). Acknowledgement of such inequities in traditional conservation approaches has given rise to the community dimension in conservation, where integrated conservation and development projects (ICDP) have become the accepted means of reconciling local development needs with biodiversity conservation objectives (Gihimire & Pimbert 1997; McShane & Wells 2004; Salafsky & Margoluis 1999). Such schemes have a mixed reputation in terms of success in achieving either or both of the twin objectives (Horwich & Lyon 2007; Hulme & Murphee 2001; Jones & Horwich 2005; Upton et al. 2008). Despite the variable effectiveness in achieving biodiversity conservation or human welfare benefits, both protected areas and ICDP continue to be the main stays of conservation strategies in the region (Plumptre et al. 2004). These attempts have included:

- supporting technical inputs and training to farmers adjacent to the national parks;

- income generating and alternative livelihood strategies and the provision of micro-credit;

- establishing a community conservation department within the protected area authorities which meets regularly with the communities;

- providing a trust-fund that supports the development of schools, clinics;

- community projects and social infrastructure such as water points, clinic and school rehabilitation in the vicinity of protected areas; and

- allowing restricted access and use of certain forest products.

The success of conservation is most often measured against progress in reducing habitat or species loss and not often in terms of the contribution of the protected area to poverty alleviation and local economic development. Improving the economic and social performance of conservation approaches is essential in terms of reconciling local human development needs with international demands for biodiversity conservation. In the last few decades, conservationists have given much attention to what has become known as the "integrated conservation and development" approach to conservation (Leach et al. 1999). The precise nature of the activities undertaken under the ICDP approaches are varied but can be basically categorised as activities that couple local economic welfare to the use of the PA or those that try to decouple local economic welfare from the

use of the PA (Barrow & Murphee 2001). For the purpose of this study it is important to distinguish between community conservation and integrated conservation and development programme approaches. CC is strictly speaking where communities are formally responsible for some form of direct management practices within the boundary of a protected area affecting its conservation status. ICDP are development projects designed to improve local welfare with the additional goal of reducing dependence on PA resources and to change people's behaviour towards the PA. The underlying premise is that communities can profit from PA-related development activities, i.e. through activities directly related to the PA, such as tourism, and benefit to rural households either directly or indirectly through community projects run by NGOs (Kiss 2004; Newmark & Hough 2000; Romero & Andrade 2004). In general, around the PNV, any conservation activities that are focused on communities --e.g. conservation education or income generating projects -- tend to be locally referred to as 'community conservation activities'. With respect to the technical definitions provided earlier, no community conservation projects are actually undertaken in the PNV. They are principally integrated conservation and development projects, alongside conservation education activities.

Ferraro's (2001) narrative on the difficulty and complexity of implementing effective ICDP identifies three principal problems associated with using development interventions to protect ecosystems. First, given the complexity of development interventions and the temporal and spatial scales at which conservation objectives must be achieved, field practitioners must spread their resources over a multitude of tasks that often have no effect on conservation-related household behaviour. Second, when practitioners do manage to have a development effect, it is often an undesirable effect from a conservation perspective -- i.e. improved income means that poachers can afford guns instead of snares (Brown 2003). Third, even if practitioners generate a desirable effect, they often have difficulty sustaining it because the effect depends on market conditions that change frequently. This has a knock-on effect on behaviour change, in that the market context is constantly changing so any given level of incentive may not continue to have the desired impact on behaviour in the future.

These general issues described above similarly affect many of the ICDP currently in operation in Rwanda and illustrate the need for accurate monitoring of the impacts of ICDP. For example, an innovative strategy in the last 5 years has been tourism revenue sharing. The principle of the programme is to spread the benefits of tourism revenue from the national parks with local communities, so that the community value (obtains direct benefit) the PA and the wildlife within it. Developing a sense of community ownership of the resources and tangible economic benefit from their existence would hopefully mitigate any negative impacts of living next to the PA (impacts of crop raiding or opportunity cost from loss of access to PA resources) and assist in community protection of the resource.

The study by Plumptre et al (2004) on socio-economic costs and benefits from protected areas in the Albertine Rift showed that tourism ranked very low as a benefit from the PA surveyed. Tourism was mainly perceived as being useful at a national level. It is clear that most tourism revenue does not accrue at the local level (Grosspietch 2007; Sabuhoro 2006). Developing the link in people's minds between tourism and other park benefits, especially revenue sharing, in all areas around the park should be part of the tourism development programme. However, the impact of tourism revenue sharing schemes in the community may be diluted due to the high population density relative to tourism revenue.

Many revenue sharing water projects have been successfully completed, but to what human and conservation effect? Clearly, many people benefit from such interventions, and generally communities appreciate them (Sabuhoro 2006); however the impacts on conservation are unclear. Anti-poaching data from the national park show that in recent years there may have been little or no change in the incidence of illegal activities including water collection in the park despite a corresponding increase in community conservation programmes (Sabuhoro 2006). Many of the poorest households live close to the park boundary, whilst the wealthier households live close to or in the village centres. Usually community water infrastructure is commonly set up in village centres for logistical reasons -- i.e. the critical constraint being having a large enough roof of appropriate material as the rain water catchments, usually a public building. This means access to the infrastructure remains difficult for the poorest people in the community, assuming they tend to live farthest from community centres. If access to developments in social infrastructure is no better for marginal groups who are high risk in terms of illegal use of PA, then little impact on their behaviour towards PA can be expected. Monitoring the distribution of benefits and changes in attitudes can help to assess if the programme is working as intended and what changes need to be made in order to make it more effective.

At a community level there may also be examples of park-adjacent communities in a better economic condition than communities further from the park boundary. In Kabatwa Sector, Nyabihu District in Rwanda, the people adjacent to the PA have cultivated potatoes as a high-value cash crop. This may be as a result of local land scarcity, topography, soil or climatic conditions and such issues need to be objectively verified.

1.2 Aims and Objectives

In recognition that the quantitative economic techniques may be difficult to replicate without specialist technical supervision and adequate funding, this methodology places emphasis on the collection and analysis of qualitative data, although the quantitative elements are included and elaborated as a ready reference for future exercises. It should be noted that the quantitative elements of the proposed method are essential in terms of accurately assessing the impacts of projects on human welfare and the resulting impact on people's behaviour towards the protected areas which we wish to influence. As such, we need to learn more about determining factors of local use of the PA and the role the PA plays in local households sustaining their livelihoods. Thus the aim of this study is to qualitatively and quantitatively examine social and economic cost benefits and equity issues for households living next to the PNV in order to provide a baseline for monitoring impacts of ICDP activities and an objective means reviewing conservation policy and management practices.

The overall aim is to define and monitor development programmes and their resulting impacts on park-adjacent community welfare and subsequent attitudes and behaviour towards the protected area.

The objectives are to:

- Understand park-adjacent households' social and economic cost benefits and attitudes towards the protected area as a baseline for monitoring future changes and impacts of community conservation programmes;

- Define park-adjacent communities' resources and household livelihoods[1] in the EEEGL project impact area using a sustainable livelihood framework (e.g. DFID[2], CARE[3]);

- Identify key entry points and resolve park and people conflicts using development methods to develop household capital and institutional processes in the park-adjacent communities; and

- Develop a social and economic monitoring strategy and methods for future use and examine the institutional and organisational basis for a long term programme.

The scope of the assessment shall cover livelihood and socio-economic analysis of the rural communities in the target area, including:

- Utilization of natural assets by rural communities, including seasonal patterns of resource portfolios, long term trends, access by different groups to the available range of economic assets, with particular attention to livestock, cropping practices and forest resources;

- Current natural resource management institutions governing resource access rights, resource use and management practices (formal and customary);

- Vulnerability of existing local livelihood strategies, due to climatic, social, economic and other factors and trends, and coping strategies, with particular regard to food security;

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[1] 'A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. 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.' Adapted from Chambers, R. and G. Conway (1992), Sustainable rural livelihoods: Practical concepts for the 21st century. IDS Discussion Paper 296. Brighton: IDS.
[2] DFID, Sustainable Livelihoods Guidance Sheets, 2000;
[3] Refer to CARE HLS manual

- Human resources available to local communities, including traditional knowledge and skills, education indicators and constraints to increase human capital resources;

- Factors affecting access to available rural infrastructure and public services;

- Financial resources available to local communities, such as through remittance of migrant labour, patterns of utilization and potential for increased access to institutional support;

- Local perceptions on development needs and opportunities related to available livelihood strategies, to increase resilience, food security, and improve living conditions; and

- Household structures, economies and wealth distribution - sources of income from farming, harvesting and use of natural resources, remittances and other enterprises.

To this end, the methods described below encompass a variety of participatory and household survey tools focused both at the community and household level. With the need for some components of the survey to be easily and relatively inexpensively replicable, we aim to adapt components of the social economic research methods to make it possible for staff of local stakeholders to collect the information needed in future rounds of M&E.

1.2.1 Report Structure

This section further explores the local context of community conservation giving an overview of findings from previous recent studies, investigating the local socio-economic situation and park-people relations, as well as outlining the basic survey approach and methods. Results are divided into two parts, as different chapters, and include discussion simultaneously. Firstly, Results Part I, the PRA results are presented to provide general context and some elaboration of specific issues. Secondly, results Part II, the household survey results are presented broken down into sub-sections. Sub-section A) sets out the sample demographics and social indicators; sub-section B) presents resource use, and management data; sub-section C presents a household income study, and sub-section D assesses household's conservation knowledge, attitudes and practices. Finally, in section 4 conclusion and discussion of the implications of the findings are made.

1.3 The Rwandan Context of Community Conservation

This section draws on recent investigations into the rural economy and conservation in Rwanda and also more generally in the central Albertine Rift region. We highlight some key issues relating to these social and economic dynamics of conservation and how CC has been focused to mitigate conflicts between local communities. Rwanda has a well-established network of protected areas. In fact, it lays claim to be part of the first national park in Africa, The Albert National Park, established in 1925, spanning DRC and Rwanda. The portion in Rwanda is now known as the Volcanoes National Park. Two other large protected areas are found in Rwanda, Akagera National Park (900 km^2) and Nyungwe Forest Reserve (970 km^2) with a third small, protected forest area called Gishwati Forest Reserve (7 km^2). All except Akagera National Park lie in the Albertine Rift, a landscape of high species endemism and diversity. In addition, the Albertine Rift contains some of the highest population densities in Africa, reaching from 314 to 1,028 people per km^2 in the sectors around the Volcanoes National Park (Table 1.1). Rwandan protected areas conserve some of the most endangered species, such as the mountain gorilla (G*orilla beringei beringei*), golden monkey (*Cercopithecus mitiskandti*), owl-faced monkey (*Cercopithecus hamlyni*), eastern chimpanzee (*Pantroglodytes schweinfurthii*) and Ruwenzori Turaco (*Tauraco johnstoni*).

Historically Rwanda has always had a high population density relative to neighbouring countries, and this pressure persists to the present day. Rapid population growth and declining agricultural productivity affect the livelihoods and very survival of thousands of households in Rwanda, where over 90 percent of the people live in rural areas and where virtually all rural households are engaged in agriculture (PPR, 2002). Farm production in Rwanda is oriented toward subsistence; farms average less than one hectare of land. Beans and sorghum, supplemented by sweet potatoes, cassava and peas, are the principal food staples. Coffee and tea are important cash crops for some farmers and important sources of foreign exchange for the nation. Rwanda's

agricultural system is labour intensive; hoes and machetes are the basic farm implements. Livestock comprise an integral part of the farming system, but the progressive conversion of pasture into cropland has caused a reduction in average household livestock production, and a parallel decline in the amount of manure available for improving soil fertility (Rwamasirabo, Clay, and Weber 1991).

Table 1.1 2009 Population Data for the 12 Park-Adjacent Sectors

Sectors	Sector geographical group	Sector Land Area	Sector Population Size	Sector people per square km
Cyanika	East	33.00	27,000	818
Rugarama	East	43.00	23,058	536
Gahunga	East	22.00	22,615	1028
Nyange	Central	54.32	24,171	445
Kinigi	Central	81.04	25,450	314
Shingiro	Central	53.40	19,338	362
Gataraga	Central	50.00	20,846	417
Mukamira	West	38.00	28,576	752
Jenda	West	30.00	29,126	971
Bigogwe	West	30.60	30,575	999
Kabatwa	West	36.00	16,300	453
Bugeshi	West	27.39	27,292	996
Mean		41.56	20,779	590

(Source: compiled from local government population data)

The resulting land scarcity from population expansion has compelled farmers to cultivate fragile, steep-slope holdings. In Rwanda's fertile north-western region, where the potential for agricultural productivity is high, the expansion of agriculture onto marginal lands is already resulting in serious slope failures (slumps and landslides) (Nyamulinda 1988). The increase in degradation processes acting on hill slopes will eventually lead to excessive sedimentation in the valley bottoms -- which, over time, can precipitate flood damage and the destruction of lowland crops (Clay and Lewis 1990).

The relentless pressure on land has led to a dramatic decrease in Rwanda's protected areas over the last 30 years. The Volcanoes National Park was reduced in size from 328 km^2 in 1958, to its current size of 150.65 km^2. Land was primarily degazetted to make way for pyrethrum production under a European Community sponsored programme in the 1970s. Akagera National Park has lost approximately 2/3 of its original area, as land was degazetted to allow settlement of returning Rwandans after the Genocide and war of the mid 1990s. Similarly, areas of Gishwati Forest Reserve were settled post-war during the mid 90s, however a World Bank sponsored agricultural project saw approximately 180 km^2 converted to agriculture and livestock production in the 1980s.

WCS, IGCP and CARE (2004) conducted an important study on the socio-economic status of people living around PNV and Nyungwe. The results of the survey show the socio-economic situation of people living within 10 km of the Virunga Volcanoes and Nyungwe, as well as around Mgahinga, Bwindi and Echuya Forests in Uganda and the Virunga Park in DRC. Communities around PNV and Nyungwe suffer high mortality or people emigrate elsewhere when older, and the average age is very low (20-22 years) per household. The limited economic opportunities existent in many areas adjacent to PAs mean that many middle-aged men and sometimes women migrate to look for economic opportunities elsewhere, usually to look for casual or formal employment or to become involved in trade. The high mortality resulting from poor accessibility to quality health services compounded by the current HIV/AIDS scourge may be contributing to this population structure also. But whether this population structure is a result of mortality or migration, it has serious implications for natural resource management. With fewer men in the age category of 21-55, the labour force needed for natural resource management activities is greatly reduced. Women from poorer households actually have to sell their labour (in digging) to earn income for household needs. Moreover, the income that migrant men earn is rarely

ploughed back into agriculture, or even household maintenance. As such, little effort is put into conservation activities, including soil management, tree planting and management. Migration of men in the community may therefore limit the adoption rates of new conservation and land management technologies if not taken into consideration by government and NGOs implementing programmes in the region.

The Batwa communities are similarly affected; however, mortality among the Batwa is higher than among other communities, because most of them will not seek medical services even where they are available, but depend on local herbs even for illnesses that need modern medicine. The discrimination that Batwa face by other community members, including workers in public facilities, may also discourage them from going to health units when they are sick. The demographic structure is typical of people living below the poverty line. The structure of people's houses, their ownership of bicycles, land, livestock and other indicators of wealth all clearly show that these people are very poor.

Having very poor people around these PAs has serious implications for conservation. Poor households are likely to have limited economic alternatives and are more dependent on the PA for their subsistence, or as an income source where they may be used by richer people to exploit PAs. Other research has also demonstrated that it is difficult for poor households to access locally available channels for improving their livelihoods, e.g. the local CBO credit and savings groups, whose membership tends to be socially stratified according to wealth and education. The poor are thus logistically excluded since they can't afford the conditions of membership. They are also less likely to benefit from interventions by NGOs if not well-targeted. The negative impact that the protected areas have on the community hits them hardest, especially crop damage and restricted resource access. As such, the poorest people seem to become significantly more negative towards the PA when they are restricted from accessing the resources therein, or when they suffer costs associated with PA, as has been revealed by results of a study made by Blomley et al. (2010).

Crop raiding remains a challenge for local communities and conservation organisations around the PA. Around PNV, the communities in conjunction with the park management erected a stone wall, but the problem is not totally solved. Crop damage creates negative attitudes among the community, especially when they perceive little being done to solve it. Crop damage is actually one of the reasons why park-edge households do not plant trees, because they believe trees create a habitat for problem animals. Around Nyungwe there is a significant buffer zone area consisting mainly of mature pine plantation. The establishment of buffer zones has affected communities around the NFR differently. People who live near the plantations are able to collect fallen dead wood for fuel wood. However, land was expropriated from local people by the government during the formation of the buffer zone -- and in such cases, and with people not deriving any direct benefits; it is felt that the buffer zone primarily serves as a limitation for the expansion of their agriculture into the reserve.

Buffer zone management schemes need to clearly research the equity and capital issues in local communities realizing benefits from the buffer zone, as it would be difficult for most communities to secure the level of finance necessary to engage in commercial forestry activities. However, communities did express a keen interest in being involved in co-management schemes. In addition to buffer zones are large tea plantations. People who live close to tea plantations have off-farm economic opportunities and have positive attitudes because buffer zone plantations provide them with seasonal income through employment.

The Universal Primary Education programme has recently seen enrolment in primary schools increase. However, school dropout rates are still high, partly because of poverty, with some households unable to afford primary school requirements such as uniforms and books. As secondary education is not free in Rwanda, many children drop out after primary level. The WCS et al survey showed a low appreciation of the value of education in many rural areas. In particular many do not see the need to educate girls and tend to marry them off early. The education levels of women are consequently lower than those of men in general. The lack of education for women in turn contributes to high rates of population increase, as women start bearing children at an early age. Uneducated people also do not easily adopt family planning. This then contributes to high rates of population increase.

1.3.1 The Local Economy
Plumptre et al (2004) state that the sample population in their study is one of the poorest on the African continent and also the most densely populated region. Farming remains the major source of livelihood, and people have little access to other opportunities to improve their livelihoods. The problem of land shortage in

north-western Rwanda means that there is a limit to the extent people can increase their wealth by extensive farming. For most of the Batwa, the lack of any land to practice some form of production remains the major problem. Overall, the lack of land to practice agriculture is one of the major indicators of poverty in Rwanda, which explains why Batwa are amongst the poorest category of people.

The The study by Masozera (2002) showed that market access was an important factor in forest dependency. In addition, Plumptre et al (2004) highlight it also as an important factor from the perspective of wealth creation. However, what is probably more important is whether or not a market for products exists and whether people can afford to buy them. For example, potatoes grown around the PNV (Ruhengeri and Gisenyi provinces) are marketed throughout Rwanda and even into Burundi, DRC and Uganda.

What is clear is that development support needs to focus on the efficient use of basic factors of production (land, labour and capital) through technology transfer as well as developing the transformative processes, e.g. help create markets for products and improve access to more distant markets. Providing credit schemes to allow the development of businesses is one way to help people in finding alternative ways of generating an income; however, these need to be linked to market development also. Fundamentally for the poorest rural households, mitigating risk in these developments may be the only way to enable them to make the technological and institutional jump to more efficient and sustainable livelihoods. Plumptre et al's (2004) study documented that in Uganda there was relatively better access to micro-projects and funds within the communities adjacent to the protected areas included in the survey than those further away. They also had access to grants, which people stated they preferred because they don't have to pay them back. These factors could also have contributed to increased wealth in the region.

However, caution needs to be taken in any interventions aimed at improving communities' livelihood opportunities. Research has revealed that membership of community group/institutions, access to services and interventions within communities in south-western Uganda are largely socially defined, and poor or marginalized people (including women and the Batwa) are largely excluded from such benefits because they don't have the means, or even do not have access to the necessary information. Even the most grassroots-based CBOs have been found to exclude the poorest people. As such, creative techniques need to be applied by development interventions in order to reach the poorest people; otherwise such interventions could easily end up widening the wealth gaps within communities.

Achieving improvements of conservation strategies in the social dimension requires objective evidence of their effects. Economic valuation of protected area resources provides a quantitative means of assessing the promise and performance of conservation policies in achieving welfare benefits to local communities. In addition, the collection of socio-economic data alongside the economic valuation data provides an important means to assess the social and economic drivers of protected area use so that conservation efforts can be more economically efficient in meeting welfare needs. Few studies have tried to quantitatively value levels of income for park-adjacent households around the PNV. CC initiative to improve the development status of park-adjacent households are effectively trying to improve household welfare, thus a quantitative understanding of the local welfare situation and the change to be made is essential in planning effective CC strategies. Two notable exceptions are the studies by Hatfield and Mallaret-King (2003) and Bush and Sabuhoro (2009). These are important early descriptive studies on quantitative values. Hatfield and Mallaret-King (2003) looked at general economic values in a total economic value framework, e.g. the value of direct and indirect benefits from local to global levels. Bush and Sabuhoro (2009) conducted a pilot study in a small selection of forest adjacent communities to examine details of the value of illegal income from the park to park-adjacent households. Whilst these studies are important descriptions of the status of households they do not provide a systematic assessment of the local economic situation statistically representative of the entire CC programme catchment so are not useful as a definitive baseline set of data for the purpose of monitoring the impacts of CC interventions around the PNV.

Findings from these studies show that the largest proportion of household income comes from agricultural activities, with little livestock income. Findings from Bush and Sabuhoro (2009) showed that in their small purposive sample up to 37 percent of households obtained incomes illegally form the national park. Differences in income sources were examined between PA users and non users. Only one parameter was significantly different, that of total annual agricultural income. PA non-users had significantly higher agricultural incomes than PA users. This indicates that PA users may have fewer other income and subsistence opportunities than those

than those that do not use the PA and may thus be more dependent on the PA to maintain their livelihoods. In support of this finding it was also shown that the largest proportion of income derived from the PA was sold for a cash income rather than subsistence use (71.6 percent of PA income). PA income can form up to 10 percent of household income, a substantial loss to livelihoods should the law prohibiting extractive use of the PA be fully implemented.

1.3.2 Community-Forest Interactions

The WCS et al survey data show that many people living around PAs derive benefit from the use of the forests. Around PNV and Nyungwe households perceived that most benefits from the park accrued at a community and national level. This may point to the general perception that park-adjacent households do not get a fair portion of park benefits, though it can be perceived that they bear the bulk of the PA costs. Instead revenue from the PA is invested at community and country levels. Community benefits cannot compensate for individual household losses, especially as a result of wildlife damage. It is true that the reason why integrated conservation and development interventions have been implemented around the two parks is to fill this gap, i.e. to bring park-related benefits to the household level. However, it should be noted that the magnitude of many of these interventions is usually small, and many households may not realize positive impact that is big enough to improve their economic situation and change their attitudes drastically.

A consistent desire to have access to the forests and harvest forest products was expressed by all people, and in particular by the Batwa communities. The problem that the conservation community faces is that granting access to everyone living around the forests will lead to their degradation. These are some of the most biologically rich forests in Africa and as such are globally important for conservation. A restriction on access to PA resources remains the main source of conflict between communities and PA managers.

Evidence from Bwindi Forest, Uganda, reveals that despite the numerous ICD interventions being implemented among local communities, law enforcement, perhaps combined with education, remains the major force in reducing illegal access to park resources (Blomley et al 2010.). Many hundreds of thousands of dollars have been put into ICDPs, a trust fund and other activities to improve community relations around Bwindi and Mgahinga forests, and yet the percentage of people admitting to accessing the forest illegally in these two (13-19 percent) was not very different to other areas (Nyungwe, PNV and Virunga), where mainly law enforcement has occurred (14-22 percent). Since many people would not admit to collecting resources illegally from parks, this may be an underestimation of the real numbers that do collect these resources. Illegal access to forest wood resources for fuel, poles, stakes and timber remain among the major illegal activities in the two parks. Some households cite lack of land and the fact that they would have to reduce the food crops they plant as a reason not to practice on-farm substitution of tree products.

Working with communities bordering the forest may not completely reduce the levels of illegal activities, but it is expected to lead to better relationships with the protected area authorities, which allows less aggressive tactics in dealing with illegal activities. Drawing again on regional experience, it would be expected therefore that Mgahinga and Bwindi would have more respondents claiming that relations between themselves and the protected area authorities have improved -- and this is the case. However, there were also more people around these two protected areas who believed that relationships had deteriorated than around the other protected areas where they believed the relationships to be stable. Several important lessons from the Ugandan experience of community conservation can be drawn to guide development of similar schemes in Rwanda. It is interesting to note that in Plumptre et al (2004), around Nyungwe not only were few conflicts with the parks noted, but also local people felt they derived fewer benefits from the park than respondents surveyed around other PAs.

Firstly, we should note that a perception of relations is shaped by the nature of interaction between communities and park staff. If the most frequent interaction between communities and PA staff is during law enforcement operations, searching for people who have broken the law -- including punishing or deterring illegal entrants -- then the community will view their relationship with PA staff negatively. There are only four Community Conservation Rangers (CCRs) in Bwindi, and three in Mgahinga. In both PAs, the ratio of CCRs to Law Enforcement Rangers (LERs) is approximately 1:6, so communities are bound to interact more with LERs, than CCRs, because the LERs are more evenly distributed. On the other hand, each CCR in Bwindi is responsible for a very large area (five or so parishes) and cannot meet the communities as often, for logistical reasons. One of the challenges of community conservation has been the slow rate at which the attitudes of park staff towards

communities change from viewing them as poachers by default towards viewing them as useful partners, in accordance to the changes in PA management policy. However, the immediate result of policy changes and increased PA management-community dialogue might be that communities around Bwindi and Mgahinga have been given the opportunity to voice their concerns about the park and tend to be more outspoken than in Rwanda or DRC as a result. Also they may feel that by complaining they may receive more benefits in the future.

Secondly, the perception of relations with the PA staff is intricately related with the perception of benefits from those PAs. We need not over-estimate the extent to which ICD interventions around BINP and MGNP have had impact on the demand for PA resources, and subsequently on the levels of illegal resource access. There is an indication that the demand for PA resources and the levels of illegal resource access are still at levels that should cause concern. However, attitudes to the parks and park staff-community relations have greatly improved relative to when the parks had just been gazetted (ITFC in prep.).

Thirdly, there is an issue of how different people define 'benefits'. One may perceive a school as a benefit to individuals and communities. Another individual may not define 'community' benefits in individual terms. In any case, some people may feel that the government (which in areas around PAs includes PA authorities) has a responsibility to provide schools and health units. So when they are provided as part of the revenue sharing programme, they are taken for granted. A person may identify income from park-related employment, or from sale of produce to tourists as a benefit from the park, but not the school built from revenue sharing or the trust fund where his/her children go.

Appreciation of community benefits takes a lot of education and sensitization that links these benefits to the presence of the PA. That said, ICD interventions around Bwindi and Mgahinga are cited among the top reasons why attitudes towards the parks have improved in the last decade. They are also cited to have increased cooperation with park authorities among the communities (ITFC in prep.). So their value in contributing to conservation goals is undoubted, even when their impact may take longer to be realized than expected. In addition, although many people around Bwindi and Mgahinga felt they did not benefit at all (about 50 percent and 35 percent respectively), it is noted that a significant number of people identified social infrastructure as benefits. This is good because it shows that some people do associate these projects with the parks. It is also encouraging that many people recognize the role of these forests in climate control and water conservation and see this as a benefit from the PA. This indicates increased awareness of the forests' ecological roles.

An issue to be highlighted around the PNV is access to water. The volcanic geology of the PNV area means that rain water either runs off rapidly or percolates quickly through fissures in the ground. The forest plays an important role in maintaining a steady supply of surface water. However, during the drier months permanent water sources may only be found within the boundary of the national park. Whilst the park authorities often grant permission for local people to access such water sources, this poses a conservation risk. As people access the park, their activities may not be restricted to the collection of water. It is difficult for the park authorities to monitor and control such activities given their limited resources. Attention must be drawn to methods of supplying water to local communities from the permanent water found in the forest. However, appropriate environmental impact assessment must be made to evaluate the risks associated with the supply of water from the park.

1.3.4 Community Conservation around PNV

With the advent of the Mountain Gorilla Programme in 1979, so began the earliest efforts to integrate local people into the conservation of the PNV. Since that time, efforts have grown in variety and scope, principally implemented by international NGOs (Uwingeli, 2008; Sabuhoro 2006). Subsequently, these efforts have evolved with national NGOs taking the lead, supported by international NGOs. Since the establishment of ORTPN in 1974, there has never been any structure to demonstrate that conservation contributes to the development of the population (ORTPN, 2005). In addition, there was also no mechanism to resolve conflicts such as those resulting from damage caused by wild animals (Uwingeli 2008). Importantly, today the national parks service plays the lead role in coordination of park-wide CC efforts, having officially adopted community conservation as a management strategy in 2005 (Uwingeli 2008). In the current framework of the evolving national parks structure, a department is established to reinforce and co-ordinate all initiatives aimed at involving local communities in conservation (ORTPN, 2005).

Evidence from a study in communities around Nyungwe National Park by Masozera (2004) depicts a series of factors that influence people's dependency, such as proximity to forest, access to markets, average age of

household etc. Such dependency on forests means that if conservation policies reduce use by or exclude local people from forests there will be serious implications on their livelihoods security. This implies that in order for conservation management strategies to be successful, some benefit sharing with communities will be necessary to reduce the feeling of alienation by local communities. Importantly, a real effort must be made to assist in making up the shortfall in local households' incomes. The potential scope for including people in the management of natural forests varies. In PNV, the area is so small relative to the population that it seems impossible to pursue the community forest management ideal. However, schemes to redistribute tourism revenues from the park to local communities are underway, including local people as passive recipients of benefits from the park. The key activities currently implemented by the community conservation department in PNV aim to improve the relations and linkages between the park and surrounding communities. The community conservation initiatives also seek to share advantages from the park and revenue generated by tourism. Under the community conservation programme, 5 percent of the total annual tourism revenue is invested in community-oriented activities. In Plumptre et al (2004), tourism ranked very low as a benefit from the national parks. Tourism was mainly perceived as being useful to the country. It is clear that most tourism revenue does not accrue at the local level. Developing the link in people's minds between tourism and other park benefits, especially revenue sharing, in all areas around the park should be part of the tourism development programme. However, the impact of tourism revenue sharing schemes in the community may be diluted due to the high population density relative to tourism revenue. The mechanisms of implementation of the revenue sharing scheme suggest that the initiatives to be supported are identified by government decentralized institutions after consultation with local communities. Since the inception of the revenue sharing programme in 2005, a total of US$428,248 has been disbursed to fund local community projects. Whilst these have been important initial contributions to local communities in respect to the population density and catchment for CC initiatives, it amounts to a total investment of US$1.45 per person in its 4 year history (to end of 2009), or annually an average of only US$0.36 per person per year (Bush, 2010).

Apart from the revenue generated by selling the gorilla permits, tourism services such as accommodation, transport and guiding have been making modest contributions to employment opportunities in the region around the park; however, these developments are not geographically widespread, being mainly confined to the central sectors near the national park headquarters and the areas adjacent to the park where the principal tourism activities take place. Although the local people may recognize the importance of conservation, they are often more concerned by problems related to park management and the benefits which are often not well felt at the individual level (Sabuhoro, 2006). The institutional mechanisms of implementation of the tourism revenue sharing programme have been also been challenging. Whilst government authorities may give priority to public investment projects such as schools and roads, the communities are concerned by the solutions to their immediate problems related to the direct costs they bear form living next to the park, such as crop raiding, and alternatives to the resources they usually get from the park (Uwingeli 2008).

In response to addressing local people's direct costs from living next to the national park, one of the key activities of the community conservation department is the management of conflicts involving local communities and wildlife. Initiatives undertaken by the community conservation department seek to reduce conflicts in identified areas and develop mechanisms to improve relations and communication between the park management and local communities, as well as their authorities. For example, a stone wall was constructed along the park boundary to stop buffalos leaving and destroying crops outside the park. By the end of 2007, a distance of 74 km was covered by the stone wall construction (PNV, 2007). Participatory mechanisms (community and park) of follow up and reporting of conflicts between the park and local people have been initiated. Individuals chosen from communities (ANICO) have been trained and now assume the role of liaison in the issues involving the PNV authority and local communities (Uwingeli 2008). In addition, local associations of ex-poachers have been formed and now receive support from the park and other conservation partners (PNV, 2007). These associations are active in supporting the park management in park protection and law enforcement.

1.4 General Survey Approach

Survey teams tended to be comprised of different mixes of people depending on the mode of questioning. PRA methods require at least 2 people per focus group, one to facilitate and one to record results. A focus group should be no more than 10 people in order to manage the process comfortably. If we use 3-4 focus groups this means that to cover all groups concurrently a team of 8 facilitators/recorders is necessary. Ideally the team should be comprised of neutral parties, i.e. not from organisations that may be the focus of local community criticism to allow free and open communication of concerns. Of course all bias may not be removed in such an exercise, but this approach can help to minimise it. However, it is essential to allow opportunities for local government to engage with communities in a participatory way; therefore, in addition to the survey team, local government representatives should be encouraged to take part perhaps as recorders to minimise influence in facilitation.

For the household survey a team of 5-6 enumerators was sufficient to cover the community level and household surveys described below. Interviews took about 2 hours per household so enumerators were able to conduct 3-4 interviews per day. Using 6 enumerators at 3 interviews per day the total amount of time taken to implement the survey in a community was around 2 days.

Enumerators were drawn from the community of recent graduates in the social, economic, or natural resource disciplines from Rwandan tertiary education establishments. Their technical disciplines already showed a demonstrated interest in issues related to rural development, poverty alleviation or conservation, as well as some basic research training. At a minimum secondary school levers that are literate and numerate can be used as enumerators, but this generally results in a lower quality of data due to less commitment to the issues and less training in research methods and the importance of good quality data.

The tools described in Appendix 1 to this document are orientated towards a community level and household level analysis shown in the table below:

Table 1.2 Levels of Analysis and Analytical Tools

Community Analysis	Household Level
Village Data	Wealth Ranking
Priority PA related Costs and PA Costs and Benefits Ranking	Household Economic Survey
PA Costs and Benefits Analysis	Household social costs and benefits
	Household attitudes

1.5 Sampling and Methods

A brief overview of the sampling frame and methods is provided as orientation. Details on the survey methods can be found in an Appendix 1.

1.5.1 Participatory Survey

The participatory survey was conducted in 5 sectors drawn from each of the districts adjacent to the PNV (Table 1.3). Two cells from each sector were selected at random from a stratified list.

Table 1.3: PRA Survey Sample

District	Sector	Cell	No. Participants
Bulera	Cyanika	Nyagahinga	10
		Kagitega	10
Musanze	Kinigi	Bisoke	10
		Kampanga	10
Nyabihu	Jenda	Gasizi	30

		Bukinanyana	30
Rubavu	Bugeshi	Butaka	30
		Kabumba	30
Burera	Gahunga	Nyangwe	22

The participants were selected randomly from all villages composing each cell by local authorities. They comprised at least 10 men and 10 women drawn as representatives of village leaders and different socio-economic groups. This was to provide a balanced discussion on issues affecting their daily livelihoods in relationship with the VNP. Initially the study had planned that 10 interviewees were adequate to represent the cell relative to the predetermined time and budget. In light of early experience from PRA discussions from Cyanika and Kinigi sectors, it was observed that the number of respondents was not adequate to broadly represent their cells on key issues affecting their livelihoods. Accordingly, the number of participants was increased to 30 for each cell. These amendments allowed us to assess comprehensively the socio-economic costs, benefits, attitudes and livelihood changes from community conservation interventions around this protected area. Discussions were carried out in suitable local buildings, providing reasonable shelter from the elements and space for plenary and sub-group discussions. Refreshments only were provided for participants.

1.5.2 Household Survey

Multi Stage Stratified Random Sample of Communities and Households was used. The target population is all potential households within an Umugudugu (village) adjacent to the PNV. To date, a number of different CC interventions have been piloted. Understanding the variable impacts or potential impacts of these interventions is essential in measuring their success and looking for opportunities to improve their local welfare and conservation impacts. To this end, a strata will be where communities have received some direct benefit from a CC programme and where they did not. In addition, the CC programme has adopted different approaches e.g. income generating or social infrastructure, therefore some measure of the variable impacts of different interventions is also necessary. Proximity to the park is another key criterion that might affect conservation knowledge attitudes and practices, thus the sample was stratified according to if a cell was adjacent (sharing the administrative boundary) to the park or non-adjacent, e.g. having at least one cell between it and the park.

The sample organisation is summarized in table 1.4 below; the detailed sample frame can be found in Appendix 2.

Table 1.4 Household Survey Sample Organisation

Stage	Organisational Group	Strata	Selection Criteria
I	Umugudugu (village)	Contact/non-contact community	Community bordering or overlapping with focal forest/PA
II	Contact community	All households	Wealth start
III	Household	Rich, Middle, Poor, Landless	Participatory wealth ranking to develop indicators of categories

Stage I - Prepare a list of cells and their Umugudugu (villages) bordering the PA and those that do not.

Stage II - List all households and separately list into those who have directly participated in a CC project and those who have not. From the stratified list select x households from each strata at random.

Stage III - At the Umugudugu level define the wealth group and sample proportionately respondents from the stratified list of Umugudugu households.

This approach was flexible enough to allow for a detailed examination of the EEEGL project and other CC project impacts on an inter-community basis, as well as be representative of the broader sample population (park-adjacent communities) to be useful for future time series analysis, (pooled observation) basis, as part of a regular long-term monitoring programme.

A total of 388 household interviews were conducted in 25 villages in each of the 12 sectors adjacent to the Volcanoes National Park, covering the 4 districts of Bulera, Musanze, Nyabihu and Rubavu (See table 1.5 below).

Table 1.5 Sampling Effort by Administrative Unit

DISTRICT	SECTOR	VILLAGE	REGION	INTERVIEWS PER VILLAGE
BULERA	CYANIKA	KARISIMBI	EAST	15
BULERA	CYANIKA	MUNINI	EAST	15
BULERA	GAHUNGA	BIHANGA	EAST	12
BULERA	GAHUNGA	MUTARA	EAST	15
BULERA	GAHUNGA	NTENYO	EAST	16
BULERA	RUGARAMA	GACOGO	EAST	15
BULERA	RUGARAMA	MUHABURA	EAST	15
MUSANZE	GATARAGA	GAHIRA	EAST	15
MUSANZE	GATARAGA	RUBAKA	EAST	15
MUSANZE	KINIGI	BUNYENYERI	CENTRAL	15
MUSANZE	KINIGI	RUTINDO	CENTRAL	15
MUSANZE	NYANGE	JITE	CENTRAL	15
MUSANZE	NYANGE	KAGANO	CENTRAL	15
MUSANZE	SHINGIRO	RYAMBUNGIRA	CENTRAL	15
MUSANZE	SHINGIRO	TERIMBERE	CENTRAL	15
NYABIHU	BIGOGWE	KAGERI	CENTRAL	15
NYABIHU	BIGOGWE	RUSENGE	CENTRAL	15
NYABIHU	JENDA	BIZU	WEST	15
NYABIHU	JENDA	NSAKIRA	WEST	15
NYABIHU	KABATWA	MASASA	WEST	15
NYABIHU	KABATWA	RUHANGO	WEST	15
NYABIHU	MUKAMIRA	KABURENDE	WEST	15
NYABIHU	MUKAMIRA	KAMIRO	WEST	15
NYABIHU	MUKAMIRA	PFUNDO	WEST	15
RUBAVU	BUGESHI	KABUMBA	WEST	15
RUBAVU	BUGESHI	KINYAMUHANGA	WEST	15
			Total	388

Villages were selected at random from within each sector, according to their proximity to the national park - e.g. villages with an administrative boundary adjoining the park or not, and whether or not a community conservation project was being implemented. Within villages, respondents were selected at random from a list of all households. Probability sampling ensures that a representative pool of respondents is interviewed reducing bias in estimates of average values. The level of sampling using the described stratification also gives results that can be broadly extrapolated to the entire sample population and give a picture representative of all households in all of the sectors adjacent to the national park. In the analysis of issue, an additional aggregation of sectors to those in the eastern, central and western areas adjacent to the park was made. This provides another way of assessing relative opportunities and constraints along geographical lines where there is market access, topographical, and agro-ecological differences.

2.0 Results Part I: Participatory Rural Appraisal - The Development Context

2.1 The Development Context

2.1.1 Seasonality

The principal objective of the exercise was to understand the impacts of seasonality on the management of local communities' livelihoods adjacent to the VNP. Respondents illustrated the relative changes or intensities of resource availability or use over a typical 12 month calendar year.

Issues such as food and meat availability, income availability, disease occurrence and accessibility, crop raiding and park use were thoroughly discussed given that these aspects strongly intertwine to actually impact livelihoods, attitudes and behaviour towards the VNP of communities adjacent to the park boundaries.

2.1.2 Rainfall Patterns and Household Activities

Participants of the study defined wet and dry season throughout the year in their area and community. Beyond having a general picture of the annual seasonal change, to aid timely development planning, understanding any micro-climatic variability is important in identifying opportunities and constraints for development interventions and any differences that may exit on a geographical basis. Often in mountainous regions there can be considerable differences in the micro-climate between valleys or attitudinally. However, no particular differences were noted when examining responses according to communities' proximity to the park (altitudinal distribution) or location around the park. The mean scores of rainfall intensity for all communities are presented in table 2.1 below.

Table 2.1 Mean Distribution of Rainfall Intensity by Cell
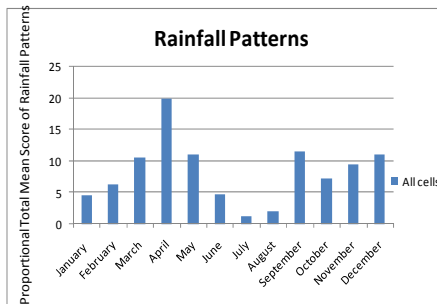
The month of April had a significantly higher mean value and July a lower mean value of rainfall intensity than the other months. The months of March and April were observed to be the acute rainy season, while July and August were the heavy dry season for all the cells surveyed.

Since households in the VNP region depend on agriculture for a living, the objective of this exercise was to establish what the labour requirements for agriculture and cultivation crop protection were for cells around the park (Table 2.2 below) and if there were potential conflicts in terms of labour shortages at particular times of year. No differences in mean values of labour requirements for agriculture were noted from communities' proximity to the park. Labour requirements for agriculture reached their peak during rainy periods such as March, April, September and December. During these months, communities are planting and harvesting mainly Irish potatoes as they are predominantly the cultivated crops within these whole cells. Other crops cultivated mostly in March and April are maize, peas, pyrethrum, and beans in September. During the dry season in July, few labour activities for agriculture are required.

Table 2.2 Mean Distribution of Labour Requirements for Agriculture by Cell
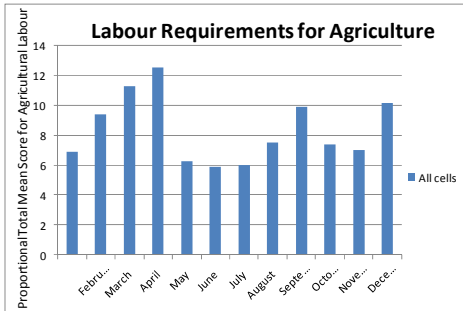
Local participants looked on what kind of activities people might have in the home throughout the year. They were divided up into two sub-groups to distinguish from labour requirements in the home for men and labour requirements in the home for women (Table 2.3). Participants suggested this sub-group division as labour requirements in the home might be different looking from the gender perspective. This is important in the development context as policy makers and project implementers need to recognize suitable periods to bring projects into communities without restraining local people's activities. There was an indication that men are quite busy in July, August and December, as they bear higher mean values than others across all cells surveyed around the VNP. This is because they are involved mainly in construction activities such as building houses, kitchen tables, fences, maintaining livestock enclosures etc. It was observed that women had a reasonably similar intensity of labour requirements in the home across the whole year. They are constantly busy fetching water, cleaning their houses, cooking and sorting out harvest crops mainly in December. Responses from communities near and far away from the park did not reveal any obvious differences in household activities in the course of the whole year.

Table 2.3 Mean Distribution of Household Activities by Cell
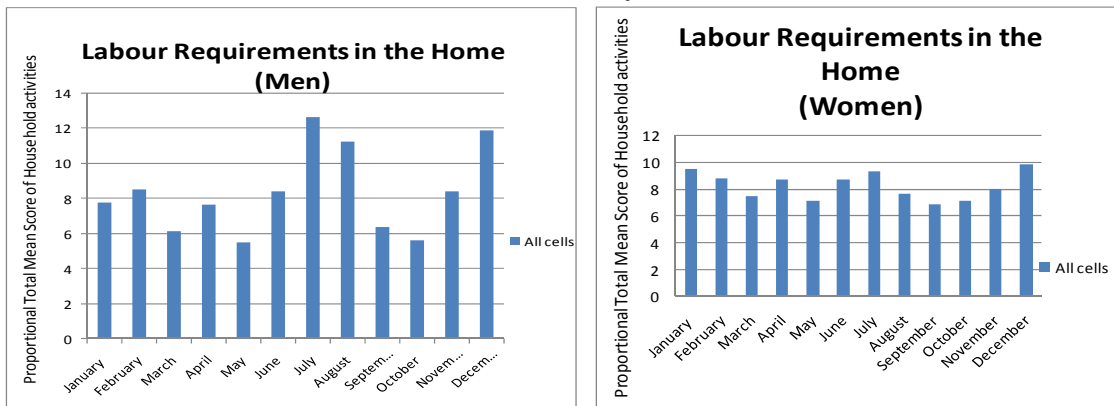
2.1.3 Food Availability

Findings revealed some slight differences in food availability between cells near the park and those far away from it. Overall, food and meat were abundant in December and January for all surveyed cells. The critical months for food scarcity overall were from July to November, which is the main cultivation and growing period before the harvest. Non-adjacent cells had higher mean scores for the availability of food and meat during the dry season and the cultivation period due to the fact these cells have better access to off-farm activities than the park-adjacent cells, thus bearing cash income that could buy food and meat during those critical periods (Table 2.4).

Table 2.4 Mean Distribution of Food and Meat Availability by Cell; Near & Far
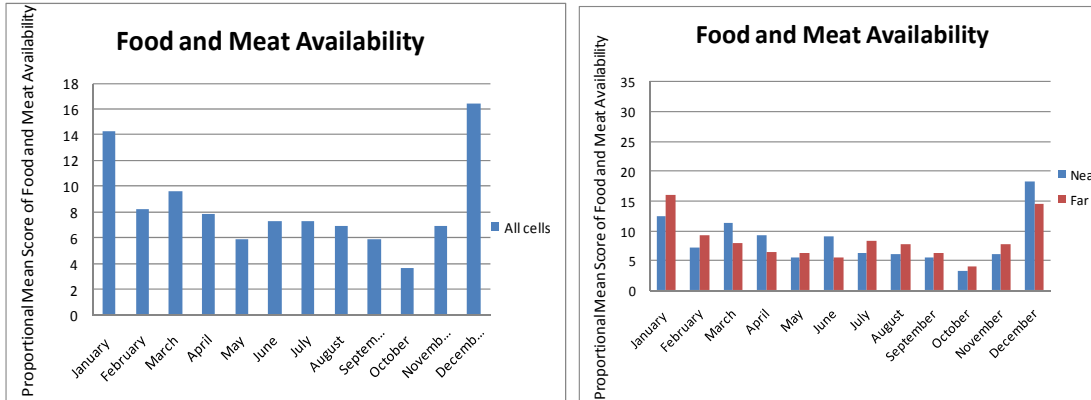
2.1.4 Cash Income Availability

Overall, cash income availability is scored highest in December and March, when locals are selling their harvested crops such as Irish potatoes (Table 2.5). Furthermore cash income enters into the household of those who are members of "tontines" or informal microfinance institutions in December for Christmas and New Year's celebrations purposes. Cash income was lowest from July to November since it is during the cultivation period – few crops to sell to obtain cash. Medium level of cash income was available in January and February. Cash is utilized for household and agricultural expenditures; paying children's school fees materials, paying agricultural inputs' loans acquired from the previous year, etc.

Non-park adjacent cells had higher mean scores for cash income availability across the whole year. During the dry seasons, households reported that they were engaged in other off-farm activities such as casual labour on public construction projects -- e.g. HIMO (Haute Intensité du Main d'Oeuvre) and non-agricultural commercial business. This allowed more off-farm income generating activities to provide cash in addition to cultivating crops. However, cells adjacent to the park reported higher mean value for income availability in December, when harvested crops such as Irish potatoes and pyrethrum are sold.

Table 2.5 Mean Distribution of Income Availability by Cell; by Near & Far
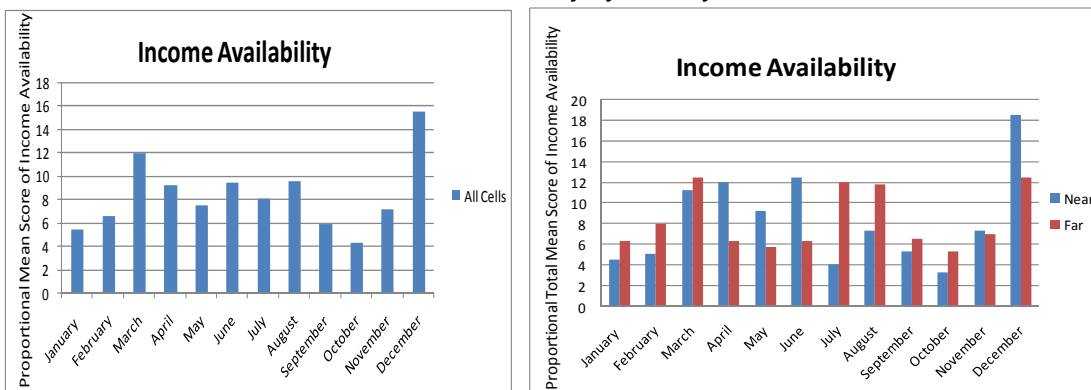
2.1.5 Crop Raiding & Local People's Park Use

Results from the exercise revealed that park-adjacent cells reported crop raiding cases more than cells living far away from the park throughout the year (Table 2.6). Buffaloes, porcupines, golden monkeys, bush pigs, rats and birds crop raid on local Irish potatoes and maize farms. These animals tend to come into fields during the months nearing the harvest. Interestingly, people reported that animals also crop raided more during the dry season, perhaps at a time when food resources for wild mammals in the park are scarce. However, there was an

indication that the central area surrounding the VNP had frequent higher mean values of crop raiding than the east and west. Local people from the central region informed us that a large mass of various animals were found in the central part of the VNP.

Park-adjacent communities were particularly reliant on the park during the dry seasons; this was reported in all surveyed cells (Table 2.7). Surface water and ground water are scarce around the park, more acutely so in the dry season, and some of the only available sources are springs and streams found within the park boundary. Households also reported that some households utilize the park for bush meat, honey, firewood and bamboos. One respondent articulated that the park is used for bush meat since meat is too expensive to buy, while another highlighted that the park is by some means easy to access given that guards are sometimes easy to bribe. One day during the survey, enumerators came across this issue from observation in Butaka cell, Bugeshi sector in the west - a guard was explicitly asking for a local person to pay him 5,000Rwf to enter into the park.

Table 2.6 Mean Distribution of Crop Raiding by Cell; by Near & Far; by East, Central & West
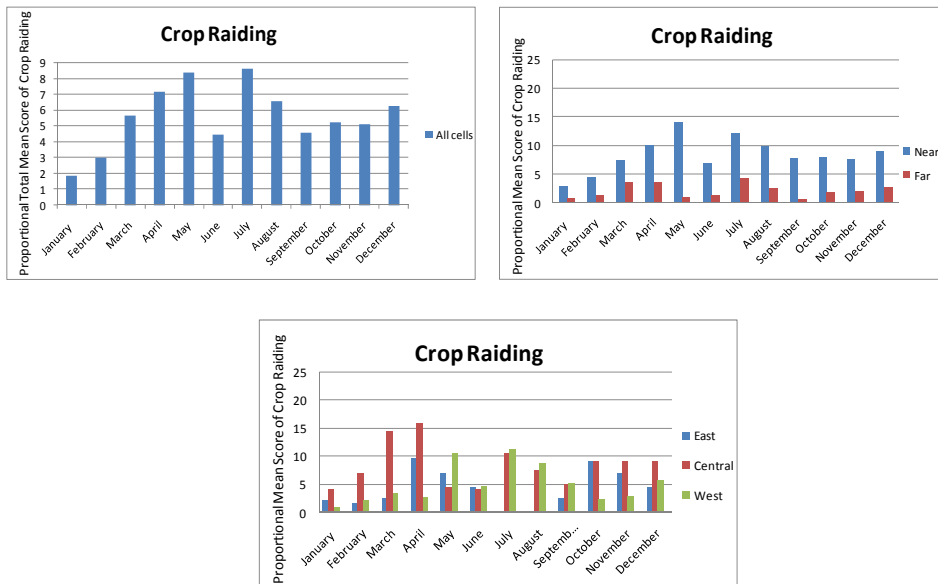
Table 2.7 Mean Score of Park Use by Near or Far from VNP
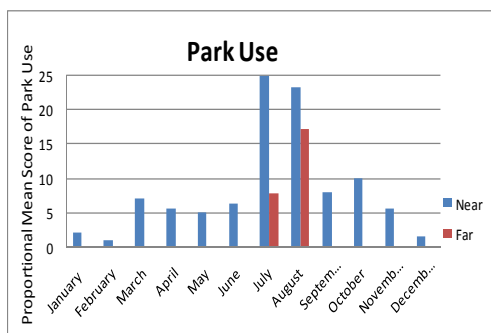
There was an indication that park-adjacent cells utilized the park more than non-park adjacent cells. The proximity to the park played a big role in the park use of communities around VNP. Cells located far away from the park utilized it during the dry season mainly for water.

2.1.6 Healthcare

This discussion allowed local participants to establish if there were any particular times of year when there are disease issues such as typhoid, malaria, cholera etc. Mean values for sickness occurrence revealed high intensity of diseases mainly during the rainy seasons for all surveyed cells (Table 2.8). Common cold,

pneumonia and flu cases appeared during the rainy season in particular. During the dry season, most cases of diseases appeared to be common cold and flu. Stomach-ache-related diseases such as diarrhoea invaded cells during both rainy and dry seasons. However, poor sanitation from erosion and poor hygiene in general were key factors causing diarrhoea among local communities. There was no indication of differences among park-adjacent and non-adjacent communities with regard to the disease occurrences throughout the year.

Table 2.8 Mean Distribution of Disease Occurrence by Cell
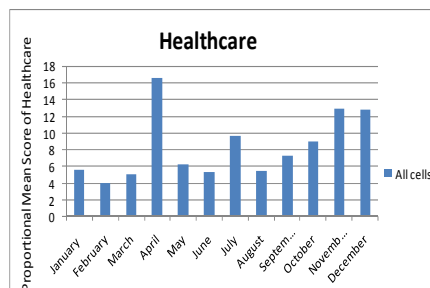
2.1.7 Key Crops
The goal of this exercise was to identify and prioritize the key food and cash crops and their production patterns.

Table 2.9 Key Food Crops

Key Food Crops	
Park-Adjacent cells	Non-Adjacent Cells
Irish Potatoes	Irish Potatoes
Beans and Maize	Beans and Maize
Vegetables	Vegetables

Common to other parts of Rwanda, the principal food crops were starches (Irish potatoes, maize) along with beans and vegetables. There were no obvious differences in the scoring of importance of these different crops between cells surveyed. It appeared that most consumed key food crops were also ranked as key cash crops, providing for both cash income and subsistence needs; these are mainly Irish potatoes, beans and maize.

Table 2.10 Key Cash Crops

Key Cash Crops	
Park-Adjacent Cells	Non-Adjacent Cells
Irish Potatoes	Irish Potatoes
Pyrethrum	Vegetables and fruits
Vegetables and fruits	Beans and maize

The overall picture showed that key cash crops (Table 2.10) grown around the VNP were Irish potatoes, pyrethrum, vegetables (onion, carrots cabbages) and fruits (Japanese prunes, papaya, sweet bananas). Irish potatoes were the most popular cash crop for all cells. This was because of its perceived high yield, good market price compared to other cash crops. The fact that potatoes are also edible should local markets fail also secures their popularity as a cash crop. Pyrethrum was only evident in communities that had substantial land areas being share-cropped under arrangements with SOPYRWA. These were park-adjacent communities in that this land was former national park degazetted under national agricultural programmes in the 1970s and 1980s. Cells far from the park scored more highly the contribution of fruits and vegetables as cash crops, citing that vegetables were more grown into valleys where soil water/moisture was more easily retained than on the steeply sloping hills.

2.2 Park and Community Relations

2.2.1 Key Costs and Benefits to Living Near the VNP

The purpose of this exercise was to define and prioritize key social and economic costs and benefits for households living near the PA. Issues are presented in order of priority, with the most important first.

Table 2.11 Key Costs of Living Next to the PNV

Key Costs	
Park-Adjacent cells	**Non-Adjacent Cells**
Crop raiding	Erosion and flooding from park gullies
Erosion and flooding from park gullies	Land loss of 6m for buffer zone establishments
Land loss for buffer zone establishments	Anticipated insecurity from war raids
No firewood, honey, water or bush meat	No firewood, honey, water or bush meat
Human deaths and property damages due to erosion from park gullies	Human deaths and property damages due to erosion from park gullies
	No job opportunities from the park

Findings proved that crop raiding, erosion and flooding from park gullies, and land loss were key costs (Table 2.11) which were principal challenges to communities living near the park as a direct result of park management. Local people's land loss for buffer zone establishments was a critical cost felt by both communities (near and far away from the park). This is because respondents living far away from the park also owned fields which border the PNV. The appraisal also showed that anticipated insecurity from war raids, human deaths and property damages due to erosion and flooding from park gullies and inaccessibility of bush meat, honey, firewood and water were similar for cells located far away from the park, as well as those near the park. Unavailability of job opportunities affected cells non-adjacent to the park since they felt that communities closer to the park boundaries were prioritized for the job offers in the park. It is crucial to remember that this study was subjective, according to how respondents felt in representation of which key issues affected most their communities.

The study carried out the same exercise, this time to observe which benefits were considered to affect livelihoods of communities surrounding the VNP.

Table 2.12 Key Benefits from Living Next to the PNV

Key Benefits	
Park-Adjacent Cells	**Non-Adjacent Cells**
Plenty of rain	Good and healthy climate
Good and healthy climate	Plenty of rain
Water tanks and schools establishments	Water tanks establishments
Job opportunities in the park	Job opportunities
Erosion control	

Findings proved that good climate and rainfall were the prime benefits for communities living around the VNP. Here good climate refers to the temperate nature of the local micro-climate, providing a fresh, clean atmosphere which prevented various human diseases according to communities' own opinions. This point is a little confusing as the climate in and around the park area may be linked more to the altitude and the presence of the Virunga Mountains as much as to the forest. Water tanks developments from revenue sharing schemes or from

donations were also realized as important factors benefiting local communities since water across the VNP area was difficult to find. One of the respondents asserted that before water tanks developments by ORTPN (RDB), it took them a 2-hour roundtrip in search of water for domestic use. Now it only takes a half-hour roundtrip to collect water from water tank establishments in the community. School establishments were solely acknowledged in communities sharing boundaries with the park where revenue sharing projects are concentrated. Job opportunities available for communities working in the VNP as guards, porters, etc. were observed to positively impact all park-adjacent cells and few non-adjacent cells.

2.2.2 PA-Related Institutional Support

Findings proved that mainly governmental institutions and CBOs were more involved in resolving development and conservation issues near the park boundaries. RDB/T&C, a government institution whose mission is to protect and conserve the VNP biodiversity as well as develop tourism across the VNP, is the first organisation to engage in resolving development and conservation issues in partnership mainly with CBOs, whose foundations were RDB/T&C initiatives. This is why many governmental organisations and CBOs were observed around the VNP. However, the number of institutions involved in resolving conservation and development issues was still quite low.

Table 2.13 Mean Score of PA-Related Institutional Support by Near and Far from VNP; by East, Central and West
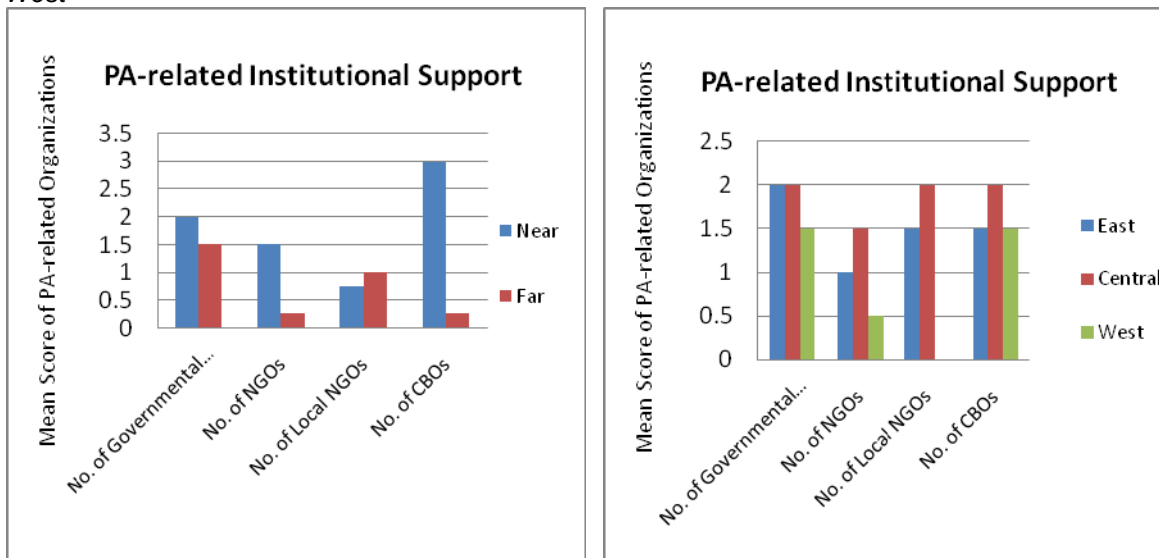
It was observed that mainly CBOs involved in resource management are found in park-adjacent cells and in the central region where tourism-related activities are concentrated. Governmental institutions were predominant in non-park adjacent cells to educate and resolve issues related to resource management.

The study showed also that cooperation between these institutions was lingering mainly between CBOs and local authorities (See Appendix 1 for PRA detailed exercise). The conflict came mostly because these institutions (both government and local authorities) lacked mainly capacity building and financial support to resolve those conservation challenges around them.

Table 2.14 PA-Related Institution by Cell

Name of the cell	Near or Far from VNP	East, Central or West	ICDP	Governmental Organisations	NGOs	Local NGOs	CBOs
Nyagahinga	1	East	0	ORTPN Local Authority	CARE Gorilla Organisation	ARECO	Turengere Ibidukikije Groupe Kashinge ANICO
Kagitega	0	East	0	ORTPN Local Authority		MOUCECORE	
Bisoke	1	Central	1	ORTPN Local Authority	CARE DFGFI/KRC		Natwe Dushyireho Akacu Porters Association ANICO SACOLA
Kampanga	0	Central	0	ORTPN Local Authority	DFGFI/KRC	Urugaga IMBARAGA	SACOLA ASOFERWA AIMPO
Gasizi	1	West	1	ORTPN Local Authority	Gorilla Organisation		ANICO APARWA Abavumvu
Bukinanyana	0	West	0	Local Authority			APARWA
Butaka	1	West	1	ORTPN Local Authority	CARE		ANICO Tubungabunge Ibidukikije Haranira Ibidukikije
Kabumba	0	West	0	Local Authority			

2.3 Livelihoods Opportunities and Constraints

The aim of this exercise was to identify and prioritize the key livelihoods problems for households (Table 2.15). Afterwards, the three highest ranked problems were thoroughly analyzed in order to identify the key opportunities and constraints for households to improve their welfare. This is critical to assess for community development priorities.

For further analysis, this study chose to focus only on three key livelihood problems, ranked at the top in each surveyed cell. The issues were analyzed according to geographical factors such as proximity to the park and by regional groupings around the park.

Table 2.15 Key Livelihood Problems

Key Livelihood Problems	
Park-Adjacent Cells	**Non-Adjacent Cells**
Land constraint	Water Inaccessibility
Erosion and degradation	Erosion and degradation
Water Inaccessibility	Family Planning
Family Planning	Land constraint
Costly inputs	Shortage & Poor services of Healthcare Personnel and Facilities
Shortage & Poor quality of roads as well as bridges	
Shortage & Poor services of Healthcare Personnel and Facilities	

For cells living near the park, respondents stressed land unavailability to be the first challenge affecting their livelihoods. Second came erosion and degradation, followed by water inaccessibility, family planning, etc. Costly agricultural inputs were also stressed as key livelihood problems affecting communities living near the park. Observations showed similar patterns of key livelihood problems for cells near and far away from the park, regardless of their order of magnitude.

2.3.1 Land Constraints and Tenure

The objective of the discussion was to understand the current distributional pattern of land in the community and discuss issues regarding the government agrarian reform process. Below is a summary of aggregated subjective responses from surveyed cells where opinions were shared on this issue.

A. Land size and fragmentation causes

Reasons for decreasing parcel size and increasing fragmentation:

- Population pressure from polygamy, in-migration and reluctance of following family planning measures;
- Subdivision of land parcels through customary law;
- Local scarcity of land: people looking outside of home area for additional land;
- Reallocation of private land at the market due to poverty; and
- Contract between SOPYRWA & park-adjacent farmers –constraints on subdivision cause people to look for land elsewhere.

B. Land distribution related conflicts

- Population pressure mainly is causing land conflicts at the household level once redistributing land through customary law for land titling;
- Not enough land to distribute amongst children, creating resentment and disputes within families;
- Polygamy –men marry to acquire land and then assume control of its management often giving away parcels to the children of other wives or excluding the original women owners;
- Females, widows, orphans and landless are mostly vulnerable, marginalized and feel cheated by customary practices and excluded from formal processes;
- Additional labour/time costs in agricultural on fragmented holdings; and
- Decrease of agricultural productivity.

NB: Most conflicts at the 'Umugudugu' level are land-related

C. Land conflict resolution constraints

- Land disputes dealt with formally take too long to resolve;
- Access to arbitration through existing institutions not accessible to the poor and marginalized;
- Unawareness of land titling rights among these vulnerable groups;
- No establishment of strong institutions to solely resolve land-related issues; and
- Corruption found in informal and formal institutions in handling land-related issues.

2.4 Institutional Support

With livelihood key problems faced by communities around the VNP, it was crucial to recognize which institutions were already established to resolve these problems.

The intention was to identify the range of organisations - governmental organisations, NGOs, local NGOs and CBOs with interests in managing or using key resources in the eight surveyed cells. The results are portrayed in tables 2.16 and 2.17 below.

Table 2.16 Mean Score of Institutions by Near or Far from VNP; by East, Central and West
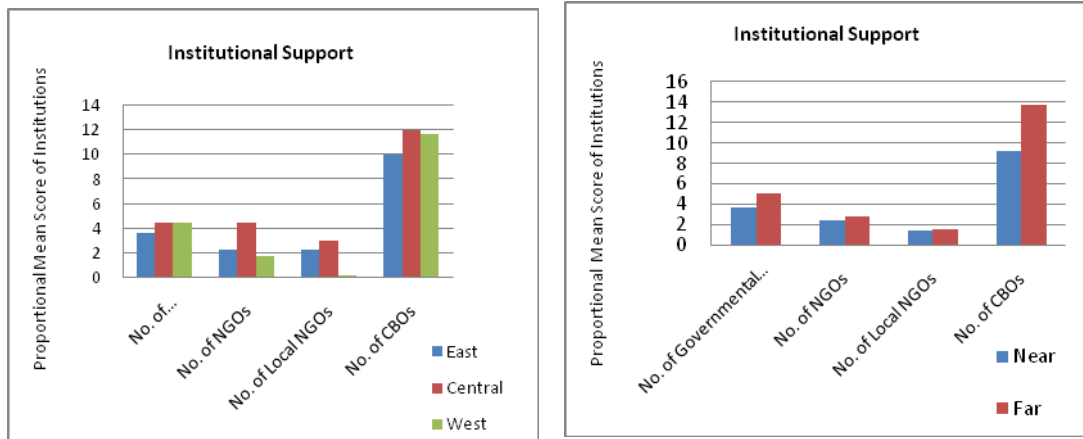
Findings indicated a higher presence for CBOs operating in cells around VNP, followed by governmental organisations, NGOs and local NGOs respectively. There was no observable difference in mean scores between park and non-park adjacent cells for organisations present. Nonetheless, there was an indication that cells located further away from the park bear more institutions from governmental organisations to CBOs overall, as more development projects are observed within these communities. More institutions were found in the sectors located in the central region, as this is the hub of development related to tourism.

Table 2.17 Institutional Support by Cell

Name of the cell	Near or Far from VNP	East, Central or West	CC/ICDP project present	Governmental Organisations	NGOs	Local NGOs	CBOs
Nyagahinga	Near	East	NO	ORTPN Local Authority One Cow One Family Project Ubudehe Programme	CARE Gorilla Organisation Blueciel	MOUCECORE Urugaga Imbaraga ARDI ARECO	Ibimina Twubakane Abatiganda Terimbere mutegarugori Turengere Ibidukikije Abasenga Coopababuki Tuzamurane Abahuje umugambi Groupe Kashinge ANICO Dutabarane Twubakirane duhana inkwano Turengere ubuzima
Kagitega	Far	East	No	ORTPN Local Authority UBUDEHE CDC Banque Populaire	COMPASSION UNICEF/PHAST SISTER RWANDA	TABARA IMBARAGA MOUCECORE	Dutabarane Abatabazi COPECEFEC Turwanyinzara PAE Abakundisuka Abarwanashyaka Turengerubuzima Abishyizehamwe Twifatanye Tugurizanya
Bisoke	Near	Central	Yes	ORTPN Local Authority	CARE DFGFI/KRC World Vision OXFAM CARITAS	Urugaga Imbaraga IMBUTO Foundation Abbe Kabayore Joseph	Natwe Dushyireho Akacu Ibimina Twizamure Duteraninkunga Terimbere mutegarugori Abadacogora Twihangire umurimo Porters Association ANICO SACOLA
Kampanga	Far	Central	Yes	ORTPN Local Authority PENAPE CENES CATALIST UBUDEHE	DFGFI/KRC CARE CARITAS	Urugaga IMBARAGA	SACOLA ASOFERWA AIMPO COOBIKI AGIRAGITEREKA UGEAKE CECEDAM ABADATANA DUFATANYE TWITEZIMBERE ABADAHARANA DUTERIMBERE CLECAM ASOFERWA SACOLA RIM URWEGO COPAVU
Gasizi	Near	West	Yes	ORTPN Local Authority	Gorilla Organisation		ANICO Tuzamurane

				SOPYRWA UBUDEHE			KMTB Ingoboka ASEPECA Dutsinde Nyakatsi COJYIMU APEKAS APARWA Abavumvu
Bukinanyana	Far	West	No	Local Authority FARG Education Institutions Rwanda Mountain Tea	COMPASSION CHAMP CARE FOFI		APARWA COIMU COTEMU COABI CODUITEJE COBUT Tuzamurane Twitezimbere Abunzubumwe
Butaka	Near	West	Yes	ORTPN Local Authority Girinka Project SOPYRWA UBUDEHE PACFA FAE	CARE		ANICO Duharanire Ibidukikije Club Turwanye Ihohoterwa Icyuzuzo Tuzamurane Sasa Neza Ryamaneza Tubungabunge Ibidukikije Haranira Ibidukikije
Kabumba	Far	West	No	Local Authority UBUDEHE CDCs ISAR	CARE	Urugaga IMBARAGA	COTUMUKA CLCP COCOMOCA COATE ZAMI TUGOBOKANE COTEMU COIMU CODAF TWIZIGAMIRE TUJYIMBERE TWUNGURANE DUKORANUMWETE AGRUNI AGASEKE K'UBWIYUNGE TWIYORORERE DUSHYIREHAMWE ABADACOGORO COGIMU KOITBU IMPUHWE

3.0 Results Part II: Household Socio-Economic Survey Results

3.1 Sub-Section A: Household Demographic and Social Indicators

3.1.1 Sample Age and Sex Distribution

The sample was predominantly young, with 69.3 percent being less than 25 years old (Table 3.1). The proportion of males to females overall and within age classes was not significantly different, although slightly more females were recorded than males overall. In addition, a slightly higher proportion of females were observed in all age classes from birth to 35 years. Overall, these findings are consistent with the general picture of Rwanda, where 67 percent of the population was below 25 years (GOR 2002).

Table 3.1 Frequency of Age Class by Sex

Age class		MALE	FEMALE	Age Class Total
80+	Count	4	3	7
	% of Total	0.2%	0.1%	0.3%
74-79	Count	4	4	8
	% of Total	0..2%	0.2%	0.4%
70-74	Count	6	3	9
	% of Total	0..3%	0.1%	0.4%
65-69	Count	6	3	9
	% of Total	0..3%	0.1%	0.4%
60-64	Count	7	8	15
	% of Total	0..3%	0.4%	0.7%
55-59	Count	14	18	32
	% of Total	0.6%	0.8%	1.5%
50-54	Count	28	29	57
	% of Total	1.3%	1.3%	2.6%
45-49	Count	26	32	58
	% of Total	1.2%	1.5%	2.7%
40-44	Count	26	39	65
	% of Total	1.2%	1.8%	3.0%
35-39	Count	57	54	111
	% of Total	2.6%	2.5%	5.1%
30-34	Count	53	69	122
	% of Total	2.4%	3.2%	5.6%
25-29	Count	78	100	178
	% of Total	3.6%	4.6%	8.1%
20-24	Count	73	93	166
	% of Total	3.3%	4.3%	7.6%
15-19	Count	131	144	275
	% of Total	6.0%	6.6%	12.6%
10-14	Count	161	170	331
	% of Total	7.4%	7.8%	15.1%
5-9	Count	205	214	419
	% of Total	9.4%	9.8%	19.2%
0-4	Count	152	171	323
	% of Total	7.0%	7.8%	14.8%

Table 3.2 Sample Population Pyramid; Count of Age Classes by Gender
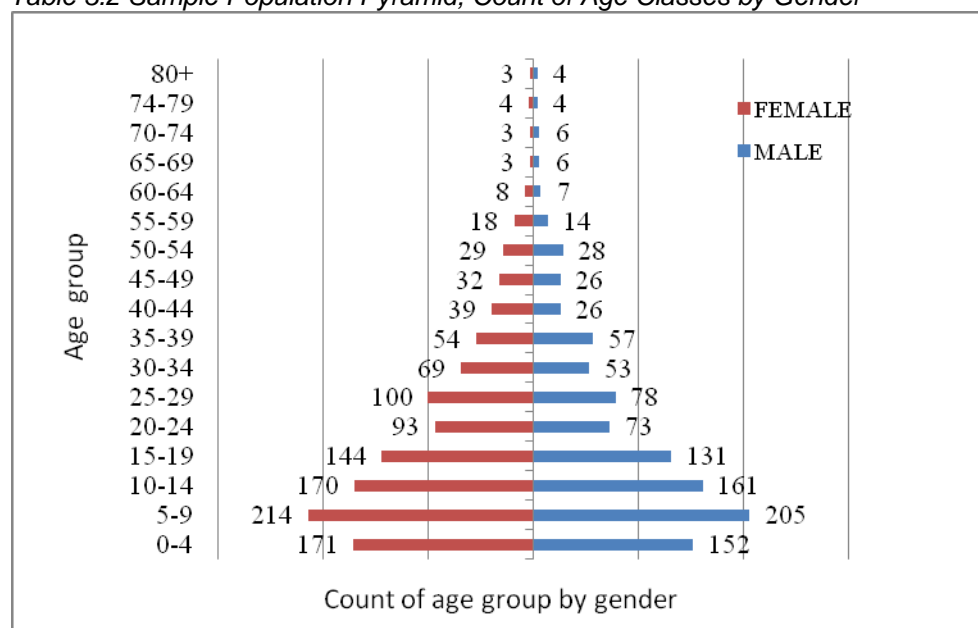
However, when comparing the national rural population structure to the sample there are some differences. In the 2002 census, it was noted that the general rural picture was similar to that of the overall picture for Rwanda: a classical pyramid. In this sample (Table 3.2) we see that that there is a narrow base with a growth then retraction of age classes from the 5-9 group to the 20-24 group; from the 25-29 group the population takes on a normal pyramidal structure. The high numbers of observations from 5-9 to 15-19 probably represent the post-war baby boom from Rwanda's genocide and civil war from 1994-1996 and the continuing insecurity in the north-western regions until 1998, just over a decade ago. The recent retraction in the proportion of 0-4 year olds may indicate that population growth is reducing in this sample population area.

The mean age of households in the sample was 20.29 years. This was not significantly different between villages, regions or proximity to the park. This was slightly lower than the means household age reported by Plumptre et al (2004) for PNV, which was 21.05 years. The proportion of under-20s in this sample was 63.80 percent compared to 63.85 percent in Plumptre et al (2004). Thus, reduction in the mean household age may be due to decreased proportions of older people in the average household or differences in sampling methods, and in any case may not be statistically significant.

3.1.2 Household Size and Composition
The mean sample household size was 5.64 individuals with a range of 1 to 13 individuals (Table 3.3). The mean household size was significantly different between sample villages (F= 2.065, d.f.=25, p<0.01). This is higher than the national rural average reported in RDHS (2005) of 4.5 individuals and slightly higher than the 5.3 people per household reported in the 2006 Comprehensive food Security and Vulnerability Analysis (WFP 2006).

Table 3.3 Mean Household Occupants per Village Ordered from Lowest to Highest Value

Village	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
KAGANO	15	4.60	1.45	0.38	2	8
PFUNDO	15	4.67	1.54	0.40	2	7
KABURENDE	15	4.80	2.11	0.55	2	10
RUSENGE	15	4.80	2.14	0.55	2	8
BIHANGA	12	4.83	2.37	0.68	1	8
RUTINDO	15	4.87	2.13	0.55	2	9

KARISIMBI	15	4.93	2.12	0.55	1	9
BUNYENYERI	15	5.07	2.25	0.58	2	9
KAMIRO	15	5.20	2.83	0.73	2	12
RUBAKA	15	5.27	2.37	0.61	2	9
TERIMBERE	15	5.40	2.06	0.53	2	11
GAHIRA	15	5.47	1.36	0.35	4	9
MUHABURA	15	5.53	2.07	0.53	3	10
KINYAMUHANGA	15	5.60	2.16	0.56	3	10
BIZU	15	5.67	2.69	0.69	3	12
KABUMBA	15	5.73	1.49	0.38	3	8
MASASA	15	5.80	2.91	0.75	2	11
MUNINI	15	5.80	2.57	0.66	2	11
NSAKIRA	15	5.80	1.86	0.48	1	9
RUHANGO	15	5.80	2.93	0.76	3	13
NTENYO	16	6.19	2.97	0.74	1	11
JITE	15	6.27	1.39	0.36	3	8
RYAMBUNGIRA	15	6.27	2.05	0.53	3	10
GACOGO	15	6.93	2.31	0.60	3	11
MUTARA	15	7.40	1.80	0.47	3	10
KAGERI	15	7.87	2.10	0.54	4	11
ALL	388	5.64	2.28	0.12	1	13

The lowest mean number of household occupants was Kagano village with 4.6 individuals per household and the highest Kageri village with 7.87. Household occupancy was not found to be significantly different in park-adjacent vs. non-adjacent villages, however there was a significant difference in values between the three regional groupings (F=18.466, d.f.=2, p<0.05).

Table 3.4 Mean Household Occupants by Region

	n	Mean	Std. Deviation	Std. Error	Minimum	Maximum
WEST	120	5.88	2.41	0.22	1	13
CENTRAL	135	5.22	2.10	0.18	2	12
EAST	133	5.86	2.29	0.20	1	11
ALL	388	5.64	2.28	0.12	1	13

The central region, comprising of sample villages in Mukamiria, Shingiro, Kinigi and Gataraga sectors, had a lower mean number of household occupants than either the west or the central regions, with an average of 5.22 individuals per household (Table 3.4).

3.1.3 Household Leadership

Only 2 minors were recorded as being household heads (child headed households) in the entire sample, one in each of Bihanga and Kamiro villages. The proportion of child-headed households reported in Plumptre et al (2004) was 3.24 percent. This proportion has significantly reduced since 2004, perhaps principally due to security and stability allowing former minors responsible for households to mature to adulthood. A significant proportion (21.65 percent) of the sample households were headed by women. However the mean proportion of female headed households reported by Plumptre et al (2004) for PNV was 17.04, implying a large increase.

Table 3.5 Gender of Household Head Ordered by Frequency of Female Head from Lowest to Highest

VILLAGE	MALE HEAD	FEMALE HEAD	ALL TYPES	% OF VILLAGE SUB SAMPLE
MUHABURA	15	0	15	0.00
BIHANGA	11	1	12	8.33
BUNYENYERI	14	1	15	6.67
GACOGO	14	1	15	6.67
MUTARA	14	1	15	6.67
TERIMBERE	14	1	15	6.67
BIZU	13	2	15	13.33
GAHIRA	13	2	15	13.33
KARISIMBI	13	2	15	13.33
NTENYO	14	2	16	12.50
JITE	12	3	15	20.00
KAGERI	12	3	15	20.00
KAMIRO	12	3	15	20.00
KINYAMUHANGA	12	3	15	20.00
RUSENGE	12	3	15	20.00
KABURENDE	11	4	15	26.67
KAGANO	11	4	15	26.67
MASASA	11	4	15	26.67
MUNINI	11	4	15	26.67
RUHANGO	11	4	15	26.67
KABUMBA	10	5	15	33.33
RYAMBUNGIRA	10	5	15	33.33
NSAKIRA	9	6	15	40.00
PFUNDO	9	6	15	40.00
RUBAKA	9	6	15	40.00
RUTINDO	7	8	15	53.33
All	302	84	388	21.65

The distribution of female-headed households (Table 3.5) was significantly different between villages in the sample (χ^2= 39.603, d.f.=25, p<0.05). 11 of the 26 villages in the sample had 25 percent or more female- headed households. The village of Rutindo, Kinigi Sector, had the highest proportion of female-headed households, at 53.33 percent. Regionally, sectors in the west and central areas were also more likely to have a higher proportion of female-headed households than in the east, 9.28 percent and 25 percent of the sub-sample respectively (χ^2= 8.035, d.f.=2, p<0.05). In addition, the proportion of female-headed households was higher in non-park adjacent villages than in those adjacent to the park, 29.23 percent compared to 14.4 percent respectively (χ^2= 13.154, d.f.=1, p<0.001).

3.1.4 Education Levels

Respondents were asked to identify the minimum level of educational experience for all household members even if completion of that education type had not been achieved. Table 3.6 below shows the proportion of a trimmed sample by age class. Household members below the age of 5 years old were not included, as the minimum age to start primary school is 5 years old. 67 percent of the sample had achieved some primary school education, with 10.83 percent achieving secondary. Only 1.2 percent had attained any sort of tertiary education, while 20.06 percent had received no formal education at all. These figures for primary school attendance are below the average for Rwanda (GOR 2002) of 87.7 percent. However, this sample takes into account a predominantly rural population leaving out the main urban area of Ruhengeri town. Historically, prior to the Universal Primary Education (UPE) programme, there were few primary schools in rural areas so results from the 2002 census may be biased upwards due to including enrolment rates in urban areas. Secondary school education levels were similar between the two surveys, showing that despite primary education facilities being more accessible under UPE, there are other barriers to further education.

Table 3.6 Education Level by Age Class % of All Household Members Over the Age of 5

Age class	No formal	Primary	Secondary	Tertiary	% of trimmed sample
5-9	3.82	13.96	0.00	0.00	17.78
10-14	1.48	16.98	0.40	0.00	18.86
15-19	1.99	9.97	3.70	0.00	15.67
20-24	2.05	4.73	2.34	0.34	9.46
25-29	1.31	7.81	0.85	0.17	10.14
30-34	1.37	4.05	1.31	0.23	6.95
35-39	1.60	3.36	1.25	0.11	6.32
40-44	1.37	1.77	0.34	0.23	3.70
44-49	0.97	1.94	0.28	0.11	3.30
50-54	1.42	1.54	0.28	0.00	3.25
55-59	0.91	0.85	0.06	0.00	1.82
60-64	0.51	0.34	0.00	0.00	0.85
65-69	0.28	0.23	0.00	0.00	0.51
70-74	0.28	0.23	0.00	0.00	0.51
75-79	0.28	0.17	0.00	0.00	0.46
80+	0.40	0.00	0.00	0.00	0.40
ALL	20.06	67.92	10.83	1.20	100.00

The breakdown of education levels by gender (Table 3.7) shows that over all villages, there were small but significant differences between sexes in terms of reported educational levels (x^2= 14.065, d.f.=3, p<0.01). Although women were more likely to have no formal education and slightly more likely to have at least primary school education, they were slightly less likely to have secondary education. Therefore the principal hurdle to female education lies in the move from primary to secondary school. Women were slightly more likely to attain a tertiary education than men, showing that once the smaller proportion of women entered secondary school, a larger proportion of women than men were likely to go on to tertiary education.

Table 3.7 Proportion of Sample over the Age of 5 Education Levels by Village and Gender

Village	EDUCATION LEVEL Sex	No Formal Male	Female	Primary Male	Female	Secondary Male	Female	Tertiary Male	Female
BIHANGA		0.57	0.97	0.34	0.23	0.00	0.00	0.00	0.00
BIZU		0.45	0.57	1.02	1.25	0.11	0.06	0.00	0.00
BUNYENYERI		0.11	0.40	1.08	1.19	0.17	0.06	0.06	0.00
GACOGO		0.23	0.40	1.88	1.70	0.40	0.28	0.17	0.00
GAHIRA		0.17	0.11	1.25	0.97	0.28	0.23	0.00	0.06
JITE		0.45	0.23	1.14	1.88	0.28	0.17	0.00	0.00
KABUMBA		0.23	0.51	1.25	1.48	0.11	0.34	0.00	0.00
KABURENDE		0.40	0.45	1.31	0.97	0.06	0.17	0.06	0.00
KAGANO		0.23	0.40	0.80	1.14	0.28	0.34	0.06	0.23
KAGERI		0.40	0.51	1.88	1.31	0.51	0.57	0.06	0.06
KAMIRO		0.45	0.40	1.53	1.31	0.06	0.11	0.00	0.00
KARISIMBI		0.68	0.63	0.74	0.97	0.06	0.06	0.06	0.06
KINYAMUHANGA		0.11	0.40	1.36	1.42	0.06	0.51	0.06	0.11
MASASA		0.23	0.40	1.42	1.36	0.40	0.28	0.00	0.00
MUHABURA		0.45	0.45	1.25	1.25	0.17	0.06	0.00	0.06
MUNINI		0.28	0.17	0.97	1.53	0.80	0.23	0.06	0.11
MUTARA		0.51	0.40	1.48	2.27	0.34	0.34	0.11	0.11
NSAKIRA		0.17	0.40	1.36	1.53	0.45	0.17	0.00	0.00

NTENYO	0.51	0.80	1.48	1.76	0.11	0.00	0.06	0.11
PFUNDO	0.23	0.57	1.19	1.19	0.11	0.00	0.00	0.00
RUBAKA	0.06	0.34	0.97	2.10	0.11	0.11	0.00	0.11
RUHANGO	0.11	0.17	1.19	1.82	0.23	0.06	0.06	0.00
RUSENGE	0.45	0.57	1.02	0.80	0.06	0.00	0.00	0.00
RUTINDO	0.17	0.45	1.02	1.42	0.57	0.17	0.06	0.00
RYAMBUNGIRA	0.40	0.80	1.93	1.36	0.06	0.11	0.00	0.00
TERIMBERE	0.17	0.45	0.85	1.14	0.45	0.17	0.06	0.00
ALL	8.24	11.93	31.70	35.34	6.25	4.60	0.91	1.02

3.2 Sub-Section B: Resources and Assets

3.2.1 House Construction

There was great variability in the reported frequency of construction materials used. Here we consider the main materials used for wall and roof construction (the principal components of a house, representing the greatest expenditure on materials). As such, they can be an indicator of a household's wealth, assuming that wealthier households are prepared to invest in construction of homes with more durable and higher cost materials (Table 3.8). The most common form of wall construction was mud plaster on timber poles (64.4 percent), followed by mud brick (13.9 percent) and mud brick with cement plaster (11.1 percent). Only 1.8 percent of households reported using burnt bricks, the most expensive building material, and few households reported using plastic sheeting (3.4 percent) or thatch (0.5 percent), the least expensive materials.

Table 3.8 Frequency of Wall Construction Materials Reported by Sector Region

Sector Region		MUD BRICK	BURNT BRICK	MUD PLASTER	CEMENT PLASTER	IRON SHEETS	PLASTIC SHEETING	THATCH
CENTRAL	Count	17	1	96	10	2	3	6
	% of Total	4.4%	.3%	24.7%	2.6%	.5%	.8%	1.5%
EAST	Count	11	4	88	14	0	8	8
	% of Total	2.8%	1.0%	22.7%	3.6%	.0%	2.1%	2.1%
WEST	Count	26	2	66	19	0	2	5
	% of Total	6.7%	.5%	17.0%	4.9%	.0%	.5%	1.3%
Total	Count	54	7	250	43	2	13	19
	% of Total	13.9%	1.8%	64.4%	11.1%	.5%	3.4%	4.9%

There was a significant difference between villages and by regional groupings, shown above (χ^2= 25.723, d.f.=12, p<0.001). Villages in the western region were more likely to have homes made from higher cost materials (burnt brick, cement plaster and mud brick) than villages in the central or western areas. Similarly, non-adjacent park households were also more likely to have homes with walls made from higher cost materials (χ^2= 40.940, d.f.=1, p<0.001). Plumptre et al (2004) reported that overall they encountered 49 percent of houses with mud plaster walls and 22.9 percent with mud brick walls. This survey sample shows a marked decline in the quality of construction materials used in rural homes. This may indicate that as the population has grown (increasing local demand), the cost of these materials has also grown at such a rate that it has made them less affordable to a greater proportion of the population. Materials for walls are perhaps the largest in terms of volume, mass and cost. This decline in the overall frequency of higher quality of houses could be as a result of increased transport costs as fuel prices have raised considerably since 2004. This is an indication of the local impact of inflation.

For roof construction (Table 3.9) the most frequently reported materials was iron sheets (58.5 percent), followed by thatch (15.2 percent), tiles (14.9 percent) and plastic sheeting (11.3 percent). Regional differences were evident (x^2= 72.357, d.f.=16, p<0.001).

Table 3.9 Frequency of Roof Construction Materials Reported by Sector Region

Sector Region		THATCH	TILES	IRON SHEETS	PLASTIC SHEETING
CENTRAL	Count	18	36	74	7
	% of Total	4.6%	9.3%	19.1%	1.8%
EAST	Count	38	9	77	9
	% of Total	9.8%	2.3%	19.8%	2.3%
WEST	Count	3	13	76	28
	% of Total	.8%	3.4%	19.6%	7.2%
Total	Count	59	58	227	44
	% of Total	15.2%	14.9%	58.5%	11.3%

Households in the western region were more likely to use plastic sheeting than the other areas, and households in the central area were more likely to use thatch. Tiles were more evident in the central region. There were also significant marked differences in the use of materials between households in park-adjacent and non-park adjacent villages (x^2=32.481, d.f.=3, p<0.001). Plumptre et al (2004) reported that iron sheet use in their sample was 51.44 percent, therefore more homes today are utilising iron sheets. Fewer homes are utilising tiles, (16.84 percent) as opposed to 14.9 percent in this study. This study also shows an increase in the use of plastic sheeting overall, up from 8.73 percent (Plumptre et al, 2004) to 11.3 percent. As with the material use for walls, similar inferences can be drawn in this case; although more households are able to afford sheeting (an improvement in living conditions), there are also more households that now have to use plastic sheeting than previously (a decline in living conditions), indicating an increasing gap between the wealthiest and poorest households.

Regional difference in the use of construction materials may be more closely related to the physical availability of different types of materials than a good indicator of which regions are wealthier or poorer than others. However, the effects of proximity to the protected area are less clear. Differences could be as a result of physical access/transport constraints, or park-adjacent households may be generally poorer.

3.2.3 Length of Residency

There was no statistical difference between villages, regions or proximity to the park in terms of the mean number of years a household had been settled in their present home (Table 3.10).

Table 3.10 Mean Number of Years Resident in Present Home

VILLAGE	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
BIHANGA	12	7.55	4.497	1.298	0	15
BIZU	15	13.73	14.548	3.756	1	41
BUNYENYERI	14	6.80	8.916	2.383	1	29
GACOGO	14	16.96	14.936	3.992	4	52
GAHIRA	14	12.07	14.636	3.912	1	55
JITE	15	6.73	3.595	.928	1	12
KABUMBA	15	11.90	13.480	3.481	0	55
KABURENDE	14	10.36	8.617	2.303	1	29
KAGANO	15	7.93	4.728	1.221	1	23

KAGERI	15	9.87	8.879	2.293	2	37
KAMIRO	14	7.57	4.894	1.308	2	18
KARISIMBI	15	12.60	21.695	5.602	2	90
KINYAMUHANGA	15	11.91	12.328	3.183	1	39
MASASA	15	11.00	10.843	2.800	1	37
MUHABURA	15	12.23	12.093	3.122	1	46
MUNINI	15	12.33	11.974	3.092	1	40
MUTARA	15	17.00	12.236	3.159	1	50
NSAKIRA	15	9.40	10.594	2.735	0	35
NTENYO	16	17.80	22.515	5.629	1	74
PFUNDO	15	7.93	5.338	1.378	1	20
RUBAKA	15	18.87	18.807	4.856	2	76
RUHANGO	15	11.53	7.953	2.053	1	30
RUSENGE	15	6.93	7.124	1.839	1	29
RUTINDO	15	15.20	15.034	3.882	3	50
RYAMBUNGIRA	15	13.00	13.701	3.538	1	43
TERIMBERE	15	8.33	11.739	3.031	1	39
Total	383	11.50	12.573	.642	0	90

The mean number of years a household reported that they had been settled in their respective villages was 11.5 years, ranging form responses of less than one year to a maximum of 90 years. This is a significant decrease in the values reported for VNP by Plumptre et al (2004), who recorded a mean value of 27.89 years. Firstly, differences could be due to significant policy developments over the last decade that have reorganized the social landscape such as Umugudugu (village collectivization), recent reorganisation of the political boundaries, and the resettlement of refugees and diaspora post-war and restrictions on the subdivision of land parcels. Such factors have caused people in recent times to move or have land reallocated to them. Secondly, population growth rates nationally at over 3 percent and the population density around the PNV peaking at more than 600 people per km^2 may have prompted many people to look for land holdings and better opportunities further away form their former home areas or places of birth.

3.2.4 Livestock Assets

Overall, villages mean levels of livestock ownership were very low. No significant differences were observed between villages, proximity to park, or on a regional basis, with the exception of poultry. Several villages had a significantly higher mean number of chickens (χ^2=39.149, d.f.=24, p<0.05) and ducks (χ^2= 39.260, d.f.=24, p<0.05). Villages not adjacent to the national park were also more likely to have poultry than villages adjacent to the national park (χ^2=4.890, d.f.=24, p<0.05).

Table 3.11 Mean Livestock Holdings by Village

Village	n	Cattle	Goats	Sheep	Pigs	Ducks	Chickens
BIZU	14	0.071	0.643	0.071	0.000	0.071	0.000
BUNYENERI	15	0.400	0.267	0.000	0.000	0.000	0.000
GACOGO	15	0.200	1.000	0.133	0.067	0.067	0.000
GAHIRA	15	0.200	0.667	0.000	0.000	0.000	0.067
JITE	15	0.133	0.600	0.067	0.000	0.000	0.000
KABUMBA	15	0.267	0.467	0.067	0.000	0.000	0.200
KABURENDE	15	0.067	0.333	0.000	0.067	0.000	0.067
KAGANO	15	0.200	0.600	0.000	0.000	0.000	0.000
KAGERI	15	0.200	0.867	0.067	0.000	0.000	0.133
KAMIRO	15	0.067	0.600	0.067	0.000	0.000	0.000
KARISIMBI	15	0.133	0.600	0.000	0.000	0.000	0.000

KINYAMUHANGA	15	0.267	0.933	0.067	0.000	0.200	0.000
KASASA	15	0.467	0.533	0.067	0.067	0.000	0.000
MUHABURA	15	0.000	0.467	0.000	0.000	0.000	0.000
MUNINI	15	0.133	0.400	0.267	0.000	0.000	0.267
MUTARA	15	0.400	0.667	0.000	0.067	0.133	0.200
NSAKIRA	15	0.133	0.333	0.067	0.000	0.067	0.000
NTENYO	16	0.313	0.438	0.063	0.000	0.000	0.000
PFUNDO	15	0.133	0.333	0.000	0.000	0.000	0.000
RUBAKA	15	0.400	0.600	0.133	0.000	0.000	0.000
RUHANGO	15	0.267	0.333	0.067	0.000	0.000	0.000
RUSENGE	15	0.133	0.200	0.133	0.000	0.000	0.000
RUTINDO	15	0.333	0.333	0.000	0.000	0.000	0.000
RYANBUGIRA	15	0.000	0.800	0.000	0.000	0.067	0.000
TERMIBERE	15	0.333	0.800	0.200	0.067	0.000	0.067
ALL	375	0.211	0.552	0.061	0.013	0.024	0.040

Clearly livestock ownership is a significant issue in addressing poverty issues. One of the key resources and methods of buffering the household against shocks is to accumulate wealth in the form of livestock. Although not without risks - e.g. losses from disease - livestock tend to be robust to inflation and may also appreciate in value with little input beyond forage and fodder, depending on the agricultural system. They may be bartered or sold for cash, and also have a valuable cultural role - e.g. dowry. The figures for cattle and goats are comparable if slightly lower than those reported in Plumptre et al (2004). However, numbers for sheep, pigs and chickens seem markedly lower. The significance of these findings is unclear; however the trend is a reduction in livestock holding per household on average. This is not an unreasonable conclusion given that landholdings have reduced overall per household, reducing the potential for livestock rearing on a per household basis.

3.2.5 Land Ownership, Access, Tenure and Use

Respondents were asked to estimate the size of their total land holding in general. The mean holding per household was 0.55 ha, ranging from 0 to 20 hectares (Table 3.12). There was a significant difference between villages and the reported land holdings (F=56.694, d.f.=25, p<0.01). The highest mean land holdings were found in Mutara village, Gahunga sector, (2.03ha) and the lowest were in Rusenge village, Bigogwe sector. Bihanga Village is a Batwa community and it was widely reported in this case that they had no more than the land on which their house stood and therefore had no land to cultivate.

Table 3.12 Mean Land Holdings (Ha per Household)

VILLAGE	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
BIHANGA	7	0	0.005	0.002	0	0
RUSENGE	15	0.13	0.137	0.035	0	1
KARISIMBI	15	0.22	0.267	0.069	0	1
JITE	15	0.23	0.176	0.045	0	1
MUHABURA	15	0.23	0.271	0.07	0	1
BUNYENYERI	15	0.26	0.171	0.044	0	1
KAGANO	15	0.29	0.312	0.081	0	1
KABUMBA	15	0.35	0.421	0.109	0	2
NSAKIRA	14	0.35	0.367	0.098	0	1
RUHANGO	15	0.35	0.462	0.119	0	2
KINYAMUHANGA	15	0.37	0.243	0.063	0	1
KABURENDE	14	0.38	0.601	0.161	0	2

BIZU	15	0.44	0.533	0.138	0	2
PFUNDO	15	0.48	0.879	0.227	0	4
RYAMBUNGIRA	15	0.49	0.636	0.164	0	3
KAMIRO	15	0.5	0.835	0.216	0	3
MUNINI	15	0.51	0.818	0.211	0	3
GAHIRA	15	0.63	0.619	0.16	0	2
NTENYO	16	0.67	1.571	0.393	0	6
RUTINDO	15	0.72	0.715	0.185	0	2
MASASA	14	0.73	0.613	0.164	0	2
RUBAKA	12	0.77	1.405	0.406	0	5
TERIMBERE	14	0.81	0.765	0.204	0	2
KAGERI	15	0.91	1.105	0.285	0	4
GACOGO	15	1.09	1.046	0.27	0	3
MUTARA	15	2.03	5.048	1.304	0	20
ALL	376	0.55	1.251	0.064	0	20

There was no significant difference at the regional level in terms of mean land holdings. However, when the sample was aggregated according to those villages adjacent to the park and those non-adjacent (Table 3.13), park-adjacent households had a significantly lower mean holding than those non-adjacent: 0.42ha compared to 0.67ha (F=3.975, d.f.=1, p<0.05).

Table 3.13 Land Holding Size between Adjacent and Non-Adjacent Villages

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
NON-ADJACENT	190	.67	1.623	.118	0	20
ADJACENT	186	.42	.667	.049	0	6
Total	376	.55	1.251	.064	0	20

3.2.6 Land Allocation

Respondents were asked to outline the main mode of land transfer or to whom land is allocated to. 82.3 percent of respondents indicated that inheritance of the use right was the principal form of land transfer. 10.3 percent indicated that land had been reallocated to returnee Rwandans displaced during the country's turbulent history. 3.5 percent of respondents indicated that land in their communities had been allocated to under-privileged people, such as the poor, Batwa or Genocide survivors. Interestingly, 3.9 percent of the sample indicated that the main recipients of reallocated land were those in positions of privilege, such as wealthy people, or local government officials. This is not an allegation of corruption, but probably an indicator that educated, successful people are perhaps more readily able to exploit opportunities.

In terms of how the allocation was managed, 63.8 percent indicated that this had been a traditional inheritance and 36.2 percent indicated that the government authorities had managed the allocation. No significant differences in response patterns were found between village, regions or proximity to park.

3.2.7 Land Quantity and Quality

Respondents were asked to rate the quantity and quality of land in their village according to the categories detailed below. The objective was to uncover perceptions about recent changes in the quantity and productivity

of land and how they think thinks will change in the future. In this exercise respondents were encouraged to think about their own situation and context in the village.

The general perception of respondents is of a worsening situation in terms of land availability. In general, there was an increase in response frequency for the not enough land and landless categories over time, showing a tendency that in recent years and in the future land will become scarcer (Table 3.14).
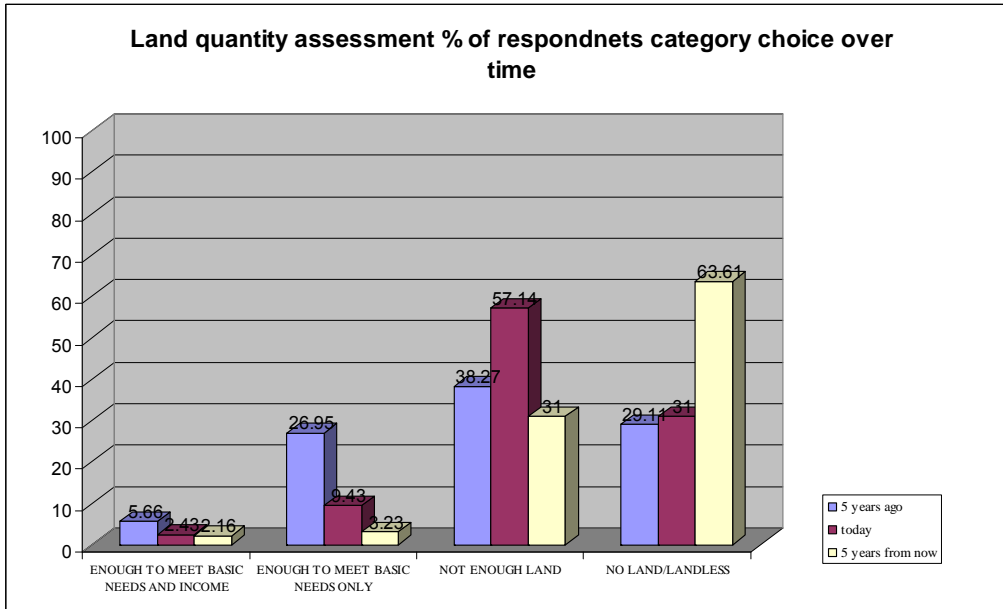
Table 3.14 Land Quantity Assessment % of All Respondents (n=388)

Time period	ENOUGH TO MEET BASIC NEEDS AND INCOME	ENOUGH TO MEET BASIC NEEDS ONLY	NOT ENOUGH LAND	NO LAND/LANDLESS
5 years ago	5.66	26.95	38.27	29.11
today	2.43	9.43	57.14	31.00
5 years from now	2.16	3.23	31.00	63.61

From 5 years ago to today there was a significant increase in responses rate in households scoring "not enough land", from 38.27 percent to 57.14 percent (χ^2= 114.505, d.f.=75, p<0.01). Respondents' predictions for the future are that whilst there is about 31 percent landlessness today, this may increase to 63.61 percent in the next 5 years. There was also a significant decline in the proportion of households who thought that they would have sufficient land to meet basic needs in the future, a drop from 9.43 to 3.23.

As with land quantity, land quality is generally perceived to have worsened from 5 years ago to today and will continue to worsen in the next 5 years (Table 3.15).
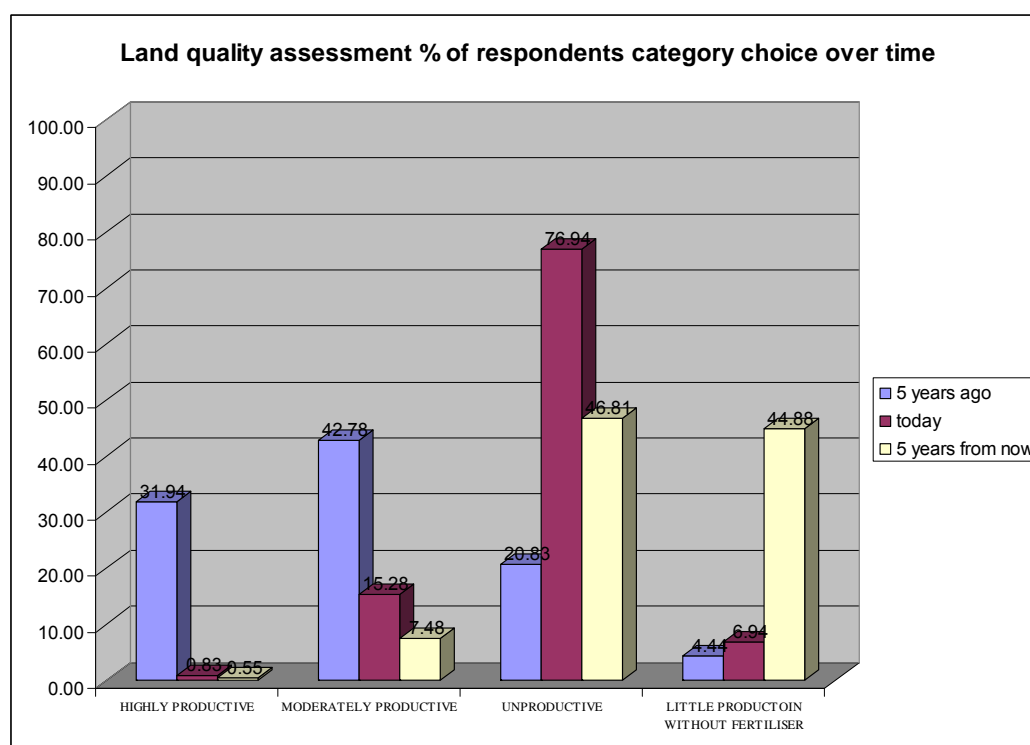
Land quality assessment % of respondents category choice over time

Table 3.15 Land Qquality Assessment % of All Respondents (n=388)

Time period	HIGHLY PRODUCTIVE	MODERATELY PRODUCTIVE	UNPRODUCTIVE	LITTLE PRODUCTOIN WITHOUT FERTILISER
5 years ago	31.94	42.78	20.83	4.44
today	0.83	15.28	76.94	6.94
5 years from now	0.55	7.48	46.81	44.88

From 5 years ago to today there was a significant increase in response rate in households scoring "Little production without fertilizer", from 4.44 percent to 40.88 percent (χ^2= 119.493, d.f.=75, p<0.001). Similarly, there was also a significant increase in response rate in the category "unproductive" from 20.83 percent to 46.81 percent (χ^2= 104.813, d.f.=50, p<0.001). Overall, this presents a challenging picture of the perceived change in land productivity. No significant differences in availability or quality were observed in terms of proximity to the park, or by region.

3.2.8 Farming Methods and Inputs

Respondents were asked about how they managed soil fertility. Key soil fertility management techniques were listed and respondents asked to indicate all methods that they used (Table 3.16).

Table 3.16 Soil Fertility Management Practices

Soil fertility treatment	% of respondents utilising treatment (n=388)
Fallow	0.56
Manure	7.22
Inorganic fertiliser	7.83
Rotation	70.83
Nothing	7.22

The most frequently used methods were firstly crop rotation (70.83 percent) and secondly inorganic fertilizer (7.83 percent). Thirdly, some households also used manure (7.22 percent). Less than 1 percent of respondents still used a fallow as a means of managing soil fertility. 16.05 percent of households claimed to use no particular methods for maintaining soil fertility; this is probably due to them having little land. These findings were not significantly different between villages or regions. Historically, the Rwandan hill farming system was a low intensity alley cropping model with fallow periods. With increasing land scarcity, many households have elected to stop the fallow period in order to grow more crops, resulting in a reduction in soil fertility over time (Clay, 1996) consistent with these findings.

In terms of differences between park-adjacent and non-adjacent villages, only crop rotation frequencies were found to be different. Non-adjacent villages were more likely to be using a rotation than park-adjacent villages (χ^2=19.893, d.f.=1, p<0.001). Speculatively, reasons for this may be that households with smaller land holdings did not feel that rotation was possible, or that they relied principally upon inorganic fertilizers and didn't feel that rotation was important. Crop rotation may in fact be conducted at any scale, including in a kitchen garden.

Overall, in the sample 22.22 percent of respondents used only one method, whilst 58.2 percent used two methods, and only 3.7 percent used 3 methods (Table 3.17).

Table 3.17 Number of Soil Fertility Management Practices Used

	Number of soil fertility methods used (n=388)			
Sector Region	0	1	2	3
CENTRAL	2.47	8.64	27.78	0.00
EAST	5.56	7.41	17.90	0.62
WEST	8.02	6.17	12.35	3.09
All	16.05	22.22	58.02	3.70

These patterns were regionally different in that households in the central area were significantly more likely to use at least 2 methods to maintain soil fertility (χ^2=21.328, d.f.=6, p<0.01). One factor influencing this might be that households in the central region sectors have better access to agricultural extension services, training and inputs.

3.2.9 Farming Constraints

Respondents were asked to rank different types of constraints on their farming activities, in terms of their most acute problems. The key constraints examined were identified during the participatory surveys and are listed in the table below. Results (Table 3.18) are displayed according to the proportion of total responses for each constraint and rank. The table is organized in descending order of proportion of total first ranked responses.

Table 3.18 Crop Production Constraints; Frequency of Rankings as A Proportion of Total Respondents

	Rank % of total responses (n=1164)			
Farming constraint	0	1	2	3
Soil fertility	1.08	19.31	4.87	2.17
Crop raiding	0.9	2.71	12.73	3.7
Insect and pest management	0.99	2.08	2.35	4.78
Labour costs or availability	0.81	1.17	3.97	4.6
Maintaining quality of crops	0.9	0.63	1.17	3.16
Soil erosion	0.9	0.45	0.63	0.63
Input access	23.1	0.18	0	0

The most frequently first ranked problem with the farming system was soil fertility (19.31 percent), followed by input access (2.71 percent), crop raiding (2.08 percent), labour constraints (1.17 percent), pest and insect management (2.08 percent), quality of crops (0.63 percent) and soil erosion (0.45 percent). Crop raiding was the

most frequently ranked second highest problem (12.73 percent), and Insect and pest management the third most frequently ranked problem (4.78 percent). Interestingly, input access was the most frequently non-ranked problem. This is interesting as input use may be the most significant technological solution to both the soil fertility as well as the insect and pest management problems. It may have been frequently unranked as the local population may be largely unaware of the technologies.

Of these factors, significant differences at the village level were found for soil fertility[4], crop raiding[5] and insect and pest infestations[6]. Table 3.19 below shows the frequency of rankings by village for soil fertility. The table is ordered by the highest proportion of respondents in a village ranking soil fertility as their number one constraint in crop production.

Table 3.19 Soil Fertility, Frequency of Rankings by Village as A Proportion of Total Observations (n=1164)

	Rank frequency % of total observations				Village sub total % of all observations
VILLAGE	0	1	2	3	
RUTINDO	0.00	4.28	0.66	0.00	4.93
BIZU	0.00	3.95	0.33	0.33	4.61
GAHIRA	0.00	3.62	0.66	0.33	4.61
JITE	0.00	3.62	0.66	0.33	4.61
RUHANGO	0.00	3.62	0.00	0.00	3.62
KINYAMUHANGA	0.00	3.29	1.32	0.00	4.61
MUHABURA	0.00	3.29	0.33	0.00	3.62
RUSENGE	0.00	3.29	0.33	0.00	3.62
TERIMBERE	0.00	3.29	0.66	0.66	4.61
GACOGO	0.00	2.96	0.66	0.99	4.61
MUTARA	0.00	2.96	0.66	0.33	3.95
RUBAKA	0.66	2.96	0.33	0.00	3.95
KABUMBA	0.33	2.63	0.99	0.00	3.95
KAGANO	0.00	2.63	0.33	0.00	2.96
KAMIRO	0.00	2.63	0.99	0.00	3.62
MASASA	0.33	2.63	1.32	0.33	4.61
RYAMBUNGIRA	0.66	2.63	0.00	0.00	3.29
BUNYENYERI	0.00	2.30	0.99	0.66	3.95
KABURENDE	0.66	2.30	0.33	0.00	3.29
KAGERI	0.00	2.30	1.32	0.00	3.62
MUNINI	0.33	2.30	0.33	0.99	3.95
NSAKIRA	0.00	2.30	0.66	0.33	3.29
KARISIMBI	0.66	1.97	0.99	0.99	4.61
PFUNDO	0.00	1.64	1.64	0.00	3.29
NTENYO	0.33	0.66	1.32	1.64	3.95
BIHANGA	0.00	0.33	0.00	0.00	0.33
All	3.95	70.39	17.76	7.89	100.00

All but 4 communities had less than half of their respondents rank soil fertility as the first key crop production problem. Examination of this issue on regional basis showed a significant difference, with the central and western areas more likely to rank it as their highest constraint (χ^2=15.791, d.f.=6, p<0.05).

Crop raiding was also found to be ranked significantly differently amongst villages. Overall, it is clear that crop raiding was most frequently ranked as a secondary problem. Table 3.20 below shows the frequency of different

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[4] χ^2=107.695, d.f.=75, p<0.01
[5] χ^2=105.936, d.f.=75, p<0.05
[6] χ^2=86.819, d.f.=75, p<0.05

rankings as a proportion of total observations. It is in descending order of village with the highest proportion of second ranks.

Table 3.20 Crop Raiding Frequency of Rankings by Village as A Proportion of Total Observations (n=1164)

VILLAGE	Rank (% of all observations)				Village sub total
	0	1	2	3	
RUHANGO	0.00	0.00	4.95	0.00	4.95
RUTINDO	0.00	0.00	4.95	0.00	4.95
BIZU	0.00	0.45	4.05	0.00	4.50
GACOGO	0.00	1.35	3.60	0.45	5.41
RUBAKA	0.90	0.45	3.60	0.00	4.95
RYAMBUNGIRA	0.45	1.80	3.15	0.45	5.86
BUNYENYERI	0.00	0.45	3.15	0.90	4.50
TERIMBERE	0.00	0.45	3.15	0.90	4.50
RUSENGE	0.00	0.00	3.15	0.90	4.05
KINYAMUHANGA	0.00	0.45	2.70	1.35	4.50
NSAKIRA	0.00	0.45	2.70	0.45	3.60
JITE	0.00	0.90	2.25	1.80	4.95
KABUMBA	0.45	0.90	2.25	0.45	4.05
KABURENDE	0.90	0.00	2.25	0.45	3.60
KAMIRO	0.00	0.00	2.25	1.35	3.60
MASASA	0.00	0.00	2.25	1.80	4.05
GAHIRA	0.00	1.35	1.80	0.00	3.15
KAGERI	0.00	0.45	1.80	0.90	3.15
MUTARA	0.00	0.45	1.80	1.35	3.60
MUHABURA	0.00	0.00	1.80	1.35	3.15
KARISIMBI	0.45	0.45	1.35	0.45	2.70
NTENYO	0.90	0.00	1.35	0.00	2.25
PFUNDO	0.00	1.35	0.90	0.90	3.15
KAGANO	0.00	0.90	0.90	0.90	2.70
MUNINI	0.45	0.90	0.90	1.35	3.60
BIHANGA	0.00	0.00	0.45	0.00	0.45
ALL	4.50	13.51	63.51	18.47	100.00

Nine communities had more than half of their respondents ranking crop raiding as their second most significant impact on crop production. This does not mean that the issue is unimportant. On the contrary, it is a highly important issue; simply, in relative terms, it was felt to be slightly less important than soil fertility as a constraint to crop production. Interestingly this issue did not show any significance when the villages were aggregated according to proximity to the park or by regional groupings. This indicates that the problems are quite site specific and may depend on other factors, such as types of crops grown (preference by crop raiding animals), terrain (ease of access by crop raiding animals), and abundance of crop raiding animals in the area of park-adjacent to the community.

Pest and insect management was ranked as the third most important factor constraining crop production (Table 3.21). This problem was also found to be ranked significantly differently between villages (χ^2=86.819, d.f.=60, p<0.05).

Table 3.21 Pest and Insect Control, Frequency of Rankings by Village as A Proportion of Total Observations (n=1164)

VILLAGE	Rank (% of all observations)				Village sub total
	0	1	2	3	
KABURENDE	1.77	0.00	0.00	0.00	1.77
KARISIMBI	0.88	3.54	0.00	0.00	4.42
MUNINI	0.88	0.00	0.00	0.00	0.88
BIHANGA	0.00	0.00	0.00	0.88	0.88
KABUMBA	0.88	0.00	0.00	0.88	1.77
MUTARA	0.00	0.00	0.00	0.88	0.88
RUBAKA	1.77	0.00	1.77	0.88	4.42
RUHANGO	0.00	0.00	0.00	0.88	0.88
RYAMBUNGIRA	0.88	0.00	0.00	0.88	1.77
GACOGO	0.88	0.00	0.88	1.77	3.54
JITE	0.00	0.88	1.77	1.77	4.42
KAMIRO	0.00	0.00	1.77	1.77	3.54
MUHABURA	0.00	0.00	1.77	1.77	3.54
NTENYO	1.77	2.65	1.77	1.77	7.96
RUSENGE	0.00	0.88	1.77	2.65	5.31
BUNYENYERI	0.00	3.54	1.77	3.54	8.85
GAHIRA	0.00	1.77	0.88	4.42	7.08
MASASA	0.00	4.42	2.65	4.42	11.50
KINYAMUHANGA	0.00	2.65	3.54	5.31	11.50
BIZU	0.00	0.00	0.88	6.19	7.08
TERIMBERE	0.00	0.00	1.77	6.19	7.96
All	9.73	20.35	23.01	46.90	100.00

Further investigation showed that the rankings were significantly different between park-adjacent and non-adjacent communities, with park-adjacent villages ranking the problem higher than non-adjacent communities (χ^2=26.239, d.f.=3, Φ=0.528, p<0.001). This finding is perhaps not surprising, as forest environments provide ideal habitat for many birds, insects or diseases that may cause problems in agricultural crops. For example, small flocking birds eating wheat and corn, insects such as aphids finding refuge on succulent forest plants, and fungal spores harboured in fallen dead wood may cause blights in certain crops.

Although these findings indicate general issues that will address key needs, they highlight the need for site or location specific adaptation in planning what types of development interventions may have a beneficial impact on the different factors limiting crop productivity.

3.2.10 Water Resource Access and Use

A key constraint in household livelihoods in the Volcanoes National Park area is access to water for domestic use and livestock. The volcanic topography means that there is very little surface water available year-round, with rain water percolating rapidly in to the aquifers through deep fissures or running off quickly over impermeable lava rock. Some of the few year-round water supplies for communities around the national park are those found emanating from within the national park, which hosts a number of year-round springs. 70.01 percent of respondents indicated that there was not enough water all year round. This problem was significantly different between park-adjacent and non-adjacent households (χ^2= 21.046, d.f.=4, p<0.001). Park-adjacent households (77.77 percent) indicated that seasonal availability was more of a problem than non-adjacent households (60.51 percent).

Respondents were asked to rank 3 out of 5 factors that were the most problematic constraints in their access to domestic water. The results in Table 3.22 presented below show the response rates as a proportion of total responses overall households.

Table 3.22 Key Domestic Water Resource Problems. Frequency of Rankings as A % of Total Responses

Domestic water resource problem	Rank % of total observations (n=1164)		
	1	2	3
Source far from home	17.46	6.22	3.31
Seasonal availability	11.38	17.59	4.76
No collection infrastructure in home	7.28	0.13	3.31
Poor quality	5.16	5.03	3.57
Unfair distribution	3.44	3.31	5.56

The most frequently first ranked problem was that the water source was far from home (17.46 percent), followed by seasonal availability (11.38 percent). Seasonal availability was also identified most frequently as the second ranked problem (17.59 percent). These stand out in the rankings beyond any other issue. Domestic collection problems, poor water quality and distributional problems from existing infrastructure were far lower in the rankings. All of these factors were found to be ranked significantly differently between villages, pointing to differences in local constraints.

Focusing on regional groupings of sectors (Table 3.23) and the two most highly ranked problems: firstly where the source was far from home and secondly seasonal availability; water accessibility in the east and central sectors was ranked significantly more often as the highest (first) problem for households than in the western region (χ^2=20.792, d.f.=6, p<0.01)

Table 3.23 Rankings (% of Total Observations) of Water Source Far from Home by Region

SECTOR REGION	Rank (% of total observations n=1164)		
	1	2	3
CENTRAL	22.97	7.18	1.44
EAST	24.40	4.31	5.26
WEST	15.79	11.00	5.26

In terms of seasonal availability (Table 3.24), the eastern region ranked this as the primary problem more frequently (15.06 percent) than the western (10.42 percent) or the central (7.72 percent) regions (χ^2=14.511, d.f.=6, p<0.05).The eastern region also more frequently ranked it as their second problem (19.31 percent).

Table 3.24 Rankings (% of Total Observations) of Water Source Seasonally Unavailable by Region

SECTOR REGION	Rank (% of total observations n=1164)		
	1	2	3
CENTRAL	7.72	17.37	5.02
EAST	15.06	19.31	3.86
WEST	10.42	14.67	5.02

Considering the same two key issues and aggregating the data by proximity to the national park, there were some significant differences in response patterns between adjacent and non-adjacent communities. With respect to the water source being far from the respondents' homes, adjacent communities ranked this problem far more frequently as their second most important issue (18,66 percent) than non-adjacent communities (3.83 percent) (χ^2=20.792, d.f.=3, p<0.001).

Table 3.25 Rankings (% of Total Observations) of Water Source far From Home by Proximity to Park

	Rank (% of total observations n=1164)		
PARK PROXIMITY	1	2	3
NON-ADJACENT	30.14	3.83	4.31
ADJACENT	33.01	18.66	7.66
ALL	63.16	22.49	11.96

Seasonal availability was ranked more frequently as the first priority issues by non-adjacent households (20.46 percent) than those adjacent to the national park (12.74 percent) (χ^2=26.969, d.f.=3, p<0.001).

Table 3.26 Rankings (% of Total Observations) of Water Source Seasonally Unavailable by Proximity to Park

	Rank (% of total observations n=1164)		
PARK PROXIMITY	1	2	3
NON-ADJACENT	20.46	27.03	1.93
ADJACENT	12.74	24.32	11.97
ALL	33.20	51.35	13.90

These results (Table 3.26) show that there are a variety of different priority constrains on domestic water access between communities based on location factors.

In terms of access to their regular domestic water source, respondents were asked how far (one way) they had to walk to collect water. Over all respondents, the mean one way distance was 1.83km - a round trip of 3.66km (Table 3.27).

Table 3.27 Mean Distance (km, one way) to Primary Water Source by Village

Village	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
BIHANGA	9	1.64	1.53	0.51	0.25	5.00
BIZU	15	4.39	4.13	1.07	0.40	12.00
BUNYENERI	14	0.28	0.28	0.07	0.02	1.00
GACOGO	15	0.52	0.36	0.09	0.00	1.00
GAHIRA	15	1.88	1.12	0.29	0.25	4.50
JITE	15	0.90	0.67	0.17	0.00	2.00
KABUMBA	15	1.09	0.64	0.16	0.00	2.00
KABURENDE	15	2.96	2.56	0.66	0.10	7.50
KAGANO	15	1.10	0.73	0.19	0.00	3.00
KAGERI	15	0.11	0.08	0.02	0.00	0.30
KAMIRO	15	4.67	2.76	0.71	0.00	12.00
KARISIMBI	10	2.08	1.43	0.45	0.75	5.00
KINYAMUHANGA	12	3.46	3.14	0.91	0.00	10.00
MASASA	15	3.65	5.27	1.36	0.00	17.00
MUHABURA	15	1.47	1.49	0.39	0.10	6.00
MUNINI	14	1.99	3.89	1.04	0.00	15.00
MUTURA	15	1.57	1.75	0.45	0.00	6.00
NSAKIRA	15	0.38	0.17	0.04	0.20	0.75
NTENYO	16	0.57	0.47	0.12	0.00	2.00
PFUNDO	15	0.77	0.49	0.13	0.20	2.00
RUBAKA	15	0.82	1.22	0.32	0.10	5.00
RUHANGO	10	2.52	2.27	0.72	0.10	6.00
RUSENGE	14	3.75	3.61	0.97	1.00	10.00
RUTINDO	15	1.54	1.87	0.48	0.10	8.00
RYABUNGIRA	15	0.55	0.37	0.10	0.10	1.50
TEREMBERE	15	3.54	3.18	0.82	0.25	9.00
ALL	369	1.83	2.55	0.13	0.00	17.00

Significant differences in the mean distance travelled to collect water were evident between villages (F= 5.366, d.f.=25, p<0.001). Looking at regional aggregations, it was found that those sectors in the west of the park had a higher mean distance to walk (2.38km) than the central (1.9km) and eastern (1.26km) areas (F=5.888, d.f.=2, p<0.001). In terms of household proximity to the park, adjacent households had further to walk on average (2.5km) than non-adjacent households (1.19km) (F=26.114, d.f.=1, p<0.001). This finding corresponds to the earlier ranking difference between adjacent and non-adjacent households that showed adjacent households rank distance to water more frequently as a key constraint than non-adjacent households.

In terms of water quality (Table 3.28), respondents were asked to assess changes over the last 5 years. Overall, the quality of drinking water seems to have improved, with a larger proportion of respondents rating their water as excellent today (21.37 percent) compared to 5 years ago (10.05 percent). In addition, there has been a decrease in the proportion of respondents indicating that water quality is poor today (20 percent) compared to 5 years ago (36.24 percent).

Table 3.28 Water Quality Changes

Water quality frequency of ratings over time (% of all time group responses)

	EXCELLENT	GOOD	FAIR	POOR
5 YEARS AGO	10.05	30.42	23.28	36.24
1 YEAR AGO	15.26	41.58	20.00	23.16
TODAY	21.37	38.63	20.00	20.00
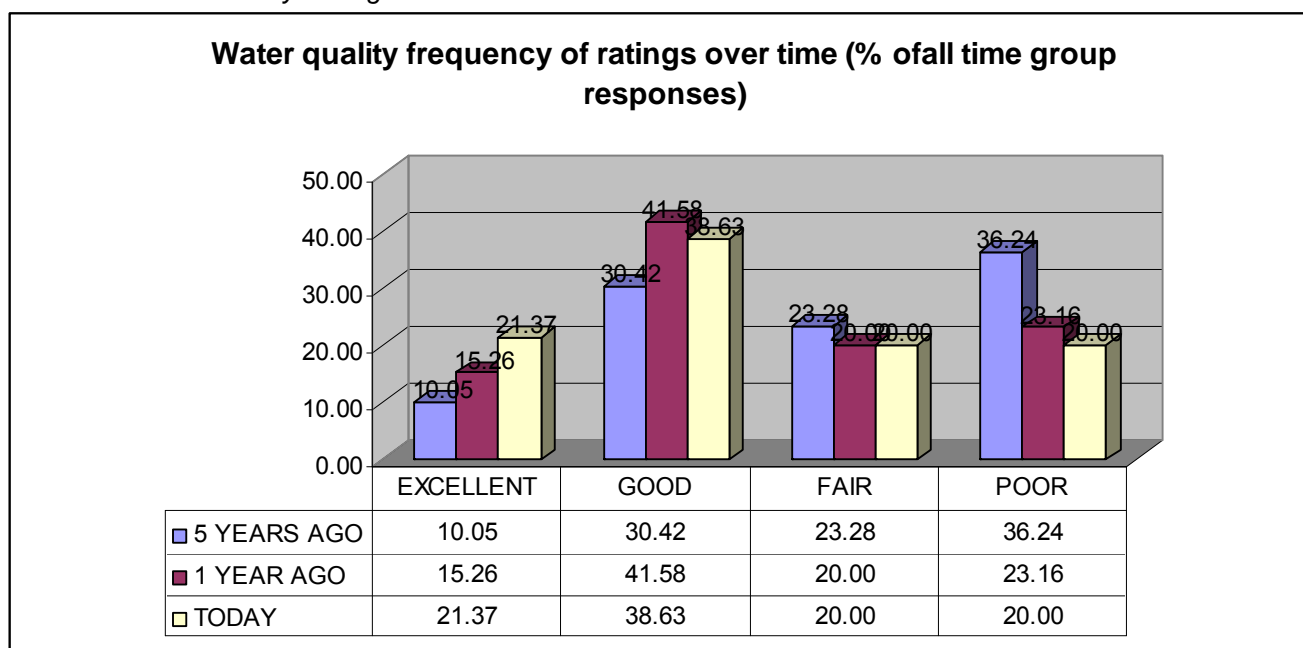
Regionally, there were no significant differences. However, when comparing proximity to park, (Table 3.29) today adjacent households were more likely to score the quality of water lower than those non-adjacent households (χ^2= 74.924, d.f.=4, p<0.001).

Table 3.29 Water Quality Today (% of All Observations n=388)

PARK-ADJACENT	RANK EXCELLENT	GOOD	FAIR	POOR
NON-ADJACENT	13.11	26.23	9.84	2.19
ADJACENT	8.20	12.30	10.11	17.76

Respondents were also asked about the forms of treatment they use for potable water. Over all the sample, almost 39 percent of respondents used no treatment at all (Table 3.30). The most common form of water treatment was boiling (48.54 percent), followed by chemical treatment (10.24 percent) then filtering (2.44 percent).

Table 3.30 Potable Water Treatment

POTABLE WATER TREATMENT	% of all responses n=388
NOTHING	38.78
BOILING	48.54
FILTERING	2.44
CHEMICALS	10.24

Households in the central region were more likely to do nothing to treat their water than households in other regions (χ^2=14.330, d.f.=2, p<0.001). This may be because in the central sectors of the park more people have access to piped water from village stand pipes, and it is perceived that this water is clean enough for drinking. Apart from this, there were no other differences detected between villages, regional groups or proximity to the national park.

3.2.11 On Farm Forest Resource Access and Use

An often cited problem is scarcity of fuel wood for domestic purposes, characterized by high cost of fuel wood or a high labour cost to obtain it. Fuel wood and also bamboo were often found to be some of the main forest goods illegally sought by local communities. Questions in this section were focused on forest resources outside of protected areas.

Respondents were asked about how they cope with increasing wood resource scarcity in their farming system. Respondents were asked to rank different options, such as increased planting of trees or bamboo, use of crop residues, use of purchased fuel wood or other commercial fuel (gas, paraffin and charcoal), use of animal residues etc. Table 3.31 below details the rankings of different options as a proportion of the total ranks awarded. The table is organized in descending order of the proportion of first ranked responses.

Table 3.31 Wood Fuel Scarcity Coping Mechanisms

Response	Rank (% of total observations) n= 1164			
	1	2	3	Village sub total
DECREASED NEED FOR FUEL	24.42	3.65	1.35	29.42
INCREASED USE OF AGRIC RESIDUES	23.08	9.42	2.50	35.00
INCREASED PLANTING OF TREES	5.96	18.08	2.12	26.15
INCREASED PURCHASE OF COMMERCIAL FUELS	1.73	0.38	0.38	2.50
PLANT BAMBOO	0.58	0.19	0.19	0.96
INCREASED SALE OF CROPS/LIVESTOCK	0.19	1.92	1.35	3.46
CHANGED ANIMAL FEEDING	0.00	0.19	0.58	0.77
NO RESPONSE	0.00	1.35	0.38	1.73

The most frequently first ranked response to fuel wood shortages was to reduce consumption (24.42 percent), followed by increasing the use of agricultural residues such as maize stover (23.08 percent), planting of trees (5.96 percent), purchasing commercial fuel (1.73 percent), and finally increasing the sale of crops/livestock to finance fuel purchases (0.19 percent). The very low ranking of the "No response" options shows that across the sample, fuel wood shortages are an acute problem affecting the broad spectrum of households in the survey.

Significant differences in rankings between villages were found for decrease in fuel use, planting of trees and use of agricultural residues as the priority responses to fuel wood shortages. In terms of decreasing use of fuel wood, the qualitative responses indicated that households prepared fewer cooked meals during the day to economize on fuel use. Table 3.32 below shows the frequency of responses for each rank as a proportion of the

total responses. Village results are presented in decreasing order of the proportion of first ranks. Overall villages, just over 58 percent of respondents ranked decreasing fuel consumption as a response to fuel shortages. 38 percent of respondents indicated that was their first ranked response. 15.8 percent of respondents ranked the response as their second choice and 4.2 percent as their third choice.

Table 3.32 Village Frequency of Ranking Decrease in Fuel Consumption as A Response to Fuel Wood Deficit

Rank (% of total observations) n= 1164

VILLAGE	0	1	2	3	Village sub total
KABUMBA	0	2.903226	1.290323	0	4.193548
JITE	0.967742	2.903226	0	0	3.870968
KINYAMUHANGA	0.967742	2.903226	0	0	3.870968
MUHABURA	0.322581	2.580645	0.645161	0	3.548387
MASASA	0.645161	2.580645	0.322581	0	3.548387
RUHANGO	1.612903	2.580645	0.645161	0	4.83871
BUNYENYERI	1.290323	2.258065	0.322581	0	3.870968
BIZU	1.290323	1.935484	0.322581	0	3.548387
KABURENDE	1.612903	1.935484	0	0.322581	3.870968
KAGERI	1.612903	1.935484	0.322581	0.967742	4.83871
KAMIRO	1.612903	1.612903	0.322581	0	3.548387
KARISIMBI	1.612903	1.612903	0.322581	0.645161	4.193548
RUSENGE	1.612903	1.612903	1.612903	0	4.83871
TERIMBERE	1.612903	1.612903	0.322581	0	3.548387
PFUNDO	3.225806	1.612903	0	0	4.83871
RYAMBUNGIRA	1.612903	0.967742	0.967742	0	3.548387
GACOGO	1.935484	0.967742	0.645161	0.322581	3.870968
KAGANO	2.580645	0.967742	0.645161	0.322581	4.516129
NSAKIRA	2.580645	0.967742	1.290323	0	4.83871
MUTARA	1.290323	0.645161	0.645161	0	2.580645
RUBAKA	3.548387	0.645161	0.645161	0	4.83871
MUNINI	1.612903	0.322581	0	0.967742	2.903226
RUTINDO	1.612903	0.322581	0.967742	0	2.903226
GAHIRA	1.935484	0.322581	1.935484	0.322581	4.516129
NTENYO	0.967742	0	1.612903	0.322581	2.903226
BIHANGA	1.612903	0	0	0	1.612903
ALL	41.29032	38.70968	15.80645	4.193548	100

3.2.12 Savings

Respondents were asked if they had any cash savings. Overall, 65.09 percent of respondents had savings. The response rate was significantly different between villages (x^2= 80.660, d.f.=25, p<0.001), with 100 percent of respondents in Gahira having some savings, down to 0 percent in Bihanga. Overall, the sample 29 respondents had no savings at all (7.5 percent) and a further 56 (14.4 percent) had less than 10,000FRW (US$17.86US @ 560FRW/$). Only 75 households (19.3 percent) had more than 100,000FRW (US$178.57US @ 560FRW/$) worth of savings. Savings data were found to be not normally distributed, being heavily skewed towards households with few or no savings.

Table 3.33 below shows the mean reported household savings by village in US$. There was a great variability in mean values between villages which was significant (x^2= 77.059, d.f.=25, p<0.001). Mutura, Terembere, Ruhango, Kageri and Nsakira villages were all found to have higher mean savings per household than any of the other villages.

Table 3.33 Mean Savings Value by Village (FRW)

VILLAGE	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
BIHANGA	12	0.00	0.00	0.00	0.00	0.00
KAGANO	15	27.45	45.86	11.84	0.00	160.71
RUSENGE	15	32.86	47.88	12.36	0.00	185.71
KARISIMBI	15	36.62	52.88	13.65	0.00	150.00
BIZU	15	40.29	101.33	26.16	0.00	385.71
JITE	15	40.40	58.74	15.17	0.00	212.14
MUNINI	15	41.23	77.38	19.98	0.00	235.71
KAMIRO	15	45.14	165.59	42.75	0.00	642.86
MUHABURA	15	52.05	97.18	25.09	0.00	357.14
RUTINDO	15	57.38	87.60	22.62	0.00	321.43
RYABUNGIRA	15	58.33	101.48	26.20	0.00	357.14
RUBAKA	15	67.81	106.56	27.51	0.00	371.43
PFUNDO	15	74.29	156.76	40.48	0.00	596.43
NTENYO	16	100.42	224.15	56.04	0.00	892.86
KABURENDE	15	115.24	257.03	66.36	0.00	892.86
KINYAMUHANGA	15	172.21	268.90	69.43	0.00	892.86
BUNYENERI	15	179.93	288.49	74.49	0.00	892.86
GAHIRA	15	184.08	229.33	59.21	1.79	714.29
KABUMBA	15	283.45	546.97	141.23	0.00	1864.29
MASASA	15	347.26	671.62	173.41	0.00	2678.57
NSAKIRA	15	436.45	1105.55	285.45	0.00	3571.43
MUTURA	15	600.19	1006.01	259.75	0.00	2857.14
RUHANGO	15	654.90	2293.03	592.06	0.00	8928.57
KAGERI	15	679.29	1243.94	321.18	0.00	3428.57
TEREMBERE	15	895.71	1907.90	492.62	0.00	7557.14
GACOGO	15	1672.74	3282.06	847.42	0.00	10714.29
ALL	388	266.85	1014.52	51.50	0.00	10714.29

No significant difference in mean savings levels was found between regional aggregations or proximity to the park.

3.2.13 Loans

The number of households currently in possession of a loan of cash was low (Table 3.34). Only 68 respondents (17.5 percent) recorded having any amount of loan. The mean value of loans recorded was U$746.73, with a high sample variance from a minimum amount of US$5.36 to a maximum of US$12,500. No significant difference in loan values was recorded between villages, regions or due to proximity to park.

Table 3.34 Mean Loan Values by Village (FRW)

Village	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
BIZU	2	285.71	353.55	250.00	-2890.84	3462.27	35.71	535.71
BUNYENERI	3	505.95	518.27	299.22	-781.50	1793.40	53.57	1071.43
GACOGO	4	120.54	62.50	31.25	21.08	219.99	89.29	214.29
GAHIRA	4	200.89	343.53	171.76	-345.74	747.52	8.93	714.29
JITE	3	190.48	298.98	172.62	-552.24	933.20	17.86	535.71
KABUMBA	2	272.32	372.49	263.39	-3074.40	3619.04	8.93	535.71
KAGANO	1	53.57	.	.	.	.	53.57	53.57
KAGERI	5	3875.00	5012.58	2241.69	-2348.94	10098.94	357.14	12500.00

KAMIRO	1	1428.57	.	.	.	.	1428.57	1428.57
KARISIMBI	3	75.60	89.93	51.92	-147.81	299.00	12.50	178.57
KINYAMUHANGA	4	180.36	147.84	73.92	-54.90	415.61	17.86	357.14
MASASA	6	132.44	207.62	84.76	-85.45	350.33	10.71	535.71
MUHABURA	2	53.57	0.00	0.00	53.57	53.57	53.57	53.57
MUNINI	6	997.32	2145.76	876.00	-1254.52	3249.16	8.93	5357.14
MUTURA	3	3017.26	5119.63	2955.82	-9700.61	15735.14	7.14	8928.57
NSAKIRA	3	416.67	412.39	238.10	-607.77	1441.11	178.57	892.86
NTENYO	5	1087.50	1924.60	860.71	-1302.21	3477.21	8.93	4464.29
RUBAKA	3	7.74	4.12	2.38	-2.51	17.98	5.36	12.50
RUHANGO	2	13.39	6.31	4.46	-43.33	70.12	8.93	17.86
RUSENGE	1	8.93	.	.	.	.	8.93	8.93
RUTINDO	1	71.43	.	.	.	.	71.43	71.43
RYABUNGIRA	1	125.00	.	.	.	.	125.00	125.00
TEREMBERE	1	107.14	.	.	.	.	107.14	107.14
Total	66	746.73	2054.93	252.94	241.56	1251.89	5.36	12500.00

The prevalence of loans between villages (Table 3.35) was significantly different (x^2= 43.639, d.f.=25, p<0.05). Whilst no significant differences in the prevalence of loans was observed in terms of proximity to park, the prevalence was different between regions (x^2= 8.283, d.f.=3, p<0.05). Households in the central sectors recorded fewer loans than those in the east or west.

Table 3.35 Frequency of Households with Loans by Regional Group

Sector Region	Count	% of sample (n=388)
CENTRAL	14	3.61
EAST	28	7.22
WEST	25	6.44
ALL	68	17.53

3.2.14 Physical Assets

Ownership of assets (Table 3.36) that can be considered indicators of wealth or means of improving the efficiency of livelihoods was quite low across all villages. The most common item owned in households was a mobile phone (57.99 percent). The most common transport asset owned was a bicycle, 12.11 percent. There was 1.03 percent ownership of motorcycles and less than 1 percent ownership of cars or pickup trucks. Less than 23 percent of households had an improved cooking stove (fuel efficient). 28.09 percent of households had a wood saw, but ownership of other implements to save labour on the farm was low, with only 4.38 percent of households having a hand cart/barrow and 3.09 percent having a hand plough. There were significant differences in bicycle ownership between villages, with Gacogo and Mutara households having higher than other communities (x^2=69.994, d.f.=25, p<0.001). Mobile phones were more likely to be owned by households in Gahira, Kageri, Masasa, and Terimbere (x^2=66.713, d.f.=25, p<0.001). Radio ownership was also found to be significantly different between villages with the lowest frequency of ownership in Bihanga, followed by Jite (x^2=80.533, d.f.=25, p<0.001). Improved cooks' stoves were evident in 22.68 percent of households interviewed, but their distribution amongst villages was significantly different. The highest ownership was in Kageri and the lowest in Bihanga, followed by Muhabura, Gacogo and Rubaka (x^2=69.226, d.f.=25, p<0.001).

Table 3.36 Mean Number of Physical Assets per Household

VILLAGE	Car	Motorcycle	Bicycle	Mobile phone	Radio	Improved stove	Wood saw	Plough	Hand cart or barrow
BIHANGA	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00
BIZU	0.00	0.00	0.26	0.52	2.32	0.52	1.29	0.00	0.00
BUNYENYERI	0.00	0.00	0.00	2.32	3.35	2.06	1.29	0.00	0.26
GACOGO	0.00	0.26	1.55	1.29	3.09	0.26	1.55	0.52	0.52
GAHIRA	0.00	0.00	0.26	2.58	2.58	0.52	1.80	0.00	0.00
JITE	0.00	0.00	0.52	1.55	1.03	0.52	0.52	0.00	0.00
KABUMBA	0.00	0.26	0.52	1.80	2.06	1.55	1.55	0.00	0.26
KABURENDE	0.00	0.00	0.26	1.03	2.06	1.29	0.77	0.26	0.00
KAGANO	0.00	0.00	1.03	0.77	3.09	1.03	0.77	0.26	0.00
KAGERI	0.26	0.00	0.00	2.58	3.09	3.35	2.84	0.00	0.77
KAMIRO	0.00	0.00	0.26	0.77	1.03	0.52	0.52	0.00	0.00
KARISIMBI	0.00	0.00	0.00	1.03	1.29	0.26	0.26	0.00	0.00
KINYAMUHANGA	0.00	0.00	0.00	2.32	3.35	1.80	1.55	0.26	1.03
MASASA	0.00	0.00	0.52	2.58	2.06	1.29	2.06	0.00	0.26
MUHABURA	0.00	0.00	0.26	1.03	1.55	0.26	0.52	0.00	0.00
MUNINI	0.00	0.00	0.77	1.80	2.06	0.52	0.77	0.52	0.26
MUTARA	0.52	0.26	2.58	2.32	3.09	0.77	2.32	0.26	0.26
NSAKIRA	0.00	0.00	0.00	1.55	2.06	1.29	1.80	0.00	0.00
NTENYO	0.00	0.00	0.00	1.03	2.84	0.52	0.77	0.00	0.00
PFUNDO	0.00	0.00	0.26	1.03	1.55	0.52	0.00	0.26	0.26
RUBAKA	0.00	0.00	0.52	1.29	2.32	0.26	1.03	0.77	0.26
RUHANGO	0.00	0.00	0.00	1.29	1.29	1.03	0.77	0.00	0.00
RUSENGE	0.00	0.00	0.52	0.52	1.29	0.52	0.52	0.00	0.26
RUTINDO	0.00	0.00	0.52	0.77	3.09	0.77	0.52	0.00	0.00
RYAMBUNGIRA	0.00	0.00	0.77	0.52	2.58	0.52	0.77	0.00	0.00
TERIMBERE	0.00	0.26	0.77	2.58	3.61	0.77	1.55	0.00	0.00
Total	0.77	1.03	12.11	36.86	57.99	22.68	28.09	3.09	4.38

Regionally, bicycle ownership was significantly higher amongst households in the eastern area than the central or western areas (x^2=11.714, d.f.=2, p<0.01). In addition, cook stove ownership was much lower in the east than in the west or central areas (x^2=22.145, d.f.=2, p<0.001). In terms of park proximity, park-adjacent households were less likely to have bicycles than non-adjacent (x^2=10.772, d.f.=1, p<0.001). This may have to do with the poor access to cycle tracks and roads rather than a uniform indicator of wealth between the two groups, but in any case it indicates more severe constraints on access to markets than in those households in communities that are not park-adjacent.

As a wealth indicator, radio ownership was slightly greater than in the study by Plumptre et al (2004) - 57.99 percent compared to 47.64 percent. Motorcycle ownership had also increased from 0.01 to 1.03 percent. However, bicycle ownership was approximately the same -12.11 percent vs. 12.01 percent (Plumptre et al (2004), which are encouraging signs that some households at least may have become wealthier.

3.2.15 Risk and Uncertainty
A number of unexpected events may occur that create unplanned stresses on the livelihood. Many of these issues require the household to find money to pay for services such as medical or burial fees in the case of illness or the death of family members. Other events may result in households not realizing the potential of their resources and reflect an opportunity cost - e.g. harvest failures or livestock losses.

The frequency of occurrence of a number of the issues was examined (Table 3.37). Over all communities, the most frequent event to cause a stress or shock to a household was harvest failure (30.41 percent). The next

most common problem was costs associated with the illness of family members. Weddings also featured as a cost to livelihoods (11.34 percent). Presumably the social pressures related to contributing often mean that households make contributions that are more than they might otherwise have been prepared to give. Other factors might be considered as minor issues in the general population. Interestingly, livestock deaths were only reported by a small minority as being a key livelihood challenge. This is presumably because livestock ownership is quite low amongst the sample population as a whole.

Table 3.37 Frequency of Occurrence of Types of Risk to the Household Livelihood

Cause of risk to the livelihood	Count	% of sample
Crop failure or other harvest problems	118	30.41
Loss of livestock (disease, theft etc.)	34	8.76
Serious illness in the family	113	29.12
Death of an adult household member	14	3.61
Wedding	44	11.34
Land loss	15	3.87
Job loss	13	3.35

Respondents were also asked to rank approaches to coping with the identified risks (Table 3.38). Over all the sample rankings, the three most frequent first responses to dealing with the costs of risk was to sell assets (15.24 percent), followed by obtaining casual labour (12.62 percent) and using cash savings (10.95 percent).

Table 3.38 Frequency of Rankings of Risk Responses

Responses to risks	Rank % of total observations n=1164		
	1	2	3
Sell assets	15.24	2.38	1.67
Casual labour	12.62	5.71	4.05
Cash savings	10.95	3.10	0.71
Nothing in particular	6.19	2.14	0.95
Assistance from friends and family	3.81	6.90	1.19
Obtain loan or credit	2.62	1.90	0.24
Harvest more forest products	2.14	0.95	0.71
Tried to reduce expenditure or consumption	1.67	4.76	3.81
Assistance from NGO, CBO or religious organisation	1.43	1.67	0.48

Household response patterns by proximity to park showed no significant differences. However, differences were noted according to regional groupings. Households in the west were more likely to turn to casual labour to meet unforeseen cash needs than in the east or central areas (χ^2=14.709, d.f.=6, p<0.05). Households in the west also more frequently ranked "do nothing" as a response to risk (χ^2=15.586, d.f.=6, p<0.05). From the PRA survey, these areas were heavily involved in growing potatoes as cash crops, so presumably more labour opportunities might be available for poorer households on larger neighbouring farms. Households in the east were more likely to rely on assistance from friends and relatives to cope with risks (χ^2=13.279, d.f.=6, p<0.05). Anecdotal evidence points towards many of these households having relatives over the border in Uganda. Presumably these relatives may be wealthier and more able to afford to assist extended family and friends. In addition, households in the east were also more likely to reduce consumption as a response to risk (χ^2=29.234, d.f.=6, p<0.05). Households in the central region ranked more frequently that they got assistance from an NGO, CBO or similar (χ^2=19.827, d.f.=6, p<0.01). This may be as a result of such organisations being more prevalent in this region.

3.3 Differences in Key Factors by Income Group

3.3.1 Geographical Distribution of Poorest Households

There was a significant difference in the distribution of the poorest quintile between villages - e.g. some villages had more households in the lowest quintiles than others (Table 3.39). Notable villages were those of Kaburende and Kamiro with 53 percent of sampled households falling in the lowest quintile group (χ^2=142.687, d.f.=97, p<0.05).

Table 3.39 Frequency of Quintile Group Occurrence by Village

VILLAGE		QUINTILE					ALL
		LOWEST 20%	LOWER MIDDLE 20%	MIDDLE 20%	UPPER MIDDLE 20%	HIGHEST 20%	
BIZU	Count	2	1	4	4	3	14
	% within Village Code	14.3%	7.1%	28.6%	28.6%	21.4%	100.0%
	% of Total	.5%	.3%	1.1%	1.1%	.8%	3.7%
BUNYENERI	Count	1	4	1	4	5	15
	% within Village Code	6.7%	26.7%	6.7%	26.7%	33.3%	100.0%
	% of Total	.3%	1.1%	.3%	1.1%	1.3%	4.0%
GACOGO	Count	2	3	1	5	4	15
	% within Village Code	13.3%	20.0%	6.7%	33.3%	26.7%	100.0%
	% of Total	.5%	.8%	.3%	1.3%	1.1%	4.0%
GAHIRA	Count	0	4	3	3	5	15
	% within Village Code	.0%	26.7%	20.0%	20.0%	33.3%	100.0%
	% of Total	.0%	1.1%	.8%	.8%	1.3%	4.0%
JITE	Count	2	5	5	2	1	15
	% within Village Code	13.3%	33.3%	33.3%	13.3%	6.7%	100.0%
	% of Total	.5%	1.3%	1.3%	.5%	.3%	4.0%
KABUMBA	Count	1	6	3	4	1	15
	% within Village Code	6.7%	40.0%	20.0%	26.7%	6.7%	100.0%
	% of Total	.3%	1.6%	.8%	1.1%	.3%	4.0%
KABURENDE	Count	8	2	2	2	1	15
	% within Village Code	53.3%	13.3%	13.3%	13.3%	6.7%	100.0%
	% of Total	2.1%	.5%	.5%	.5%	.3%	4.0%
KAGANO	Count	5	3	2	4	1	15
	% within Village Code	33.3%	20.0%	13.3%	26.7%	6.7%	100.0%
	% of Total	1.3%	.8%	.5%	1.1%	.3%	4.0%
KAGERI	Count	2	2	4	2	5	15
	% within Village Code	13.3%	13.3%	26.7%	13.3%	33.3%	100.0%
	% of Total	.5%	.5%	1.1%	.5%	1.3%	4.0%
KAMIRO	Count	8	0	3	1	3	15
	% within Village Code	53.3%	.0%	20.0%	6.7%	20.0%	100.0%
	% of Total	2.1%	.0%	.8%	.3%	.8%	4.0%

KARISIMBI	Count	2	3	4	3	3	15
	% within Village Code	13.3%	20.0%	26.7%	20.0%	20.0%	100.0%
	% of Total	.5%	.8%	1.1%	.8%	.8%	4.0%
KINYAMUHANGA	Count	0	4	3	4	4	15
	% within Village Code	.0%	26.7%	20.0%	26.7%	26.7%	100.0%
	% of Total	.0%	1.1%	.8%	1.1%	1.1%	4.0%
MASASA	Count	2	0	5	3	5	15
	% within Village Code	13.3%	.0%	33.3%	20.0%	33.3%	100.0%
	% of Total	.5%	.0%	1.3%	.8%	1.3%	4.0%
MUHABURA	Count	5	3	2	2	3	15
	% within Village Code	33.3%	20.0%	13.3%	13.3%	20.0%	100.0%
	% of Total	1.3%	.8%	.5%	.5%	.8%	4.0%
MUNINI	Count	4	3	4	4	0	15
	% within Village Code	26.7%	20.0%	26.7%	26.7%	.0%	100.0%
	% of Total	1.1%	.8%	1.1%	1.1%	.0%	4.0%
MUTARA	Count	4	0	2	3	6	15
	% within Village Code	26.7%	.0%	13.3%	20.0%	40.0%	100.0%
	% of Total	1.1%	.0%	.5%	.8%	1.6%	4.0%
NSAKIRA	Count	4	3	1	3	4	15
	% within Village Code	26.7%	20.0%	6.7%	20.0%	26.7%	100.0%
	% of Total	1.1%	.8%	.3%	.8%	1.1%	4.0%
NTENYO	Count	4	3	2	5	2	16
	% within Village Code	25.0%	18.8%	12.5%	31.3%	12.5%	100.0%
	% of Total	1.1%	.8%	.5%	1.3%	.5%	4.3%
PFUNDO	Count	5	4	2	1	3	15
	% within Village Code	33.3%	26.7%	13.3%	6.7%	20.0%	100.0%
	% of Total	1.3%	1.1%	.5%	.3%	.8%	4.0%
RUBAKA	Count	5	1	5	3	1	15
	% within Village Code	33.3%	6.7%	33.3%	20.0%	6.7%	100.0%
	% of Total	1.3%	.3%	1.3%	.8%	.3%	4.0%
RUHANGO	Count	3	4	3	3	2	15
	% within Village Code	20.0%	26.7%	20.0%	20.0%	13.3%	100.0%
	% of Total	.8%	1.1%	.8%	.8%	.5%	4.0%
RUSENGE	Count	5	8	1	0	1	15
	% within Village Code	33.3%	53.3%	6.7%	.0%	6.7%	100.0%
	% of Total	1.3%	2.1%	.3%	.0%	.3%	4.0%
RUTINDO	Count	0	3	4	4	4	15
	% within Village Code	.0%	20.0%	26.7%	26.7%	26.7%	100.0%
	% of Total	.0%	.8%	1.1%	1.1%	1.1%	4.0%
RYAMBUNGIRA	Count	0	7	4	3	1	15

	% within Village Code	.0%	46.7%	26.7%	20.0%	6.7%	100.0%
	% of Total	.0%	1.9%	1.1%	.8%	.3%	4.0%
TERIMBERE	Count	1	0	6	4	4	15
	% within Village Code	6.7%	.0%	40.0%	26.7%	26.7%	100.0%
	% of Total	.3%	.0%	1.6%	1.1%	1.1%	4.0%
ALL	Count	75	76	76	76	72	375
	% within Village Code	20.0%	20.3%	20.3%	20.3%	19.2%	100.0%
	% of Total	20.0%	20.3%	20.3%	20.3%	19.2%	100.0%

No significant difference in the frequency of occurrence of quintile group was found by proximity to the park or between regional groupings of sectors.

3.3.2 Length of Residency

There was no significant difference in the number of years resident between income groups.

3.3.3 Land Holdings

A highly significant difference in mean land holdings was observed between income groups (x^2=202.769, d.f.=4, p<0.001).

Table 3.40 Land Holding by Quintile

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
LOWEST 20%	68	0.03	.059799	.007252	.000	.320
LOWER MIDDLE 20%	76	0.19	.255904	.029354	.000	2.150
MIDDLE 20%	76	0.39	.391719	.044933	.000	3.000
UPPER MIDDLE 20%	76	0.70	.642940	.073750	.000	3.000
HIGHEST 20%	72	1.52	2.484279	.292775	.000	20.000
Total	368	.56	1.261742	.065773	.000	20.000

The lowest quintiles had a mean holding of 0.03 ha with the highest quintile having a mean holding of 1.52ha, some 50 times larger than the lowest quartile.

3.3.4 Livestock

With the exception of pigs and chickens, livestock ownership was significantly different between income groups. The higher the income group the higher the mean number of livestock owned. In the case of pigs and chickens, ownership overall was very low, and the number of cases too few to adequately compute test statistics.

Table 3.41 Livestock Ownership by Income Group

Livestock Type	Income group	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Goats**	LOWEST 20%	75	.20	.435	.050	0	2
	LOWER MIDDLE 20%	76	.39	.613	.070	0	3
	MIDDLE 20%	76	.68	.867	.099	0	3
	UPPER MIDDLE 20%	76	.53	.663	.076	0	2
	HIGHEST 20%	72	.97	.919	.108	0	3
	ALL	375	.55	.761	.039	0	3
Cattle**	LOWEST 20%	75	.00	.000	.000	0	0
	LOWER MIDDLE	76	.11	.309	.035	0	1

		N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
	20%						
	MIDDLE 20%	76	.26	.472	.054	0	2
	UPPER MIDDLE 20%	76	.30	.654	.075	0	4
	HIGHEST 20%	72	.39	.618	.073	0	2
	ALL	375	.21	.492	.025	0	4
Sheep*	LOWEST 20%	75	.00	.000	.000	0	0
	LOWER MIDDLE 20%	76	.01	.115	.013	0	1
	MIDDLE 20%	76	.12	.325	.037	0	1
	UPPER MIDDLE 20%	76	.09	.291	.033	0	1
	HIGHEST 20%	72	.08	.278	.033	0	1
	ALL	375	.06	.240	.012	0	1
Pigs	LOWEST 20%	75	.01	.115	.013	0	1
	LOWER MIDDLE 20%	76	.00	.000	.000	0	0
	MIDDLE 20%	76	.00	.000	.000	0	0
	UPPER MIDDLE 20%	76	.04	.196	.022	0	1
	HIGHEST 20%	72	.01	.118	.014	0	1
	ALL	375	.01	.115	.006	0	1
Ducks*	LOWEST 20%	75	.00	.000	.000	0	0
	LOWER MIDDLE 20%	76	.00	.000	.000	0	0
	MIDDLE 20%	76	.04	.196	.022	0	1
	UPPER MIDDLE 20%	76	.00	.000	.000	0	0
	HIGHEST 20%	72	.08	.278	.033	0	1
	ALL	375	.02	.153	.008	0	1
Chickens	LOWEST 20%	75	.00	.000	.000	0	0
	LOWER MIDDLE 20%	76	.00	.000	.000	0	0
	MIDDLE 20%	76	.05	.361	.041	0	3
	UPPER MIDDLE 20%	76	.08	.317	.036	0	2
	HIGHEST 20%	72	.07	.256	.030	0	1
	ALL	375	.04	.245	.013	0	3

Kruskal Wallace **p<0.001, *p<0.01

3.3.5 Savings

There were significant differences between income groups' amounts of savings (X^2=63.313, d.f.=4, p<0.001) with a large difference between the lowest and highest groups (Table 3.42). However, we see that even in the upper quintiles there are cases where households had no cash savings.

Table 3.42 Mean Savings by Income Group

Income Group	N	Mean ($)	Std. Deviation	Std. Error	Minimum	Maximum
LOWEST 20%	38	20.23	31.92	5.17	0	126.31
LOWER MIDDLE 20%	54	80.17	190.36	25.90	0	1263.15
MIDDLE 20%	61	249.62	564.81	72.31	0	3508.77

UPPER MIDDLE 20%	55	1148.52	4010.23	540.74	0	27789.47
UPPER 20%	62	2827.36	9644.60	1224.86	0	61403.51
Total	270	958.48	5060.21	307.95	0	61403.51

3.3.6 Loans

As with savings, the mean loan value was significantly different between groups (X^2=21.066, d.f.=4, p<0.001). Interestingly, looking at the minimum and maximum values (Table 3.43), all households in the survey had some form of a loan, even in the lowest income households. This underlines the extent and importance of rural credit in all its forms in contributing to livelihoods opportunities.

Table 3.43 Mean Loan Value by Income Group

Income Group	N	Mean ($)	Std. Deviation	Std. Error	Minimum	Maximum
LOWEST 20%	3	11.69591	5.359738	3.094446	7.017544	17.54386
LOWER MIDDLE 20%	13	74.22402	121.028	33.56713	5.263158	438.5965
MIDDLE 20%	13	103.1039	147.8448	41.00477	8.77193	526.3158
UPPER MIDDLE 20%	19	536.7498	1189.152	272.8102	5.263158	5263.158
UPPER 20%	18	1993.372	3407.213	803.0879	8.77193	12280.7
Total	66	733.6257	2018.882	248.5072	5.263158	12280.7

3.4 Sub-Section C: Household Income

3.4.1 Income Analysis

The measure of income used in this study comprises goods sold, the prevailing market value of own-produced goods consumed in the home, monetary, non-monetary transfers into the household account, and income from wage labour in cash or the value of goods in kind. The measure of income used in this study is net of input costs, although little or no use of agricultural inputs (variable costs) or wage labour was evident. Where inputs into the agricultural, livestock or other enterprises were recorded, these were deducted from the total income for that activity or groups of activities. As a stratified random sample of households around each site was used, representative of all the probable users of the forest resource, no special treatment of one of or infrequent use of forest resources was required, on the assumption that the sample would be representative of the overall annual similar uses of forest goods by the population, thus no particular bias would be introduced as a result.

In the study following (Ellis 1993), own labour in the peasant farming system is assumed to have a zero value, this is because the opportunity cost of labour in general is either zero or extremely low. The seasonal nature of farm work in a peasant farming system shows that there are work peaks and troughs. During planting or harvesting periods, the opportunity cost of labour can be very high as household labour resources are stretched to capacity to complete activities within a limited period of time (Upton 1987). At other times of the year there may be a surplus of labour. With a finite amount of household labour resources, the only option to increase the labour requirements would be to hire workers. However, given that on a regional scale every other peasant farming household will also be facing the same acute labour constraint, little labour is available even if the means to pay for it were obtainable. Thus there is little scope to vary farm labour requirements according to work needs. The result is that the marginal product of labour varies from season to season, where an extra unit of labour in the seasonal work peaks would generate a high return in terms of total yield and nothing in the

seasonal troughs. Thus there is no single meaningful value for the marginal product or opportunity cost of household labour (Byerlee et al. 1976; Upton 1987).

A meta analysis of environmental incomes from forest resources, by Vedeld et al. (2004), show that 56 percent of studies in the analysis did not include labour costs whilst estimating forest environmental income. This implies an over-estimation of the economic rent derived from it. However, when they included labour costs and checked for any systematic differences between studies that included labour costs and those that did not, they found no significant differences in either absolute income or relative measures. This implies that the assumption that the opportunity cost of labour is low or zero as discussed previously is reasonable. However, the Vedeld et al. (2004) study also indicates that the fact that labour costs were included in some studies might point toward a more rigorous effort in identifying and valuing all sources of income, thus estimates in such studies may have been higher, explaining the lack of significant difference between cases. At best then, the marginal value of labour is very low, so the treatment of these costs as zero is rational in this case.

Income can also be a relative concept depending on unit of analysis. A household that earns a US$1,000 per annum and has 5 members has a higher income on a per capita basis than a household that earns a US$1,000 per annum and has 10 members. However, a larger household enjoys better economies of scale than smaller households, with more labour available for different activities. In addition, the composition of a household in terms of age and sex structure affects levels of production and consumption of the household as a unit of analysis (Campbell & Luckert 2002; Deaton 1998). In order to make valid comparisons in absolute terms across households, an "adjusted net household income" was therefore used in this study, to reduce bias in inter-household comparisons of income. The weakness of this approach lies in a critique of the validity of the coefficients in different national settings, as they are based on a study conducted in Sri Lanka (Campbell et al. 2002). However, the biases created in the analysis by the use of such scaling will be considerably less than using either unadjusted figures or per capita income (Lanjouw & Ravallion 1995).

Adjusted net income was calculated by dividing the total net income by a factor comprised of two coefficients of adult equivalency and economy of scale (Table 3.44), to give an adjusted equivalent unit (AEU) derived from World Health Organisation methodology reported in Campbell & Luckert, (2002). A household's AEU was calculated according to the following procedure. A coefficient of a standard adult equivalent unit is awarded to each household member. The sum of the coefficients gives a standardised measure of household size. Each household was scored on its number of occupants and given a coefficient of economy of scale. The absolute income (net value) is then divided by the AEU coefficients to give the income per AEU and the product then multiplied by the economy of scale coefficient (referred to as an *adjusted* value)[7]. This helps to account for biases otherwise introduced if comparisons are made on the basis of unadjusted income.

Table 3.44 Coefficients for Adult Equivalence and Household Economies for Scale Calculations (Adapted from Cambell and Luckert 2002)

Household economy scale	
Household Size	Economy of scale
1-2	1.000
3	0.946
4	0.897
5	0.851
6	0.807
7	0.778
8	0.757
9	0.741
10	0.729
10+	0.719

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[7] Example AEU calculation: If a households had 3 members, an adult female aged 19-59, an adult male aged 18-59 and an infant aged 3-4 years, their combined value of their AEU would be 0.88+1.00+0.48=2.36 adult equivalents. If the household had US$1,000 total annual income, then their income per AEU would be 1,000/2.36=$423.73 per AEU. This value is then multiplied by the economy of scale coefficient from a household of 3 people (US$423.73*0.946) to give the AEU/ES value US$400.

| Adult equivalent scale | | |
Age	Male	Female
0-2	0.40	
3-4	0.48	
5-6	0.56	
7-8	0.64	
9-10	0.76	
11-12	0.80	0.88
13-14	1.00	1.00
15-18	1.20	1.00
19-59	1.00	0.88
60+	0.88	0.72

Effectively, the adjusted income value gives a figure that depicts income on the basis of a standard adult unit. Therefore inter-comparisons of income are presented using income quintiles adjusted net total income figures.

household household based on the

3.4.2 Sources of Bias and Error

In order to minimize strategic bias, a concise briefing of the survey objectives was delivered to each respondent. Despite two of the survey partners playing a local development role (CARE International and International Gorilla Conservation Programme), the implementation of the project through Karisoke Research Center made clear that this was policy level research, not necessarily directly related to any local level intervention. In general, therefore, we feel that the data underestimates household income and consumption, because of recall problems, but it is difficult to know by how much. However, we feel that any underestimation is probably evenly spread across all the household income data, therefore there will be little effect on the trends and patterns observed. Fortunately, the seasons prior and during our data collection were not considered unusual. The data collection period corresponded with the end of the long rainy season and the beginning of the long dry season (April to August). This corresponds to a period when food is relatively abundant, but the advent of the 'hungry gap', September to October before the new harvest, may put additional burdens on households' incomes. In addition, payment of third trimester school fees and other associate costs were due in September. The relative abundance of food may put a downward bias on the use of own capital resources, with an upward bias for a short period in July to August. The two effects may lead to cancelling each other out, therefore results should be fairly representative of the real trends and differences between income groups.

In this study, net figures are total revenues less any recorded variable or capital costs associated with the enterprise so a form of gross margin rather than true profit in the strict economic sense. From a pure accounting stand point, true profit would also require a subtraction for overhead costs apportioned to the enterprise. For the purposes of estimating the effects on general incomes in a largely peasant farming systems, where there are few overhead costs -- e.g. depreciation of farm assets and general management costs - this does not cause any particular biases in terms of assessing the trends and general differences between grips at an aggregate level.

No records of illegal forest income were recorded during the household survey, although this was one of the specific objectives of the study. Data from a pilot study of 5 communities around the PNV revealed that almost 30 percent of respondents admitted to some illegal off-take of goods from the VNP. The pilot study was conducted under much more discrete circumstances with a smaller survey team (3 people) with more experience of household surveys and conservation issues around the PNV. In addition, the low key approach attracted less interest from the local government authorities. It is highly likely that in an individual interview people were reluctant to discuss illegal activities related to the park due to fear of repercussions, despite the guaranteed anonymity of the respondents. Thus the estimates of net income are likely to be underestimated as an entire source of income has not been factored.

3.4.3 Income Sources

The mean net annual household income was estimated to be 302,622FRW - approximately US$540 per household (Table 3.45). This figure is a little above the national average of US$500 (MINECOFIN 2009). In adjusted terms, the mean per adult equivalent unit was 77,601RWF (US$139). Interestingly, this is not too different from the mean of US$525 reported by Hatfield and Mallaret-King (2003). Worryingly this is an indicator that in real terms, considering inflation since 2003, households in this region have lower mean incomes. In the case of the lowest income quintile (lowest 20 percent), the mean values appear to be extremely low, to the point where it seemingly becomes impossible to survive. In this quartile we experience a large proportion of respondents who claimed no arable or livestock income. These are the poorest of the poor, with few resources barely scraping by. In such a condition, people are living from day to day, so general recall of erratic revenues and consumption means it is difficult to obtain an accurate estimate of annual income streams using a one off general household survey.

Table 3.45 Comparison of Annual Adjusted and Unadjusted Income Measures and % of HH Income in Cash, Mean Annual Values (RWF)

Income group	n	net total annual household income	Adjusted* net total annual household income	Proportion cash income
LOWEST 20%	74	5,996	1,659	16.91
LOWER MIDDLE 20%	76	40,196	10,686	32.00
MIDDLE 20%	76	118,936	30,120	44.90
UPPER MIDDLE 20%	76	283,406	74,857	45.00
UPPER 20%	72	1,102,785	280,357	48.64
ALL	374	302,622	77,601	40.99

*Income per adult equivalent unit adjusted for household economy of scale

For both, net annual household income was significantly different between groups (KW, χ^2=342.278, d.f.=4, p<0.001); similarly adjusted household income follows the same pattern (KW, χ^2=359.070, d.f.=4, p<0.001). An estimate of the mean value of total income that was sold for cash compared to own consumption was made (proportion of cash income). Overall, the mean proportion of cash realized in the household is just over 40 percent of the total value of own goods harvested and business transactions. Importantly, that means that more than 50 percent of the total value of goods produced is consumed within the home, indicating a high level of overall subsistence. Goods sold to realize cash in the home increased with income group; this was significantly different between groups (KW, χ^2=25.951, d.f.=4, p<0.001), yet even the highest group monetized less than 50 percent of own produced goods and services.

Although adjusted incomes were lower in park-adjacent communities, in unadjusted and adjusted terms no significant differences were found. This was an interesting observation, as mean holdings for park-adjacent communities were significantly smaller than for those households in communities not adjacent to the park. Interestingly, no significant differences due to proximity were detected in responses to trends in land quality (see earlier section). These responses relied on respondents' own contextual understanding of the situation. This is unlikely to include a direct comparative experience of farming, both near to and further away from the park, so does not conclusively rule out better soil quality in park-adjacent communities. Intuitively and from ad hoc observations of the situation on the ground, land closer to the park seemed often to have deeper soils. Another reason for this might be that park-adjacent land (at slightly higher elevations than non-adjacent) might be more productive due to better rainfall.

Most households in the survey were subsistence farmers to some degree (there was only one record of a household that sold all of their agricultural produce). The key constituent of household income was income from arable agriculture both consumed in the home and sold. Mean net household income from arable agriculture (Table 3.46) was estimated at 241,447RWF per annum (US$431).

Table 3.46 Arable Income and Costs, Income Group Mean Annual Values (RWF)

Income group	n	Arable income	Arable costs	Net Arable income
LOWEST 20%	74	3,101	883	2,222
LOWER MIDDLE 20%	76	47,195	13,901	33,295
MIDDLE 20%	76	163,409	62,360	101,048
UPPER MIDDLE 20%	76	335,129	105,492	229,637
UPPER 20%	72	1,105,955	234,777	871,178

ALL	374	323,565	82,089	241,477

Gross arable income overall was 323,565RWF. The mean cost overall (inputs to the farming system) was 82,089RWF. Values were significantly different between groups (χ^2= 235.999, d.f.=4, p<0.001), showing an increase in arable income with higher income groups. No significant differences in arable income and costs were found according to regional grouping of sectors or proximity to park.

Livestock holdings on the whole were very low. This is reflected in the mean capital value of livestock holdings (Table 3.47). On the whole, few households generated many revenues from the ownership of livestock, indicating that in principle livestock is regarded more as a store of wealth rather than a productive asset.

Table 3.47 Livestock Income and Costs, Income Group Mean Annual Values (RWF)

Income group	n	Livestock income	Livestock costs	Net livestock income	Capital value of livestock assets
LOWEST 20%	74	0	13	0	22,400
LOWER MIDDLE 20%	76	855	1,799	956	82,132
MIDDLE 20%	76	2,507	10,144	3,529	151,289
UPPER MIDDLE 20%	76	11,724	16,995	16,717	133,354
UPPER 20%	72	104,347	24,492	164,948	456,668
ALL	374	23,092	10,570	28,969	166,493

The highest income group also had the highest mean capital value of livestock owned, as well as the highest revenues (net income) from livestock assets. In addition, the higher income groups also showed higher levels of investment in their livestock in terms of costs - e.g. investments in to the enterprise. No significant differences in livestock values were observed between park-adjacent and non-adjacent households. However, there were differences on a regional basis in livestock income. Households in the eastern region had higher overall annual livestock income (47,516RWF) than in the central (7,963RWF) or western (5,273RWF) areas (χ^2=16.717, d.f.=2, p<0.001). The mean capital value of livestock was also highest in the eastern region (χ^2=7.544, d.f.=2, p<0.05), where a number of households had invested in zero grazing dairy projects.

Records were also made of business transactions, e.g. from market trading, income from wage labour as well as remittances from family and friends (Table 3.48). Income received through local NGO or CBO projects, either for meeting immediate household needs (welfare payments) or for small development projects e.g. micro-credit increased and then decreased by income group. This indicates that these payments are accessed less by the highest and lowest two income groups then the middle. We can infer form this that for the highest two income groups such payments are less important and for the lowest two that there are probably some barriers to accessing them. Business incomes made a substantial contribution to total household income; the mean for the whole sample was 29,664RWF (US$53). There were significant differences in the mean business incomes between income groups (χ^2=12.054, d.f.=2, p<0.01), with the lowest two groups receiving zero. Generally, the trend was increasing business income the higher the income group. However, only 75 respondents of 374 (20 percent) indicated any kind of business-related income. This indicates that the opportunities for diversifying income are few in general, but for those who can, the contributions can be significant.

Table 3.48 Non-Natural Resource Based Income Group Income and Costs, Mean Annual Values (RWF)

Income group	Net business income (n=75)	Remittances (n=305)	NGO & Welfare payments (n=142)
LOWEST 20%	0	2,987	787
LOWER MIDDLE 20%	0	5,322	724
MIDDLE 20%	5,053	7,211	3,257
UPPER MIDDLE 20%	29,105	5,632	7,595
UPPER 20%	118,444	8,458	3,903
ALL	29,664	5,903	3,253

Remittances were received across the board, the mean value overall being 5,903RWF (US$10.54). Although there was no significant difference between groups in the mean amounts of remittances being received, proportionately the importance of remittances is much greater in the lower income groups. Welfare payments or NGO support was evident in all groups; the mean value of assistance over all groups was 3,253RWF (US$5.80) per household annually. Differences were significant between groups (x^2=12.054, d.f.=4, p<0.05), with the lowest level of support going to the two lowest income groups.

The proportionately most important sources of revenue were examined by income group (Table 3.49). Over all groups, the largest proportion of household income was derived from agriculture (56.62 percent) and net business income (34.8 percent). Livestock provided a low proportion of overall revenue (6.8 percent), followed by NGO & welfare payments (2.02 percent) and remittances (1.7 percent).

Table 3.49 Relative Importance of Income Sources (% of All Revenue by Quartile)

Income group	n	Net Arable income	Net livestock income	Net business income	Remittances	Welfare payments
LOWEST 20%	74	40.05	0.00	0.00	58.91	30.76
LOWER MIDDLE 20%	76	80.74	2.26	0.00	16.81	5.43
MIDDLE 20%	76	67.54	2.22	25.08	5.11	5.20
UPPER MIDDLE 20%	76	66.96	4.73	26.39	1.91	5.44
UPPER 20%	72	61.28	12.70	25.26	0.76	0.70
ALL	374	56.62	6.80	34.80	1.70	2.02

Income is not uniformly distributed between the income groups (Table 3.50). The Upper 20% group captures more than 67 percent of the available total income, with the Lowest 20% capturing only 0.43 percent of the total available income.

Table 3.50 Quintile Cumulative Income and Proportionate Share of Total Recorded Income

Income group	n	Cumulative income	% share of all income
LOWEST 20%	75	461,180	0.43
LOWER MIDDLE 20%	76	3,172,640	2.96
MIDDLE 20%	76	9,306,883	8.68
UPPER MIDDLE 20%	76	21,862,404	20.40
UPPER 20%	72	72,376,540	67.53
ALL	375	107,179,647	100.00

This shows that there is very high income inequality between the highest and the lowest income groups - e.g. the highest group earns 157 times more than the lowest.

3.4.4 Efficiency Issues in the Farming System

The small land holdings and high population densities mean that some considerations of how efficient the farming systems are in terms of inputs and outputs, as well as financial efficiency in terms of returns on investments in the system, are of interest. Land use patterns by different income groups were explored (Table 3.51); we saw that over all the sample, an average of 7.98 percent of a households' land holdings was not being cropped. This proportion increased with income group and was significantly different between groups (χ^2= 205.164, d.f.=4, p<0.001)

Table 3.51 Mean Crop Cover per Land Holding

Income group	n	Land holding	Area cropped	% not cropped
LOWEST 20%	68	0.03	0.02	0.79
LOWER MIDDLE 20%	76	0.20	0.17	2.82
MIDDLE 20%	76	0.42	0.37	5.06
UPPER MIDDLE 20%	76	0.61	0.51	10.14
UPPER 20%	72	1.52	1.29	23.33
ALL	368	0.56	0.48	7.98

The traditional farming system involves a fallow period using a four field or five field systems, which means that anything up to 25 percent of the land holding might be out of production (fallow). Clearly the need to produce food today versus food in the future means that under a critical land constraint with no technological change as allowing a fallow period to maintain future productivity of the soil is not possible. The highest income households with more land can still possibly use traditional techniques to maintain soil productivity. However, from the upper middle group down land holdings are too small to allow a fallow period, thus land must be kept in production constantly.

The output efficiency of different income groups can also be considered (Table 3.52). Having a total output and input costs for the arable farming system we derived the net arable income. To assess the output efficiency of income groups we can look at the financial return per unit of input (return on investment).

Table 3.52 Mean Net Returns on Investment (RWF)

Income group	total arable costs	net income (gross margin)	return on investment	total arable costs per ha	net income (gross margin) per ha	Net return on investment per ha
LOWEST 20%	883	2,222	2.52	32,989	43,891	1.33
LOWER MIDDLE 20%	13,901	33,295	2.4	164,309	345,803	2.10
MIDDLE 20%	62,360	101,048	1.62	251,906	441,175	1.75
UPPER MIDDLE 20%	105,492	229,637	2.18	278,760	610,660	2.19
UPPER 20%	234,777	871,178	3.71	367,132	1,057,803	2.88
ALL	82,089	241,477	2.94	219,019	495,131	2.26

What we observe at the level of the complete arable enterprise is that overall for every RWF invested in agricultural inputs a household can on average expect a net return of 2.264RWF. For the Lowest 20%, the mean net return was only 2.52RWF, and for the Upper 20% it was 2.88RWF; between groups the differences were significant (χ^2= 107.310, d.f.=4, p<0.001). We see two distinct trends: firstly, from the Lowest 20% to the Middle 20% net returns diminish. Secondly, from the Middle 20% to the Upper 20% they increase. Consider the output efficiency per unit area of land (hectare) we see similar patterns. Overall, the expected net return per hectare was 2.38RWF per RWF invested. The general trend is that the returns per ha diminish as we move up the income group. Thus, in general, higher income household farm enterprises give better returns than lower income household farm enterprises.

Assuming that all households are using similar technological packages, this result does not make sense as it does not follow the economic law of diminishing marginal returns[8], assuming that over all the sample the technological parameters are the same. However, if we examine the costs per unit area of land, we see they also follow the same dual trend of declining and then increasing with income groups.

What we must consider then is that there are effectively two technological modes of production, each as economically efficient as each other under different resource constraints. Firstly, for the lowest two income groups, this is a low input system with high labour intensity per unit area of land. Secondly, from the middle group to the top, it is a high input system with relatively low labour inputs per unit area of land. Typically, the first system might be where the farmer practices alley or intercropping over the largest part of their holding. The second system might be observed with farmers with land holdings, where a substantial proportion of the holding might be mono-cropped, e.g. potatoes and maize.

Looking at the differences in net returns per hectare from the Middle 20% and the Upper 20%, we see that the gross returns (a form of profit, but not in the strict economic definition) improve with income group. This indicates that for the middle and upper middle groups the current production systems are not as economically efficient as the top 20%. This may be mainly due less to resource constraints than to technological limitations. Profit is the difference between total costs and total revenues. Profit is maximized where the difference between total costs and total revenues per unit area of land is greatest. This is an important issue as maximizing income in an enterprise is not the same as maximizing profit. This is not surprising when we examine this in the context of subsistence farming, where the priority goal is food security, which equates to maximum yield. Also in light of the high population density, contrary to most other scenarios in sub-Saharan Africa, farmers are primarily concerned with squeezing every last bit of production or money from the land (maximizing gross return). What needs to be concentrated on then is maximizing profit as much as possible in this context. This implies either reducing costs without reducing yield, improving revenues - e.g. better prices - or both. A few key issues need to be addressed. Larger farms may enjoy economies of scale therefore improving input access and output marketing for the smaller farms of the middle and upper-middle lower income households - e.g. cooperatives - may be an option. These enterprises are all able to function in such market based systems having some, all be they in most cases meagre, resources to deploy towards the approach - e.g. land and capital. However, for the poorest two groups (assuming some modest land holding), the acute constraints on resources mean that other approaches will need to be adopted to address the most basic poverty issues.

What might it cost to have a significant increase in agricultural output and therefore household income? In a simple model we could consider increasing the per-household return on investment of the 4 lowest quintiles up to the same level as the highest quintile of 3.71. There are 294,347 people in the 12 sectors around the PNV. At an average household occupation of 5.64 per household, this gives a total of 52,190 households (or 10,438 per quintile). The differences in investment and returns between the lowest 4 quintiles and the highest quintile were calculated (Table 3.53) and then multiplied by the number of households in each quintile to give the aggregate investment and return per household required to achieve the return on investment of 3.71 per household.

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8 In economics, diminishing returns (also called diminishing marginal returns) refers to how the marginal output per unit of a factor of production actually starts to progressively decrease the more units of the factor are added. According to this relationship, in a production system with fixed and variable inputs (say factory size and labour), beyond some point, each additional unit of the variable input (e.g. man hours) yields smaller and smaller increases in outputs, also reducing the mean productivity of each worker. Conversely, producing one more unit of output costs more and more (due to the major amount of variable inputs being used to little effect).

Table 3.53 Estimate of Aggregate Capital Direct Investment and Return to Improve Agricultural Ration of Returns to 3.71 per Household

Income group	Increased average investment per household (FRW)	Increased average income per household FRW)	Number of households per quintile	Aggregate additional investment per quintile (FRW)	Aggregate additional return per quintile (FRW)
LOWEST 20%	233,894	868,956	10,438	2,441,385,572	9,070,162,728
LOWER MIDDLE 20%	220,876	837,883	10,438	2,305,503,688	8,745,822,754
MIDDLE 20%	172,417	770,130	10,438	1,799,688,646	8,038,616,940
UPPER MIDDLE 20%	129,285	641,541	10,438	1,349,476,830	6,696,404,958
UPPER 20%	0	0	10,438	0	0
Totals	-	-	52,190	7,896,054,736	32,551,007,380
				($13,852,728)	($57,107,030)

(US dollar equivalent in parenthesis at exchange rate of 570FRW/$)

The total investment required would be just under US$14 million, giving a return of just over US$57 million. If we add 40 percent of the investment cost to cover implementation costs (management infrastructure and human and technology capacity development) this gives rise to additional costs of approximately US$5.5 million. The total cost of investment required to substantially raise the game to possibly sustainable levels would therefore be almost US$20 million. This model implies a number of naïve assumptions about the current capacity to absorb and utilize the investment. From a poverty alleviation perspective, there needs to be a large capital investment in agriculture to promote new technologies and improve productivity to a sustainable level. The lowest three income groups cannot possibly hope to achieve development improvements through loans with commercial rates of interest. Improving agricultural productivity amongst these households will address critical public goods such as poverty alleviation and food security at local and national levels. If these basic issues are addressed the improved yields of marketable produce will also contribute to national economic development. In recent years food prices have fluctuated wildly in east and central Africa due to erratic supply and Rwanda is in a prime position to access regional markets for produce. Already marketing agents from Burundi and DRC can be found in the remote village of the Virunga purchasing potatoes for export. Obviously this type of investment could not be made in a single year and would have to be implemented in phases, with a resulting marginal increase in costs. However, it does serve to illustrate the level of investment required to significantly improve agricultural efficiency and outputs in this area. In addition, we must remain aware that a significant proportion of households are landless so this model is not relevant to their situation and does not equate to ensuring equity. It is an economic growth model *ceteris paribus.*

3.5 Sub-Section D: Community Conservation Knowledge, Attitudes and Benefits

A series of questions to examine the impacts of community conservation activities were developed assessing respondents' attitudes towards the community conservation (CC) programme around PNV. The method builds on a previous study by Uwingeli (2008) assessing local people's knowledge and factors influencing their attitudes towards the PNV CC programme. The study was conducted with a relatively small sample (120 respondents) and gives important insights into people's knowledge and attitudes towards the national park and CC activities.

In particular, the questionnaire contained questions about the knowledge of the development impacts of the CC programme and people's perception of the relevance and impact of the programme to people's livelihoods. These questions were analyzed according to geographical strata to assess if there were any differences in response rates. This serves as a useful indicator to define geographically priority areas to increase CC efforts in the future. An assumption in combating illegal use of the national park is that it is the poorest households who

are the highest risk group in terms of illegal park use. Evidence from Bush and Sabuhoro (2009) shows that the mean annual household income for households claiming to illegally use the park was significantly less than for those households who did not. Thus it is important to assess how the CC programmes of the PNV might be impacting on the poorest households as an incentive to reduce illegal park activities. This can be done through assessing how the different income quintiles' responses to questions regarding their conservation knowledge, attitudes and practices may differ.

In general, 96 percent of respondents knew about the CC activities, and 82 percent of respondents felt that the CC activities were making a positive contribution to local development. There was no significant difference in response rates between income groups, showing that poor and wealthy households were equally as likely to be exposed to the education campaign surrounding the CC programme. Geographically, there was no significant difference in response rates between park-adjacent and non-adjacent communities, however respondents in the central sectors showed a small but significantly different, lower rate of positive responses: 90 percent of the category compared to 74 percent in the east and 79 percent in the west (χ^2= 12.177, d.f.=2, p<0.01). This might be because in general there is a much more diverse array of development projects and programmes, as well as other opportunities to generate income, hence households are less engaged in the CC programme because it is not as relevant as an opportunity to improve their livelihoods.

The development projects commonly undertaken by the CC programme can be broadly categorized into social infrastructure (roads, water tanks clinic rehabilitation etc.) and income-generating activities (honey production, handicrafts, agricultural improvement) and conservation education also known as "sensitization". The social infrastructure in general provides assistance at a community level affecting the general living conditions of a group of people and income generation acts to improve the welfare of individual households. Again, an important assessment is how different economic groups might be impacted, in order to assess the potential for improving the welfare of the poorest and highest risk groups in conservation terms. Respondents were asked if they were aware of an activity and its link to conservation and then to assess the relevance of the programme activity to their livelihood - e.g. did they benefit directly or not. If a direct benefit was recorded they were then asked to rate the impact on a 4 point scale from very beneficial to no benefit.

3.5.1 Stone Wall Construction to Control Crop Raiding Animals

87.8 percent of respondents indicated that they had heard about the stone wall construction and felt a direct benefit from the stone wall construction. There was no significant difference in impact scores geographically, according to sector region or proximity to park. 65.7 percent of respondents scored the impact as very beneficial. In addition, no significant difference in the impacts of the wall was reported by income groups, indicating that the wall has broadly beneficial effects across all socio-economic groups.

3.5.2 Public Water Tank Construction

59 percent of respondents had heard about the construction of water tanks on public buildings (schools, clinics etc). Only 46.5 percent felt that they had a direct benefit from the programme. Geographically, respondents in the west (71 percent) scored more highly the benefits (very beneficial) of the programme than respondents from the central (64 percent) or east (57 percent) (χ^2= 130.155, d.f.=2, p<0.001). Park-adjacent respondents were less likely to score a direct benefit than non-adjacent respondents, 40 percent compared to 53 percent from each category (χ^2=7.134, d.f.=1, p<0.01). Lower income households were less likely to receive a direct benefit from the water tanks than higher income households (χ^2=29.721, d.f.=4, p<0.001). Only 20 percent of the lowest quintile category indicated a direct benefit compared to 53 percent of the highest income category. In terms of impact, there were also significant differences between income category responses (χ^2=44.416, d.f.=4, p<0.001). Only 59 percent of the lowest income households scored the impact as very beneficial compared to 71 percent of the highest income category. As discussed earlier, access to potable water is a key development issue and conservation threat. This programme provides widespread benefits in a community, helping to directly improve the livelihoods of local people. In general, low income households have poor access to public infrastructure - e.g. they live on the periphery of a community and have longer to walk to central areas where public buildings are found. Some effort must be made to ease access to water by the poorest households. In addition, park-adjacent households benefit less form this programme. Some more strategic targeting of park-adjacent households will help to improve the impacts of the programme in the future.

3.5.3 School Infrastructure Development

46 percent of respondents had heard about projects to improve the infrastructure of local schools funded by the CC programme. Only 37 percent of respondents felt that it had a direct impact on their livelihoods. Geographically, respondents in the central region scored the benefits lowest (χ^2=37.488, d.f.=2, p<0.001). 60 percent scored no benefit in the central region, compared to 20 percent in the east and 36 percent in the west. By income categories, there were significant differences in the scoring of benefits (χ^2=25.982, d.f.=12, p<0.05). Only 61 percent of the respondents in the lowest income category rated the programme as very beneficial, compared to 71 percent of the respondents in the highest income category. The importance of education is widely appreciated. With the advent of the Universal Primary Education programme, many of the lower income households can now afford to send their children to school. The lower rating of benefits by the lowest income households may be due to the fact that educating children is less of a priority than other immediate income generating activities. Although the difference is significant, it is not large.

3.5.4 Health Centre Infrastructure Development

Only 13.4 percent of the respondents had heard about the CC programme assisting in developing local health centres, and only 12 percent of the respondents felt a direct impact on their livelihoods. No significant differences in response patterns were seen between geographical regions, proximity to the park or by income quintile. Thus the support of health centres seems largely irrelevant, in terms of what local people perceive as their development priorities and thus in terms of having a conservation benefit.

3.5.5 Honey Production

Efforts to work on beekeeping and honey production have been ongoing for several years around PNV. As an income generating activity it is a means of directly improving incomes to those households involved with the activities. In terms of addressing a conservation issue, improved techniques may help to reduce the risk of fires in the park started by honey gatherers. 33 percent of respondents had heard about the honey production activities of the CC programme. However, only 20 percent of the respondents indicated that they were direct beneficiaries. More respondents benefited from the programme in the central and eastern areas than in the west (χ^2=19.096, d.f.=2, p<0.001). However, significantly fewer park-adjacent households benefited from the programme than non-adjacent (χ^2=37.488, d.f.=2, p<0.001). 16.2 percent of park-adjacent households indicated a direct benefit compared to 24 percent of non-adjacent households in the survey. In terms of income categories, higher income households more frequently rated the impact as very beneficial than the poorest households (χ^2=27.358, d.f.=16, p<0.05). There are of course limitations in the scope of honey processing to widely contribute to income generating around the PNV. Production of honey requires specialist knowledge, often passed down through generations, so only some households can be involved. In terms of participation by different income groups, the production of honey naturally requires investment in some equipment, e.g. hives, thus is not as accessible to the poorest households. Within the limitations honey processing seems to have a significant impact on welfare, but it is not an activity that can bring about widespread benefits.

3.5.6 Handicrafts Production

Several income generating projects have been developed in the region to assist local artisans to produce souvenirs for the tourist market. As with honey processing, this is an activity that is limited in scope to provide widespread benefits, as it relies to some extent on developing an individual's innate artistic abilities. Only 12 percent of respondents had heard about the handicrafts programme, with only 8.7 percent indicating that they received direct befits form it. There was a significant difference in regional benefits (χ^2=33.8, d.f.=2, 01, p<0.001), with the central area having the highest proportion of all beneficiaries (81 percent). Park-adjacent respondents were less likely to be beneficiaries than non-adjacent (χ^2=13.087, d.f.=1, p<0.001). 26 percent of all beneficiaries in this programme were from park-adjacent communities, compared to 74 percent from non-adjacent communities. Interestingly, there was no significant difference by income category, with 67 percent of beneficiaries ranking the impact as very beneficial. At least artistic talent and participation in handicraft production is not limited by socio-economic status.

3.5.7 Agricultural Improvement

Of all the areas that could be most beneficial to local households, agricultural development has the most potential. Agriculture and agricultural processing are the most widespread of activities affecting every household in the PNV catchment, yet it is probably the area that has received the least attention and investment since the advent of the CC programme. Accordingly, only 5 percent of the respondents were aware of any agricultural

development projects related to conservation. There was a significant difference in regional benefits (χ^2=10.054, d.f.=2, p<0.01), with the eastern area having the highest proportion of all beneficiaries (57 percent). No significant differences in benefits were seen by proximity to the park. No significant differences by wealth category were observed, however this may principally be due to too few observations per category included in the test. For those few households impacted by agricultural improvement projects, 80 percent score them as very beneficial.

3.5.8 Buffer Zone Plantation

In the establishing of the 6m buffer zone around the PNV, some local jobs were created in the planting and management of the eucalyptus forest. 84 percent of the respondents were aware of the buffer zone plantation activities, with 54 percent of the respondents indicating they had a direct benefit from it. There was no significant difference in responses between regional categories, or by proximity to the park. Between income categories, the lowest income groups were slightly less likely to benefit than the higher income households (χ^2=10.151, d.f.=4, p<0.05). Of the lowest income category, 57 percent scored it as a direct benefit, compared to 62 percent of the highest income category. In terms of impact, it was the lower income groups that were more likely to score it as very beneficial than the highest group (χ^2=41.661, d.f.=16, p<0.01): 66 percent of the lowest income category respondents scored it as very beneficial compared to 56 percent of the highest income group. This activity was widespread around the park having an impact on a large scale. Generally speaking, it impacted widely across all socio-economic groups, however the poorest probably had difficulty participating, as these households often have relatively less labour available in the home to participate in such activities.

3.5.9 Conservation Education

Conservation education activities focus on two main groups, adults and youth. The respondents in the survey were all adults and therefore they may not have been aware of the conservation education that goes on in schools and is widespread around the national park. Thus the focus of these results is on adult conservation education, which is restricted mainly to the national park service CC programme. 43 percent of the respondents had heard about the national park CC education programme, with 32 percent of the respondents having been directly involved in it. No significant differences in exposure to the programme were found between regional groups of sectors, proximity to the park or income group. In terms of impact, 52 percent rated it as very beneficial, whilst 43 percent rated it as not beneficial. This polarized split may be due to the fact that some may have interpreted the question as meaning what was the impact in terms of improving their welfare and some may have been considering the impact as simply building awareness. Regardless, it is clear that the CC unit of the national park has made a systematic effort to ensure uniform coverage of the PNV impact area in awareness raising and has had a noticeable effect.

3.5.6 Development Impacts of Community Conservation Activities

In order to assess the development impacts on communities from typical CC activities, respondents were asked to indicate if they were firstly aware of the project and its link to conservation and secondly if they considered themselves to be direct beneficiaries, either through participation in implementation - e.g. income from building the buffalo wall - or through directly experiencing the intended benefits of the project - e.g. lower crop raiding or improved access to water. Table 3.54 below shows the proportions of the respondents' awareness and benefits.

Table 3.54 Awareness and Beneficiaries of Community Conservation Activities

Community conservation activity	Type	Awareness % of sample	Direct Beneficiary % of sample
Buffalo Wall	Social infrastructure	100.00	89.74
Public Water Tanks	Social infrastructure	60.79	46.32
School Infrastructure	Social infrastructure	47.11	36.84
Health centre Infrastructure	Social infrastructure	13.68	11.58

Honey production	Income generation	34.47	19.47
Handicrafts production	Income generation	13.16	8.42
Agricultural improvement	Income generation	5.00	2.89
Buffer zone plantation	Social infrastructure	85.79	50.00
Conservation education	Education	42.63	30.0

In general, social infrastructure projects and education create more awareness, can impact on more people about conservation issues, and help to improve attitudes, typically having higher response rates than income generation projects e.g. 100 percent awareness of the buffalo wall and 87 percent direct benefits compared to 13 percent awareness for honey production and 2.89 percent direct benefits.

Table 3.55 examines the ranking of impacts from the various CC activities. Those direct beneficiaries were further asked to indicate how much the projects impacted their livelihood as a measure of the significance of the project.

Table 3.55 Rankings of CC Project Impacts

Community conservation activity	Type	Impacts % of Direct Beneficiaries			
		Very Beneficial	Beneficial	Little Benefit	No Benefit
Buffalo Wall	Social infrastructure	65.71	15.18	14.66	4.19
Public Water Tanks	Social infrastructure	64.40	3.24	8.74	23.62
School Infrastructure	Social infrastructure	61.34	1.42	1.06	36.18
Health Centre Infrastructure	Social infrastructure	30.93	0.04	0.00	66.95
Honey Production	Income generation	52.10	6.51	4.22	37.17
Handicrafts Production	Income generation	77.16	3.87	3.02	15.95
Agricultural Improvement	Income generation	81.41	0.93	1.86	15.80
Buffer Zone Plantation	Social infrastructure	50.56	9.04	11.02	29.38
Conservation Education	Education	51.03	1.38	2.07	45.52

Generally, income generating projects and social infrastructure projects focusing on key livelihoods constraints or with indirect income generating potential showed a slightly higher impact of benefits than other projects. This is simply because these projects put money in households' pockets or directly eased the general living conditions. As such, they are more likely to influence behaviour towards the park.

To understand the variable impacts of these projects on income groups, a sub-set of data was analyzed to see from which income groups the proportion of project direct beneficiaries scoring the projects as very beneficial came from.

Table 3.56 Development Impacts of Community Conservation Projects between Income Groups

% of direct beneficiaries ranking very beneficial		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	
Community conservation activity	Total % of sample	Lowest 20%	Lower Middle 20%	Middle 20%	Upper middle 20%	Highest 20%	Chi Sq P value
Buffalo Wall	89.64	14.30	18.66	17.54	19.16	19.98	ns
Public Water Tanks	46.32	3.50	8.55	9.81	13.30	11.17	<0.001
School Infrastructure	36.74	4.68	6.77	5.97	8.16	11.15	<0.01
Health Centre Infrastructure	11.87	0.58	1.64	2.22	3.57	3.86	<0.05
Honey Production	19.47	1.32	1.88	5.64	6.11	4.51	<0.001
Handicrafts Production	13.16	2.46	2.46	1.59	3.76	2.89	ns
Agricultural Improvement	5.00	0.00	1.55	1.03	2.41	0.00	<0.05
Buffer Zone Plantation	85.64	15.64	20.75	12.85	15.64	20.75	<0.05
Conservation Education	42.76	4.26	6.93	9.59	10.79	11.19	ns

Significantly it was most often the poorest households that scored the least benefits, with the notable exceptions of buffalo wall, handicrafts production and conservation education. The poorest households are often furthest from community centres, less likely to send children to school or able to afford healthcare, and lack the skills or resources to participate in technical improvement projects. However, they are the groups that are generally considered to be the most likely to illegally use the park, which indicates that the CC programme needs to more effectively target the lowest income groups.

4.0 Conclusions and Recommendations

4.1 Reconciling Development Needs with Conservation Challenges

Evidence from previous studies indicates that it is the poorest households around PNV that are actively engaged in illegal activities in the park. Other evidence not presented in this summary, but collected as part of the PRA study, also supports this thesis. The use of the park was clearly linked to seasonal stresses in the dry season, when poor households went to look for bush meat and other NTFP as sources of income. More generally uses of the park were linked to acute constraints in resource access, such as fuel wood and domestic water. If we accept the assumption that resolving such welfare problems in park-adjacent communities can lead to improved conservation outcomes, addressing such key constraints is essential. Thus the conservation of the park is clearly linked to resolving these key resource constraints.

The efforts to date are widely appreciated, but to what extent they actually are able to influence household behaviour toward the park is extremely difficult to assess - e.g. direct cause and effects. The law enforcement environment around VNP is quite unique. The park's prominence at the frontier with DRC ensures a heavy military and police presence, making movements or incursions into the forest by local people difficult. This impact in reducing illegal activities should probably not be underestimated.

4.1.1 Agriculture in Poverty Alleviation

Living standards of the lowest two quintiles were extremely poor. Important determinants of the living conditions of households and their members will be the economic activities in which they are engaged and the returns they are able to attain in these activities. For many households, poverty may be associated with having too much labour (given available land, capital or demand), which is likely to manifest itself in underemployment or unemployment. For other households though, it may be associated with too little labour, with members working long hours, typically at low returns, and so in a situation of time poverty to add to their other dimensions of poverty (these pressures may imply lower school attendance by children of these households).

It is clear that poverty is disproportionately concentrated among households whose primary livelihood is agriculture; the poorest also have the smallest land holding. There is very little other diversification in households' economic activities. Once again, the prevalence of agricultural activity is apparent, especially among the poor, and the majority of households appear to have few other alternatives. Agriculture must be a central element of poverty reduction and income generation strategies. It is therefore particularly important to understand the factors behind the low income levels of many of those working in this sector. Some initial key issues explored here are ownership of land, ownership of livestock, patterns of crop cultivation and the use of output, and the use of inputs in crop cultivation.

4.1.2 Land Ownership and Access

Access to land is clearly a key issue. Farms of this size are generally quite inadequate to support a household at a reasonable level, especially where the land is of poor quality. To add to this, few agricultural households have the opportunity to raise their incomes by being engaged in off-farm activities. The implication here is that there is a high vulnerability for households owning small land sizes, given that the majority of the households in the survey survive on subsistence, and at a low level. Besides the fact that a large proportion of poor households own some agricultural land, the practices of land renting, share-cropping and lending also exist. The implication of this case is that people, particularly the financially constrained poor, would not make long-term investments where land is being rented, and the land law ought to address this problem. Security of land tenure is a particularly factor important here.

4.1.3 Land Productivity

From this study's findings, the productivity of the land is the most highly ranked problem, yet knowledge of soil fertility management seems to be poor. Moreover, for the poorest farmers with the smallest holdings, the use of traditional techniques to maintain productivity is not possible. The income data shows that as farm holding sizes shrink, income per unit area of land also reduces. Although subdivision in terms of formal ownership/use right is prohibited below a minimum parcel size, in reality the use rights are traded informally. Interestingly, the data showed that below a certain income threshold a different strategy of farming was adopted (low technology and

high labour). This is partly consistent with findings of Clay et al (1996), who reasoned that farmers on smaller holdings intensify their farm operations through more rigorous use of available family labour, a substitution toward higher-yielding crops, sowing seeds more densely, and growing more crops in association. However, the key bottle neck for these poorest farmers is likely to be the inability to afford the improved seeds and agricultural inputs.

However, Clay et al (1996) reports that paradoxically, despite heavier investments, Rwandan farmers do not report a significantly greater improvement in productivity on parcels they own, than on parcels they operate as tenants. This may be due to the fact that owner-operated parcels have been cultivated over a longer period (23.2 years on average), compared to only 10.7 years for holdings operated under lease agreements. The implication here is that the levels of investment farmers are currently making merely compensates for the number of years of intensive cultivation and the loss of nutrients associated with this "mining of the soil," a problem identified as one of the major barriers to agricultural growth and sustainability across the entire highland region of East Africa. The long-term sustainability agriculture will be challenged by continued population growth and resource scarcity. Demographically induced changes in the structure of landholdings exert an appreciable impact on reported changes in soil productivity, to the extent that population pressure has contributed to less stable land use rights (e.g. sub-leasing rather than ownership), expanded use of more distant and fragile lands on steep slopes, and longer periods of use without fallow. There must be incentive schemes, locally sponsored, that simultaneously extends viable technologies to farmers and encourages them to adopt those best suited to their own particular needs. The integration of trees into cropping systems, for example, has not yet been well-extended in Rwanda, despite the reported successes of on-station research trials (Yamoah, Grosz, and Nizeyimana 1987). Green manure is applied to less than 2 percent of farm holdings, and hedgerows are grown on just 22.7 percent of holdings. Soil conservation and fertility management in Rwanda is still a long way from what has been achieved in Nepal, Peru and the Mandara Mountains of Cameroon and in other regions where mountain agriculture prevails, but the general policies have been initiated to achieve this and there is a growing body of national "know-how".

4.1.4 Poverty Alleviation versus Income Generation

From the demographic data presented, there are clear indications that mean household land holdings are decreasing and family sizes are increasing on previous data. Data presented on household assets and their value also shows that the lowest two quintiles are not endowed with a sufficient set of assets to enjoy a sustainable livelihood. These bottom two quintiles are in a state of abject poverty, existing well-below the minimum US$1 per day poverty line. There exists a conceptual paradigm between poverty alleviation and income generation in that the latter may not necessarily imply the former. With the resource constrained households as in the lowest quintiles development interventions need to focus on basic food security and well-being. The critical bottleneck for these households is obtaining the minimum necessary means for a sustainable livelihood -- i.e. they are inadequately capitalized. For households in the middle and upper quintiles it is more a question of utilizing the resources at hand more efficiently to produce greater volumes of agricultural output and improve on profits.

This is important from a conservation perspective as the poorest households are also most likely to be illegally utilizing the national park, having labour, but no land or employment on which to expend it. Fundamentally, this means that achieving welfare developments with the poorest groups will not be the same as the approaches that can be used with the upper quintiles. The focus needs to be on simple interventions such as revolving funds (cash or livestock), subsidized or free basic inputs to improve productivity. Essentially this is risk sharing. To encourage highly risk-averse rural households to adopt new technologies their losses need to be guaranteed in some manner.

Critically there needs to be a large capital investment in order to raise the performance of the agricultural sector to a level that can be sustainable.

4.2 Recommendations for Development Interventions That Might Best Support Conservation

Based on the above conclusions some recommendations are presented below on the key development activities that will most likely lead to improved conservation. It is important to understand that the challenges of the rural poor are multifarious and require comprehensive sustained efforts to make the profound changes to their welfare that will ultimately make a significant change to their development status. It is unimaginable that any one of the recommendations provided here will lead to a significant change on their own; change will require a mixture of some if not all of the approaches. Utilising the framework of recommendations promulgated by Plumptre et al (2004) immediate action is required under the following areas:

Improve food security amongst the poorest. Efforts to improve agricultural productivity and food storage may significantly improve the welfare of the poorest households. This will require linking with organisations able to provide appropriate advice on sustainable agricultural practices, agricultural extension and training, as well as appropriate technologies. Fundamentally for conservation organisations, this means prioritizing the rural development activities of the poorest households around the VNP.

Develop income generating potential of current and alternative household activities. Generally, people in this region are some of the poorest in Africa in income terms. Developing the potential of existing activities as well as introducing alternatives is essential. This implies a range of activities from agricultural production improvements to increase efficiency and profit, crop marketing to improve output price at the farm gate, to added value activities such as agri-processing - e.g. potato chips or freeze dried instant potato powder. Alternative activities such as handicrafts and community tourism are also important, but less likely to provide impact on a large scale. Poor market access is a critical factor associated with forest dependency. Enabling remote rural communities to trade more effectively in local markets would assist in reducing forest dependence. Better knowledge of market prices would be one way of achieving this, as would the development of producer/marketing groups. Support for such activities may be found from such organisations as the IITA Foodnet programme, the USAID funded SPREAD programme in Butare. There is potential to help communities in this region add value to products they sell, and improve export goods production, e.g. pyrethrum, by using the conservation of the forests as a niche-marketing tool. Apart from production efficiency there are broadly two ways of making this work: firstly, by directly marketing products from communities who live around the protected areas, cutting out middlemen and reducing transactions costs to improve farm gate prices; secondly, through the added value of marketing the 'green' credentials of products to improve on farm gate prices. The role and value of potatoes as a cash and food security crop should not be under looked. Currently anecdotal evidence suggests that potatoes may yield the highest gross margins of any crop. This is an excellent opportunity to explore added value activities with potatoes, e.g. freeze dried instant mashed potato powder.

Ensure adequate provision of credit facilities. Access to credit to make investments in agricultural or business enterprises needs to be made widely available. Here we need to consider credit any form of borrowing not just credit form the banks. The poorest households may need credit on social terms - e.g. revolving funds in a community - or livestock funds - e.g. where a person is given a goat and passes on the first female offspring to another. In the case of cash crop production, pre-financing by the private sector marketing or processing companies could be investigated - e.g. pyrethrum farmers could be supported with a technology package under contract to supply a specified amount and quality of produce to the input supplier. We have to think more broadly than simple bank lending on interest terms when considering poverty alleviation. This is justified in terms of the public interest in achieving certain levels of development.

Supply water to communities around Virunga Volcanoes. Most of the communities living adjacent to the PNV in Rwanda entered the forest to collect water. This can take up some considerable time that could be better used elsewhere if it was available. In doing so, some people may become involved in other activities in the forest, which are illegal. Supplying water to communities living outside the forest through boreholes and rainfall collection methods will not only aid these people by freeing up time but also help protect the forest. In addition, there are significant health issues related to poor water supply around the park - e.g. seasonal typhoid outbreaks in the dry seasons when water is scarce. Fortunately a UNICEF and MININFRA programme is currently being implemented in Musanze and Bulera Districts to address rural water access

Community conservation projects need to take place with law enforcement and monitoring. The increased positive relationship between people and the park in areas where projects have been operating over the past 10 years is a good sign, as seen in recent experience from Bwindi, Uganda. CC planning should take this into account and also contribute to the support of community-friendly law-enforcement activities in parallel with supporting the local communities. Making the links clear as to why policing is important and that in the long term it can benefit people is needed so that they better appreciate the role of park authorities. Importantly, should community conservation efforts include community use or management, there is still a pressing need for third party monitoring and enforcement of regulations to ensure sustainable harvesting limits are adhered to. Emerging evidence from around Bwindi Forest in Uganda and other CC programmes worldwide can provide useful lessons.

Further develop and expand the conservation education programme. The recently formed community conservation department in the RDB-T&C coupled with the revenue sharing programme has done much to improve the local public opinion about the national park and conservation. Further conservation education in the local communities about the biodiversity and importance of the park to the local and national ecosystem will continue to build good relationships. The investments in this and all other areas of community conservation will be essential to keep pace with the growing challenge of increasing population.

Improve coordination and synergies between conservation and development projects. Conservation projects are trying to not only conserve the national park in this region but also support the development of local communities. However, there are much larger sources of funds for development and many different development projects nationally. Many of the needs identified in this study could be supported by development projects already working on the issues, but who are not linking the activities to the conservation of the national park. A notable exception is the EEEGL (CARE and IGCP) project and more initiatives of this type should be encouraged.

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Appendix 1 Detailed Method

Parc National des Volcans Socio-Economic Monitoring Methods

Assessing Costs and Benefis from Community Conservation Interventions

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Date: April 2009

Part I PNV Socio-Economic Monitoring Methods

1.0 Aims and Objectives of the Study and General Approach

1.1 Background

In the last few decades, conservationists have given much attention to what has become known as the "integrated conservation and development" approach to conservation. (Leach et al. 1999). The precise nature of the activities undertaken under the ICDP approaches are varied but can be basically categorised as activities that couple local economic welfare to the use of the PA or those that try to decouple local economic welfare from use of the PA (Barrow & Murphee 2001). For the purpose of this study it is important to distinguish between community conservation and integrated conservation and development programme approaches. CC is strictly speaking where communities are formally responsible for some form of direct management practices within the boundary of a protected area affecting its conservation status. ICDP are development projects designed to improve local welfare with the additional goal of reducing dependence on PA resources and to change people's behaviour towards the PA. The underlying premise is that communities can profit from PA-related development activities, i.e. through activities directly related to the PA, such as tourism and benefits to rural households either directly or indirectly through community projects run by NGOs (Kiss 2004; Newmark & Hough 2000; Romero & Andrade 2004).

Ferraro's (2001) narrative on the difficulty and complexity of implementing effective ICDP identifies three principal problems associated with using development interventions to protect ecosystems. First, given the complexity of development interventions and the temporal and spatial scales at which conservation objectives must be achieved, field practitioners must spread their resources over a multitude of tasks that often have no effect on conservation-related household behaviour. Second, when practitioners do manage to have a development effect, it is often an undesirable effect from a conservation perspective, i.e. improved income means that poachers can afford guns instead of snares (Brown 2003). Third, even if practitioners generate a desirable effect, they often have difficulty sustaining it because the effect depends on market conditions that change frequently. This has a knock-on effect on behaviour change in that as the market context is constantly changing so any given level of incentive may not continue to have the desired impact on behaviour in the future.

These general issues described above similarly affect many of the ICDP currently in operation in Rwanda and illustrate the need for accurate monitoring of the impacts of ICDP. For example, an innovative strategy in the last 5 years has been tourism revenue sharing. The basic idea is to spread the benefits of tourism revenue form the national parks with local communities, so that the community values (obtains direct benefit) the PA and the wildlife within it. Developing a sense of community ownership of the resources and tangible economic benefit form their existence would hopefully mitigate any negative impacts of living next to the PA (impacts of crop raiding or opportunity cost from loss of access to PA resources) and assist in community protection of the resource.

The study by Plumptre et al (2004) on socio-economic costs and benefits from protected areas in the Albertine Rift showed that tourism ranked very low as a benefit from the PA surveyed. Tourism was mainly perceived as being useful at a national level. It is clear that most tourism revenue does not accrue at the local level (Grosspietch 2007; Sabuhoro 2006). Developing the link in people's minds between tourism and other park benefits, especially revenue sharing, in all areas around the park should be part of the tourism development programme. However, the impact of tourism revenue sharing schemes in the community may be diluted due to the high population density relative to tourism revenue.

Many revenue sharing water projects have been successfully completed, but to what human and conservation effect? Clearly many people benefit from such interventions and generally communities appreciate them (Sabuhoro 2006), however the impacts on conservation are unclear. Anti-poaching data from the national park show that in recent years there may have been little or no change in the incidence of illegal activities including water collection in the park despite a corresponding increase in community conservation programmes (Sabuhoro 2006). Many of the poorest households live close to the park boundary, whilst the wealthier households live close to or in the village centres. Usually community water infrastructure is commonly set up in village centres for logistical reasons, i.e. the critical constraint being having a large enough roof of appropriate material as the rain water catchments, usually a public building. This means access to the infrastructure remains difficult for the poorest people in the community, assuming they tend to live farthest from community centres. If access to developments in social infrastructure is no better for marginal groups who are high risk in terms of illegal use of PA, then little impact on their behaviour towards PA can be expected. Monitoring if the distribution of benefits and changes in attitudes can help to assess if the programme is working as intended and what changes need to be made in order to make it more effective.

At a community level there may also be examples of park-adjacent communities in a better economic condition than communities further from the park boundary. In Kabatwa Sector, Nyabihu District in Rwanda, the people adjacent to the PA have cultivated potatoes as a high value cash crop. This may be as a result of local land scarcity, topography, soil or climatic conditions and such issues need to be objectively verified.

1.2 Aims and Objectives

Following recent discussions on issues to do with the need to set up effective monitoring and evaluation of community conservation initiatives between local stakeholders, DFGFI, IGCP and CARE International have agreed to embark on a collaborative approach to set up a programme of work to establish social and economic baseline monitoring indicators of the impacts of integrated conservation and development projects (ICDP) initiatives related to conservation efforts around the Parc National des Volcans, Rwanda. This approach is a pilot to establish a long term monitoring programme that can be utilized more widely in the region. As such, it is intended to be flexible, utilizing a selection of participatory and household survey techniques involving the collection of qualitative and quantitative data.

In recognition that the quantitative economic techniques may be difficult to replicate without specialist technical supervision and adequate funding, this methodology places emphasis on the collection and analysis of qualitative data, although the quantitative elements are included and elaborated as a ready reference for future exercises. It should be noted that the quantitative elements of the proposed method are essential in terms of accurately assessing the impacts of projects on human welfare and the resulting impact on people's behaviour towards the protected areas which we wish to influence. As such, we need to learn more about determining factors of local use of the PA and the role the PA play in local households sustaining their livelihoods. Thus the aim of this study is to qualitatively and quantitatively examine costs social and economic cost benefits and equity issues for households living next to the PNV in order to provide a baseline for monitoring impacts of ICDP activities and an objective means reviewing conservation policy and management practices.

The overall aim is to define and monitor development programmes and their resulting impacts on park-adjacent community welfare and subsequent attitudes and behaviour towards the protected area.

The objectives will be to:

1. Understand park-adjacent households social and economic costs benefits and attitudes towards the protected area as a baseline for monitoring future changes and impacts of community conservation programmes;

2. Define park-adjacent communities' resources and household livelihoods[1] in the EEEGL project impact area using a sustainable livelihood framework (e.g., DFID[2], CARE[3]);

3. Identify key entry points and resolve park and people conflicts using development methods to develop household capital and institutional processes in the park-adjacent communities;

4. Develop a social and economic monitoring strategy and methods for future use and examine the institutional and organisational basis for a long term programme;

The scope of the assessment shall cover livelihood and socio-economic analysis of the rural communities in the target area, including:

- Utilization of natural assets by rural communities, including seasonal patterns of resource portfolios, long term trends, access by different groups to the available range of economic assets, with particular attention to livestock, cropping practices, forest resources;

- Current natural resource management institutions governing resource access rights, resource use and management practices (formal and customary);

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[1] '*A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. 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.*' Adapted from Chambers, R. and G. Conway (1992) Sustainable rural livelihoods: Practical concepts for the 21st century. IDS Discussion Paper 296. Brighton: IDS.
[2] DFID, Sustainable Livelihoods Guidance Sheets, 2000; etc
[3] Refer to CARE HLS manual

- Vulnerability of existing local livelihood strategies, due to climatic, social, economic and other factors and trends, and coping strategies, with particular regard to food security;

- Human resources available to local communities, including traditional knowledge and skills, education indicators, constraints to increase human capital resources;

- Factors affecting access to available rural infrastructure and public services;

- Financial resources available to local communities, such as through remittance of migrant labour, patterns of utilization and potential for increased access to institutional support;

- Local perceptions on development needs and opportunities related to available livelihood strategies, to increase resilience, food security, improve living conditions;

- Household structures, economies and wealth distribution - sources of income from farming, harvesting and use of natural resources, remittances and other enterprises;

To this end the methods described below encompass a variety of participatory and household survey tools focused both at the community and household level. With the need for some components of the survey to be easily and relatively inexpensively replicable, we aim to adapt components of the social economic research methods to make it possible for staff of local stakeholders to collect the information needed in future rounds of M&E.

1.3 General Approach

It is envisaged that the survey teams will spend the first day (or two) in the community conducting participatory and focus group work detailed in Sections below. Subsequent days will be spent implementing the household survey Section below. The template is orientated towards forests at present, but can be easily adapted to other types of PA/resources.

Survey teams tended to be comprised of different mixes of people depending on the mode of questioning. PRA methods require at least 2 people per focus group, one to facilitate and one to record results. A focus group should be no more than 10 people in order to manage the process comfortably. If we use 3-4 focus groups this means that to cover all FG. Concurrently a team of 8 facilitators/recorders is necessary. Ideally the team should be comprised of neutral parties, i.e. not from organisations that may be the focus of local community criticism to allow free and open communication of concerns. Of course all bias may not be removed in such an exercise, but this approach can help to minimise it. However, it is essential to allow opportunities for local government to engage with communities in a participatory way; therefore, in addition to the survey team, local government representatives should be encouraged to take part perhaps as recorders to minimise influence in facilitation.

For the household survey a team of 5-6 enumerators were sufficient to cover the community level and household surveys described below. Interviews took about 2 hours per household so enumerators were able to conduct 3-4 interviews per day. Using 6 enumerators at 3 interviews per day the total amount of time taken to implement the survey in a community was around 2 days.

Enumerators were drawn from the community of recent graduates in the social, economic, or natural resource disciplines from Rwandan tertiary education establishments. Their technical disciplines already showed a demonstrated interest in issues related to rural development, poverty alleviation or conservation, as well as some basic research training. At a minimum secondary school levers that are literate and numerate can be used as enumerators, but this generally results in a lower quality of data due to less commitment to the issues and less training in research methods and the importance of good quality data.

The tools described in this document are orientated towards a community level and household level analysis shown in the table below:

Community Analysis	Household Level
Village Data Priority PA related Costs and PA Costs and Benefits Ranking PA Costs and Benefits Analysis	Wealth Ranking Household Economic Survey Household social costs and benefits Household attitudes

1.4 Sampling (Household Level)

Multi Stage Stratified Random Sample of Communities and Households will be used. The target population is all potential households within an Umugudugu (village) adjacent to the focal PA. A key assumption is that various income groups will use the forest resource in different ways and will display varying levels of dependence on the forest to maintain their livelihood. To date a number of different CC interventions have been piloted. Understanding the variable impacts of these interventions is essential in measuring their success and looking for opportunities to improve their local welfare and conservation impacts. To this end, a strata will be where communities have received some direct benefit form a CC programme and where there was none. In addition, the CC interventions have adopted different approaches, i.e. income generating or social infrastructure. Some measure of the variable impacts of different interventions is also necessary.

The sample organisation is summarized in the table below

Stage	Organisational Group	Strata	Selection Criteria
I	Umugudugu (village)	Contact/non contact community	Community bordering or overlapping with focal forest/PA
II	Contact community	Direct/Indirect beneficiary household	Households that had directly benefited from CC projects
III	Household	Rich, Middle, Poor, Landless	Participatory wealth ranking to develop indicators of categories

Stage I - Prepare a list of cells and their Umugudugu (villages) bordering the PA. Separate list into contact and non-contact communities, select x at random from stratified list;

Stage II- in a contact community list all households and separate list in to those who have directly participated in a CC project and those who have not. From the stratified list select x households from each strata at random;

Stage III- At the Umugudugu level, within each strata of direct/indirect CC beneficiaries, define the wealth group and sample proportionately form each category or simply take a random sample of respondents form the list of Umugudugu households;

This approach is flexible enough to allow for detailed examination of EEEGL project and other CC project impacts on an inter and intra-community basis as well as be representative of the broader sample population (park-adjacent communities) to be useful for future time series analysis, on a pooled observation basis, as part of a regular long term monitoring programme.

Part II Community and Household Economic and Social Cost Benefit Survey

2.1 Introductions

The first step before any questions are asked to the various focus groups or individual households should be the proper introduction of the survey purpose and goals and enumerators. It is important to ensure that the necessary formalities and clearances have been dealt with from local government authorities before presenting the survey at the local level.

In the communities it is necessary to give a good overview of the survey methods, objectives and organisations involved just to make sure that every one is clear about what will be going on and why.

An information sheet covering the basic facts will be provided to the survey team as a guide for introduction to communities during the survey.

2.2 Village Survey Data

This information is required for each of the villages in the survey. Most of the information can be obtained from secondary sources, key informants, focus group meetings, while some of the data will require simple measurements at the village level.

A. Geographic and Climate Variables

1. What is the name of the village?	
2. What are the GPS coordinates of the village? (taken from wherever, a focus group meeting is held if there is no obvious centre of community. *(UTM, WP34)*	Latitudes (UTM)
	Longitudes (UTM
3. What is the mean elevation (masl) of the village (or district)?	Masl
4. What has been the average annual rainfall (mm/year) in the district during the past 20 years? *(ref. district environment reports)*	mm/year
5. What is the coefficient of variation in rainfall for the past 20 years?	
6. What is the total land area of the village (km^2)? *(estimate from population size/land size per HH or other local government documents)*	km^2
7. What proportion (%) of the village land is covered by forest/woodland? *(estimate from local government documents)*	%

B. Demographics

8. For how many years have people settled in this village *(or settlement when large villages, cf. guidelines)? (Village social map see methods below)*	Years
9. What was the total population of the village 10 years ago? *(Population census data)*	
10. What is the current population of the village?	
11. How many households live in this village?	
12. What proportion of the total population has settled in the village over the past 10 years (in-migration)?	%
13. What proportion of the total population has left the village over the past 10 years (out-migration)?	%

C. Wages and Prices

		Male	Female
14. What is the daily wage rate for unskilled agricultural/casual **male/female** labour during the **high/low** season in this village (RwF/day)?			
	High		
	Low		
15. What is the main staple food in the village? *(Code-crops)*			
16. What was the price of a kg/bunch/basket of the staple	**Before harvest**		**After harvest**

food during the last year **before** and **after** the main agricultural harvest (in RwFr./kg)		
17. What is regarded as good agricultural land?		
18. What is the sales value of one hectare of good agricultural land in the village (i.e., within 1km from the main road or settlement, not degraded, not too steep, and suitable for common crops) RwFr./hectare		
19. Do traders regularly (at least once a month) visit the village to buy crops and/or forest products? *(0-1)*		
20. What other activities do you engage in after farming/cultivation?		

D. Infrastructure

21. What proportion (approximately) of the households in the village has access to electricity (from public or private suppliers)?	%	
22. What proportion (approximately) of the households in the village has access to tap/piped water?	%	
23. Do you have access to formal banking/saving institutions?		
24. Which banks and other formal credit institutions ?		
25. Are informal credit institutions such as savings clubs and money lenders present in the village? *(0-1)*		
26. Are there health centre in this village (how many)?		
27. Do you have access to communication facilities (e.g. telephone, fax, post box)?		

28. What is the distance from the village centre to the nearest …….. (in *minutes* by most common means of transport and in *km*)	i. district market	min	km
	ii. market for major consumption goods	min	km
	iii. market where the main agricultural produce can be sold	min	km
	iv. market where the main forest produce can be sold	min	km
	v. major road (useable all year)	min	km

E. PA User Groups (PAUG) or Community Conservation Groups (CCG)

29. Are there any organized PAUG/CCG in this village? (0-1)	
30. How many PAUG/CCG ((or similar[4]) are there in the village?	
31. When was the first such group formed? (year)	
32. How was that group formed? *Codes: 1=local initiative; 2=Initiative from NGO; 3=Initiative From Forest Department or government; 4=other, specify*	

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[4] This includes any groups or associations whose main function relates to forestry, i.e., producer organisations that include forest products in their portfolio, grazing associations, natural resources committees.

33. How is membership organized?		
34. What are the main tasks of the group? *(Tick as many as appropriate)*	1. Setting rules for use	
	2. Monitoring and policing	
	3. Silvi-culture & management	
	4. Harvesting forest products	
	5. Selling forest products	
	6. Other, specify:	
35. Has the PAUG/CCG over the last year imposed any penalties on those breaking the rules? *(0-1)*		
36. If yes, what type of penalties? *Codes: 1-fee (cash payment); 2=labour (extra work); 3=exclusion from group; 4=other, specify:*		
37. How many times per year does the PAUG have meetings? (If several PAUG, ask about the oldest one.)		
38. Do you get paid whenever you attend/participate in the PAUG meetings? If yes how much?		

F. Risk

1. Has the village faced any of the following crises over the past 12 months? *Codes: 0=No; 1=Yes, mild crisis; 2=Yes, severe crisis*	i. Flood and or excess rain	
	ii. Drought	
	iii. Wild fire (in forest/grasslands etc)	
	iv. Widespread crop pest and or animal disease	
	v. Human epidemics (disease)	
	vi. Political/civil unrest	
	vii. famine/hunger	
	viii. Refugee or migration infusion	
	ix. Other…………………….	

G. Development Services

2. Has the village received any direct benefits (e.g., cash payment) related to forest services over the past 12 months? *Codes: 0=No; 1=Yes, directly to households; 2=Yes, directly to village (e.g. development project); 3=Yes, both to household and village*		
3. If the village has received payment, Please indicate the amount the village has received (RwF)	**Type of payment**	**Amount (USD)**
	1. Payments related to tourism	
	2. Payments related to carbon projects	
	3. Payments related to water catchment projects	
	4. Payment related to biodiversity conservation	
	5. Others………………	
4. Has the village received any external support (government, donors, NGOs) in the forestry sector over the past 5 years? *(0-1)*		
5. Indicate type of support (in village narrative)		

2.3 Participatory Well-Being Ranking

Ask the participants to identify (make a list) all of the households in the community. Once all the households are listed, a group discussion follows on what constitutes wealth and well-being until agreement is reached on the main criteria. These criteria may include such things as type of house, number of livestock, cash remittances and food supply, as well as access to education and health care. Let them decide.

Questions To Ask While Facilitating
- How many households are there? Size of the households? What is the total number of people?
- Is the village growing or shrinking? Why? (birth-rates, out-migration, in-migration)
- Are families polygamous or monogamous? Are living arrangements by nuclear family or extended family? How are these defined?
- If the village has more than one ethnic group, caste or religion, are they found mostly in certain areas?
- Is there some part of the village where poorer people or landless people are concentrated?
- What are the local definitions for "rich" and "poor"? Which households are rich, poor or medium?
- How many households are female-headed? Is the number growing?
- How many households are child-headed? Is the number reducing?

An example of how household wellbeing categories might be depicted is shown below (poor household on the left and wealthier on the right):

Once the ranks have been ascertained, ask the group to place the listed households within each category identified. This will then serve as a sample frame.

2.4 Stakeholder Priority Costs and Benefits - Pair Wise Ranking

Pair Wise Ranking is a tool that helps us to learn about the most important issues of different community members in relation to their life next to the protected area. It also allows for easy comparison of different people's priorities

Many people's priority problems are those related to the day-to-day struggle to meet basic needs, while others stem from hopes for the future. Some problems are related specifically to gender issues, such as women's lack of control over key resources or the gender-based division of labour. Pair Wise Ranking highlights how the priority problems of women and men differ, and where they overlap. Similarly, the priority needs of members of different socio-economic groups are revealed.

Process

Organise separate focus groups: one from each identified wealth category. Make sure that a mix of men and women is included in each. Ask the participants to think about their local protected area costs and benefits (brainstorming) making reference to the key issues you have learned along the way. In discussion among themselves, ask them to list the 6 or so benefits and then about 6 costs (in any order) that are most important to them related to their interactions with the protected area.

Starting with benefits, write the list on both the vertical and horizontal axis of the prepared blank Pair Wise Ranking Matrix (see example). Also write each of the problems onto separate cards. Present a pair of cards (showing two different problems) to the group. Alternatively draw up the matrix on flip char paper and write in the list of costs or benefits. Ask them to choose the more important one. Record their choice on the prepared matrix. Ask them also to explain the reasons for their choice. Repeat until all combinations of cards have been presented and decided upon. Looking at the completed Pair Wise Ranking Matrix, count up the number of times each problem was selected and rank them. Repeat for the costs.

The three problems selected the highest number of times are the priority costs or benefits of the group. In addition, researchers could also organize a second set of focus groups - this time according to socio-economic group. Make sure that both women and men are in each. Repeat the exercise. Compare the learning's from the two sets of focus groups.

Discussing problems can encourage people to identify a wish list of needs, rather than issues that are appropriate for development activities. It is important to refer to the learning's from the previous focus group discussions and own knowledge of local issues.

Some Questions To Ask While Facilitating
- What are the different issues related to the PA identified by women and men? Which problems result from the gender-based division of labour or from other inequitable access to resources?
- Which problems are shared by both?
- What are the different problems identified by the different socio-economic groups?
- Which problems result from poverty or discrimination? Which problems are shared by all groups?
- Which problems relate to the development context, i.e. framework conditions such as park regulations? Which problems relate to the livelihood issues i.e. guarding crops against crop raiding animals? Both?
- Are the problems related to one another?
- Was there consensus or disagreement about the ranking of problems in order of importance?

Pair Wise Ranking Example Matrix and Scoring

Problems	Climate	Pests	Weeds	Costs of Inputs	Lack of Land	Lack of Irrigation	Lack of Tech. K.
Climate		Climate	Climate	Costs of Inputs	Climate	Climate	Climate
Pests			Pests	Cost of Inputs	Lack of Land	Lack of Irrigation	Pests
Weeds				Cost of Inputs	Lack of Land	Lack of Irrigation	Weeds
Costs of Inputs					Cost of Inputs	Cost of Inputs	Cost of Inputs
Lack of Land						Lack of Land	Lack of Land
Lack of Irrigation							Lack of Irrigation
Lack of Tech. K.							

Problems	Number of Times Preferred	Ran
Climate	5	2
Pests	2	5
Weeds	1	6
Costs of Inputs	6	1
Lack of Land	4	3
Lack of Irrigation	3	4
Lack of Technical Knowledge	0	7

2.5 Costs and Benefits Analysis Chart

Once the priority costs and benefits of all the different groups in a community are identified, it is time for further analysis. This is the purpose of the Cost/Benefit Analysis Chart. With this tool a selection of the priority costs and benefits are presented and discussed with the wealth group, showing where different people's priorities overlap and where they differ. It also allows for an expanded discussion of the causes of the problems, as well as current coping strategies, livelihoods impacts and possible solutions. Coping strategies are important to learn about because they may be strategies that can be built upon for development. We can also learn if efforts to address a particular problem have already been made, and have failed or have not addressed the problem completely.

Process

Plan and organise a meeting for different focus groups, i.e. wealth groups. The meeting should begin with a summary of the learning's thus far, beginning with a summary of findings from the priorities for development matrix. The presentation should be accompanied by the various maps, diagrams and charts produced by the participants. It is best if these are posted around so that participants can circulate them and look at each one. It is also appropriate to ask different members of the community who were involved in the particular exercise to stay by the posted graphics to answer people's questions. Depending on the size of the community, allow at least a couple of hours.

Prepare the Analysis Chart (see below for example) listing down the far left column the three priority costs and benefits identified by each of the different groups in the Pair Wise Ranking Matrix. Where a problem has been identified by more than one group, list the problem only once. In the second column, list the causes of the problems as identified in the Flow.

Present the Analysis Chart to the meeting. Review the costs and benefits and point out where priorities overlap. For each problem, present also the causes identified and ask if anyone has anything to add. Then ask people to explain what they currently do to cope with their problems. List the coping strategies in the third column. Finally, with specific reference to each cost or benefit, discuss opportunities for development asking both the local community members and any outside experts to contribute their ideas.

Use the following criteria to shorten the list: of problems: (a) when a problem has been identified by more than one group, list it only once; (b) when two or more problems are very closely related (sharing causes, effects and solutions), name them as one problem; and (c) when a problem has no local solution, e.g. climate, eliminate it from the list of problems (but do keep it as an important part of the development context).

Questions To Ask While Facilitating
- Which priority costs and benefits were shared by different groups? Which priority problems are related? Is there consensus or disagreement about which problems are the most important for the community as a whole?
- Did the outside experts identify additional causes of the problems? What are they?
- What are the current coping strategies? What are the gender implications? e.g. women go further and further to fetch water.
- How do the protected areas, i.e forests and wetlands, specifically assist in coping with identified problems?

Cost and Benefits Analysis Chart

Cost/Benefit	Livelihood Impact	Solutions *Costs – mitigation measures or coping strategies* *Benefits - improvements*
Benefit 1 Clean domestic water from the PA	Reduced cost of water purification. Few health problems and reduced related costs. Regular supply all year round	Improve distribution i.e. storage tanks in different parts of the village. Protect the water source better
Benefit 2 Supply of forest products	Available when there is little money or own produced food available. Reduces seasonal risks Fear of arrest/prosecution.	Legitimate access to the PA.
Cost 1 Crop raiding animals	Poor harvest. Fear of trampling by elephants or buffaloes	Dig a ditch or plant a hedge to prevent animal incursions into village
Cost 2 Limited land to expand in to	Not enough food for the family No income from cash crops as need to plant food crops	Intensify agriculture. Promote other income generating activities. Create employment opportunities for cash income.

2.6 Household Survey

Section A. Household Information

Name of enumerator………………………………… Date………... Time start:…… Time end:……

1. Information on Interviewee/s

1.1	**Name of Village**		
1.2	**Distance of house to the PA boundary[5] or GPS reading**		
1.3	**Does Household have an arrangement to access resources from the PA**	1.3.1 Yes	1.3.2 No

Interviewed? Tick as appropriate	
1.4 Female headed household (unmarried, separated, divorced or widowed)	1.5 Child headed household[6]

1.6 Household Composition
Can you tell us about the composition of your household (see guidelines on definitions), the members, their age, gender and educational level?

---

[5] If within the PA then "0", otherwise estimate distance in kilometres to the nearest 0.1km
[6] Under 18 years

Household member	Relation to hh head (See codes below)	Age (years)	Sex (M=male F= female)	Formal Education Level (N=none; P=Primary; S= Secondary, H=Higher)
1	Household head			
2				
3				
4				
5				
6				
7				
8				
9				
10				

Relation to hh head codes: 1: Spouse; 2: Son/daughter; 3: Son/daughter in law; 4: Grandchild; 5: Mother/father; 6: Mother/father in law; 7: Brother or sister; 8: Brother/sister in law; 9: Uncle/aunt; 10: Nephew/niece; 11: Step/foster child; 12: Other/Not related.

1.7 Do any of the household members occupy a local administration leadership position?
Identify which member……..

2. Rapid Social Impact Assessment

In his section of the questionnaire each question has two parts:

a) Go through the list of possible **effects** asking simply whether this effect is significant. If no then leave blank. If yes then mark a "+" in column 3 if it delivers a benefit, or "-" if a cost. Clarify with a brief explanation where necessary. For the effects that are identified as delivering a benefit/cost and ask about the relative impact of this benefit on the well-being of his/her household.

b) Where effects that have been marked as delivering a cost and ask the about the relative **impact** of this cost on the well-being of his/her household. Score impact on the household as High (3), Medium (2), Low (1)

*The **effect** is what has changed, and scored according to how much of a change has occurred. The **impact** is then scored on how the effect makes a difference to the household livelihood. For example, an effect might be that households can no longer access timber due to changes in access rights this might be scored as a -3 (high cost) effect having a 3 (High) impact on the household. Alternatively, households might be allowed access to the forest to harvest medicinal plants this could be a +3 (high benefit) in terms of the change in benefits, but having only a 1 (low) impact on the household, because they don't harvest medicinal plants very often and it is not an important part of their livelihood.*

	Direct or indirect <u>effects</u> of the PA on:	**Benefit or <u>Cost</u>**	**Impact on HH**	**Explanation**
Natural capital: Natural resource stocks from which the goods and services needed for livelihoods are derived				
2.1.	Has The PA/NP had an effect on your access to farming land?		2.1.1	2.1.2
2.2.	Has The PA/NP had an effect on your agricultural productivity in any other way (specify)		2.2.1	2.2.2
2.3.	Has The PA/NP had an effect on access to grazing for livestock		2.3.1	2.3.2
2.4.	Has The PA/NP had an effect on		2.4.1	2.4.2

	Direct or indirect <u>effects</u> of the PA on:	<u>Benefit</u> or <u>Cost</u>	<u>Impact</u> on HH	Explanation
	access to water for livestock			
2.5.	Has The PA/NP had an effect on your livestock productivity in any other way (specify)		2.5.1	2.5.2
2.6.	Has The PA/NP had an effect on your access to trees for timber		2.6.1	2.6.2
2.7.	Has The PA/NP had an effect on your access to firewood		2.7.1	2.7.2
2.8.	Has The PA/NP had an effect on your access to non timber forest products (specify which)		2.8.1	2.8.2
2.9.	Has The PA/NP had an effect on rainfall amount or patterns		2.9.1	2.9.2
Physical capital: Basic infrastructure to support livelihoods, and the tools and equipment people use to function productively				
2.10.	Has The PA/NP had an effect on road development or maintenance		2.10.1	2.10.2
2.11.	Has The PA/NP had an effect on water infrastructure development or maintenance		2.11.1	2.11.2
Social capital: social resources upon which people draw in pursuit of livelihoods, e.g. vertical networks (patronage), horizontal networks, group membership, other social relations that facilitate cooperation, reduce transaction costs and/or act as safety nets.				
2.12.	Has The PA/NP had an effect on social relations/conflict within your community		2.12.1	2.12.2
2.13.	Has The PA/NP had an effect on social relations/conflict between different communities		2.13.1	2.13.2
2.14.	Has The PA/NP had an effect on the level of support to your community from NGOs		2.14.1	2.14.2
2.15.	Has The PA/NP had an effect on your social status/influence within your community		2.15.1	2.15.2
2.16.	Has The PA/NP had an effect on the level of security for people		2.16.1	2.16.2
Human capital: skills, knowledge, ability to labour and good health people need to achieve their livelihood objectives				
2.17.	Has The PA/NP had an effect on availability and/or quality of education or health services?		2.17.1	2.17.2
2.18.	Has The PA/NP had an effect on school attendance of your children		2.18.1	2.18.2
2.19.	Has The PA/NP had an effect on your knowledge and skills?		2.19.1	2.19.2
2.20.	Has The PA/NP had an effect on the time you have available for your farming and other activities?		2.20.1	2.20.2

	Direct or indirect <u>effects</u> of the PA on:	Benefit or <u>Cost</u>	Impact on HH	Explanation
2.21.	Has The PA.OR NP caused any population in migration?		2.21.1	2.21.2
2.22.	Has The PA.OR NP caused any population out migration?		2.22.1	2.22.2
Financial capital: financial resources people use to achieve their livelihood objectives, including flows (e.g. pensions, remittances, regular income) as well as stocks (cash, savings, loans, debts) that contribute to consumption as well as production.				
2.23.	Does you HH have income from employment related to The PA/NP		2.23.1	2.23.2
2.24.	Does you household incur fines?		2.24.1	2.24.2
2.25.	Has The PA/NP had any other effect on your HH income (specify)		2.25.1	2.25.2
Livelihood outcomes: other direct or indirect effects of the PA on livelihood outcomes, e.g. income, food security, self-esteem, sense of control and inclusion, physical security, health status, access to services, political enfranchisement, cultural heritage etc				
2.26.	Has The PA/NP had an effect on availability of transport (other than effects on road infrastructure)		2.26.1	2.26.2
2.27.	Other.(probe to identify any other significant effects.)		2.27.1	2.27.2

3. Attitudes Towards the Protected Area

3.1 The PA/NP was created over 80 years ago. Do you think that this was a good thing to do?
    3.1.1 0 No   1Yes   2 Not sure
    3.1.2. Why?...

3.2 How do you consider/rate the relationship between you and The PA/NP?
  1)Good. 2)Average 3)Could be much better 4)Indifferent or not applicable

3.3 Why?

3.4 Do you feel that you get a fair deal from the PA
    1 Yes 2. No
    What could be done to make this a more equitable arrangement/fairer deal?

3.5 How would you score the overall impact of The PA/NP on your household?
    3.5.1 Positive: High (+3), Medium (+2), or Low (+1)
    3.5.2 Negative: High (-3), Medium (-2), or Low (-1)

Section B. Economic Survey

 1. Assets

1.1a Land Holding/Transactions

Please indicate the amount of arable land (in hectares - ha) that you own or had access to during the last year.

How much agricultural land do you own?	*Ha*
Of the land that you own, how much is under: a. cropping by the household	*Ha*
b. fallow/idle	*Ha*
c. pasture	*Ha*
d. rented out	*Ha*
If rented out land, what was the contract? Code: 1: fixed rent; 2: share cropping;	
What was the payment (for fixed contracts, and as % of crop to you (the owner) when share cropping)	
How much land did you rent-in to cultivate?	*Ha*
If rented in land, what was the contract? Code: 1: fixed rent; 2: share cropping;	
What was the payment (in RwF for fixed contracts, and as % of crop to the owner when share cropping)	
Are any of the mentioned holdings outside of the village?	
If yes what proportion?	
Where are these located? (Distance from home km)	

1.1b Land allocation

F2: To whom are the field(s) allocated?……………………………………………………….

F3: Who allocated the piece(s) of land?…………………………………………………..

F4: When did this allocation take place?…………………………………………

F5: Has the household extended their arable land area since their original allocation?
YES☐   NO☐
F6: If F5 is YES, what was the main reason for this?………………………..…………………
………………………………………………………………………………………………..

F7: Has the household ever allocated land to a woman? YES☐ NO☐

F8: If F7 is YES, to whom and for what purpose? …………..…………………………………
………………………………………………………………………………………………..

F9: Can a woman inherit either part or all of land?   YES☐   NO☐
F10: If F9 is YES, from whom?…………………………………………………………………...

1.2 Savings

a. Does the household have any savings in banks, credit associations or village savings and loans associations? *(0-1)*	
b. If Yes, what is the total amount of your savings?	

1.3 Implements and Other Large Household Items

Please indicate the number and value of implements and other large household items that are owned by the household.

	No. of units owned	Total value (current market value, not purchasing price)
Car		
Tractor		
Motorcycle		
Bicycle		

Handphone/phone		
TV		
Radio/cassette		
Charcoal stove for cooking		
Spray pump (for potatoes)		
Chainsaw		
Rain Water tank		
Hand cart		
Shotgun		
Others (worth more than approx. 50 USD)		

1.4 Forest/Wood Resource Base

a. How has the household responded to forest resource decline (rank max 3):		Rank
	Increased planting of (fuel wood and fodder) trees on private land	
	Increased purchase of commercial fuels	
	Increased use of agricultural residues (as fuel and fodder)	
	Decreased need for use of fuels, such as using improved stove	
	Changed animal feeding system, such as zero-grazing or stall-feeding	
	Increased sale of crops and livestock products	
	No responses required as still sufficient forest resources available	
	Other, specify	
b	What fuel do you principally use for cooking in the home	Wood
		Charcoal
		Paraffin
		Other
1.5	Where do you get your fuel from?	
1.6. Does your household have any planted woodlots? (0-1)		
1.7. If YES	i) How many hectares of planted woodlots does the household have?	Ha
	ii) What is the main purpose of the trees planted? *Please rank the 3 most important purposes*	*Purpose* / *Rank*
		1. firewood for domestic use
		2. firewood for sale
		3. fodder for own use
		4. fodder for sale
		5. timber/poles for own use
		6. timber/poles for sale
		7. other domestic uses
		8. other products for sale
1.8. Does the household have any agro-forestry fields? (Yes/no)		
1.9. If yes, approximately how many ha of planted agro-forestry?		ha
1.10. What are the main agro-forestry products? (Rank 3 most important)	Product	Code-product
- Rank 1		
- Rank 2		
- Rank 3		

2. PA Product Markets

a) What is the forest product that gives the household the highest cash income (including income from barter trade)? *Use products codes*		
b) Where does your household sell this product? *Please rank the top 3 markets*	*Rank*	*Type of market (code market)*
	1.	
	2.	
	3.	
c) For how long have you been selling to the main market/agent (rank 1)?		years
d) What is the distance you have to transport the forest product from your house to where you sell it?		km
e) What is the mode of transportation to the market? *Codes: 1=walk; 2=bicycle/wheelbarrow; 3=animal transportation; 4=vehicle (car, bus); 5=boat; 6=other*		
f) If you sell to a trader/organisation/agency, do you get any credit/loan from them? *Codes: 0=No; 1=occasionally; 2=often/usually*		

3. PA Income

1. Do you sometimes use the forest?

2. How far is it to the forest in km?

3. How long does it take to walk there?

4. Your household is involved in different activities to generate subsistence and cash income: How would you compare forest activities to the other activities when it comes to …….. *Codes: 1=forest activities (FA) score better; 2=FA about the same; 3=FA score lower; 4=don't know*		**Code**
	i) Food security	
	ii) Profitability (cash/day of work)	
	iii) Level of risk	
	iv) Enjoyment of the work	
5. What changes do you think would be most important to increase the income from forests? *Please rank the 3 most important*		**Rank**
	i) better access to the forest	
	ii)better protection of forest (avoid overuse)	
	iii) better skills	
	iv) better access to credit/capital	
	v) better access to markets	
	vi) reduced risk	
	vii) Other, specify	
6. Have your household over the past 5 years used forest income to invest in any of the following	**0-1**	**Approx. amount**
a. Education for the children		
b. New/Improved house		
c. Investment in forest business		
d. Investments in agriculture		
e. Investments in other business		
f. Buying other major assets (e.g. iron roof, rain water tank, land, motorcycle, etc.)		

7. In Which months do you experience high cash expenses and what are they?	
Expense	**Month**

8. Which months of the year do you use the forest most?

Month	Reason

9. Which months is food scarce or expensive?

Month	Reason

4. Risk

1. Has the household faced any major income shortfalls or large expenditures during the last year?

Event	Code [1]	Estimated income loss or costs
Harvest/crop failure (including wild animal damage)		
Serious illness in family (unable to work for more than one week)		
Death of adult member		
Weeding		
Land loss (expropriation, etc.)		
Livestock loss (theft, drought, etc.)		
Other asset loss (fire, theft, etc.)		
Lost job		
Other: _____		

1) For each, use the following codes: 0=no; 1=yes, mild crisis; 2=yes, sever crisis. See guidelines for definitions.

*2. If at least one adult member of the household has been unable to work due to illness over the last 12 months please indicate the number of **man-days** lost due to illness and the **medical costs incurred by household***

Relationship with household head *See codes*	Man-days lost	Total medical costs

3. How did you cope with the crisis mentioned in the first question (not just health related)? (Rank maximum 3)

	Rank
Harvest more forest products	
Cash savings	

Sell assets (land, livestock, etc.)	
Casual labour work	
Assistance from friends and relatives	
Assistance from NGO, community org., religious org. or similar	
Get loan from money lender, credit association, bank etc.	
Tried to reduce consumption	
We did nothing in particular	
Others, specify:	

5 PA Services

5.1 Has the household over the past 12 months received any cash payments related to the following forest services?

	Code: 0-1	**If yes, indicate amounts received**
Tourism		
Carbon projects		
Water catchments projects		
Biodiversity conservation		
Others, specify:		

6. Forest/Land Clearing

a) Did the household clear any forest or wood lot for agricultural purposes the last year? *0-1*		
b) **If YES,**	i) how much land was cleared?	Hectares
	ii) what was the cleared land used for? *Codes: 1=cropping; 2=pasture*	
	iii) If used for crops, which crops were grown? *Code-product (can have more than one)*	
	iv) That type of forest did you clear? *Code-forest.1-natural primary, 2-secondary 3-forest fallow land p-private land, s-state land c-community land, t-customary tenure land*	
	v) If secondary forest, what was the age of the forest (rotation period)?	years
	vi) How far from the house is the new plot located?	km
c) Has the household over the last *five* years cleared forest for agricultural purposes? *0-1*		

7. Income from Agriculture, Crops and Land Management Practices

Note: This includes both annual and perennial crops, i.e., it should include agro-forestry, woodlots etc. See also guidelines.

7.1 Please indicate the quantity and values of crops you harvested during the last 12 months.

Crops	Code product	Production (No. of units)	Unit measure	Family consumption	Sale	Price/unit

Note: Production = Family consumption + sale.
See technical guidelines for code list.

7.2 Please indicate the quantities and values of inputs used in crop production over the last 12 months (this refers to agricultural cash expenditures).

Inputs	Unit	Amounts	Price per unit	Total costs
Seeds				
Fertilizers				
Pesticides				
Manure/crop residues				
Hired labour				
Extension services				
Other				

Note: The key is to get total costs.

7.3: What forms of fertility management are practised?……………………………………..
……………………………………………………………………………………………………..…………………………………
…………………………………………………………………..

7.4: Which crops are controlled by women and which by men and why?……
…………..……………………………………………………………………………………………..…………………
…………………………………………………………………..……………………………………………………………
…………………………………………………………..

7.5: What problems are faced in crop production?
a).……………………………………………………………………………………………….
b) ………………………………………………………………………………………………
c) ………………………………………………………………………………………………
d) ………………………………………………………………………………………………
e) ………………………………………………………………………………………………
f) ……………………………………………………………………………………………….
g) ………………………………………………………………………………………………
h) ………………………………………………………………………………………………

8 Income from Livestock

8.1 Please indicate the number of animals you have, and how many you have sold, bought, slaughtered or lost over the 12 months.

	Beginning number	Sold (live or slaughtered)	Slaughtered for own use of gift	Units sired (births)	Lost (theft, died,..)	Bought	Gifts received	End number	Price unit
Cattle									
Goats									
Sheep									
Pigs									
Ducks									
Chicken									
Others									

8.2 Please indicate the quantity and value of animal products that you have produced over the last 12 months.

Product	Production (No. of units)	Unit measure	Family consumption	Sale	Price/unit
Meat					
Milk					
Cheese					
Ghee					
Eggs					
Skin					
Manure					

8.3 Please indicate the quantities and values of inputs used in livestock production over the last 12 months (cash expenditures).

Inputs	Amounts	Unit	Price per unit	Total costs
Feed and fodder				
Fodder				
Medicines, vaccination and other veterinary services				
Costs of maintaining barns, kraals etc.				
Hired labour				

Note: the key is to get total costs.

9. Income from Own Business

Type of business: Code: 1: shop/trade; 2: agric. processing; 3: forest based; 4: handicraft; 5: carpentry; 6: other skilled labour; 7: transport (car, boat,…), 9=other			
	Per month	**Last year**	**Comments**
Gross income (net sales)			
Costs:			
Purchased inputs			
Own inputs from farm or forest (equivalent market value)			
Hired labour			
Transport and marketing cost			
Capital costs (repair, maintenance, etc.)			
Current value of capital stock			

Remittance	
Support from government, NGO, organisation or similar	
Pension	

10. Income from PA

Forest Product	Code product	Production (No. of units)	Unit measure	Family consumption	Sale	Price/unit
Fuel wood						
Timber						
Wild animals						

11. Household Expenditure

Item	Amount	Time of year
1 Government Taxes		
2 School Fees		
3 Medical bills		
4 Food		
5 Agricultural Inputs		
6 Socializing (beer etc.)		
7 Clothing		
8 Transport		
9 Contribution to social activities		
10 Other, specify		

12 Water Resources

12.1: Sources of water for household use

12.2. Where do you get your water?

Source Type	All year	Dry season	Wet season	PA source
Bore hole/well				
Stream/river				
Spring Protected				
Spring Unprotected				
Pond/Dam				
Lake				
Other Specify				

12.3 Does your water come from the PA? Yes/No
If yes indicate which sources in table above

12.4: What are the problems encountered in getting water for the household?
a) ……………………………………………………………………………………………..
b) ……………………………………………………………………………………………..
c) ……………………………………………………………………………………………..
d) ……………………………………………………………………………………………..
e) ……………………………………………………………………………………………..
f) ……………………………………………………………………………………………..

12.5. How far is it from your home (one way) to the water source?

12.6. Who collects water in the household? (If hired labour skip to 19)

12.7. How many 20l jerry cans do you use each day?

12.8. What type of treatment do you use to purify water for drinking?

Nothing	
Boiling	
Boiling and Filtering	
Chemicals	

12.9Does the quantity of drinking water change during the year? Why?

12.10. What is the quality of your drinking water?
1.Excellent   2.Good   3.Fair   4.Poor

12.11 How has the quality of water from your domestic source changed over time? I f (no change go to 24)

Time	Quality
5 years ago	
1 year ago	

Score - 1.Excellent 2.Good 3.Fair 4.Poor

12.12 How do you expect water quality to change in the future?
1.Improve   2.Deteriorate   3.No Change   4. Don't know (go to 25)

12.13 Why would you expect the above?

12.14: Sources of water for livestock

Source	Wet Season	Estimated Distance	Dry Season	Estimated Distance/time

12.15: How reliable are these livestock water sources?
All year/water plentiful☐
All year/water sometimes limited☐
Seasonal/water plentiful☐
Seasonal/water sometimes limited☐

12.16 What are the problems encountered in getting water for livestock?
a) …………………………………………………………………………………………..
b) …………………………………………………………………………………………..
c) …………………………………………………………………………………………..
d) …………………………………………………………………………………………..
e) …………………………………………………………………………………………..
f) …………………………………………………………………………………………..

2.7. Household Contingent Valuation Exercise

The **contingent valuation method** (CVM) uses a direct approach to valuing an environmental good or service in that it asks people through surveys what they are willing to pay for the good or willing to accept for the loss of the good. Contingent valuation is particularly attractive because it can estimate values where markets do not exist or where market substitutes cannot be found. For these reasons, CVM is widely used to measure existence values, option values, indirect use values and non-use values.

People reveal their value for the benefits derived from a protected area through their willingness to pay (WTP) for those benefits. A person's WTP can be elicited through surveys or surrogate markets. People also reveal their value for an environmental benefit through their willingness to accept (WTA) compensation for foregoing the benefit. In the case of loss of access to a resource, people reveal their values through a willingness to pay to prevent the loss of access and their willingness to accept compensation to tolerate the loss.

These two concepts of benefit, WTP and WTA, should reveal the same values for the protected area. But empirical studies suggest this is not the case. It is generally believed that this is because people value the things they have more than those things they do not have. Therefore WTP is usually smaller than WTA.

Values produced by CVM are "contingent" because value estimates are derived from a hypothetical situation that is presented by the researcher to the respondent. The two main variants of CV are open-ended and *dichotomous choice* (DC) formats. The former involves letting respondents determine their "bids" freely, while the latter format presents respondents with two alternatives among which they are asked to choose (yes/no responses to a given value). Open-ended CVM formats typically generate lower estimates of WTP than DC designs.

Proponents of CVM argue that its theoretical foundations are firmer than those of other valuation techniques, because it directly measures true WTP (or WTA). Moreover, CV is the only generally accepted method for estimating non-use values, which are not traded in markets and for which there are no traded substitutes, complements or surrogate goods, which can be used to impute values.

On the other hand, because no payment is made in most cases, some observers question the validity of stated preference techniques. Critics argue that CVM fails to measure preferences accurately and does not provide useful information for policy. Even practitioners accept that poorly designed or badly implemented CV surveys can influence and distort responses, leading to results that bear little resemblance to the relevant population's true WTP.

Recent attention has focused on overcoming potential sources of bias in CVM studies. Resolving these difficulties involves careful design and pre-testing of questionnaires, rigorous survey administration, and sophisticated econometric analysis to detect and eliminate biased data.

The hypothetical scenario that is established as the basis of a response must enable the respondent to fully understand the good being valued, as well as the market. The criteria in the table (Table A1) below set out guidelines which if not met in the questionnaire design will result in biased and inaccurate data.

A key source of error in estimating the mean value for ATP/WTA is from respondents bidding strategically. An example is when a respondent may bid lower than their true WTP for services. This may be because they may feel that in doing so they may gain some advantage later on, i.e. lower user fees for access to the PA. In the case of WTA compensation it may be to inflate the value so as to try to receive a higher compensation package. In order to reduce the impacts of such strategic bidding a mechanism known as a 'provision point' was developed.

Table A1. Scenario Design Criteria for CVM

If the scenario is not…	*The respondent will…*	*Effect on measurement*
Theoretically accurate?	Value the wrong thing (theoretical misspecification)	Measure wrong thing
Policy relevant?	Value the wrong thing (policy misspecification)	Measure wrong thing
Understandable to the respondent?	Value wrong thing (conceptual misspecification)	Measure wrong thing
Plausible to the respondent?	Substitute a condition or not take the exercise seriously	Measure wrong thing or give unreliable, biased or protest response
Meaningful to the respondent?	Not take the exercise seriously	Give unreliable, biased or protest response

A provision point establishes in the explanatory scenario the concept of a target amount of money which either must be met or not exceeded in order for a hypothetical scheme to go ahead. In the case of WTP, we might say that the community must raise sufficient money to cover the administration costs of the scheme. If this money is not raised then the scheme will not go ahead, in favour of some other course of action, or maintaining the *status quo*. The incentive is then for the respondent to bid more honestly if they truly wish the scheme to go ahead, although if the resource is of little value to them then the incentive is reduced. In the case of WTA compensation, we stipulate that only a limited amount of funds are available, and that if the community bids exceed the 'pot' of money, then the scheme will not go ahead, here the incentive to over inflate the value of the contribution of the resource to their welfare is reduced, because they risk not receiving any compensation if they over inflate their bid.

WTAC Scenario (using direct community enforcement with government enforcement):
1. In the previous part of the survey we discussed some of the benefits as well as costs from the protected area. Currently the level of harvesting of many of the PA resources people access is beyond the ability of those natural resources to be replenished. For example, the demand for fuel wood is very high and the local community may have already noticed that stocks within the PA are become increasingly low and of poorer quality, which means that household members have to spend more time searching for fuel wood.

2. Clearly if the current level of use continues then eventually the stock of fuel wood and other goods from the protected area may run out entirely. This means that life will be much more difficult for your families or your children's families in the future.

3. As the PA authorities become more aware of the impact that the local community has on the loss of biodiversity they are looking for more effective or new ways of enforcing the necessary management rules. However current management relies heavily on exclusion of people from the PA and tends to create tension between local people and the PA as local people see the regulations as unfair.

4. If the local community wishes to be able to receive direct benefits from the PA in the future something has to be done to effectively manage or regulate the use of the PA by the local population and reduce tension between the park and local people. One option would be to implement a collaborative management scheme in partnership with in the PA authority focusing on regulated community use of the PA.

5. Responsibilities/Benefits- Under such a scheme members of your community would be asked to protect a specific area of the park, i.e. a zone extending some distance within the boundary of the protected area adjacent to your community boundary. Within that zone community members would be expected to look for snares and signs of illegal activity and report illegal activities to the PA authority whilst they access the forest. Protection activities would be carried out by a community protection association (CPA). Membership of the CPA would be free and open to one member from each household in the community, provided that they are able to be actively involved in protection activities. Each household in the community would receive a direct payment to compensate them for their loss of access to the PA.

6. Management- Access would be regulated by a committee of the CPA made up of elected CPA members and a representative of the national park and local government. The committee would be responsible for managing and monitoring the activities of the CPA rangers in collaboration with the PA authority. The committee would also conduct impact monitoring on the state of the community managed zone in order to verify indicators.

7. Penalties- Failure to effectively protect the identified zone may result in the reduction or loss of the amount paid by the PA authority to the community fund or in extreme cases the closure of the collaborative management scheme in favour of exclusion with no compensation.

8. The community is being asked to make monetary bids to assess the demand for such a scheme and estimate the level of compensation. Only a limited amount of funds are available for such a scheme. If the sum of all the community compensation amounts is less than or equal to the money available, then the scheme would go ahead as described. If the sum is **more** than the money available then such a scheme **would not** go ahead and it is likely that the current management practices would continue with increased enforcement efforts.

Bidding:
Have a think about how much the protected area contributes to your current livelihood. What is the *minimum* amount of money you would be willing to receive *annually*, for the foreseeable future, in compensation for reduced access to the forest?

Amount: _____RwF

Part III Rapid Participatory Assessment Method

3.1 Introduction

This section is focused on rapid qualitative assessments of livelihoods and institutional issues including local perceptions of inter temporal constraints and change. As such, it can be used as a monitoring tool to understand how context and priorities for development and perceptions of costs and benefits from the PA change from an initial baseline. The methods outlined in the table below draw on several developed in the previous sections with the addition of some specific tools to investigate the context of development, livelihoods and institutional

3.2 Sampling and Overview of Tools

Six of the Umugudugu bordering the park in the Rwandan EEEGL project area will be selected at random for the exercise.

Focus groups concentrating on wealth and gender issues as well as mixed groups will be surveyed to elicit community level perceptions of issues related to livelihoods and park related costs and benefits.

The principle tools used are categorised as follows:

Type of enquiry	Tool	Issue
Development Context	Community context key informant survey (Section 2.2)	Various contextual resource and institutional information
	Participatory wealth ranking (Section 2.3)	Identify different socio-economic groups and their livelihoods assets
	Trend lines (Section 3.3)	Environmental, economic and population trends Resources trends
	Institutional profiles (Section 3.4)	Goals, achievements and needs of local groups and institutions
	Seasonal calendars (Section 3.5)	Seasonality of labour food and water availability Seasonality of income and expenditures
Park community relations (by socio-economic group)	PA cost and benefit prioritisation (Section 2.4)	Key costs and benefits from PA as they affect peoples livelihoods
	PA Problem analysis chart (Section 2.5)	Priority problems of women and men and different socio-economic groups Causes & effects of priority problems
Community development priorities (by socio-economic group)	Livelihoods opportunities and constraints, pair wise ranking (adapted from section 2.4)	Key livelihoods opportunities and constraints (development focused)
	Livelihoods problem analysis chart (adapted form section 2.51)	Priority problems of all groups causes of problems Local coping strategies Local people's and outside experts' Identification of opportunities to address problems
	Institutional conflict & cooperation chart (Section 3.6)	identification of conflicts of interests between Stakeholders identification of common interests and partnerships between stakeholders

3.3 Development Context Tool: Trend Lines

3.3.1 Purpose

Trend lines are tools that help us to learn about community perceptions of change in the local environmental, economic, social or institutional patterns. It is a tool for looking at what is getting better and what is getting worse. A trend line is a simple graph depicting change over time.

3.3.2 Process

Organise separate focus groups of older women and older men. Involving the elderly in developing the trend lines is essential because they know more about past events. Ask the participants about important changes in the community, for better and worse. Use the questions to probe about changes in natural resources, population and economic opportunities. Ask about what other changes are important to them. Draw a large blank graph on paper for each trend to be explored. Explain how the far left of the horizontal axis represents the past and the far right represents the present. Ask what intervals (years, events in history, etc.) should be used along the bottom axis, e.g. 1950, 1960, 1970. Explain how the estimates of increase and decrease are to be shown on the vertical axis.

Ask the participants to produce a trend line for each issue. If the trend lines are placed directly above one another it will be easier to facilitate discussions about interactions and linkages among the different trends. Look also for intermediate- and macro-level causes for the trends.

3.3.3 Notes to the RA team

Encourage a discussion on the reasons for the trends that have emerged. This will help learning about key problems. Discuss what solutions have been tried in the past and how effective they were. Ask what might ease the situation. Probe to see if there is a relationship between two or more of the trends, e.g. decrease in forest resources parallels increase in population of people and/or increase in population of livestock. Time permitting, the trend lines can be expanded upon to include the future. Ask the participants to show what they would like the future to look like for each issue. Discuss what changes would be necessary to achieve them.

3.3.4 Example

Trend lines from Jeded Village in Somalia were produced by women, men and young people. Each group was asked to discuss what they thought was important among recent trends and changes. By far the most important and most frequently discussed were the trends in population and education. The population was of interest because of the large influx of new families (fleeing the troubles prevalent in the urban areas).
Education was a persistent problem in the absence of a government. A fledgling school collapsed in 1980 and was yet to be replaced. The Koranic school began in 1990 and gained in strength, but girls were not included.

Some Questions To Ask While Facilitating
- What are the most important environmental trends? e.g. drought, deforestation, erosion.
- What are the most important economic trends? e.g. jobs, wages, prices, costs of living, crop yields, livestock population.
- What are the most important demographic trends? e.g. birth-rates, infant mortality, in migration, out-migration, increases in female-headed households.
- What other trends are important?
- What are the linkages between the trends?
- Are there linkages or causes stemming from the intermediate- or macro-levels?
- What is getting better? What is getting worse?
- What trends impact women and men differently?
- What trends impact the poor more so than the rich?
- Are there differences by ethnicity, caste, etc.?

Development Context Tool 4
Trend Lines
Example: Trend Lines in Jeded Village, Somalia

A. Population

OBSERVATIONS:

1975-1980 - Sharp drop in population due to the 1974 "Long Tail
(Dabadweer) Drought
1980-1996 - Gradual increase in population, with a special rise in
early 1990s because of disruptions and displaced persons from the
present Somali civil wars

B. Employment

OBSERVATIONS:

1970-1975 - Good employment because of construction of water reservoirs
1975-1980 - Dabadheer Drought reduced jobs
1980-1985 - House and reservoir construction brought jobs
1985-1994 - Many displaced (unemployed) people have come from the
South due to civil wars

C. Livestock

OBSERVATIONS:

1975-1980 - Animal population increasing due to good rains,
following the 1973-74 drought
1980-1985 - Many animals died due to drought
1985-1990 - More animal deaths due to continued drought
1990-1994 - Good rains increase animal numbers

Development Context Tool 4 continued
Example: Trend Lines in Jeded Village, Somalia

D. Vegetation

OBSERVATIONS:

1975-1994 - Establishment of the village, new water sources, and overgrazing have greatly reduced vegetation in Jeded and its surrounding area, leading to strong seasonal winds and dust

E. Education

OBSERVATIONS:

1970-1975 - Government literacy campaign had helped some people learn to read
1979-1980 - Primary school opened and closed during the same year
1990-1994 - Koranic School has opened

F. Human Health

OBSERVATIONS:

1970-1975 - Good rains and no epidemics contributed to overall good health
1975-1980 - Dabadheer drought caused ill health and mortality
1980-1994 - Outbreaks of malaria due to heavy rains; infant mortality due to influx of displaced people from South; otherwise improving health due to PHC programme (MCH) and better nutrition

Source: Ford, Adam, Abubaker, Farad and Barre, (1994) PRA with Somali Pastoralists: Building Community Institutions for Africa's Twenty-First Century, Clark Univeristy/ GTZ/Gardo

3.4 Development Context Tool: Institutional Profiles

3.4.1 Purpose

Institutional Profiles are tools that help us to learn more about the nature of the institutions identified in the Venn Diagrams. An analytical chart is created for each institution in the community to examine what they have accomplished and what they need to foster development work. If local communities are to implement development activities which they can sustain, explicit attention must be paid to their capacities.

3.4.2 Process

Work with the whole groups of participants; discuss at least four kinds of information: founding and goals, management, achievements and needs. Pre-prepare a chart on flip chart paper for each institution (see example). Use the questions to deepen the discussion. Be sure to ask about leadership, membership, activities, decision-making processes, and interactions or conflicts with other groups or institutions, including those from the intermediate- and macro-levels.

3.4.3 Notes to the RA team

The Institutional Profiles show details about how these institutions function and for what purposes. Together these tools facilitate learning about the local institutional context. This information will be very important when the community is planning development activities and for monitoring impacts of different institutions on the livelihoods of the people.

Some Questions To Ask While Facilitating
- How many local groups or institutions are there? Who participates in them? e.g. elders, women, farmers. What are their purposes?
- Are leadership positions dominated by a particular social group, (e.g. high caste wealthy elderly men)?
- Do women occupy leadership positions in any of the local institutions? If so, which women? Which institutions?
- Which institutions have achievements related to meeting community development needs?
- Which local institutions have links with outside institutions? For what purposes?

3.4.4 Example

In the case of Jeded Village in Somalia there were only three community groups/institutions: elders, women and youth. Institutional Profiles for each are shown in Figure A6. Discussions revealed that Jeded's Council of Elders was by far the most important and that it worked closely with the other groups in the village. Later, when designing their Community Action Plan it was decided that the Council of Elders would retain a leading role, but a Steering Committee also would be formed consisting of three members from each group. Further, responsibility for certain development priorities was assigned to the different groups: education and soil erosion to the Youth Committee, human health and income generation to the Women's Organisations, and animal health and jobs to the Council of Elders. Water issues would be overseen by both the elders and women.

Institutional Profiles

Example: Institutional Profiles of Jeded Village, Somalia

Council of Elders

Group	Foundation and Goals	Management	Achievements	Needs
Council of Elders	Founded in 1954 Goals:..to solve community problems ..to manage water and other community affairs ..to develop a water schedule for nomads ..to adjudicate disputes	The Council elects a Chair for a flexible term; Criteria for membership on the council include age, wisdom, and significant experience	..Maintaining peace in the village ..Borehole water management ..Sanitation ..Education	..Office equipment and stationary ..Training ..Transport ..Petty Cash

Institutional Profiles

Example: Institutional Profiles of Jeded Village, Somalia

Women's Organization

Group	Foundation and Goals	Management	Achievements	Need
Women's Organization	Founded in 1991 Goals:..solve Women's problems ..advocate rights of women and children ..participate in implementation of development projects ..solve problems among themselves ..serve as link between women of Jeded and aid organizations ..initiate income generating projects ..care for displaced families	Chairwoman elected in a Congress of women of Jeded Annual elections for Chair and other leaders Any women 20 years or older may be a member Membership fee is 1000 Somali Shillings Meets once a month Links with women's groups in other villages	Helped to resettle families coming from the Civil War in the South Sanitation activities Created income generating projects such as weaving mats Fund raising for business activities	Training Space and equipment Income generating activities

3.5 Livelihood Analysis Tool: Seasonal Calendars

3.5.1 Purpose

Seasonal Calendars are tools that help us to explore changes in livelihood systems taking place over the period of a year. They can be useful in counteracting time biases because they are used to find out what happens in different seasons. Otherwise there is a tendency to discuss only what is happening during the time the RA is taking place. Calendars can be used to study many things, such as how much work people have at different times of year or how their incomes change in different periods. It can also be used to show the seasonality of other important aspects of livelihoods such as food and water availability.

3.5.2 Process

Work with the entire group of participants or in socio-economic sub-groups and gender groups. Explain that this time you want to learn about what people do in a year. Find a large open space for each group. Calendars can be drawn on a large paper or can be traced in the sand or on a dirt floor using stones or leaves for quantification. Draw a line all the way across the top of the cleared space (or paper). Explain that the line represents a year -- and ask how people divide up the year, i.e. months, seasons, etc. The scale to use is the one that makes the most sense to the line.

It is usually easiest to start the calendar by asking about rainfall patterns. Ask the participants to put stones under each month (or other division) of the calendar to represent relative amounts of rainfall (where more stones equal more rain).Once the rainfall calendar is finished, you can draw another line under it and ask them to make another calendar, this time showing their labour for agriculture (putting more stones over the time periods of high labour intensity). Make sure the labour calendar, and all subsequent calendars, is perfectly aligned with the rainfall calendar. This process is repeated, one calendar under another, until all the seasonal issues of interest are covered. Be sure that calendars include those for food availability, water availability, income sources and expenditures. Ask the participants to put a symbol or sign next to each calendar to indicate the topic. As much as possible ask the participants also to describe the sources of food and income, etc.

3.5.3 Notes to the RA Team

Additional issues for Seasonal Calendars may be added according to the needs and interests of the participants, such as animal diseases, fodder collection, fishing seasons, marketing opportunities, health problems and so on.

3.5.4 Example

Groups of young women, young men, old women and old men, each produced their own seasonal calendars during PRA exercises held in Pemba Village, Malawi. Shown here are those for young women and young men. This example illustrates how Seasonal Calendars can be used to look at the linkages among several different patterns: rainfall, agriculture labour, other labour, food availability, disease, income and water availability. (An expenditures calendar needs to be added here.) These calendars can also show important differences between the women's and men's work and resources, in this case labour and income patterns.

Some Questions To Ask While Facilitating
- Are the overall livelihood systems fairly stable or with great seasonal variations?
- How do women's calendars compare with men's? What are the busiest periods for women? for men? Are there labour bottlenecks?
- How does food availability vary over the year? Are there periods of hunger?
- How does income vary over the year? Are there periods of no income?
- How do expenditures vary over the year? Are there periods of great expense, e.g. school fees, food purchases?
- What are the key linkages among the different calendars? e.g. income and food supply or rainfall and labour.

Livelihood Analysis Tool 4
Seasonal Calendars

Example: Seasonal Calendars for Pemna Village, Malawi
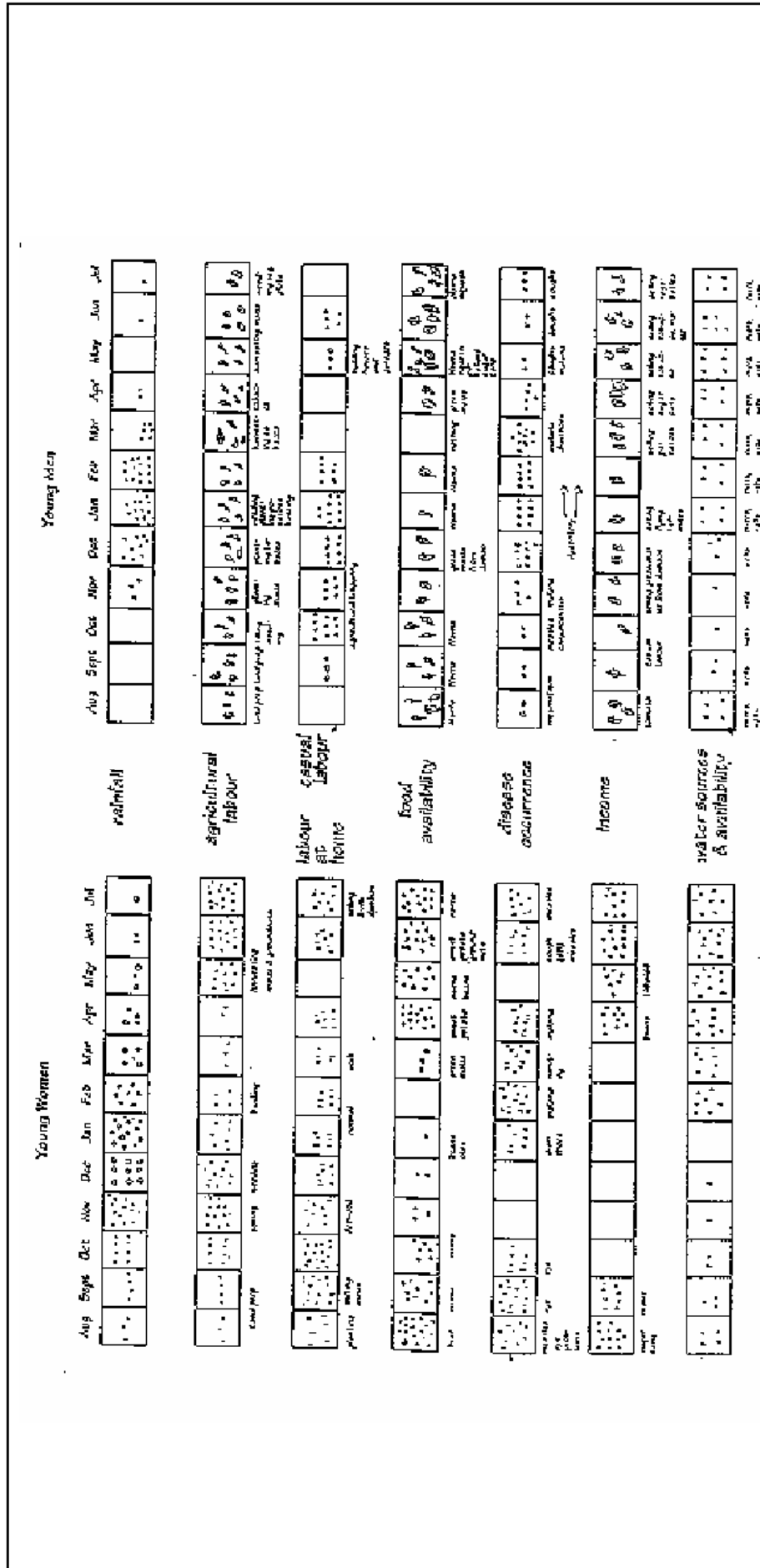
3.6 Stakeholders Priorities for Development: Stakeholders Conflict & Partnership Matrix

3.6.1 Purpose

The Stakeholders Conflict & Partnership Matrix is a tool that helps us to understand where there is conflict and where there is partnership between different stakeholders, and whether the extent of conflict or partnership is small or large in nature. Conflict is a fact of life. Conflicts of interest arise due to competition for use or control of resources or because of differences in goals. Examples of this are when expansion of cultivated land encroaches on land traditionally used for grazing, or when people are denied access to forest products necessary for their livelihoods within their traditional production system, or when there is competition for water for livestock or irrigation.

The participatory planning process itself, by allowing everyone to share information and air their views, often creates a supportive environment for resolving conflicts and reaching consensus. But this is not always the case; sometimes conflicts are very strong and long-standing. It is important to recognise where such conflicts may doom specific development activities to certain failure. Partnerships often exist between different stakeholders. Existing networks of groups of individuals or institutions that share a common interest may be strengthened in the development process. The identification of such partnerships can promote more efficient ways of getting information and show where there is existing expertise to address a particular development problem. New partnerships too may be formed around specific development goals, especially among those who have a stake. Working with existing partnerships, and forming new ones, is a great way to ensure successful implementation of development activities.

3.6.2 Process

Working in socio-economic and gender groups, focusing on one development problem at a time as identified in the Problem Analysis Chart (Section 1.?), list all the stakeholders that specific set of development activities on both the vertical and horizontal axis of the pre-prepared flip chart paper for Stakeholders Conflict &Partnership Matrix (see example). If the participants say conflict, for example, ask whether the conflict is small, medium or large mark a minus sign (-) for the scale of the conflict (- for small, -- for medium, --- for large). If they say partnership, ask them to choose small, medium or large and mark a plus sign (+) in the matrix accordingly. If they say neither, proceed to the next set of comparisons. Probe to discover the reasons for their selection. Then put the selected size circle or square in the appropriate box on the flip chart paper matrix. Repeat until all combinations of cards have been presented and decided upon. Looking at the completed Stakeholders Conflict & Partnership Matrix ask the participants to explain reasons for conflict and histories of partnership. Use the questions to deepen the analysis. Repeat for each proposed development activity.

3.6.3 Notes to the RA Team

Be sure that the conflicts discussed have a focus relevant to stakeholders' interests and development activities. Personal animosities are to be avoided.

Some Questions To Ask While Facilitating
- Which stakeholder groups have common interests with respect to the development activities in question?
- Are there existing partnerships (or histories of support and collaboration or networking) between some of the stakeholder groups? Around which activities, issues or ideals were these partnerships formed? Are there partnerships linked to gender or other group attributes?
- Could the existing partnerships be built upon for implementation of specific development activities? or, could new partnerships be formed?
- Which stakeholder groups have conflicting interests with respect to the development activities in question? Is there a history of conflict between these groups? Are there conflicts linked to gender or other group attributes? How have past conflicts been resolved?
- Are there conflicts so deep and long-standing that certain proposed development activities are doomed to fail? What are the implications for women? for other marginalised groups?
- Given areas of conflict and partnership, which of the proposed development activities are most likely to succeed?

3.6.4 Example

The Stakeholders Conflict & Partnership Matrix shown below focuses on the local, intermediate and macro-level stakeholders for tree resources in Northern Thailand. The matrix shows that there is a conflict of interests between the local people and government departments but strong partnership between the local people and NGOs.

Example: Matrix showing Conflicts and Partnership Between Stakeholders in Tree Resources, Northern Thailand

NOTE: The symbol ● respresents the existence of conflict,
The symbol ▬ represents the existence of partnerhsip, or support and cooperation.

Source: Adapted from Grimble, Chan, Aglionby and Quan (1995), Trees and Trade-offs: A Stakeholder Approach to Natural Resource Management, IIED, Gatekeepers Series No. 52.

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Appendix 2 Main Outcomes of Planning Meeting To Discuss Study Objectives

Musanze, 8th November 2009 Minutes of planning meeting
Prepared by Giuseppe Daconto

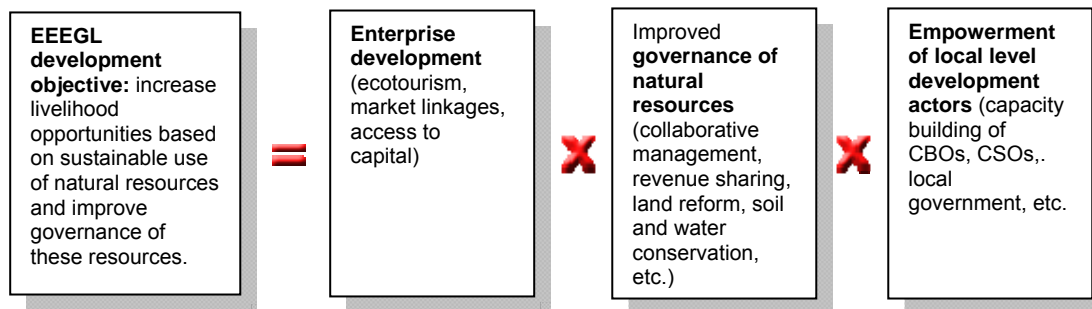Participants: Jackson Mutebi (CARE), Jean-Damasceine Muvunyi (CARE), Glenn Bush (DFGFI)

Background
The UNDP/GEF/PAB Project has provided the Karisoke Research Center with a grant to support a social analysis for costs and benefits accruing to people living near PNV as related to the existence of the park. The aim is also to assess more specifically:

- Which community based conservation activities can work in providing incentives against illegal harvesting of resources within the park? So far there has been little impact, and illegal activities are being addressed mainly through law enforcement. It is expected that an updated assessment of community perceptions of conservation activities might provide direction to ongoing and future work aimed at blinking conservation and development goals around PNV.
- What are the positive and negative impacts due to the PA on people's livelihood. The study would also like to establish a sound baseline for household income to support ongoing and future monitoring of impacts of conservation and development work.

The objective of the EEEGL programme in the area around PNV is to increase livelihood opportunities based on sustainable use of natural resources and improve governance of these resources. The programme is nested in a broader framework of work of IGCP and CARE in the same area. This complex conservation and development agenda hinges on three main and complementary goals:

- Establishing positive feedback loops between park conservation and livelihood development, mainly through the promotion of economic development activities linked to park and biodiversity (i.e. tourism industry development, honey production, sharing of tourism revenues accruing to government, etc.).
- Supporting the diversification of income generation for local communities based on resources not related to the park (that is, decoupling economic development from park conservation), yet sustainably managed, through improved access to microfinance and value chain based enterprise development;
- Supporting the development of governance systems for natural resources (park and non-park related) and of capacities of local level development actors (CSOs, CBOs local government) to devise, initiate and promote grassroots development agendas in an increasingly autonomous manner.

EEEGL development objective: increase livelihood opportunities based on sustainable use of natural resources and improve governance of these resources.	=	**Enterprise development** (ecotourism, market linkages, access to capital)	✖	Improved **governance of natural resources** (collaborative management, revenue sharing, land reform, soil and water conservation, etc.)	✖	**Empowerment of local level development actors** (capacity building of CBOs, CSOs,. local government, etc.

General objectives for the study
Given the social and environmental realities of the PNV area, efforts linking economic development to conservation goals (coupling conservation and development) have an important but limited potential for the majority of local communities. A far more important challenge appears to be the opportunity to support economic diversification and decoupling of economic activities from park conservation. The EEEGL programme needs to understand better:

- who are the actors that can be engaged to promote this agenda more effectively;

- how local actors (rural people, CBOs and local government) can become more effective in pursuing own development agendas respectful of natural resources; and
- how best the economic diversification agenda can be broadened beyond the pilot project approach and become more structured, proactive, strategic and closer to local people's development aspirations.

Limited data and analysis exists to support this assessment. The few earlier socio-economic studies tend to take pictures of the economic and social conditions of the people living around the park. Little effort has been paid to understanding in a more holistic manner how local livelihood has been shaped during the past years and how people are reacting and adapting to some very significant and fundamental drivers of change, i.e.: demographic growth, loss of soil fertility, broader economic trends such as rise of inflation, and sudden crises and shocks (man induced or natural, such as erratic rainfall patterns. Therefore the EEEGL programme needs to support its work through a comprehensive livelihood analysis based on:

- building on earlier socio-economic studies (Bush 2004; Hatfield & Mallaret-King 2003; Plumptre et al. 2004) (Plumtre et al, 2003; Weber, 1985);
- capturing local knowledge through a qualitative participatory appraisal of livelihood, which would also involve local actors (community members, local government and CSO officials) in collecting, reviewing, analyzing and disseminating results; and
- supporting this qualitative assessment with a robust quantitative survey of household livelihood.

This assessment should provide a picture of ground realities in terms of agriculture and livestock practices; access to capital assets (land, credit, inputs) and services; linkages to market actors (enterprises, services, buyers, cooperatives, etc.); linkages to authorities and service providers (local government, local leadership, development actors); and participation in development processes (e.g., ubudehe).

Appendix 3 Survey Sample Frame

District	Sector	Cell	Proximity to park-adjacent 1=	ICDP 1= project present
Burera	Cyanika	Kamanyana	1	1
Burera	Cyanika	Nyagahinga	1	0
Burera	Cyanika	Kabyiniro	1	0
Burera	Cyanika	Gasiza	1	1
Burera	Cyanika	Gisovu	0	0
Burera	Cyanika	Kagitega	0	0
Burera	Rugarama	Cyahi	1	1
Burera	Rugarama	Karangara	1	1
Burera	Rugarama	Rurembo	0	0
Burera	Rugarama	Maya	0	1
Burera	Rugarama	Gafumba	0	0
Burera	Gahunga	Nyangwe	1	1
Burera	Gahunga	Gisizi	1	0
Burera	Gahunga	Buramba	1	1
Burera	Gahunga	Kidakama	0	0
Burera	Gahunga	Rwasa	0	0
Musanze	Nyange	Muhabura	1	1
Musanze	Nyange	Ninda	1	1
Musanze	Nyange	Kabeza	0	1
Musanze	Nyange	Kivugiza	0	0
Musanze	Nyange	Kamwumba	0	0
Musanze	Kinigi	Nyonirima	1	1
Musanze	Kinigi	Nyabigoma	1	1
Musanze	Kinigi	Bisoke	1	1
Musanze	Kinigi	Kaguhu	1	0
Musanze	Kinigi	Kampanga	0	0
Musanze	Shingiro	Mugari	1	1
Musanze	Shingiro	Mudende	1	0
Musanze	Shingiro	Gakingo	0	0
Musanze	Shingiro	Kibuguzo	0	0
Musanze	Gataraga	Murago	1	1
Musanze	Gataraga	Rungu	1	0
Musanze	Gataraga	Rubindi	0	0
Musanze	Gataraga	Mudakama	0	0
Nyabihu	Mukamira	Gisizi	1	0
Nyabihu	Mukamira	Jaba	0	0
Nyabihu	Mukamira	Rugeshi	0	0
Nyabihu	Mukamira	Rubinja	0	0
Nyabihu	Mukamira	Rukoma	0	1
Nyabihu	Mukamira	Rurengeri	0	0
Nyabihu	Mukamira	Kanyove	0	0

Nyabihu	Jenda	Gasizi	1	1
Nyabihu	Jenda	Kareba	1	0
Nyabihu	Jenda	Rega	0	0
Nyabihu	Jenda	Nyirakigugu	0	0
Nyabihu	Jenda	Kabatezi	0	0
Nyabihu	Jenda	Bukinanyana	0	0
Nyabihu	Bigogwe	Basumba	1	1
Nyabihu	Bigogwe	Muhe	0	0
Nyabihu	Bigogwe	Kora	0	0
Nyabihu	Bigogwe	Rega	0	0
Nyabihu	Bigogwe	Arusha	0	0
Nyabihu	Bigogwe	Kijote	0	0
Nyabihu	Kabatwa	Rugarama	1	1
Nyabihu	Kabatwa	Batikoti	1	1
Nyabihu	Kabatwa	Cyamvumba	0	0
Nyabihu	Kabatwa	Ngando	0	0
Nyabihu	Kabatwa	Myuga	0	0
Nyabihu	Kabatwa	Gihorwe	0	0
Rubavu	Bugeshi	Butaka	1	1
Rubavu	Bugeshi	Buringo	1	0
Rubavu	Bugeshi	Nsherima	1	1
Rubavu	Bugeshi	Hehu	1	0
Rubavu	Bugeshi	Mutovu	1	0
Rubavu	Bugeshi	Rusiza	1	0
Rubavu	Bugeshi	Kabumba	1	0