THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

*****

COPYRIGHT PERMISSION

Self-Organization and Cross-Scale Interactions in Integrated Development and Conservation Projects: A Comparative study of Honey Care Africa's beekeeping projects in Kakamega District and Kwale District, Kenya.

By

Stephane Maurice

A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of Manitoba in partial fulfillment of the requirement of the degree

Of Masters of Natural Resources Management

(c) 2006

Permission has been granted to the Library of the University of Manitoba to lend or sell copies of this thesis/practicum, to the National Library of Canada to microfilm this thesis and to lend or sell copies of the film, and to University Microfilms Inc. to publish an abstract of this thesis/practicum.

This reproduction or copy of this thesis has been made available by authority of the copyright owner solely for the purpose of private study and research, and may only be reproduced and copied as permitted by copyright laws or with express written authorization from the copyright owner.

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

*****

COPYRIGHT PERMISSION

Self-Organization and Cross-Scale Interactions in Integrated Development and Conservation Projects: A Comparative study of Honey Care Africa's beekeeping Projects in Kakamega District and Kwale District Kenya

BY

Stephane Maurice

A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of Manitoba in partial fulfillment of the requirement of the degree

OF

MASTER OF NATURAL RESOURCES MANAGEMENT (M.N.R.M.)

Stephane Maurice © 2006

Permission has been granted to the Library of the University of Manitoba to lend or sell copies of this thesis/practicum, to the National Library of Canada to microfilm this thesis and to lend or sell copies of the film, and to University Microfilms Inc. to publish an abstract of this thesis/practicum.

This reproduction or copy of this thesis has been made available by authority of the copyright owner solely for the purpose of private study and research, and may only be reproduced and copied as permitted by copyright laws or with express written authorization from the copyright owner.

Abstract

Conservation and development have often been understood to be in direct conflict with one another. Today the paradigm has shifted from the *fines and fences* approach to one that views local people as an effective instrument for furthering conservation goals, especially considering the limited capacity to expand protected areas in many countries.

Honey Care Africa (HCA) is a private Kenyan corporation that has promoted beekeeping in numerous parts of Kenya and was one of the 2002 Equator Initiative finalists. The United Nations Development Programme (UNDP) Equator Initiative (EI) is intended to reduce poverty and promote conservation of biodiversity and sustainable use of natural resources at the local level through support for and strengthening of community partnerships to reduce poverty, thereby helping to protect species-rich areas from over-use and encroachment.

The purpose of this research was to examine two of the HCA projects in Kenya in an attempt to glean some of the factors contributing to the success and/or failure of the projects. Since there are a great number of factors affecting these projects it is necessary to limit the examination to a few aspects. The specific research objectives of the study were: (1) to identify the role of their leadership in the projects as relating to the initial and ongoing organization of the projects; (2) to determine how HCA is related to institutions at other scales including; vertical linkages such as to the government at state/provincial, and national levels, non-governmental organizations (NGO's), private business, and community groups and horizontal linkages such as how specific community projects interact with others across space; (3) to ascertain how if at all the HCA beekeeping project has affected local perceptions and actions regarding the environment including the conservation of species.

The research design consists of two case studies of HCA beekeeping projects in Kenya. Fieldwork was conducted during a four-month field season. The data collection methods used were derived from the Participatory Rural Appraisal approaches and included semi-structured interviews, focus group interviews, and participant observation.

The research was conducted at two sites selected from amongst the larger number of sites where HCA has beekeeping operations in Kenya. Both sites have been involved with the HCA beekeeping project since 2000. The first site, Kakamega District (in western Kenya) contains the only remaining tract of equatorial rainforest in Kenya - the Kakamega Forest, a protected area with a high degree of biodiversity, which tied in well with the EI focus linking conservation and poverty alleviation. The second site, Kwale District (in eastern Kenya) provides a contrast to the first site in that it is located near the east coast of the country and has a different climate, vegetation, and is populated by a different tribal group.

The research findings include the identification of the numerous stakeholders located at different scales that are involved with the two case study projects. The interactions between the different stakeholders were examined in an effort to understand the relative importance of the different cross-scale linkages to the projects and how effectively these linkages were functioning.

In both cases the strength of local level leadership was found to be crucial to the success of the beekeeping projects in providing an economic return to the farmers. In the Kakamega case

strong central leadership allowed the project to recover from difficult times that were created at least in part by weak local leadership. In the Kwale case the lack of local level leadership hurt project performance. It was also found that the management structures and styles were critical to the success of the projects.

The two case study projects are managed in different ways by the development organizations. In the Kakamega case the beehives are professionally managed by HCA and the development organization; this has led to relatively good economic returns for the farmers but has imparted little knowledge or skills with the communities and project participants. In the Kwale case the beekeepers manage their own hives either by themselves or with their neighbours, this has allowed for greater learning by beekeepers. Though due to a lack of leadership and inadequate training the level of hive management has been low and most beekeepers have earned less income than they might have reasonably expected.

The Honey Care Africa model provides an example of how private enterprises can be a useful partner in development projects. The inclusion of a private company into beekeeping projects has helped to overcome some of the problems plaguing other beekeeping projects in Kenya that mostly stem from such projects being heavily subsidized, not linked to markets, and not operating under realistic market conditions.

Acknowledgment

Special thanks to the people of Kakamega and Kwale who participated in the study and to CARD, CRSP, and HCA for their assistance during the course of my research.

I would like to thank Moses for his help in so many different ways in Kakamega and for his and Sharald's friendship and hospitality, my translator in Kakamega Jairus for his great help. Thanks to Haroun and his family for their hospitality, and Ben for his guidance in Ileho. And thanks to everyone else at CARD who helped my in my research.

Thanks to my translator in Kwale, Mwaniki for his assistance, and thanks to Mwanzighe for his insight and advice on the state of beekeeping in the district. And thanks to everyone else at CRSP who helped me in my efforts in Kwale.

Thanks again to Farouk, Robert, Paul and everyone else at Honey Care Africa who helped me in so many ways in my research and in getting orientated and settled in Nairobi in my first days in Kenya.

Thanks to Peter Paterson for informing me on many aspects of beekeeping in Kenya and to Naomi Saville and Narayan Acharaya for their kind help and advice in the field, and their fine company.

The study was supported by funds from the Canada Research Chair of Dr. Fikret Berkes, and by funding from IDRC. EI project coordination by IDRC and UNDP is also appreciated.

Finally, thanks to my committee for their help, guidance, and patience. Thanks to John for always being supportive, and for suggestions and advice to numerous to list. Thanks to Fikret, for recruiting me to the EI project and all his help along the way financial and otherwise. Thanks to Jim for his advice on traveling in Kenya and excellent and constructive criticisms. Thanks to Harry for his comments, contacts, and experience in Kenya, which made my life and research much easier during the field season.

List of Tables

List of Figures

List of Plates

Glossary of Terms

AKF	Aga Khan Foundation
BCP	Biodiversity Conservation Project
CARD	Community Action for Rural Development
CBC	Community-Based Conservation
CBO	Community-Based Organization
CRSP	Coastal Rural Support Programme
EI	Equator Initiative
EU	European Union
FD	Forest Department
GSU	General Service Unit
HCA	Honey Care Africa
HCA PO	Honey Care Africa Project Officer
IBG	Ivihiga Beehive Group
KRSP	Kwale Rural Support Program
KES	Kenyan Shillings
KTBH	Kenya Top-Bar Hive
KWS	Kenya Wildlife Service
MFH	Movable Frame Hives (Langstroth Hive)
MLFD	Ministry of Livestock and Fisheries Development
NGO	Non-Governmental Organization
NTFP	Non Timber Forest Product
SIDA	Swedish International Development Agency
VDC	Village Development Committee
VDO	Village Development Organization
VSO	Voluntary Service Overseas
UNDP	United Nations Development Programme

Chapter 1 Introduction

1.1 Background

Integrated conservation and development projects (IDCPs) have become a common fixture of international development; they are seen as a model that can overcome obstacles that have stymied past development and conservation efforts. ICDPs like community-based conservation (CBC) projects seek to conserve biodiversity through economic and social incentives in a manner that includes participation of local communities and resource users, though there tends to be greater emphasis on the economic aspects of the projects in IDCPs than in CBC projects, which have tended to focus more on environmental conservation. There are, however, relatively few examples of successful community-based development and conservation projects (Wilshusen et al. 2002); in part at least because the complexity of the structures employed to achieve the inclusion of all desired stakeholders have made these initiatives difficult to administer.

The link between income generation and conservation of biodiversity is an important one since the lives of many rural people in Kenya, as well as other poor countries, are dominated primarily by survival. People in such circumstances cannot partake in conservation projects if their short-term economic needs are not met even if the project returned economic benefits in the medium to long term (Cox 1998). This is not to imply that the poor are shortsighted, for while they may be forced to adopt a short-term view they would likely prefer to take a longer-term view if they had the luxury.

> Contrary to popular belief, it is less the poor and weak and more the rich and powerful who take the short-term view. Economists discount future

benefits: the further off benefits are, the less they are worth now. (Chambers 1997: 176)

The conservation of biodiversity in the form of protected areas has often been seen by poor rural farmers as being for the benefit of others at their expense, as they are prohibited from harvesting resources they had in the past. Conservation initiatives that integrate both conservation and development objectives and are not focussed on protected areas that exclude human actions are a potential vehicle for getting local people onside with conservation goals.

The United Nations Development Programme (UNDP) Equator Initiative (EI) is intended to reduce poverty and promote conservation of biodiversity and sustainable use of natural resources at the local level through support for and strengthening of community partnerships to reduce poverty, thereby helping to protect species-rich areas from over-use and encroachment (UNDP 2003). Honey Care Africa Ltd. (HCA) is one such development project. Located in Kenya, Honey Care Africa has recruited nearly 2200 rural households to become involved in their beekeeping projects (UNDP 2003).

Beekeeping is in many ways well suited to address the problems posed by community based conservation programs as it provides a source of income to subsistence farmers in addition to providing a beneficial environmental services such as pollination (Davis 1992; Singh and Singh 1992), starts generating returns relatively quickly, and requires little investment of time. As the majority of the population of many developing countries are rural and agricultural beekeeping is ideally suited for easy adoption. Beekeeping is particularly well suited for improving the lives of the poor, as the beekeeper need not own land in order to keep bees. Additionally beekeeping has the

benefit of pollinating agricultural crops thus a synergy between the primary and secondary economic pursuits of subsistence farmers can be created. Honey is also an important part of the local culture in many parts of Africa including Kenya, for both its medicinal qualities as well as for other traditional cultural applications (Quist-Arcton 2002). Another aspect of beekeeping that is advantageous for rural people in developing countries who may not have access to refrigeration or other modern storage techniques is that hive products such as honey, beeswax, and propolis are relatively non-perishable.

In an effort to provide other communities with information on how to create their own successful community-based conservation and development projects, this research compares two communities that are involved with Honey Care Africa in beekeeping projects. This research is one of several EI case studies in a coordinated team project at the Natural Resources Institute, University of Manitoba, in cooperation with IDRC and the Biodiversity Conservation Office of Environment Canada. By documenting these two projects have developed the research outputs can be used to further the practice and theory of community-based development and conservation initiatives.

1.2 Purpose

The purpose of this research is to examine how and why HCA has been successful in reducing poverty and protecting biodiversity through beekeeping. Since there are a great number of factors affecting these projects it is necessary to limit the examination to a few aspects.

1.3 Objectives

Given the purpose of the study the specific objectives were:

1. To identify the role of leadership/self-organization in the initial and ongoing organization and operation of the HCA beekeeping projects.
2. To examine the cross-scale linkages that connect HCA to the other stakeholders at other scales including; vertical linkages such as to the government at state/provincial, and national levels, non-governmental organizations (NGO's), private business, and community groups and horizontal linkages such as how specific community projects interact with others across space.
3. To ascertain how if at all the HCA beekeeping projects have affected local perceptions and actions regarding the environment.

1.4 Summary of Methods

The research design consisted of two case studies of HCA community beekeeping projects. Fieldwork was conducted in two willing communities during a four-month field season. The methods employed were derived from the Rapid Rural Appraisal and Participatory Rural Appraisal approaches (Chambers 1994). These include semi-structured interviews, focus group interviews, and participant observation. Each of these methods is described in detail in Chapter 3.

1.5 Significance of the Study

As part of a larger EI study on the impact of cross-scale interactions and self-organization on community-based management in integrated conservation and

development projects this study will contribute to the literature on community based conservation and development. Through examining the contexts and inventive methods that have led to effective integrated conservation and development, the research findings may contribute to increased management capacity and policy strengthening in Kenya and other developing countries.

1.6 Limitations of the Study

This study is limited to an assessment of specific aspects of the social and economic conditions created through HCA and as such does not attempt to assess the biophysical aspects and effects of HCA beekeeping projects on the local environment. Time was a significant limiting factor to the level of detail in interviews and the sample sizes that are used in the study. Time constraints also limited the number of communities that research could be conducted in. English is an official language in Kenya an many interviews were conducted in English, though cultural and language barriers necessitated the use of a local interpreter in some cases limiting the depth and content of the interviews and other field research conducted. Lastly as this is a case study of two specific geographic areas some of the results may not be generalizable to other settings.

1.7 Organization of the Thesis

The thesis is organized into eight chapters. This introduction is followed by Chapter 2, which introduces several of the relevant concepts from the literature including community based conservation and development, biological diversity, cross-scale interactions, self-organization, poverty, and beekeeping, all in the context of agricultural

areas of Kenya. Chapter 3 reviews the methodology of the study. Chapter 4 details the two case study sites to provide a context for the research.

The results of this study are presented in chapters 5 through 7. Chapter 5 is focused on the role of leadership and self-organization in the two projects. Chapter 6 examines the cross-scale interactions that support the two projects and how these interactions have contributed to or hampered the operation of the projects. Chapter 7 examines the affects the projects have had on the local environments and local perceptions of the environment.

Chapter 8 brings together the results of the research to address the research objectives by highlighting some of the key differences in the two case studies. In doing so several lessons can be brought forth from the Honey Care Africa experience.

Chapter 2 Conservation, Development, and Agriculture in Kenya.

2.1 Introduction

This research deals in the main with themes of integrated conservation and development, in particular with cross-scale interactions, self-organization, and the potential of beekeeping as an economic activity for rural Kenyans. In this chapter literature relevant to the above topics has been reviewed beginning with the topic of community based conservation and development projects. The concept of community is then explored. Biological diversity is examined in brief as are the histories of conservation and agricultural development in Kenya. Two aspects of community based development, cross-scale interactions and self-organization are then explored. The concept of poverty is briefly examined in the Kenyan context. Following this is some information on beekeeping development in Africa and the effects of beekeeping on the environment. The last part of this chapter introduces Honey Care Africa Ltd.

2.2 Community Based Conservation & Integrated Conservation and Development

Generally it has been the case that conservation and development were considered to be in direct conflict with one another, with the conservationists viewing development as a problem that causes loss of biodiversity and economists seeing the environment and its resources as potential sources of capital, often being underutilized by remaining in their natural state. This conflict-laden view led conservationists to establish protected areas that exclude the pursuit of livelihoods (Brown 2002). Today the paradigm has shifted and many conservationists now view local people as an effective instrument for furthering their conservation goals rather than as adversaries or stumbling blocks. This

change in attitude has not fully resolved the earlier conflict as local people are more likely to view conservation as a means rather than an end (Murphree 1994).

Community-based conservation has become the dominant paradigm amongst major donors and environmentally conscious NGOs (Browder 2002). Little (1994) defines community-based conservation as:

> Voluntary initiatives involving a minimum of several households in which at least one of the outcomes of local management practices is either the maintenance of habitats, the preservation of species, or the conservation of critical resources and another outcome is improvement of social and economic welfare (Little 1994).

While this definition does well to explain community based initiatives that have both conservation and development as objectives the absence of the word 'development' from the term indicates a bias towards conservation that communities (especially poor ones) do not likely have. At the local level, communities will not likely protect biodiversity for its own sake without suitable incentives (Koziell 2001). Thus the term community-based conservation reveals it's origins as created by academics and conservation professionals reflecting their conservation bias rather than the bias of economic development that most recipient communities have.

Integrated conservation and development projects (ICDPs) like CBC projects seek to bridge the gap between conservation and development proponents. ICDPs differ from other approaches by regarding conservation and economic development as equal ends that should be linked together in a symbiotic relationship (Alpert 1996). This is unusual in practice if not theory, as most conservation and development projects favour one

objective over the other and are evaluated based on the favoured objective (Michaelidou et al. 2002). Such projects take as their theoretical basis something called the *interdependency hypothesis*: which asserts that ecosystem viability and community viability are interconnected, each one being reliant upon the other (Michaelidou et al. 2002). This can make ICDPs more attractive to rural communities than conservation dominated projects, as cases where low-income communities manage their resource bases with the prime objective of conservation instead of improved economic welfare are rare.

If there is an indirect linkage between conservation and livelihoods then the adoption of strategies to develop alternative sources of livelihoods that substitute for biological resources previously used/harvested by local people is frequently utilized. This commonly manifests itself in the form of buffer zones around protected areas or limited access reserves that allow some level of use, typically at a lesser intensity than previously was the case (Brown 2002). A complimentary strategy of this type is to increase the economic return that local people obtain from their current livelihood pursuits outside the area valued for its biodiversity (Abbot et al. 2001).

If the livelihoods of rural communities have developed a dependant relationship with their local biological resources then this direct linkage can provide an economic incentive to conserve biological diversity (Brown 2002). Conservation programs are more likely to be accepted by communities in situations where lucrative resources that generate income for the local population are at issue and local access to these resources is guaranteed (Little 1994). In this scenario livelihoods induce conservation rather than merely being compatible with conservation as is the case with indirect linkages (Brown 2002). This situation need not require that local people have the same interests as those

of conservationists; rather sustained conservation of biodiversity requires only that local people have a stake in conservation that is greater than they have in unsustainable resource use patterns (Bromley 1994), this can apply to both indirect and direct linkages between conservation and livelihoods though it is more easily applied to the later than the former.

2.2.1 Community

Formally protected areas account for a small percentage of the earth's total land surface area and therefore most of the biodiversity we wish to protect is found outside of protected areas. In order to conserve biodiversity in areas that are under some form of land ownership either private or collective the support of communities must be solicited, this is best achieved through having communities participate in these conservation efforts in a meaningful way (Little 1994).

The inclusion of the community level in natural resource management is based on the previous failures of centralized 'command and control' conservation strategies. The rigidity of 'command and control' solutions is a hindrance to their success as their policies are often too inflexible to be effective in the variety of situations that exist in different communities. Lack of community involvement has been identified as a problem based on the failure of many projects which showed that if communities are treated as a passive objects projects will lack long-term sustainability (Alpert 1996, Campbell and Vainio-Mattila 2003, Michaelidou et al. 2002, Wainwright and Wehrmeyer 1998). Communities have no incentive to use their resources sustainably if they are not involved in the management of those resources, conversely they may receive benefits that create

incentives for them to be good stewards if they are included in resource management (Agrawal and Gibson 1999). The inclusion of the community as a the principal stakeholder in resource management is based on the idea that local populations have a greater interest in the sustainable management of resources than do distant managers; that local people are more familiar with the intricacies of the local environment; and that the are better able to effectively manage said resources through traditional methods (Brosius et al. 1998). It is also at the local level where successful examples can have the greatest impact in convincing local people of the legitimacy of the principles of sustainable development (Bridger et al. 1999).

It is important that the community have some input in the type of development that occurs in their locale so that they are not subjected to a development plan that is imposed on them by outsiders who do not understand their specific situation, which may result in low levels of participation and ill suited development projects (Ostrom et al. 1999; Shiva 1993). Similarly a level of community ownership and control over the enterprises is required to gain more complete participation (Hoff 1998).

The social structures of small communities are thought to create conditions that make collective action easier and more effective (Johnson 2001; Ostrom et al. 1999), though, it should not be assumed that communities are homogenous entities distinguished from outsiders by virtue of this sameness. Communities are made up of unique individuals, some of whom will likely have competing interests so far as natural resource uses are concerned (Agrawal and Gibson 1999; Berkes 2004; Brown 2002; Johnson 2001; Leach et al. 1997a). There are also the dynamics of the particular communities to consider, more powerful groups and individuals tend to exercise their power to gain

better access to resources compared to weaker groups and individuals (Agrawal and Gibson 1999; Leach et al. 1997b), this may or may not manifest itself in the membership of community resource use groups and the objectives of these groups.

There are also other advantages that are manifest at the community level which if utilized can result in better management outcomes. The incorporation of traditional ecological knowledge (TEK) and local knowledge from non-indigenous groups can be a great asset, it is a source of detailed information that already exists, provides a different perspective from traditional Western scientific bias, and tends to be important to local people (Johnson 2001). Monitoring is best accomplished at the community level. This is the level at which the consequences of environmental degradation are most acutely felt and where successes are most easily seen (Bridger et al. 1999).

Communities need to be involved in a meaningful way in any conservation program if it is to be successful, because it is the local communities that are the major actors in carrying out the programs, therefore they must internalize the values of the program, or at least be sympathetic to them. Getting communities to internalize the values and goals of conservation programs has often been difficult in practice (Berkes 2004). There have been a variety of strategies employed to overcome this problem that have met with varying degrees of success such as using monetary incentives, and legislation or other government pressure. Internalization of conservation values in poor countries has been a great challenge as in many cases people are dependant upon the very resources that are slated for protection. This can bring the short-term and possibly long-term interests of the community into direct conflict with those of the conservation.

2.3 Biodiversity

Biodiversity or biological diversity is a concept that has gained much importance in recent years. There are a variety of definitions of biodiversity though most have much in common focussing on two related concepts: genetic diversity (the amount of genetic variability within a single species) and ecological diversity (the number of species within a community of organisms) (Baydack and Campa III 1998). Biodiversity does not have a standardized quantifiable measure that can be applied to a location, measurements of biodiversity are often related to scale and depend on the perspectives of the managers (Baydack and Campa III 1998). Environment Canada (1996) defined biodiversity as: "The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species and of ecosystems." (Environment Canada 1996).

Resilience in ecosystems is important for human welfare since our survival is dependant on the environmental services provided by ecosystems (Folke et al. 1996, Davidson 2000). If we proceed from this point, it is the ability of an ecosystem to function that most matters to humans, not that it has a full stock of species, though having a full stock of species will contribute to the ability of an ecosystem to function (Folke et al. 1996).

In order for any ecosystem function to be sustained there needs to be a minimum number of living organisms structured in specific manners to facilitate the energy flows and nutrient cycling between the primary producers, consumers, and decomposers, which in turn affect the temporal and geographical patterns of vegetation that are more

commonly associated with ecosystems. This minimum number and composition of organisms required to maintain an ecosystem in a functional state is unknown, furthermore this number varies between and within ecosystems based on environmental conditions.

Because ecosystems can retain much of their functionality even after experiencing reductions in the species diversity and number, loss of resilience is often not noticed until after external shocks that were previously absorbed by the system can no longer be absorbed and there are notable consequences associated with this, often this state is reached near the threshold where an ecosystem can change from one equilibrium state to another (Folke et al. 1996).

While the conservation of biodiversity is important for a wide variety of reasons particular concern is directed towards what are called 'ecosystem services', which are the beneficial effects of ecosystems on human well-being (Davidson 2000). In the case of agricultural systems, vital ecosystem services such as providing food, fibre, fuel, building materials, and income as well as less obvious services such as recycling nutrients, regulations of hydrological processes, controlling micro-climates, and detoxification of noxious chemicals would be greatly hindered by a reduction of biodiversity. These functions are largely biological and if they are to persist a sufficient degree of biological diversity must be maintained (Altieri 1999), though what level of biodiversity must be maintained is a contentious issue. The loss of these services due to degradation of local environments has negative economic ramifications for agriculture, as costly external inputs are required to compensate for the lost services. Often the costs also include a decrease in the quality of soil and crops due to erosion and contamination from pesticide

and nitrates that become required inputs to the degraded system (Altieri 1999). The end result is a system that is maintained only by constant and costly human intervention and tends to result in soil contamination and degradation.

One of the common aspects of traditional agriculture is the greater degree of plant diversity compared to modern agriculture, both intentionally in agro-forestry or polycultures but also unintentionally as traditional systems are less able to manipulate the environment through the use a chemicals and machinery than modern industrialized systems. Therefore traditional agricultural systems are less able to adopt the monoculture model that dominates agriculture in the developed countries due to economic factors that favour mechanization. Polycultures – the dominant form of agriculture in developing countries, tend to require greater labour input and are less suited to mechanization, though they can provide adequate returns to farmers while maintaining a high degree of biodiversity (Paoletti 1999), this is especially the case in developing countries where the labour input is relatively low-cost compared to the case in the developed nations.

The expansion of agricultural lands throughout the world has been a major contributor to the reduction of biodiversity. Naturally occurring plant species are replaced by a small number of species that are often alien to the ecosystem (Pagiola et al. 1998). This can have a domino effect as the fauna are affected by the change in flora. Not all forms of agricultural conversion are equally detrimental to biodiversity. Altieri (1999) identifies four factors that affect the degree of biodiversity in agroecosystems: (i) the diversity of vegetation within and around the agroecosystem; (ii) the permanence of the various crops with the agroecosystem; (iii) the intensity of management; (iv) the extent of the isolation of the agroecosystem from natural vegetation.

In order to protect biodiversity there needs to be an approach that addresses the factors that are contributing to the pressure to expand agriculture. Markets undervalue biodiversity, especially non-use and indirect benefits of biodiversity such as environmental services, therefore decisions made about agriculture tend to reduce biodiversity in order to achieve economic gains (Pagiola et al. 1998). While there are dangers inherent in the commoditization of nature the reality is that economics tends to be the driving force behind most policy decisions, particularly in poor countries so despite the unsatisfactory manner in which markets value biodiversity they cannot be ignored. Therefore the linking of economic returns and biodiversity is important. Koziell (2001) suggests that the goal should be to have direct use and indirect use values of biodiversity yield better and more equitably distributed returns for the poor in a sustainable manner.

Linked to the strategy of increasing the value markets assign to biodiversity there is a need to improve rural economies, and to help reduce the pressure to expand agricultural lands (Hackel 1999). Economic stimulation of rural economies is needed to provide more options to the people than just expanding their agricultural land base (which is not always possible or desirable), and also to provide a greater deal of economic security in the lives of rural people. This lack of economic security is often cited as a hindrance to the acceptance of conservation views (Pagiola et al. 1998; Schroeder 1999).

ICDPs intend to reduce pressure on specific biodiversity rich areas by developing and improving livelihoods in adjacent areas so as to reduce the pressure on biodiversity rich areas to be cleared for agriculture. This is common for many such conservation

projects that include protected areas. Abbot et al. (2001) identify another aspect of an ICDP in Cameroon, that the livelihoods program will generate goodwill in the communities towards the conservationists as the project demonstrates its concern with people's livelihoods. This is important, as there is often an antagonistic relationship between conservationists and local resource users. Regardless of the local attitudes towards conservation of biological resources, these resources will only be conserved if the immediate needs of the local population can be met either from adjacent agricultural lands or from sustainable harvests of resources from the protected area, if this is not possible then local people will meet their consumptive needs in whatever manner is necessary even if it is unsustainable.

2.3.1 Resource Valuation

Some of the recent thinking on conservation particularly that influenced by neo-liberal economics has moved from protectionism to a focus on the market to properly value biodiversity so that it can be fit into the economic models used in development (Brown 2002). An economic approach to conservation is often thought to require assigning the correct values to biological resources in order to ensure their wise and/or sustainable use through market mechanisms (Jacobs 1993), and legal regimes that prevent the destruction of genetic resources at zero cost to the responsible parties (Bromley 1994)

An economic approach to conservation often takes the form of cost-benefit analysis, which is problematic for several reasons: economic theories are not well suited to pricing certain biological resources because they are not currently being traded efficiently in the marketplace; cost-benefit analyses include assumed discount rates that

are subjectively set, and value the present more than the future supporting short-term profits as the most rational path to pursue (Davidson 2000). Thus the use of discount rates in economic analysis for natural resource issues is at odds with most theories of sustainable development, which tend to embrace the 'precautionary principle'.

From a development perspective the idea of "fair-trade' agricultural commodities such as coffee are seen as a promising vehicle for ICDPs. One of the most basic ways to improve the lives of subsistence farmers is to increase the money they receive for their crops, this can be accomplished in some cases by appealing to those people who are willing to pay a premium for products that benefit poor farmers, especially those who are engaged in some type of biodiversity conservation project.

2.4 Conservation in Kenya

Conservation in East Africa has a history that starts in the colonial era. Initially parks and reserves were established to protect wildlife from the locals so that the colonists and other European and American visitors could have animals to hunt. In 1904 the Northern and Southern Game Reserves were established in western Kenya on lands seasonally occupied by the Maasai tribe (Knappert 1987). Officially hunting for game animals was banned in the reserves themselves, but the colonial authority did not have sufficient manpower to patrol the reserves effectively, and the borders of the reserves were not firmly established (Ridgeway 1998). Kenya became the country of choice for big game hunting in the first half of the 20th century; this reputation was cemented by Theodore Roosevelt's massive safari in 1909 that was covered worldwide in the press (Ridgeway 1998). Land that was deemed 'unoccupied' by the colonial authorities was

expropriated and access restricted - often lands used seasonally by pastoral tribes were considered unoccupied. The locals were forcibly removed from their land and forced to live in "African reserves" (Ward & White 1971, Western 1994). In 1945 the National Parks Ordinance gazetted several national parks, the land was expropriated for this purpose (Western 1994). After the end of the colonial era things did not much change in respect to the protected areas in Kenya, the new government saw value in protected areas and maintained those established under British rule. Furthermore, conservation remained mostly the domain ex-colonial officers who stayed in Kenya and maintained a protectionist philosophy that still exists (Igoe 2003, Western 1994).

In Kenya many rural people see protected areas as being for the benefit of others at their expense. This negative response towards conservation programs is a natural reaction to the history of colonialism in Africa that has alienated rural people from conservation efforts through the establishment of protectionist parks and reserves that restrict access to resources of people who previously had depended on the resources in these areas (Hackel 1999; Schroeder 1999; Western 1994; Woodhouse1997). The situation is made worse by the revenue flows from many parks, in Kenya a small minority of national elites profit from the parks, which are visited almost exclusively by foreigners (Igoe 2003).

Wildlife protection, one of the most visible forms of biodiversity conservation in Kenya (with its own agency - the Kenya Wildlife Service) is a prime example of this alienation and is seen as misguided by many subsistence farmers because it ranks the needs of wildlife above those of people, this is revealed acutely in situations where animals destroy crops when they leave the parks or other protected areas to feed (Hackel

1999; Western 1994). The laws of Kenya still reflect this as it is a serious crime to shoot wildlife, and yet compensation for the destruction of crops or for injuries or death caused by wildlife is minimal.

2.5 Agriculture in Kenya

The agricultural landscape of Kenya has been greatly influenced by the colonial history of the country. The British imposed peace upon the different tribes, providing a stability that allowed for agricultural development. The British Foreign Office and later the colonial administration expropriated land from the native tribes of Kenya for the railroad and for European settlers who wanted large tracts of land to farm. "African reserves" were established where the locals could live a traditional lifestyle on less land than their tribe previously ocupied. This process established the 'white highlands' in the first years of the 20th century, where European settlers were able to acquire large tracts of land for 'estate farms' in the cooler climate of the central Kenyan highlands (Knappert 1987). This policy also resulted in the colonial government reserving large areas of the highlands for future European settlement, and barring Africans from occupying this land despite the growing population pressure and the fact that these lands were unoccupied (Ward & White 1971). It was not until 1960 with population pressure and land shortages becoming apparent that the colonial government opened up areas of the 'white highlands' for Africans (mostly Kikuyus) to settle and farm on 20,000 holdings of 25 acres each. After independence in December 1963 and the emigration of many European farmers in 1964, there was a sub-division and redistribution of the large estate farms previously owned by Europeans – white farmers were compensated for their land by the British

government. This redistribution of land took until 1972 and included 3 million hectares of farmland (Knappert 1987). The re-distribution of land benefited some over others, and some members of the new Kenyan elite acquired large estate farms whole and continued on in the same manner as had the European farmers who previously owned the land (Knappert 1987).

The Kenyan economy is largely dependent on agriculture for most of its export revenue (CIA 2005). Though the agricultural sector's share of the GDP has been declining from 36.6% of the GDP during 1964-1973 to 26.2% during 1990-1995 (Government of Kenya 1999) and to 19.3% in 2004 (CIA 2005). The agricultural sector accounts for 75% of Kenya's employment (CIA 2005), with small-scale agriculture being the single largest source of employment in Kenya accounting for 51% of the total labour force (Government of Kenya 1999).

Poor performance in the agricultural sector has been a contributing factor to the economic difficulties experienced by many African nations, including Kenya (Eicher 1992). In 1986 in an effort to make this sector more robust the government of Kenya adopted a strategy of agricultural diversification. Seven commodities were identified that formed the core of the country's agricultural policy both for local consumption and for export: maize, wheat, milk, and meat (for food security); horticultural crops for local consumption as well as export; and coffee and tea primarily for export (Eicher 1992). This approach indicates that the government had realized the importance of both revenue from exports and local and national food security, and does not necessarily put food crops in direct conflict with cash crops. Nonetheless, growth in the agricultural sector has been well below its potential in recent years due to a number of factors such as: inappropriate

technologies for small holder farming; lack of access to credit for small holder farmers; high cost of farm inputs; poor and inadequate rural infrastructure, especially roads, power, supplies, and markets (Government of Kenya 2000). The root cause of at least some of these agricultural deficiencies has been the low level of public expenditure on the agricultural sector. Government expenditure on agriculture declined from 8.2% of total government expenditure during 1980-87, to 5.2% during 1993-95, the bulk of this money was spent on large-scale agriculture and cash and horticultural crops, with the small-scale agriculture sector suffering from a lack of adequate funding and attention (Government of Kenya 1999).

2.5.1 Small-Scale Farmers and Declining Farm Size

Small-scale farming tends to be complex and diverse as well as risk prone (Chambers 1997). The first two aspects of this type of farming are meant to compensate for the third. In an attempt to manage and reduce risk small-scale farmers are motivated to preserve agricultural biodiversity, diversity helps to spread livelihood flows more evenly across seasons thus avoiding a situation where there is only one harvest per year (Chambers 1997, Netting and Stone 1996). One of the principle agroecological strategies is to exploit the synergies and complementary aspects of various combinations of crops, trees, natural vegetation, and animals (Altieri 1999). To a large extent this is also done in traditional agricultural methods where farmers multiply the internal links and flows within their farming systems and their local environments. Smallholder farmers do not follow fixed procedures, rather they improvise and adapt constantly in accord with the changing seasons and their changing circumstances (Chambers 1997). For smallholder

farmers who produce a large portion of the food they consume and sell a bit of surplus in the local market a variety of food crops is important (Netting and Stone 1996). Multiple species of plants and animals provides farmers with some security against unpredictable yield fluctuations due to weather, pests, or disease, and against market fluctuations.

The declining size of farmlands of rural people is a serious issue in Kenya, a country that has experienced rapid population growth in the years following independence. Kenya's population increased from 15.3 million in 1979 to 33.8 million in 2005 (CIA 2005). The majority of the population (more than 80%) is resident in rural areas, and most of these people are economically dependant upon agriculture (Government of Kenya 1999). This rapid population growth has forced a decrease in average size of landholdings as lands are subdivided down through generations with a father dividing his land among his children (Hackel 1999, Murton 1999). This pattern of land subdivision is common in many areas of Kenya resulting in a decline in the average farm size through generations. With most of the arable land in the country already occupied, migration to new areas is not a feasible option for farmers.

Declining farm sizes have created pressure on farmers to adopt more intensive agricultural practices as they seek to maintain their agricultural livelihoods. There are various ways by which farmland productivity per unit of area can be increased. The most obvious is applying more labour to the land to farm it more intensively; this is more easily accomplished on smallholdings than large ones. Intercropping also increases the productivity of a given area and grants the farmer greater security as polycultures are more resilient than monocultures in terms of both climatic and market conditions. Intercropping allows for the farmer to produce food as well as cash crops. Planting trees

on farmlands regulates the micro-climate, reduces erosion from wind and water, provides firewood, and depending on the tree species may also produce a valuable commodity such as fruits or nuts, though in an agroforestry system there is the potential that trees will compete with the other crops for sunlight, water, and nutrients thus negatively impacting crop yields (Sanchez and Palm 1996).

In his 1999 study of population growth and poverty in Machakos District, Kenya, Murton noted that the main strategies to deal with declining farm sizes were to increase the amount of land planted with cash crops, and to increase the number of fruit trees planted and intercropped. Other changes in land use that Murton (1999) observed were conversion of grazing lands to agricultural lands, and planting very little traditional grains such as millet and sorghum concentrating instead on maize and beans. The adoption of a zero-grazing cattle practice has become more common in some areas of Kenya, this has coincided with a decrease in lands available for grazing due to the conversion of such lands to agriculture and as a result of changes in government policy that prohibit grazing of cattle inside some protected areas (Anjina 2004).

2.5.2 Importance of Multiple Income Sources for Small Scale Farmers

Murton (1999) found that non-farm income was the most important factor contributing to on-farm investments and with it soil fertility and livelihood security for subsistence farmers. Families with non-farm income are able to use this extra income to insulate themselves from some of the impacts of difficult agricultural times such as drought, pestilence, or fluctuations in the market value of their crops, and to make on-farm investments, which in turn led to higher yields from crops and greater farming

income. In contrast families that lacked such income sources were found to be experiencing a cycle of declining soil fertility and declining crop yields (Murton 1999).

Poorer farmers are unable to purchase inputs and are unable to leave land fallow thus they must rely principally on increased labour to raise (or maintain) their crop yields and whatever non-farm income they do obtain is usually spent on immediate food needs with little left over to make investments in their farmland (Murton 1999). Only greater access to land or other income sources will enable the poor to escape from this trap (Murton 1999). Greater access to land is not likely due to the magnitude of present land pressure and the rate of population growth in Kenya increased income may be the best way to overcome this difficulty.

Smallholder farmers need to secure relatively high and continuing yields of crops and livestock from resources like land and water that are limited. Without access to new technologies or full-time alternative employment smallholders must intensify their efforts on the land available to them. This trend is reinforced by the fact that on-farm labour cannot always be readily shifted to off-farm income generation, this is especially true of women and children who have very limited opportunities to engage in non-farm labour.

The introduction of cash crops has been vital to the ability of the rural sector to generate more income and absorb more labour therefore reducing the effects of population pressure. The principal cash crops in Kenya are tea, coffee, sugar cane, and horticultural products (CIA 2005). A high value cash crop can allow farmers to earn more income from the same area of land than they were previously able to. However, cash crops are subject to volatile commodity markets and therefore not a secure means of producing income in of themselves.

The adoption of cash crops is a strategy that cannot be employed by all farmers, there are investments required that inhibit the poorer members of a community from converting land from subsistence crops to cash crops as they must still meet their food needs. Sugar cane is only harvested once every 18 months so farmers must be able to wait this long for their money from such a crop, this is an investment that some of the poor cannot make due to the time lag involved. Tea similarly takes a few years to grow from the size of a seedling (common size at which they are purchased by farmers) to a harvestable size. Beekeeping is similar to these two cash crops in that there is a considerable lag time before the farmer begins to receive any benefits from the investment, at least 6 months and sometimes up to 12-18 months before a return is realized. Furthermore cash crop production for export markets can be very uncertain, as there are a myriad of factors affecting the price of such commodities, including variable consumer demand, the quantity of the commodity in the market, and climatic conditions.

2.6 Poverty

Land is the dominant asset in rural areas of Kenya; it is the principal source of income, food, status, wealth, and security (Bibangambah 1985). Inadequate access to land occurs not only in countries with high population densities compared to the amount of arable land, but it also occurs where there is relatively abundant land but it is unevenly distributed due to socio-economic and political factors.

There are demographic factors that contribute to rural poverty in Africa. Though Kenya's birth rate has declined in recent years it is still quite high at 40.13/1000, and the population growth rate is at 2.56% (CIA 2005). There is a direct relationship between

dependency and poverty at the household level because of the impacts on household income and costs. Children, the elderly, and those incapable of working due to illness, injury or other ailments are dependants. The dependency ratio in most African nations is very high, in Kenya it is at 44.8% (CIA 2005).

In most African nations rural people are the largest and poorest group as well as the most disadvantaged occupational group (Bibangambah 1985). In Kenya the poor comprised 52% of the country's total population in 1997, with three quarters of the poor living in rural areas, and women making up a larger portion of the poor and the total population than men (Government of Kenya 2000). The government of Kenya defines the poor as: being those people who cannot afford basic food and non-food items, this definition is likely to change as the government has acknowledged that insecurity, isolation from mainstream development, illiteracy are all aspects of poverty (Government of Kenya 2000).

2.6.1 Vulnerable Social Groups

Despite the fact that women play a dominant role in the African subsistence agricultural sector (while men are dominant in the cash crop sector), rural women have not typically been the target population for the introduction and dissemination of new techniques in agriculture (Muro 1985, Wainright and Wehrmeyer 1998). Agricultural extension services have been given to men in the hopes that they will pass the information along to their wives; this has often resulted in men not paying attention to the programs, since their wives were the cultivators of the crops in question with the end result being that the women were deprived of this new knowledge (Muro 1985). Women

in most parts of Africa are land users but not land owners. This has restricted their access to credit or joining co-operatives, as land is often required as collateral or as status (in the case of cooperatives) (Chavangi 1992, Muro 1985).

It is common in rural Africa for men to migrate to urban centres for employment; women usually stay at home and take care of the children and the rural homestead. For these women, there is little opportunity to find other employment, as such opportunities are rarely available in close proximity to their homesteads, and their domestic responsibilities usually take up much of their time leaving little left for working.

The burden of household chores is another factor that limits the time that women can spend learning new techniques or performing agricultural labour, which further undermines their position and that of their families. In areas that have suffered from environmental degradation the time that must be allotted to conducting daily chores has often increased. Lower water tables and/or contaminated water means that acquiring adequate supplies of water becomes more difficult and time consuming. Deforestation means that more time is required to gather firewood and that trees that otherwise would not have been harvested are (trees on high grade slopes) this can have the further effect of increasing the level of risk from natural hazards such as landslides as well as increasing the rate of soil erosion and potentially causing siltation and contamination of water supplies.

HIV/AIDS has had a devastating effect on the population of Kenya as it has in much of sub-Saharan Africa. While there has been some progress - the adult HIV prevalence rate in Kenya has declined from a high of about 13.5% in 2000 to 6.7% at the end of 2003, the epidemic is still extremely serious (Kimalu et al. 2004, UNAIDS 2005).

In 2003 there were 150 000 deaths from HIV/AIDS in Kenya (UNAIDS 2005). HIV/AIDS has greatly increased the mortality rate of young adults – the most economically active group; this has created even greater burdens on already poor households in rural Kenya (Singh and Kalala 1991). The virus creates a situation where afflicted households have increased medical and funeral costs and decreased labour available to meet these costs, for people living on the margins of poverty these added costs tend to drive them further into poverty, forcing them to sell off assets such as livestock, and even land (Singh and Kalala 1991). HIV/AIDS also is having a negative affect on education, as families may be forced to take children out of school to tend for the sick, or the price of school fees may become too expensive due to increased medical costs. Women who because of HIV/AIDS have become widows are along with orphaned children a particularly vulnerable group; this is especially so because of the system of land tenure that can make it difficult for a widow to acquire title to her husband's land (Singh and Kalala 1991). The HIV/AIDS epidemic is having a grave impact on the social fabric of Kenyan society as it threatens to kill a large proportion of an entire generation.

2.7 Development in East-Africa

There has been a shift in development paradigms from one based on the transfer of technology, capital, and food aid from the developed countries to the developing countries, to a paradigm based on the development of local capacity and institutions (Eicher 1992). This change has not resulted in the exclusion of the ideas of the earlier paradigm entirely but rather comes to the realization that the problem is more complex than previously imagined.

It had been assumed that the major constraints to development in Africa were shortages of capital and technical skills, the colonial legacy, and disadvantageous terms of trade and commodity prices (Eicher 1992, Korten 1995). The goal was to transform African economies into facsimiles of Western industrialized economies. There was a bias towards the modern industrial sector in the adopted growth models that saw the rural/traditional sector as having low productivity. Agriculture is in some ways disadvantaged compared to the modern industrial sector; besides the close relationship between agriculture and climatic conditions there are market factors that place the agricultural sector at a disadvantage. Due to the long maturation periods that crops require, agricultural production cannot be adjusted according to sudden shifts in market situations at the same speed as manufactured goods can be. Demand for food is largely inelastic, which can also put farmers at a disadvantage compared to producers of manufactured goods. These factors have helped to drive macro-development towards the modern industrial sector rather then the agricultural sector that employs many more people. Therefore it was thought that resources needed to be shifted to the modern industrial sector to stimulate growth (Livingstone 1986).

The modern sector has tended to grow very slowly in African nations due to the large amount of capital required and the lack of local markets for the goods produced. This sector of the African economy has tended to be foreign dominated due to its capital-intensive nature and tends to be of the import-substituting variety (producing locally what had been previously imported), mostly relatively sophisticated and expensive consumption goods for the wealthy elite who can afford them (Livingstone 1986).

Import-substitution development can result in the displacement of local industries that produce the goods that poor people purchase (Korten 1995).

It has now become clear that the economic growth models adopted by African nations after their independence were inappropriate for the stage of development that these countries were in. In order for a country to successfully adopt new technologies there must be a minimum level of local scientific capacity to efficiently utilize the new technology (Eicher 1992). With the failure of the modernization type of development there has been a new emphasis on reaching the poorest members of society directly rather than relying on 'trickle-down' effects from the modern economy. Thus the emphasis has been shifted to increasing the incomes of the poor in the activities that they are already conducting (i.e. agriculture) rather than trying to recruit them to other more productive sectors of the economy.

2.8 Self-Organization/Leadership

Leadership and self-organization are two interrelated factors that have a significant impact on development projects. Self-organization is a critical aspect of all living systems, ecological and social. Within living systems the components of that system are connected to each other in specific ways, and each system is embedded in larger systems. The relationships between the different organisms and their environment in a living system are regulated by feedbacks (Holling et al. 1998). Human constructed social systems exhibit many of these same characteristics. Leadership is required at a variety of scales, but often the most important is the local scale. Instances where communities are able to organize projects themselves have the highest potential for real

participation at the greatest number of levels of project development and therefore for the project goals to best relate to the goals of the community.

Often it is the case that governments or NGO's will influence communities to adopt development or resource management programs. In these cases the impetus for the project cannot usually be said to have come from within the community. Even in circumstances where communities organize their own institutions for managing local resources these institutions are still affected by the power relations that exist in the community. "In producing particular notions of a collective good, and appearing to act for it, such organizations frequently reproduce exclusions, marginalizing the environmental perspectives and priorities of certain social actors" (Leach et al. 1997b).

Leadership is an important aspect of self-organization in community development projects. Leadership must be vested at various scales including the local level, as problems that need to be remedied and are apparent at the community level, may not even be known to those operating at higher scales. Projects that are initiated by strong leaders are usually proficient at defining the issues and mobilizing community members for action through effective use of symbols to capture varying interests to integrate them into a compelling scenario (Westley 1995). Such leaders usually demonstrate creativity in resource mobilization, not going after conventional sources such as government grants in order to remain unfettered by restrictions or obligations attached to such funds, rather they often are able to garner sufficient commitment on part of their followers to finance the project (Westley 1995), though this may not be appropriate or realistic in the context of impoverished communities. The strong leadership of a particular individual may lead to over-dependence on this individual, which can result in a power vacuum in the absence

of this leader. Furthermore a strong leader often resists the institutionalization of tasks necessary for the long-term survival of the project as leaders place a high value on personal creativity (Westley 1995). Conversely initiatives that do not have a single strong leader may not be able to acquire as much in the way of resources, though such community projects may fare better in the long term than those dominated by a single leader especially after the leader vacates that position. Additionally there is a better chance that a more diffused leadership will more accurately portray community goals than an organization dominated by a single individual.

Another aspect of self-organization for CBC projects has to do with individuals who work as liaisons between institutions (Murphree 1994). Community based projects cannot function sustainably in isolation so the ability to interact effectively with institutions at other scales is especially important. In some cases the same local leaders may be able to perform this task, but such individuals who can relate well to subsistence farmers may not be the most suitable for dealing with government ministries, NGOs, or international donors.

2.9 Cross-Scale Linkages

Centralized environmental management is based on the idea that ecosystems can be thought of as basically larger versions of micro-scale systems that have been more intensively studied and therefore management can be effectively scaled-up. History seems to indicate that this is not the case. However, neither should we assume that environmental management can be scaled-down, replacing all centralized bureaucracies with local-level institutions (Folke et al. 1998). If management is too localized then links

between the environmental feedbacks and environmental stresses or impacts may not be understood, as it becomes difficult for information to be shared and examined from a larger-scale perspective from which the environmental feedbacks can be more clearly seen. Rather environmental management requires co-ordination across scales.

The importance of establishing a partnership between communities and other institutions (i.e. governments, NGOs, etc.) in conservation projects is now recognized. Such partnerships can be understood in terms of cross-scale interactions, which consist of the linking of institutions both vertically (across hierarchies or levels of organization) and horizontally (across space) (Berkes 2002). This is especially pertinent to the management of natural resources, which are affected by factors that are wide ranging geographically. An understanding of cross-scale interactions allows for a view of how different factors interact contributing to a specific situation rather than viewing each component in isolation. Furthermore no one organization can solve the problems of ecosystem management of even the least complicated (jurisdictionally) ecosystems unilaterally (Westley 1995). Coordination between different scales is necessary for many resource related development projects as local level institutions are not by themselves generally capable of controlling all the factors affecting the area they are attempting to manage. This in turn will require more effective local level management institutions and methods of transferring and sharing information across vertical and horizontal scales.

Centralized management of resources tends to result in a shift in the knowledge system used, from a local system to one based on universal science; this can undermine local knowledge systems and institutions (Berkes 2002). Decentralization of resource-management is therefore necessary for local communities to regulate their own activities

in community-based conservation projects. However, much resource management remains government controlled, though it is now generally accepted that there are benefits to be accrued from collaboration between the centre and the periphery. The centre sets operational guidelines, allocates resources, and monitors their use; the periphery carries out implementation of development objectives (Oyugi 1985). Unfortunately, it is common for governments to delegate authority to the periphery while the power often remains at the centre (Little 1994, Livingstone 1986, Oyugi 1985). The degree to which decentralization is genuine can be seen by examining several factors such as the extent to which the authority to negotiate with external bodies, financial decisions, and the power to sanction resource offenders are devolved to communities (Little 1994).

2.10 Beekeeping and Development

Beekeeping is an example of a traditional livelihood pursuit that is intricately connected with the health of a wide spectrum of productive ecosystems. Beekeeping is most often practiced in Africa as a supplementary activity that provides income for rural subsistence farmers (Nel et. al 2000, Shakleton and Shakelton 2004). Bees pollinate a variety of flora both wild and domesticated, many of which are high value agricultural or cash crops such as certain flowering horticultural crops, fruit trees, canola, flax, sunflowers, tomatoes, peppers, cotton, coffee, tea, and others.

Beekeeping has become an attractive development option for rural communities and development organizations (government departments and NGOs). This attractiveness can be attributed to a number of factors:

- It relies on indigenous knowledge. There are many traditional beekeepers in Kenya as in other parts of Africa, and many have extensive knowledge of the bees and vegetation in their areas. As well, many governments and NGOs have been promoting beekeeping for many years, which has increased the level of beekeeping knowledge and experience in Africa.
- It uses locally available resources. Hives can and are made from locally available materials, some of which can be harvested inexpensively.
- Easily & locally traded products are produced. Honey and wax are the two most common products harvested from the beehive, both can be stored for considerable lengths of time without refrigeration, and do not require specialized or expensive machinery for their processing. They can also be readily traded in local markets, though wax is more difficult to sell locally than honey. In addition there are a variety of other hive-products that can be harvested and sold by beekeepers, such as pollen, propolis, royal jelly, and bee venom, though some are more difficult to extract and require specialized equipment.
- It helps rural farmers to diversify their income sources thereby increasing their financial security.
- Beekeeping requires little land. Only enough land to place the hives is required, and in many cases hives (particularly traditional beehives) are placed on communal lands. This makes it an attractive activity for areas that are experiencing extensive pressure on the land due to population growth and the associated subdivision of land, as is the case in Kenya (Murton 1999).

- Beekeeping has relatively low physical demands. This has made it attractive to development organizations attempting to improve the livelihoods of women (Abbot et al. 2001). This has been facilitated by the use of non-traditional beehive technologies that are placed near the ground and close to the home rather than high in trees and possibly distant from the home, thus allowing a traditionally male activity to be conducted by women.
- Honeybees are excellent generalist pollinators, therefore beekeeping has a positive effect on many indigenous species of vegetation and provides a synergy with the primary livelihood pursuit of most rural Africans – farming,
- Beekeeping fits nicely with the conservation and development goals of many NGO's and other organizations. It also has the potential to encourage individuals and communities to support environmental conservation as it is in the interest of the beekeepers to conserve nectar and pollen producing plants, as well as to forgo the use of chemical pesticides that could be harmful to the bees.

It should be noted that the incentive for conservation that is associated with beekeeping are likely to only be effective if the returns from beekeeping are equivalent to those from alternative livelihood pursuits that individuals may conduct which are detrimental to the environment and beekeeping. For example if the return from the production of charcoal is greater than that from beekeeping (as is typically the case) then it is not economically rational for an individual to forgo charcoal production even though it is damaging to the environment and potentially to the same individual's beekeeping activities. There is a similar situation with the use of pesticides, as most beekeepers are

primarily farmers their decision to use pesticides will likely be made less consideration for their bees than for their crops.

2.11 Honey Care Africa Ltd.

Honey Care Africa Ltd. (HCA) is a Kenyan owned and based private company that has helped to initiate a number of beekeeping projects in rural communities throughout Kenya. HCA is involved with roughly 2200 rural households, providing income and teaching beekeepers about the link between conserving biodiversity and beekeeping (Jiwa 2004).

HCA operates within a tripartite model that is an example of a synergistic partnership between the private sector, development organizations, and rural communities (Jiwa 2002). The inclusion of a private sector organisation (HCA) helps to ensure that the projects operate within realistic market conditions, something often lacking in donor-driven projects where it is not always necessary for projects to be financially viable.

HCA typically seeks to partner with development organizations (NGOs and CBOs) that are already established in an area that has potential for beekeeping so that the NGO or CBO can act as a conduit through which the beekeeping project can be introduced to a community. The development organization (having community development as its goal) can play the role of the primary arbitrator and mediator in this system to ensure that an exploitative relationship does not develop between the private sector (HCA) and the farmers. The development organization may also be the initial financier of the project, providing loans to farmers so they can purchase hives, bee

keeping equipment, and receive training. The third partner in this model are rural communities, or more accurately small-scale/subsistence farmers who are the honey producers (beekeepers). This model creates a favourable environment for them in which to start bee keeping. This is achieved through a combination of training, easy access to loans, extension and advisory support, a guaranteed market for their product at a mutually acceptable price, and cash-on-the-spot payments (Jiwa 2002).

Beekeeping in developed countries, like most other agricultural practises is usually conducted using a monoculture model. Typically, specific species of honeybees are used to produce the highest yield of honey; these bees displace native bees much in the same way that agricultural crops displace native vegetation, thus reducing the overall level of biodiversity in the area. HCA's beekeeping like most beekeeping development projects in the tropics uses native bees. Honeybees (*Apis mellifera*) are indigenous to Kenya and so local bees are allowed to colonize the hives, this simplifies the operation as otherwise it would be necessary to rear queens and transport them to the sometimes remote apiaries, the expenses involved in such an operation would likely be prohibitive. This method also helps to prevent problems with the introduction of invasive alien species, as has been the case with the honeybee in North America where it is an exotic species (Mosquin 1997).

HCA acknowledges the environmental aspect of beekeeping and uses its influence and interaction with rural people to promote a holistic approach to honey that places high value on the conservation of the natural biological diversity found in local environments. HCA staff involved in the training of farmers in beekeeping stress the connection between the protection of the local environment and long-term honey-yields. This is

crucial because the community level is the most important for conservation, as conservation objectives will not likely succeed without local cooperation (Agrawal and Gibson 1999; Berkes 2004; Johnson 2001). As well, there have been several projects where HCA has been able to form partnerships with NGO's such as the Belgian Technical Cooperation, and with the Kenyan Government to link beekeeping with tree-planting in agro-forestry projects, which are working to plant and protect non-commercial indigenous species of trees (Jiwa 2002).

HCA's projects fit with the idea of a community as an entity made up of unique individuals, as HCA while supporting the creation of community beekeeping associations, deals first with beekeepers on an individual basis. HCA tries to avoid the difficulty of the benefits from development projects being captured by only the elites through the project structure that it establishes. Since HCA operates as a collection of individual micro-enterprises there is less opportunity for local elites to monopolize the benefits from the project than more centralized project ownership structures allow, though, it is the local elites who are most able to invest in the HCA projects.

HCA insists that NGO's sell the hives to the farmers rather than giving them to the farmers so that only those people who are truly interested in participating in beekeeping become involved and that they develop a feeling of ownership for their hives. This also helps to ensure that the project attracts those people who have a suitable income level for the technology being used – meaning that those who get involved in the project are those who can afford the financial risk and upkeep of the hives. The terms of financing the purchase of the hives from the NGO's are flexible so as to accommodate people from a range of income levels. The structure of the HCA program thus requires

cross-scale interactions between communities and NGO's as well as private enterprise (in this case HCA).

The honey produced by HCA farmers is of a higher quality than most honey produced by traditional methods in Kenya, and as such it is able to command a higher bulk price due to the method of extraction (Quirst-Arcton 2002). This is made possible by the introduction of Movable Frame Hives (MFHs), these hives, the type used in most 'developed' countries allow for easier extraction and more efficient production of honey (provided there is adequate management) than other hive types that are in use in Kenya – log hives and Kenya Top-Bar Hives (KTBHs). HCA stresses the importance of a high quality product in their training of farmers in beekeeping (Jiwa 2002). These are aspects of the honey production that are important for HCA honey being marketed as a 'high-end' product that may not be well understood at the local level (Koziell 2001; Quirst-Arcton 2002). With any high value commodity marketing is an important aspect of the economic process. The rural poor rarely possess the requisite market information and savvy to negotiate a favourable price for their products, especially when the product is not being sold locally (Koziell 2001). The system established by HCA helps to overcome this problem by handling the marketing of the honey and setting standards for quality that are necessary for the success of the product. By making honey a high value product and by paying farmers a fair price for their honey HCA has started a system that in some respects parallels 'fair-trade' in coffee.

The adoption of the Movable Frame Hive technology has allowed for beekeeping to be an activity undertaken by women as well as men. Traditionally beekeeping was an activity done by men only. The change of technology and related harvesting techniques

has allowed more women to become involved in beekeeping as the Movable Frame Hive is kept at ground level (the KTBH shares this characteristic) instead of atop a tree as traditional log hives are. HCA also actively encourages women to become involved in beekeeping through promoting the idea of women beekeepers to the development organizations they partner with and by providing additional incentives for women beekeepers (Jiwa 2004).

2.12 Summary

This chapter has introduced some of the important concepts that provide the context for the study and highlights some of the relevant literature. The HCA beekeeping projects can be properly termed development projects that provide direct and indirect environmental benefits to their locales. The state of conservation, development, and agriculture in Kenya has great importance for the HCA beekeeping projects that are geared towards rural Kenyans including small-scale farmers. Cross-scale interactions, and self-organization, both of which are key aspects of the two projects that are directly related to their success or failure are the focus of the case studies and therefore the two concepts were reviewed. Additionally it was necessary to look at some of the aspects of beekeeping development and Honey Care Africa Ltd.

Chapter 3 Methods

3.1 Introduction

A comparative case study methodology was used for the examination of two community beekeeping projects associated with HCA Ltd. As HCA has beekeeping projects dispersed throughout Kenya it was considered useful to examine two different communities in which projects have been established. The comparison of two cases allows for an examination of how differences in the local situations affect the manner in which the project was initiated, the institutional linkages established, and how successful the projects are in relation to each other. Information has been gathered from four different sources belonging to two main research methods (literature review and fieldwork), as multiple data sources help to increase the validity of results. The sources include literature review, interviews, focus group discussions, and participatory observation techniques. Primary data was generated through fieldwork. The fieldwork consisted of techniques based on Participatory Rural Appraisal (PRA) methods, as well as semi-structured interviews with community members based on an interactive, adaptive approach (Nelson 1991). The questions were largely qualitative in nature though quantitative data pertaining to economic aspects of the projects is included.

3.2 Participatory Rural Appraisal

Participatory Rural Appraisal (PRA) is a term that is used to describe a variety of research methods that are designed to allow researchers to facilitate local people expressing and analyzing their views and to understand and learn from local people (Mukherjee 1993). PRA is especially suitable for learning about the conditions of rural

life (Chambers 1994). PRA has developed out of Rapid Rural Appraisal (RRA), but differs from RRA where information is more elicited and extracted by outsiders, whereas in PRA information is more generated, analyzed, and shared by local people (Chambers 1994).

PRA is a diverse set of methods and as such there are a wide variety of principles that could be incorporated within its domain, Chambers (1994) compiled a list that he feels would be widely accepted including:

- To learn from local people directly, on site;
- Learning in a flexible, opportunistic, and adaptive manner;
- Being relaxed, unimposing, listening rather than lecturing, seeking out poorer people and disadvantaged groups, and generally proceeding from a position of humility rather than importance;
- Relating the costs of learning to the usefulness of the information gained, being open to tradeoffs between quantity, relevance, accuracy, and timeliness;
- Triangulating data through multiple investigations;
- Seeking out variability, outliers, dissenters and generally not ignoring the diversity of results in an attempt to fit the data into trends;
- Facilitating investigation and learning by local people;
- Being self-critical of one's own behaviour and actions in the process of gathering data;
- Using one's own best judgement rather than relying on preset practices for unexpected situations;

- Sharing of information and ideas with local people, and others involved or impacted by the research.

3.3 Secondary Data

The first source of data examined was secondary data, including journal articles, theses, government documents, edited volumes, and other relevant literature, as well as newspaper articles and internet sites. Literature review was carried on previous to and following the direct research component of the study had been completed. The topics covered in the literature reviewed include: integrated conservation and development, biological diversity, poverty issues, a brief history of conservation and agricultural development in the region, cross-scale interactions, self-organization, and beekeeping development including Honey Care Africa, to help provide a context for the research.

3.4 Semi-Structured Interviews

In the Kakamega area the research consisted of a total of 25 semi-structured interviews with beekeepers (19 farmers who have bought HCA hives and 6 traditional beekeepers), in addition to 6 semi-structured interviews conducted with government and Community Based Organization (CBO) personnel.

In the Kwale area a total of 20 semi-structured interviews with beekeepers (17 HCA beekeepers and 3 traditional beekeepers), and 4 semi-structured interviews with Government and NGO personnel were conducted.

Semi-structured interviews were the primary source of data for this research. Semi-structured interviews entail having a list of questions to be asked but that the

interview be conducted in a manner that is informal, open-ended, and fluid, following up on the unexpected with new questions (Chambers 1997, Mukherjee 1993). Semi-structured interviews were used for gathering data from community members both involved in HCA beekeeping and not involved in HCA beekeeping, representatives of the organizations involved, including beekeeping/self-help groups, NGO's, and government agencies and departments that are involved with the various HCA projects in the selected communities. Interviews also produced the data for a seasonal livelihood timeline to show temporally where beekeeping fits into the overall economic pursuits of the project participants.

Self-organization: How community members were able to organize themselves within an HCA project and who the key leadership personnel were and how they went about establishing the project's management structure were considered to be of special importance. This portion of the research helped to identify key informants within the community.

Semi-structured interviews were used for gathering data from community members involved in beekeeping. These interviews were conducted to collect data on what factors provided the impetus for the adoption and organization of the HCA project in specific communities. Key theme question areas included: the sources of project inspiration, the origins of the project, how existing knowledge was utilized, capacity building, learning, and identification of key leadership people, and the process by which the project is funded.

Cross-scale: Cross-scale linkages are concerned with determining how these particular HCA projects are related to institutions at other scales (vertical linkages)

government at state/provincial, and national levels, non-governmental organizations (NGO's), private business, and community groups; and how specific community projects are related to others across space (horizontal linkages).

Semi-structured interviews were conducted with NGO's and government agencies and departments that are involved with the various HCA projects in the selected communities. Semi-structured interviews were used to gather information from key personnel within the community as to how cross-scale linkages and interactions affected their involvement with HCA and within the community for the purposes of beekeeping. Key theme question areas included: how the different project partners interact with each other, specifically how the project is linked from the beekeepers to HCA vertically and how different organizations are linked horizontally in the project.

Environmental Effects: Local perceptions on the environmental effects of beekeeping constitute an important set of information that reflects on the sustainability of the projects and the conservation of biodiversity.

Semi-Structured interviews were conducted with both HCA beekeepers and non-HCA beekeepers as well as with specific personnel such as HCA employees, government representatives, and NGO representatives. Key theme question areas included: how if at all the introduction of new technology and training from HCA affected community members' understanding of beekeeping and their local environment; how the involvement with beekeeping has altered local perceptions of the environment and how different practices affect their environment.

3.5 Focus Groups

This method was used several times in both Kakamega and Kwale in order to gather data on the research objectives (including the data for the seasonal diagrams) in a group interview setting, so as to diversify the data sources since individual semi-structured interviews produced much of the research data. Additionally, these group discussions were used to verify data gained through other sources.

3.5.1 Seasonal Diagrams

Most rural poor people in the developing world have livelihoods that are closely connected with the change of seasons. Beekeeping is an activity that is strongly seasonal. The rural poor tend to employ a variety of different strategies for supporting themselves that change according to the seasons (Chambers 1997, Mukherjee 1993).

Seasonal diagrams are method used for temporal analysis across annual cycles that use months as the basic unit of measurement (Kumar 2002). Villagers prepare charts of displaying various socio-economic and physical phenomena such as crops grown, wage labour, food consumed, rainfall, and others (Mukherjee 1993). Seasonal diagrams reflect people's perceptions. Seasonal diagrams were created for both Kakamega and Kwale from data gathered through semi-structured interviews.

3.6 Participant Observation

Participant observation is a widely used qualitative research method that can provide a great degree of detail and insight into daily life of the community. Though this method has an inherent potential for the researcher's biases to influence the data

collected. During the course of the research and the time spent in the communities there was much opportunity for observations and this method was used while the researcher was actively engaging in other data collection methods as well as at other times.

3.7 Selection of Communities

The selection of communities for the case studies was based on several criteria. The criteria were: that there was a sufficiently large sample group of people involved with HCA (a minimum of 20 people); and that the community was willing to participate in the study; the length of time that the communities have been involved with HCA - with longer time periods being more desirable than shorter ones so that more of the effects of the projects will have manifested; location, with projects near to areas with a high degree of biodiversity (i.e. National parks or other protected areas) being favoured since these may be useful considering the EI focus linking conservation and poverty alleviation; and, practicality in getting to the research sites. It was desirable to select communities that exhibit differences in their environmental, economic, and social situations to facilitate a more interesting comparison.

3.8 Data Analysis

The data collected during the field research of this study is primarily qualitative in nature. EXCEL was used to deal with the quantitative data that is collected. Interviews were transcribed for analysis later, but were not recorded, as many people were uncomfortable with being recorded.

3.9 Results and Dissemination

The following outputs were expected at the end of the research:

- Technical report to be submitted to IDRC after field season.
- Masters thesis/Final project report produced by researcher.
- Journal paper.
- Materials/Report for communities and HCA.
- A diagram of cross-scale (both horizontal and vertical) linkages between institutions and organizations.

Chapter 4 Research Sites

4.1 Introduction

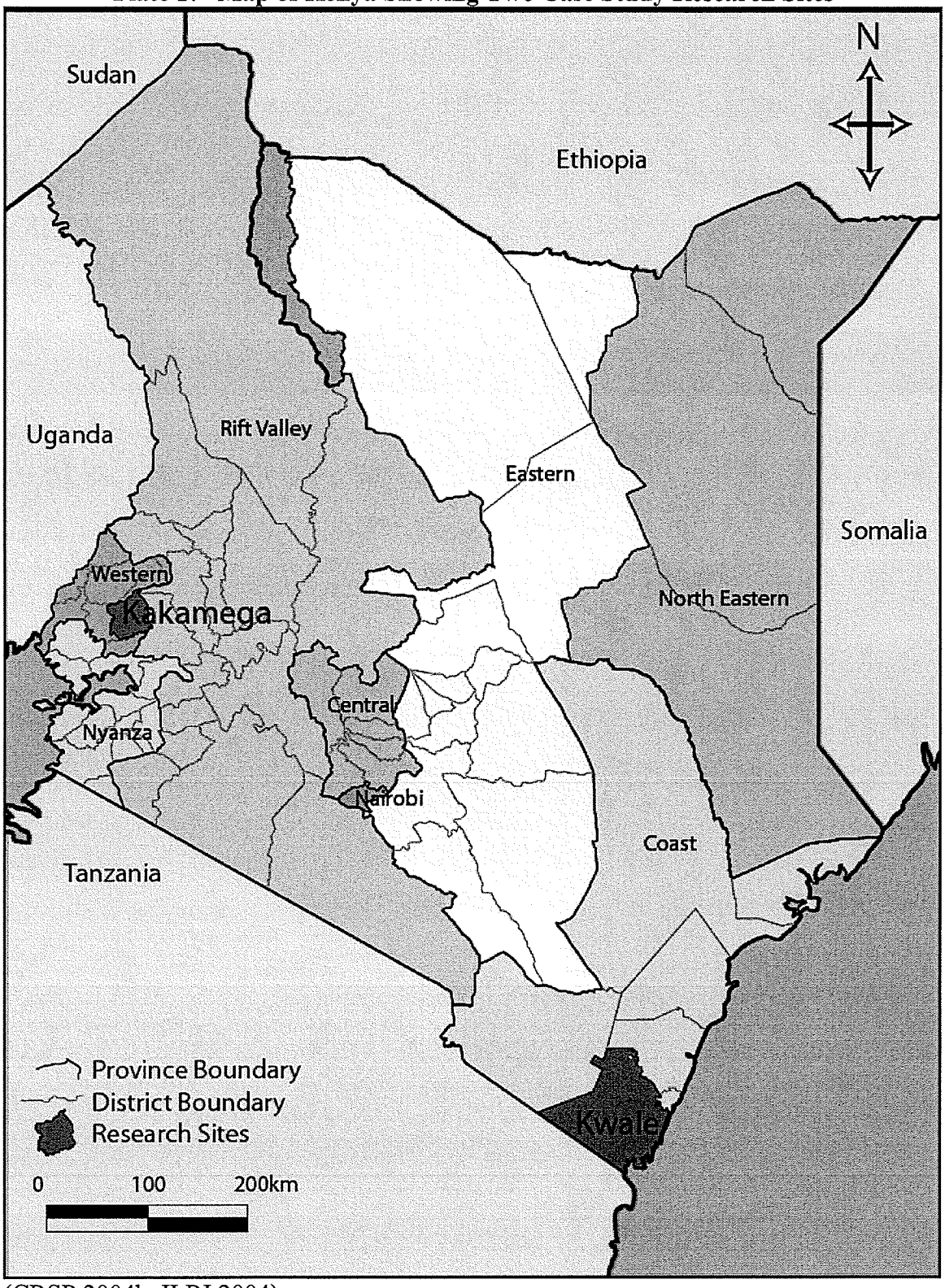
The two research sites chosen for the case studies were selected from amongst the larger number of sites where HCA has beekeeping operations in Kenya. The sites were selected based on several criteria outlined in Chapter 3. The first site, Kakamega District, in Kenya's Western Province (see figure 4.1) was chosen because it met the criteria and had the added benefit of encompassing the only remaining tract of equatorial rainforest in Kenya - the Kakamega Forest, a protected area with a high degree of biodiversity which tied in well with the EI focus linking conservation and poverty alleviation. The second site, Kwale District in Kenya's Coast Province (see figure 4.1) was chosen because in addition to meeting the prime criteria, Kwale provided a contrast to the first site in that it is located near the east coast of the country and has a different climate, vegetation, and resident tribal group.

4.2 Kakamega

4.2.1 Geography

The Kakamega District is one of four districts in the Western Province of Kenya. The district's most notable physical feature is the Kakamega Forest. The Kakamega Forest lies within the Lake Victoria Basin, and was surveyed in 1964 as covering 23,796 ha of land that ranges generally in elevation from 1500 - 1700m, with a few forested hills reaching as high as 2060m (KIFCON 1994, Mitchell 2004, Swift 2004). The Kakamega Forest is the only remaining rainforest in Kenya and is the furthest east remnant of the

Plate 1: Map of Kenya Showing Two Case Study Research Sites



(CRSP 2004b, ILRI 2004).

Guinea-Congolean rainforest, which at one time was a contiguous rainforest stretching from West Africa through the Congo Basin and into East Africa.

The Kakamega Forest now separated from this larger forest has become an island of great biodiversity surrounded by densely populated agricultural lands and forested areas such as the North and South Nandi Forests that contain different vegetation species than Kakamega Forest.

The Kakamega Forest is famous for its great diversity of flora and fauna. The unique diversity of species found in the Kakamega Forest derives from the combination of West African species from the Gunieo-Congoloian rainforest and the montane forest species of the neighbouring North and South Nandi Forests, the later of which was contiguous with the Kakamega Forest as recent as 1959 (Mitchell 2004, KIFCON 1994). There are over 330 species of birds that live in the Kakamega Forest and 400 species of butterflies; most of the larger mammal species (i.e. elephant, waterbuck, and buffalo) have been extirpated from the forest, though many smaller species such as baboons, monkeys, bushpigs, and duikers remain (Swift 2004, KIFCON 1994). Over 380 species of plants have been identified in the forest, about 50 of which are used by local people for traditional medicinal or cultural purposes (KIFCON 1994). It is estimated that 10-20% of the animal species in the forest are not found elsewhere in Kenya (KIFCON1994).

The Kakamega Forest like other equatorial rainforests, exhibits a complex physical structure comprised of multiple vegetation layers. Furthermore, the forest has experienced varying intensities of human use, which has altered its form significantly resulting in a patchwork of areas at different stages of forest growth, and under different vegetation regimes, particularly in the southern part of the forest (see figure 4.2).

The research in Kakamega took place primarily in the villages of Ileho, Ivhiga, Shibuye, and Bukhungu. Ileho and Ivhiga are on the eastern side of the forest while Shibuye is to the west of the forest (see figure 4.2). Bukhungu is located to the north and west of Kakamega town, this area had been converted from forest to farmland at an earlier period than the other villages and it displayed less diversity of indigenous flora than the villages bordering the forest.

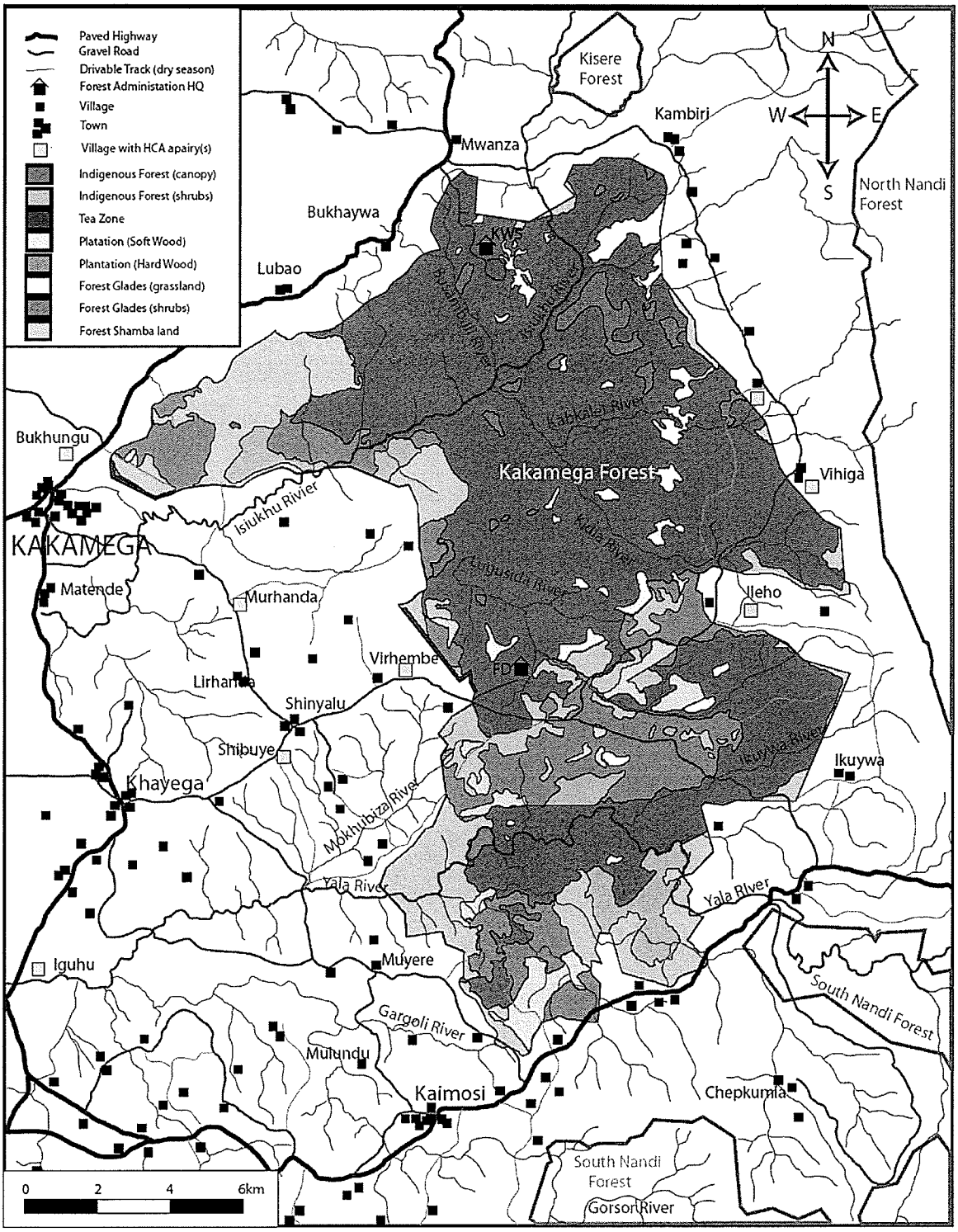
4.2.2 Climate

The Lake Victoria Basin wherein Kakamega District is located receives some of the greatest amounts of precipitation in Kenya with an average annual rainfall of 1800-2200mm. The rainfall is fairly well distributed throughout the year in a bimodal pattern (as is typical of equatorial regions) with the greater amount of precipitation falling in March/April/May ("long rains") and August/September ("short rains"). December, January, and February are the driest months characterized by lower rainfall. There is little seasonal variation of temperature throughout the year due to the equatorial latitude, with a mean daily range of between 11C and 26C, though during the rainy periods the temperature is slightly lower as cloud cover is the variable that most significantly affects temperature in the region (Morgan 1973).

4.2.3 Local Population

The main tribe living in the area is the Luhya, a group that is present throughout western Kenya and across the border into Uganda. Besides providing important resources to the communities that surround it the forest is also of cultural importance to

Plate 2: Map of Kakamega Forest and HCA Sites in Surrounding Area



(ICIPE 2000, Provincial Surveyor 2004)

NB: This map does not show all the villages involved with HCA via CARD, due to the scale of the map

the people of Kakamega District, with certain important ceremonies being preformed in the forest (KIFCON 1994). Kakamega District is one of the most densely populated districts in Kenya with 522 persons/km^2, considerable pressure is thus brought to bear on the forest resources, which are important to the people living around the forest, particularly fuel wood, pole wood for construction of homes, medicinal plants, and grazing lands for cattle (KIFCON 1994, NEMA 2004).

4.2.4 Land Use / Economy

The primary economic activity in Kakamega District is agriculture. As the local population increased areas of forest were cleared for agriculture. This process continued unchecked until 1932 when the British colonial government gazetted the Kakamega Forest as a forest reserve where clear-cut and selective logging was allowed (principally for valuable hardwoods) and continued until 1986 when the national government decided to protect the forest for its scientific value (there is still a limited quantity of timber legally harvested from plantations of fast-growing soft-woods established in the southern parts of the forest). During the period of commercial timber exploitation the forest became fragmented and due to clear-cut timber harvesting and farming by local people within the forest. However, the Forest boundaries have been maintained to their 1932 positions with very little erosion by local farmers (Mithcell 2004). Between 1986 and 1989, 443 ha of indigenous trees along the forest edges were felled and replaced by tea plantations. This was done by Presidential decree so as to provide economic opportunity and protect the forest's border from agricultural encroachment, after a few years it was discovered that only a few areas were suitable for commercial tea plantations and the

remaining areas were converted to eucalyptus plantations (Mitchell 2004). During the late 1940s and 1950s the Forestry Department (FD) developed a plantation scheme called the 'shamba system'. Under this management system farmers were encouraged to grow crops on clear-cut land within the forest in return for protecting saplings planted by the FD, often the saplings were exotic species selected for their commercial value (KIFCON 1994). This system was very popular with the local residents and many farmers in villages neighbouring the forest had forest shambas. The system continued until 1985 when due prolonged unsatisfactory tree growth the program was abolished, though later it was reinstated due to widespread political pressure. However, the system was again abolished in 2004 when the new government ordered that all shambas in the nation's forests be abandoned so that they may be returned to tree cover. The scale of deforestation in Kakamega has been considerable with roughly 50% of the 1965 timber volume lost by 1991 (KIFCON 1994).

Currently the Kakamega Forest is gazetted as a National Reserve, which since 1985 has been jointly managed by the Forestry Department and the Kenya Wildlife Service (KWS). Within the forest there are three more intact patches that have been established as nature reserves specifically conserved to protect their diverse biological resources. These are Buyangu Nature Reserve to the north (administered by KWS), Isecheno Reserve in the central part of the forest and the Yala Nature Reserve in the south (both administered by the FD) (Mutangah 2004). Management focuses mostly around law enforcement, licensing of permitted extraction of forest products, control of problem animals, maintenance of infrastructure such as trails, roads and buildings, fuel wood and pole wood plantations, and education and tourism development. Management

of the forest, however, is often ineffectual due to lack of funding to the FD and KWS, a problem common to many government departments in Kenya (Walubengo 2004). This problem has been compounded by widespread and publicly exposed corruption in the FD having to do specifically with illegally authorizing logging of indigenous trees from protected areas of the Kakamega Forest and other protected forests throughout the country. This public embarrassment resulted in the government placing many FD personnel on administrative leave and temporarily replacing them with officers from the General Service Unit (GSU), a national police force. The KWS has retained control over its areas of the forest, as this branch of the government was not implicated in the scandal. In general the part of the Kakamega Forest that is managed by the KWS (which does not allow any human activity) seems to be in better shape than that managed by the FD (which allows certain extractive activities to take place) as might be expected by their differing mandates.

The majority of the local population are subsistence farmers with small plots of land typically a few acres in size. The principal crops grown in the area are maize, beans, sweet potatoes, cassava, bananas, and mangos. Tea, sugar cane, and to a lesser extent coffee are the most significant cash crops grown in the area, with more affluent farmers often putting a portion of their land under tea or sugar cane with the rest of their land reserved for food production. Livestock are kept and valued, though grazing them is becoming increasingly difficult with the forest off-limits, therefore many people have zero-grazing cattle. The pressure on the land is such that intensive cultivation is required with two harvests per year and almost no lands allowed to remain fallow.

Plate 3: Kakamega Forest Reserve & Nandi Escarpment.

Plate 2: Shamba, Ileho

Plate 5: Small-scale tea plantation, Vihiga

The soils of the area are moderately fertile clay-loam soils (KIFCON 1994). These soils are dependent on the decomposition and re-incorporation of dead organic matter to maintain their fertility; this is usually the case under normal forest conditions, however the fertility of the soils may decline as legal and illegal loggers and local people have increasingly removed biomass from the Forest.

As there are two pronounced rainy seasons in the district most farmers plant crops for two growing seasons, this has accelerated the rate at which nutrients have been leached from the soils. This continued depletion of the soil's nutrients has made the local farms less productive and has also made it more difficult to re-establish forest cover in areas that were previously farmed under the Forest Department's 'shamba' system.

The Kakamega Forest is surrounded by farmlands, numerous small villages, and several larger townships such as Kakamega (holding the Provincial and District Administrative Headquarters), Kayega, and Kaimosi. Due to the influence of agriculture there has been extensive clearing of land for cultivation of crops, this has created a 'derived savanna' from what previously was forest (Morgan 1973). The transportation network in the district is in poor condition with many roads becoming impassable during the rainy seasons. This is a hindrance to the beekeeping project, especially for the transportation of supers to and from the CARD office and apiaries.

The communities neighbouring the Kakamega Forest are densely populated and there are few employment opportunities, thus the forest can provide a source of income for people with few other options. Fuel wood, charcoal, timber, and bark for medicinal uses, are all extracted illegally from the forest for sale (KIFCON 1994). This extraction of forest resources for sale takes place in addition to the subsistence harvesting of forest

resources such as firewood, grass for thatching and cattle-feed, poles for building, and fibres for making ropes. Wood and charcoal are the primary cooking fuels in the Kakamega District. If subsistence harvesting of forest products is taking place on a scale that matches the growing population in the area, the result will be rates of resource extraction that exceed the forest's capacity to regenerate these resources. Furthermore due to the illegal nature of the resource extraction these activities are conducted in an unorganized and uncontrolled manner, which also contributes to the problem. In short the forest's resources are being extracted at such a rate that not only is the volume of forest resources diminishing, but also the capacity of the forest to recover is being negatively impacted (KIFCON 1994).

There is some animosity towards the Forest Department and KWS in communities neighbouring the forest. This animosity stems from the government policy that bans all extractive activities from the forest according to several of the farmers interviewed in Kakamega. The government policy means that the investment of labour that people made on their shambas inside the forest is lost as they will no longer have access to these lands, they will also no longer be allowed to graze their livestock in the forest, nor is anyone allowed to collect firewood or building materials from the forest

Previous to HCA's involvement in Kakamega there were already a large number of traditional beekeepers in the area around the forest using traditional log hives, though some (mostly those who were involved with other beekeeping projects either government or NGO initiated) use KTBHs. There is a wealth of beekeeping knowledge held by the traditional beekeepers that live near the forest, and while few of these traditional beekeepers have become directly involved with HCA a number of them have nonetheless

shared some of their expertise with their neighbours who have purchased hives from HCA.

4.2.5 Beekeeping Potential

Due to the great diversity of flora species in the forest, including many different flowering species of plants the area has excellent sources of bee forage to be utilized year-round. As well there are a variety of domestic crops that the bees can forage from including: maize (for pollen), beans, avocado, mango, banana, and passion fruit to list a few.

The climate of the district makes it a high potential area for beekeeping. There is an abundance of flowering plants providing nectar and pollen throughout the year. As well the great variety of nectar sources available to the bees gives the honey produced from this area an interesting and variable flavour. The distinct rainy seasons work to the benefit of beekeepers as bees are less active during these times compelling them to produce and store large quantities of honey to feed the colony during this period, thus there are good honey harvests to be obtained just prior to the rainy seasons. Even during the rainy seasons that are not favourable for the bees due to cooler temperatures and the rain itself the climate is not sufficiently adverse for the colony to promote absconding from the hives, rather the bees just become less active. This can be beneficial in some respects as there are likely to be fewer conflicts between bees and farmers even when the hives are kept on the edge of fields that are under cultivation. Due to the great pressure to convert all available land to croplands beekeeping may suffer, as many crops are inferior sources of forage for bees in Kenya compared to the native vegetation.

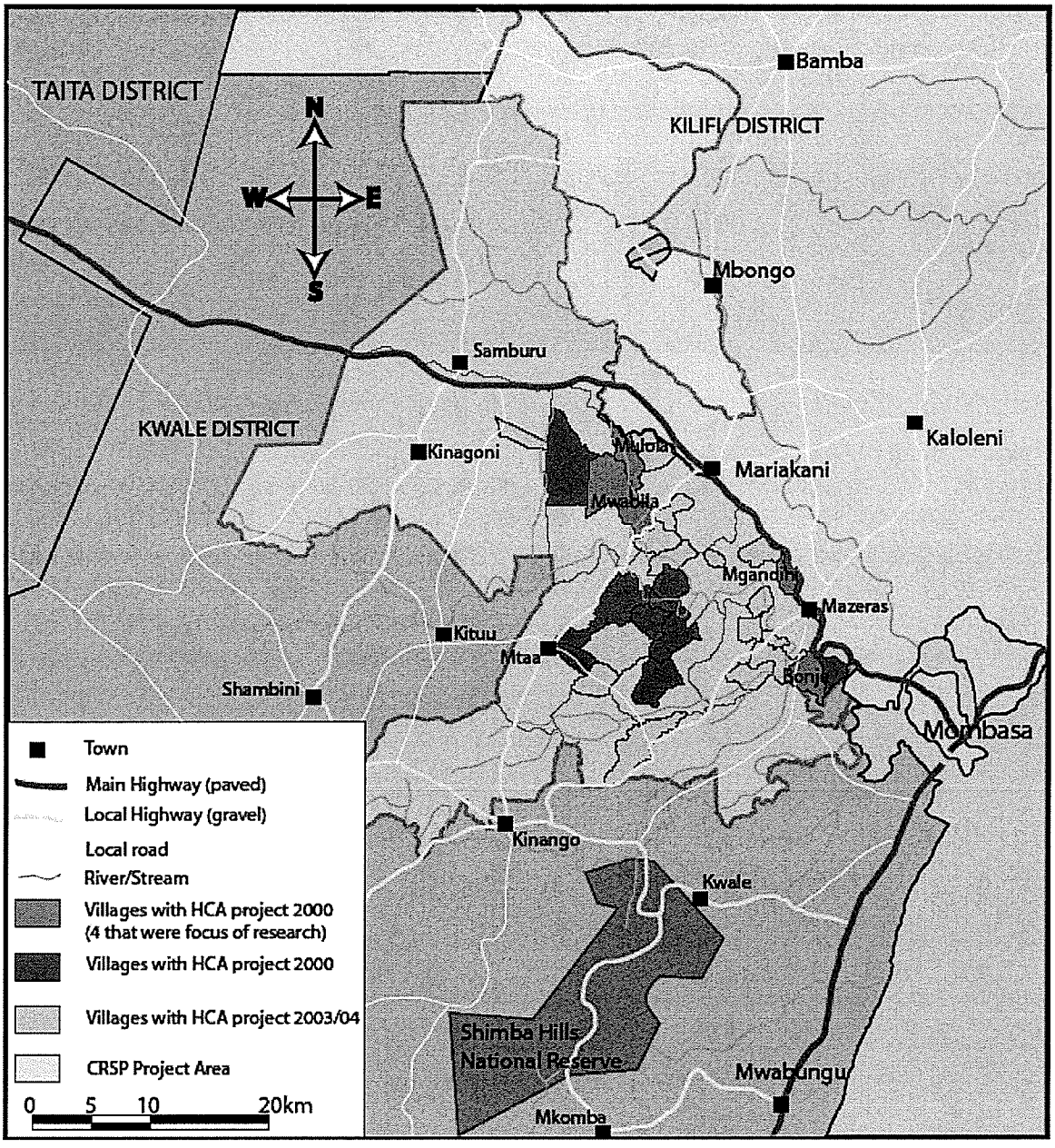
4.2.6 CARD

Community Action for Rural Development (CARD) was formed in 1998. It is a non-political Community Based Organization in the Kakamega District, Western Province, Kenya. CARD's activities include: the beekeeping project with HCA, and a spin-off small-scale industry of making bee suits; the Kakamega Forest Participatory Management Project, a soy bean farming project, and HIV awareness projects – this is CARD's other main activity as HIV/AIDS is a serious problem in Kenya and the Western province is one of the areas in the country that has a particularly high adult HIV prevalence rate (Kimalyu et al. 2004).

CARD is financially supported in three principal ways: donors funding, membership fees, and commissions from the beekeeping project. CARD has received funding from the British Voluntary Service Overseas (and more importantly volunteers), the Australian High Commission, the US Embassy, and the European Union. Membership fees are an initial payment of 300KES and then annual fees of 300KES; however, payment of membership fees is unreliable. CARD receives a commission of 20KES/kg of honey sold to HCA through the beekeeping project. Donor funding is CARD's most important source of funds, though as the beekeeping project expands CARD may become less reliant upon donor funds.

4.3 Kwale

Plate 6: HCA projects within CRSP project area, Kwale



(CRSP 2004a, CRSP 2004b, CRSP 2004c)

4.3.1 Geography

Kwale is one of four districts in the Coast province of Kenya. Kwale District is situated such that it overlaps the humid coastal belt and the semi-arid interior, presenting a stark contrast between the eastern and western parts of the district. The town of Mariakani is the hub of HCA's beekeeping program in the district; this is where the partner NGO the Aga Khan Foundation's (AKF) Coastal Rural Support Program (CRSP) has their office. Mariakani is situated on the Mombassa-Nairobi highway, roughly 35km west of Mombassa, the second largest city in Kenya.

The research in Kwale was mostly conducted in 4 villages: Mulola, Mwabila, Mgandini, and Bonje, though other villages in the district were also visited during the course of the research. These 4 villages were selected from the original 12 villages in Kwale that the HCA project began with in 2000. These villages were selected because they are located in different parts of the district and span the two climatic zones and the transition area between them, and because they were more easily accessed than some of the other villages farther removed from the main roads.

- Mulola: This area is semi-arid, the dominant vegetation is Acacia-Commiphora scrub. With the low levels of precipitation that fell in 2003 the area was extremely dry in 2004.
- Mwabila: This area is also in the semi-arid interior zone though there is more vegetation and bee forage in this area than in Mulola, in particular there are more coconut palms.
- Mgandini: This area is situated in the transition zone between the coastal humid belt and the semi-arid interior. There was greater tree cover in this area than in

the interior areas. There are many coconut and mango trees in the area and other sources of bee forage.

- Bonje: This area is in the coastal humid belt, close to mangrove swamps. There is significantly greater tree cover in this area than in any of the above listed areas, and greater diversity of bee forage.

4.3.2 Climate

Within the district of Kwale exist two distinct climatic zones with a gradual transition between the two: the humid coastal belt and the semi-arid interior, with the later covering a greater portion of the district than the former and also being the area where most of the HCA beekeeping in Kwale is located.

The semi-arid part of the district (western part) is characterized by deciduous species such as thorny *Acacia* and gnarled *Commiphora* scattered throughout the landscape, along with succulents such as *Aloes* and *Euphorbias* (Morgan 1973). Grass and shrub cover is seasonal, flourishing after the rains and then dying away again during the dry season (Ojany and Ogendo 1973). During the dry season the landscape appears nearly lifeless with much bare soil exposed and most trees devoid of leaves.

The eastern part of the district, which is in the coastal climatic zone, has high relative humidity. This area does not display the homogeneity of vegetation that the interior of the district does; the higher rainfall of this area supports a greater variety of vegetation both indigenous and introduced exotics. There are some forested areas in this coastal zone including mangroves along the coast itself and other forested areas slightly

further inland, such as the Shimba Hills forest (a protected area) though much of these forests have been cleared for agriculture (Ojany and Ogendo 1973).

The average annual rainfall for the semi-arid interior of Kwale District is 500 - 600 mm/year, with the eastern part of the district (humid coastal zone) receiving an average of around 1,000 mm/year. The rain pattern is bimodal with the wettest months being April/May ('long-rains") and October/November ("short rains"). In 2003 both the short and long rains were well below their average levels of precipitation resulting in the semi-arid landscape becoming even more dry and presenting difficulties to farmers both for their crops and for the harvesting of fuel wood much of which now comes from small shrubs rather than trees due to the severe deforestation in the district.

4.3.3 Local Population

The population of Kwale District is made up of mixture of tribal groups from eastern Kenya. The homogeneity that is common in other rural areas of Kenya is to an extent lacking, as much of the land in the area has been re-settled after independence. With most of Kwale District being semi-arid and having low agricultural potential the district population density is relatively low for southern Kenya with 65 persons/km^2 (NEMA 2004). The more humid eastern parts of the district are more densely populated than the drier western parts of the district. Despite the low population density there is significant stress on natural resources, especially on the few remaining patches of forest due to the demand for fuel wood, which is the most common form of cooking fuel in the area.

Plate 7: Mulola

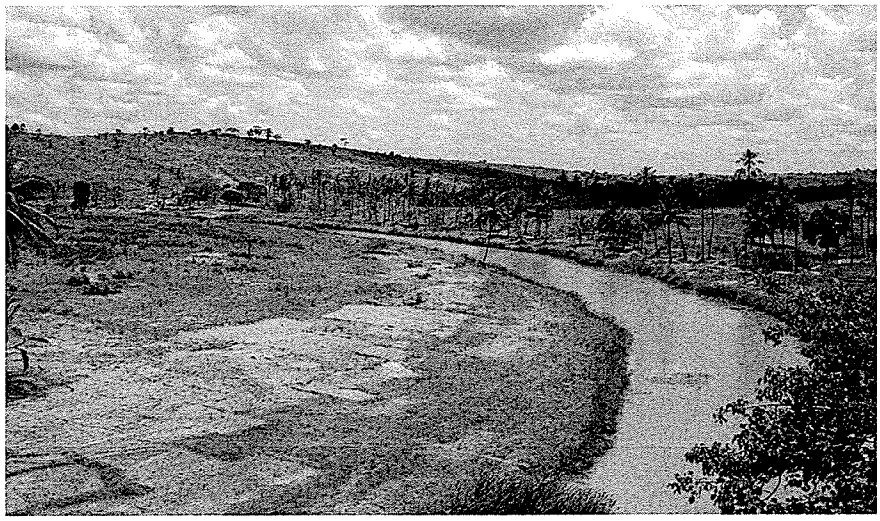


Plate 8: Mgandini

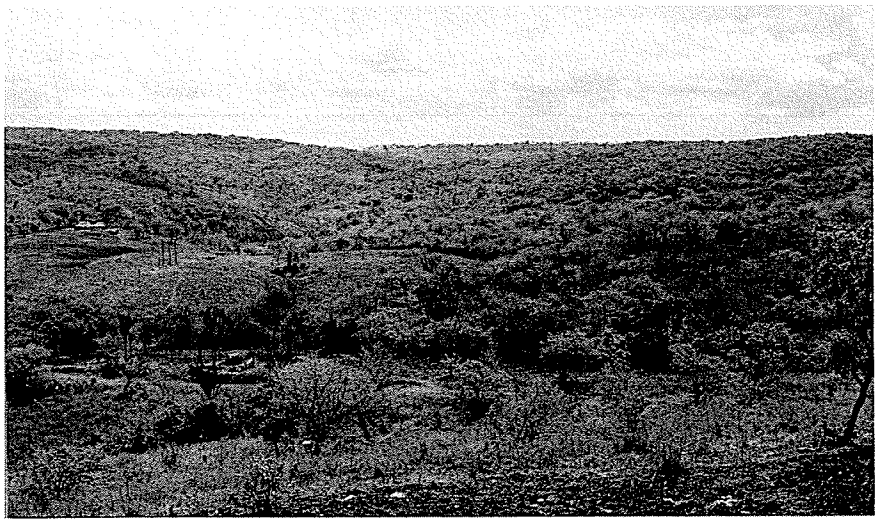


Plate 9: Bonje.

4.3.4 Land-use / Economy

The majority of people in Kwale District are subsistence farmers with small shambas (farms) of usually around 4-5 acres in size. Subsistence agriculture accounts for 81% of household incomes in the district, with most rural households able to produce only about 3 months worth of food supply (KRSP 1997). The majority of Kwale is low potential agricultural lands that were previously used primarily as seasonal grazing areas, though they have since been converted to permanent agriculture due to population pressures. The vast majority of land in the CRSP project area is held under group ranch (communal) tenure and is apportioned by clan elders according to a clan system. Each family is allotted land that they can call their own (though there are no titles for these lands held by farmers), and there is also communal land that is accessible to everyone for grazing livestock and access to water (Smith 2004).

Low fertility soils and inadequate rainfall, makes crop failure an endemic feature of agriculture in the semi-arid parts of Kwale District, particularly for those households growing less adapted (non –indigenous) crops such as maize, and beans. The main crops grown in the area are maize (the staple food crops of most households), cowpeas, cassava, millet, beans, coconut, mango, and cashew. The main cash crops grown in Kwale by subsistence farmers are coconut, which is cultivated both for the fruit as well as for the tapping of palm wine and cashew (only grown in coastal areas). The coastal areas of the district receive adequate rainfall and numerous tree crops such as coconut, cashew, mango, and citrus, as well as subsistence crops such as maize and cassava.

Deforestation is severe in many parts of Kwale District. This has resulted in serious problems for retention of water and soil moisture, and has contributed to the

declines in soil fertility (Smith 2004). Deforestation in the district is caused primarily by charcoal production for cooking. Charcoal and wood are the most used cooking fuel in Kwale District (Smith 2004, MPND 1997).

The transportation infrastructure in Kwale District is in poor condition, the exceptions being the main road from Mombassa to Nairobi and the road from Mombassa to Lunga Lunga (near the Tanzanian border). All other roads become impassable during the rains (MPND 2000). The poor transportation infrastructure in the district makes sale of agricultural products more difficult and less profitable for farmers as many agricultural goods may potentially perish before reaching the larger markets.

4.3.5 Beekeeping Potential

Beekeeping is an activity that can be undertaken even in areas that are too arid for most agricultural pursuits, as nectar-bearing trees may be able to reach the water table far below the surface (Bradbear 2004). As Kwale District exhibits variation in climate and vegetation so to does the potential for beekeeping vary. Closer to the coast there is higher potential for beekeeping than in the semi-arid interior of the district, though even in the interior areas there is good potential for low-density beekeeping along river valleys (Saville and Acharaya 2004). The semi-arid areas will likely only produce honey seasonally and there are high levels of bee absconding due to the dearth of water and forage in the dry seasons.

There are high densities of coconuts palms in parts of the district and these provide year round bee forage, improving the bee habitat in these areas (Saville and Acharaya 2004). Other sources of bee forage found in the district, include: cashew, mango, acacia, aloe, tamarind, desert rose, neem, and euphorbia (this list is not

exhaustive but only includes those species that were observed and mentioned as important by local beekeepers).

There are a number of traditional beekeepers in the district though not nearly so many as are to be found in the vicinity of the Kakamega Forest. Due to the poor climatic conditions the experience of traditional beekeepers would be of great value to the less experienced HCA beekeepers, in maintaining their colonies and managing their hives in this environment. Because of the limited forage available in the semi-arid parts of Kwale District, consisting mostly of acacia, the honey produced tends to have a stronger and more bitter flavour that is perhaps somewhat of an acquired taste and is less attractive to some buyers. Honey from the coastal part of this region also tends to be darker and crystallize faster than some other honeys due to the bees foraging for nectar from mangrove trees (Saville 2004); again this could potentially make the honey more difficult to sell, though this is not an issue as far as the contract with HCA is concerned.

Honey badgers are prevalent in the district, they are a problem for beekeepers because these animals are prone to destroying hives in order to feed on the bee brood, thus they not only cause significant bee mortality which tends to lead to the colony absconding, but the hive (an expensive investment) is also damaged or even destroyed.

Areas of low agricultural potential may be suitable for beekeeping as there is less pressure to convert land supporting native vegetation to cropland. While it may become necessary to provide water for the bees during parts of the year, semi-arid lands tend to frequently have warm sunny days, which are ideal conditions for bees to work. As well the dearth of nectar in the dry season may encourage the bees to work harder to stock-pile

adequate stores of honey to feed the colony during this period if they can be prevented from absconding, thus there is a good potential for honey yields.

4.3.6 CRSP

The Coastal Rural Support Programme began as the Kwale Rural Support Programme in 1997, in Kwale District, Coast Province, Kenya. The project is one of many rural support programs operated by the Aga Khan Foundation and was initiated as a 10-year pilot program. The project was renamed CRSP and the project area expanded to include some small areas from the neighbouring Kilifi District in addition to the areas in Kwale District. CRSP has five main areas that it focuses on: social and institutional development, productive and physical infrastructure development, agricultural technology and practices, rural enterprise development, and policy influencing (Smith, 2004). CRSP is financially supported by the Aga Khan Foundation, which receives some dedicated funding for CRSP from DFID. The main development projects that is currently CRSP managing in its project area are: a Small Farm Reservoir program, the beekeeping with HCA, goat breeding, and social mobilization (the formation of VDO's), there are several other smaller projects operated by CRSP in the area as well.

Plate 10: Mgandini

Plate 11: Mariakani

Plate 12: Dry stream bed, Mgandini

Chapter 5 Leadership / Self - Organization

5.1 Introduction

The history of beekeeping projects in Kenya is fraught with donor and government initiated projects that have faltered after a few years. These projects have typically been unsuccessful for a variety of reasons: inadequate training, and a lack of extension support; communally owned hives, often received at no cost resulting in poor motivation for individual beekeepers to put a lot of effort into hive management; and poor marketing of the hive products, though in Kenya honey can be sold locally without too much difficulty (KBA 2001, AKF & PI 2003, Anjina 2004, Mwanzighe 2004, Saville 2004). Many of these problems are contributed to by a lack of strong leadership at the local level where hives are managed, and at the level at which the project is managed.

5.2 Sources of project inspiration

The development of HCA as a private company interested in promoting beekeeping using Movable Frame beehives in Kenya provided a new model for beekeeping development projects. HCA saw an opportunity to develop a high quality honey supply to serve the domestic market in larger centres that had up to that point been serviced by honey produced in Sudan and Tanzania (KHC 2003).

The idea for the projects came from HCA and the management structure in both case studies was developed by the development organization (CBO/NGO) involved, the communities had no role in project design. The community members are given the option as individuals to become involved with the project if they wish to and can afford the investment. Thus the HCA beekeeping projects should not be considered community

based in the sense that Little(1994) describes CBC projects, rather they are closer to Integrated Conservation Development Projects (ICDPs) – ones that are primarily focused on economic development, but in a manner that provides environmental benefits.

In both cases the project was introduced by HCA to a development organization operating in the area (CARD and CRSP). Then the project was introduced to communities as the development organizations and HCA held a series of barazas (public meetings/demonstrations held in a village) to demonstrate the MFH technology in rural communities and to promote the project. These were only held at the beginning of the project. Others, who were already CARD or VDO members previous to HCA being introduced to the community, learned of HCA through the development organizations of which they were a part. Now in both areas the project relies primarily on word-of-mouth for promotion (see figure 5.1 – neighbours & MLFD).

Figure 5.1 Means by which current project participants were introduced to HCA

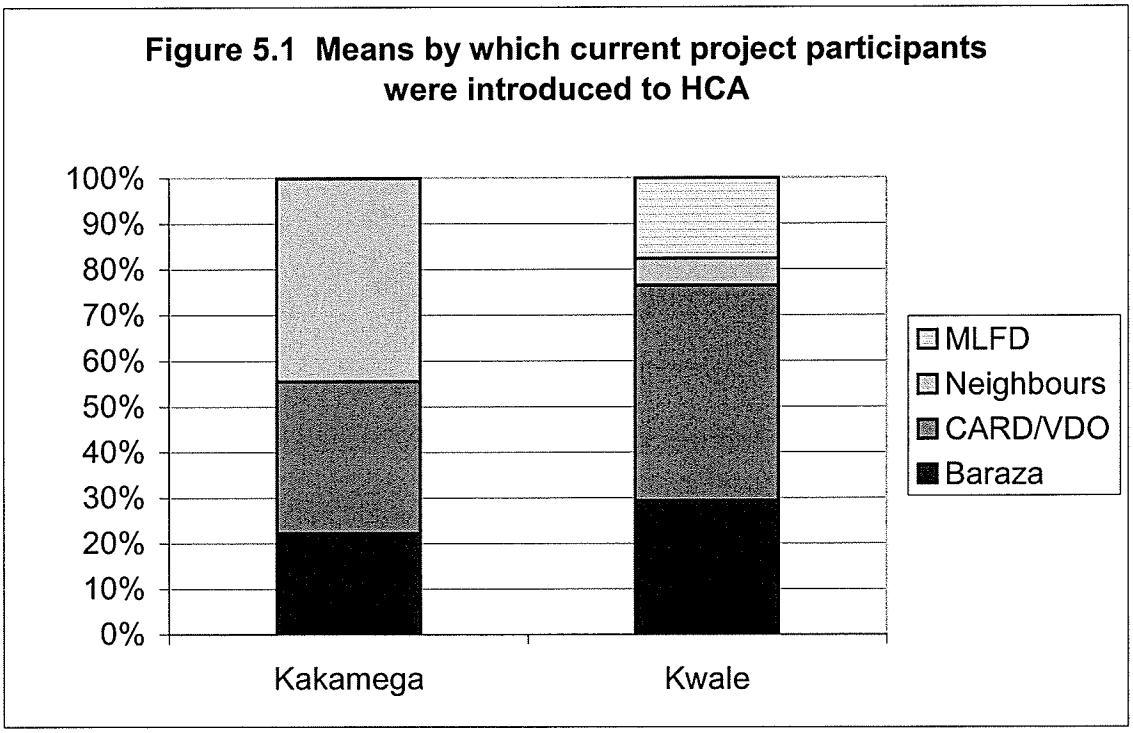


Figure data source: semi-structured interviews

5.3 Origins of the project

Kakamega

HCA came to Kakamega in 2000 with the efforts of two Voluntary Service Overseas (VSO) personnel stationed with CARD. The project started with the purchase of 100 hives in 2000, this has subsequently been followed by a steady increase in the number of HCA hives in Kakamega District to a point where by the end of 2003 there were more than 600 HCA hives in the district under CARD's supervision (see figure 5.2) with orders for more continuing to come in.

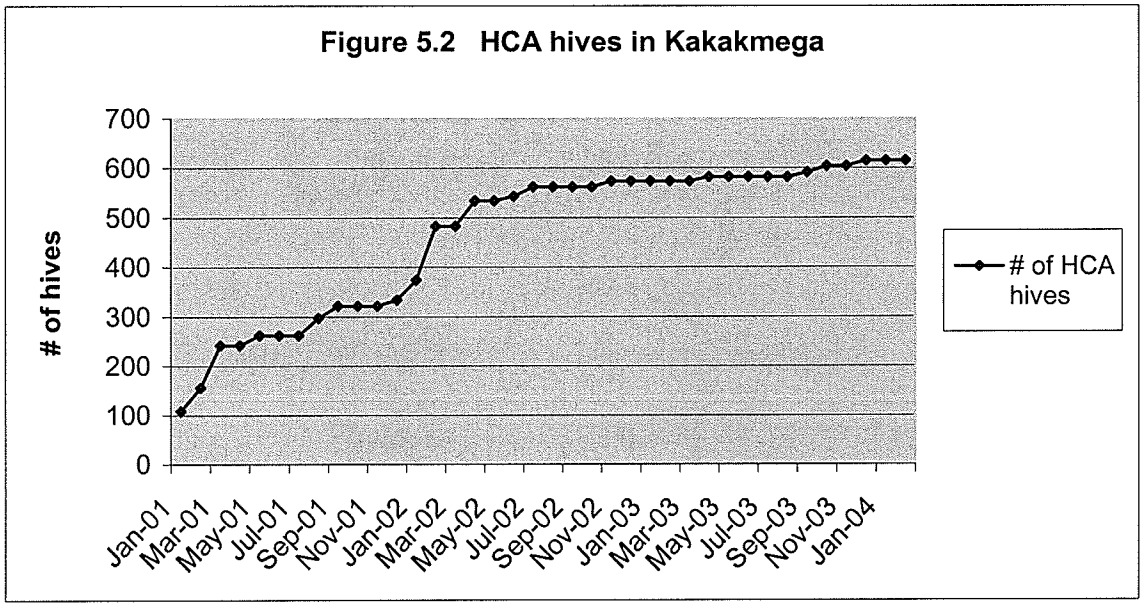


Figure data source: CARD 2002, CARD 2004

CARD is the organization that is responsible for the management of the Honey Care beekeeping project in Kakamega. This project operates under a different management scheme than the project in Kwale does. The management of the hives is undertaken by CARD staff (CARD Project Manager) and volunteers, and the HCA PO, not by the actual owners of the hives (the farmers). Hive management includes: regular inspection of the hives to deal with any pest problems (such as ants, wax moth) and to

monitor the amount of honey the colony has produced so as to determine when to remove supers for harvest; the removal and transportation of the supers to the CARD office for honey extraction via manual centrifuge; and then the return of the empty supers to the apiaries to be placed back on the hives so as to encourage the bees to continue to produce honey. By making hive management the responsibility of professionals CARD has improved the quality of management and increase the honey yields, though there is not much involvement by the farmers in the project.

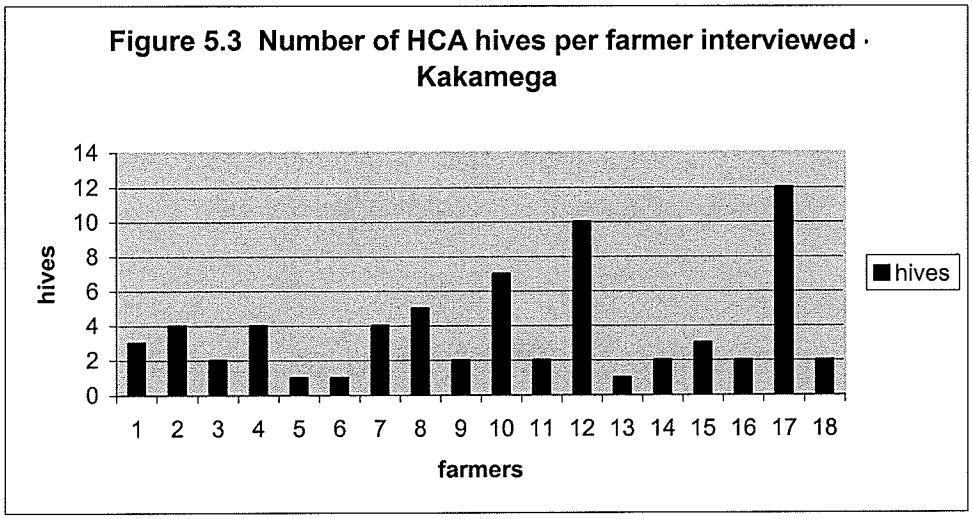


Figure data source: semi-structured interviews, CARD 2004

The farmers as individuals only invest the capital (either with a loan – to a maximum of two loans per person, or without a loan if they can afford this) in one or more hives (see figure 5.3). The farmers must become members of CARD to access the HCA project. Hives owned by multiple individuals are grouped together into apiaries containing 10-20 hives, which is a suitable number of hives to have in one apiary so as to prevent overcrowding (Paterson 2000). Hives are grouped together in this manner for ease of management. An exception to this is found in the case of individuals who own more than 10 hives, in this situation an apiary is put on that person's land to contain their

hives and possibly a few of their neighbours' (those individuals in Kakamega who own more than 10 HCA hives are wealthier individuals with larger shambas).

Kwale

CRSP became involved with HCA in 2000 with the purchase of 220 hives distributed to 12 villages by the end of 2000. After the initial purchase of 220 hives there was an observation period before a decision was made on buying more hives. This decision was made in 2003 when CRSP more than doubled the number of HCA hives in the district (see figure 5.4).

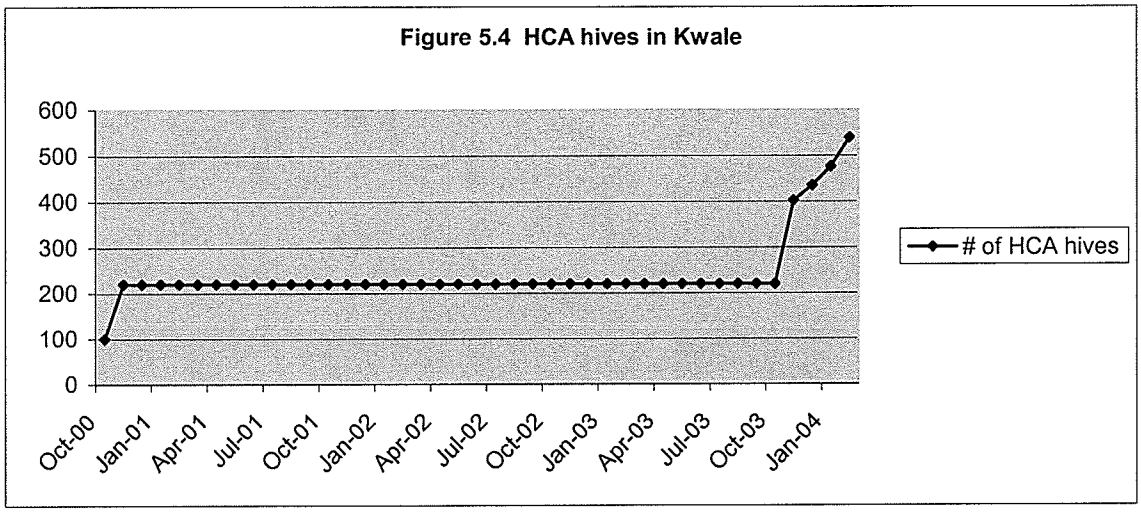


Figure data source: CRSP 2004a, CRSP 2004b

The HCA beekeeping project in Kwale is managed by the AKF-CRSP and operates under a different management structure than the project in Kakamega. Farmers purchase the hives and place them on their own lands and manage the hives themselves, so they may be more accurately referred to as beekeepers than the HCA farmers in Kakamega. Farmers must become members of their local VDO in order to get access to HCA hives through CRSP. In the initial phase of the project KRSP organized groups of

5 individuals per village that wished to become involved in the project and could afford to purchase 4 hives each via the loan scheme (see figure 5.5). Because the initial purchase of 4 hives was an expensive commitment for most HCA participants and the honey yields were poor CRSP arranged for some beekeepers to sell some of their hives to their neighbours (see figure 5.5). More recently, in late 2003 (see figure 5.4) CRSP began purchasing hives on behalf of farmers again, this time farmers are nor required to purchase a minimum number of hives and the hives were highly subsidized.

The hives are owned privately but the beekeeping equipment used to manage the hives (2 bee suits, 2 pairs of gloves, 1 smoker, and 1 hive tool per VDO involved in the project) is communally owned by the beekeepers of the VDO. The beekeepers manage their hives privately either individually or in cooperation with some or all of the other beekeepers in their VDO. The supers are collected by CRSP and extraction occurs at the CRSP office in Mariakani, or in a tent set up in a convenient village.

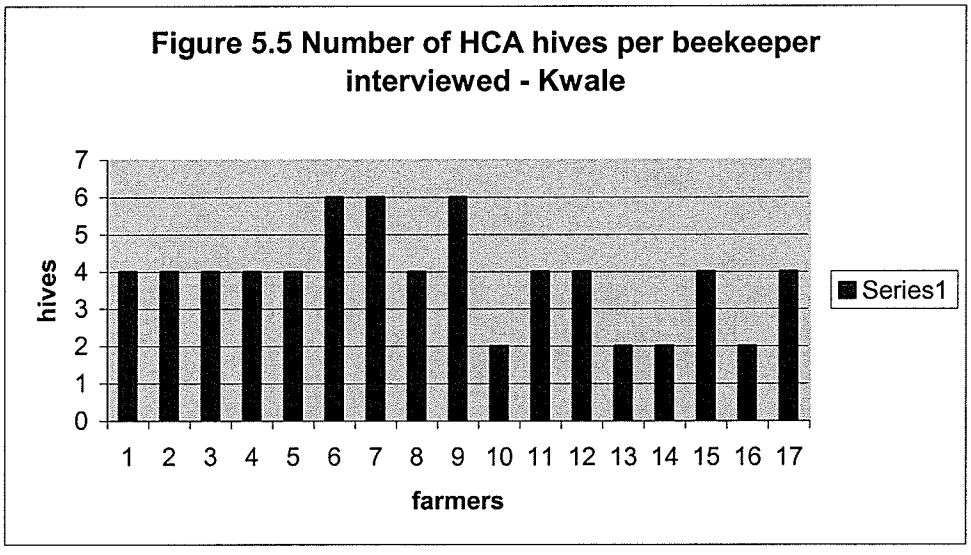


Figure data source: semi-structured interviews, CRSP 2004a

In Kwale the individual nature of the project and profits has worked as an incentive for beekeepers to continue the project in some cases even where honey

production was much below expectations and there was limited involvement and oversight from the CRSP. The debt incurred by the beekeepers from the purchase of the hives was also an incentive to keep with the beekeeping (though this factor may not have been that significant as the loans are only repaid from honey sales). Those beekeepers with previous experience in keeping bees in the area were aware of the migratory habits of the local bees during the dry seasons and were not so easily discouraged when their colonies absconded while drought conditions prevailed, confident that the bees would return with the rains, though due to the poor climatic conditions they have been forced to wait longer than they expected.

In Kwale District, CRSP for a time did not provide sufficient extension support for the beekeepers; most beekeepers interviewed stated that after their initial training they received little or no further technical support. There were a number of less experienced and less successful beekeepers that basically gave up on the project when the weather became unfavourable (low precipitation) and the bees absconded. If these beekeepers had received some interaction or advice from CRSP during this time they may have been able to maintain their bee colonies during this difficult period by providing food and water for the bees to deter absconding so that when the rains again came and flowers bloomed their hives would still be inhabited. The more experienced beekeepers were mostly able to prevent absconding due to the weather. The poor level of hive management that is prevalent in the project is directly related to a lack of extension support from CRSP and MLFD and the absence of a HCA project officer. The result has been that the majority of hives observed (about 80) in Kwale were being improperly or inadequately managed and many hives were in a state of disrepair and not in a suitable

condition to attract new swarms of bees once the rains return, except in the case of a small number of mostly more experienced beekeepers who managed their hives well and profitably.

5.4 Knowledge

5.4.1 Holders of Relevant Local Knowledge.

Kakamega

The project was introduced by HCA to the community based-organization (CBO) CARD. Along with the overall project structure HCA also introduced the technology (Movable Frame Hives). In most, if not all the communities in Kakamega District there already existed extensive knowledge about bees and beekeeping (especially in communities bordering the forest) using traditional log hives and to a lesser extent using the KTBH.

Knowledge of traditional beekeeping is mostly held by men, as traditional beekeeping in Kenya is an activity not undertaken by women. Such knowledge includes harvesting techniques, which trees to use for fashioning log hives, what flowers the bees prefer, how to attract bees to their hives, and dealing with pests and predators that

Hive Technology – Adaptation
Some of the more experienced and inventive beekeepers in Kakamega have altered their top-bar hives based on their experiences and observations of the newly introduced MF hives. They have done so by incorporating self-made queen excluders constructed from wire mesh into their hives. This allows them to be sure that those combs they harvest from the side of the hive that the queen cannot access are full of honey only – with no brood combs. One local beekeeper (a carpenter) has made his own top-bar hives to the same specifications as the HCA hives in the area. His hives are much the same, except that they lack frames (as he is unable to obtain the wire or foundation sheets necessary) having top-bars instead, though he has designed them with queen excluders and supers that can be removed just as with MF hives.

affect the bees. As for coexisting in close proximity to the bees this knowledge is often shared by both men and women, though as bee hives are typically kept at a distance from the shamba if possible, women may not have had much contact with their husbands' log hives. While it is mainly men hold knowledge of beekeeping, there are a small number of women who have knowledge of beekeeping with KTBH technology that they gained from their involvement with government supported beekeeping projects in the past (see figure 5.6).

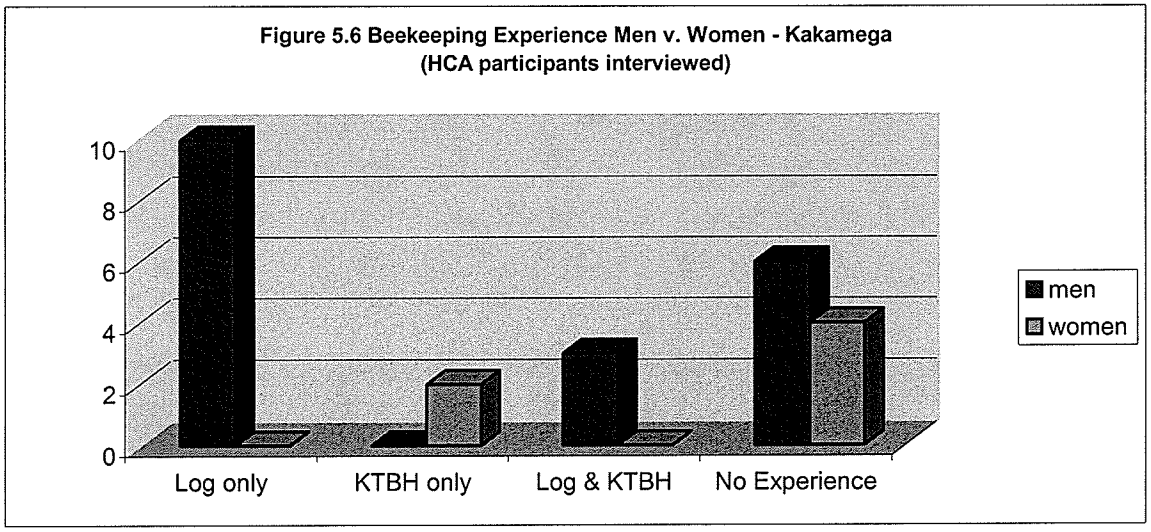


Figure data source: semi-structured interviews

Traditional log hive beekeeping is a common activity in Kakamega District, particularly in those villages that are near the Forest and numerous log hives were observed during the field research. There is a wealth of traditional beekeeping knowledge in Kakamega District, but the majority traditional beekeepers have not become involved with the HCA project, primarily due to the expense of the hives, which is much greater than for the log hives they use. As well, many traditional beekeepers in Kakamega feel that they can get a better price for their honey locally than offered under the HCA project, with 5 traditional beekeepers reporting selling their "sieved" honey in

neighbouring towns for 150-200 KES/kg. Though most expressed interest in the movable-frame hives the common opinion was that the technology is good but too expensive and not durable enough. While in the end most farmers who have HCA hives in Kakamega have previously kept bees (see figure 5.7), due to their lack of involvement in hive management this knowledge is not being utilized by the project.

Figure 5.7 Previous Beekeeping Expereince - Kakamega

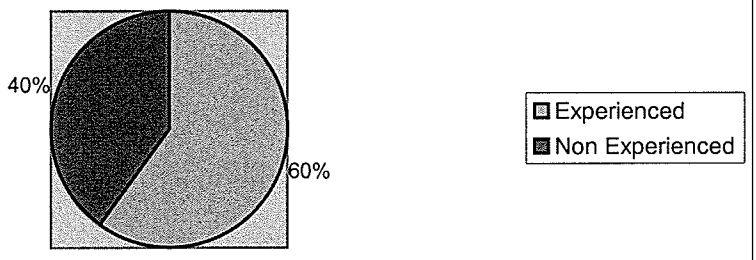


Figure data source: semi-structured interviews

Kwale

The MFH technology and related management techniques were introduced to the Kwale area by HCA. The level of local knowledge on the subject of beekeeping amongst project participants was in general low with less than 1/3 of the HCA beekeepers having kept bees previously (see figure 5.8).

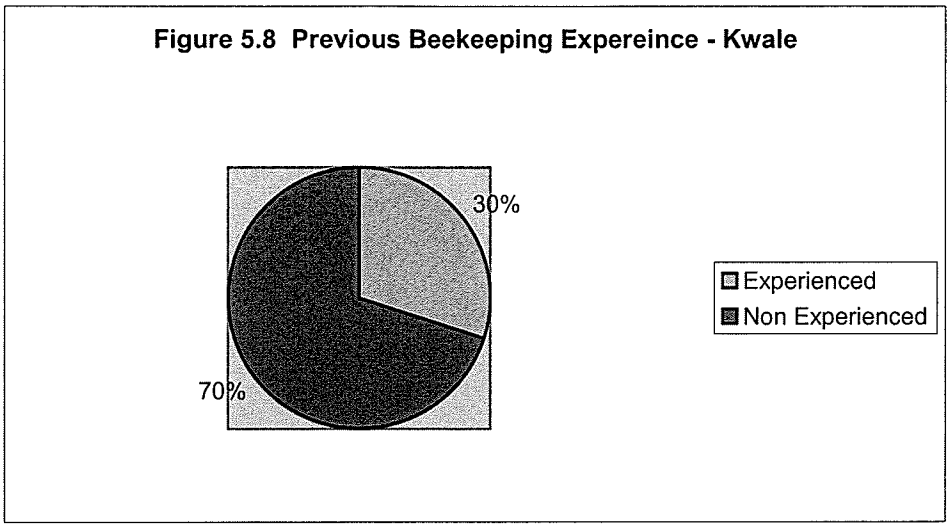


Figure data source: semi-structured interviews

Traditional Beekeepers

In Kwale, as in Kakamega, it is men who dominate the traditional beekeeping sector. There are not as many traditional beekeepers in Kwale as in Kakamega and most have fewer hives than the beekeepers in Kakamega – likely due to the less suitable environment for beekeeping. Traditional beekeepers are usually not amongst the wealthier members of the community and therefore most have not become involved with the HCA project due to the expense of the hives, which is beyond their means, though they would probably be the most productive beekeepers due to their experience. Some traditional beekeepers are not convinced that the HCA hives are worth the expense, others do not wish to become tied to selling only to HCA, feeling that they can get a better price for their honey elsewhere, the end result has been that not many traditional beekeepers have become involved in the HCA project in Kwale (see figure 5.9). Some of those traditional beekeepers in Kwale who have bought HCA hives have not been using their traditional knowledge in the management of their new hives, particularly in aspects of attracting swarms, perhaps due to the wax foundation sheets the hives came with that

attracted swarms quickly. When these sheets have been destroyed and the colony absconded the beekeepers have not been using their knowledge to attract new swarms thinking that it may not work or be necessary with the new MF hives. While log hives are not intensively managed in the same way as MF hives, traditional beekeepers do possess knowledge about how to attract bees to the hives that can work equally well with MF hives as with log hives. This is important due to the high rate of colonies absconding in the area.

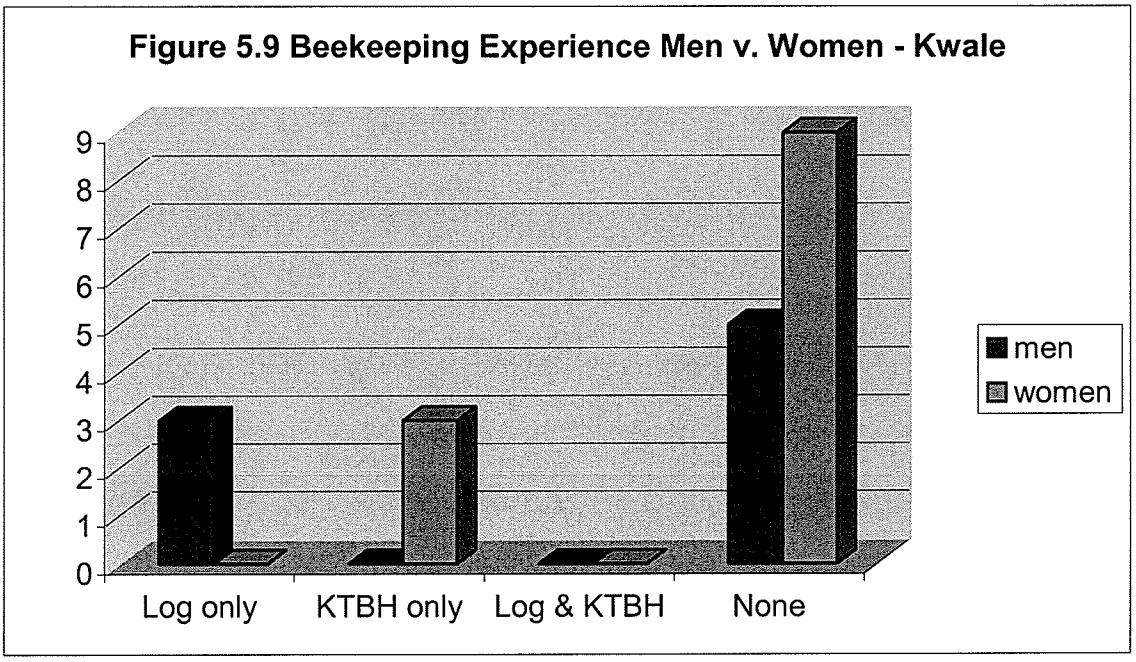


Figure data source: semi-structured interviews

After the weather one of the greatest challenges to beekeeping in Kwale is dealing with the honey badgers, traditional beekeepers in the past placed their hives in tall trees to protect them. In Kwale, due to the degree of deforestation that the district is experiencing there are few tall trees to hang or place hives in so traditional beekeepers have adopted different methods of deterring honey badgers. One such method that was observed is to attach sheets of metal to the trunk of the tree that the hives are hanging from so that the

honey badger cannot grip the tree's bark with its claws to climb, thus preventing it from reaching the hive. Others traditional beekeepers interviewed said that they have woven wreaths of thorns around the bases of trees where they keep their hives to deter the honey badger. Other beekeepers (including one HCA beekeeper interviewed in Mulola) have gone so far as to set snares around their hives to catch the honey badgers, which they then kill (they do not eat the meat of the honey badger as most people in Kwale are Muslims and consider the honey badger to be inappropriate for food).

Traditional beekeepers posses a great wealth of information on many aspects of bees and beekeeping, however as few have become involved in the Kwale HCA project, and the cross-scale linkages are not effective, the knowledge that these individuals hold is not being disseminated to the other HCA beekeepers in the district.

Honey Badger
The Honey badger (*Mellivora capensis*) is one of the most difficult pests that beekeepers in Kwale District have to deal with. The honey badger or ratel is found in a variety of habitats throughout most of sub-Saharan Africa (though they seem to be absent in Kakamega), the Middle East and even in India and Nepal. Males can reach as much as 1 meter in length and 14kg in weight, with females being somewhat smaller. As their name suggests honey badgers prey on bee colonies, though it is the brood rather than the honey they desire (Begg and Begg 2004). While honey badgers are carnivores with a wide range of prey contributing to their diet their favourite food is the bee brood and they will put great effort into obtaining it if available. Honey badgers have long claws and are powerful diggers, capable of tearing apart wooden beehives to get at the brood (Begg and Begg 2004). Many beekeepers in Kwale have had their hives (HCA hives and others) damaged or destroyed by honey badgers. This animal is a significant cause of colonies absconding in the region for the HCA beekeepers. Traditional beekeepers often hang their hives from the branches tall trees to deter honey badgers and fashion their hives from tough wood to prevent the honey badger from breaking the hives open. Unfortunately these methods are not always successful as the honey badger is adept at climbing and quite strong.

KTBH Beekeepers

Beekeeping is an income generating activity that can be undertaken by women on or near their homesteads, this is important because the number of economic pursuits open to women in rural Kenya is limited. This feature has made the HCA project particularly attractive to women, especially those who have been involved with previous government sponsored beekeeping projects (see figure 5.9). These women have been able to apply their knowledge of KTBHs to the use of MFHs and often act as mentors for other HCA beekeepers in their villages. The HCA project to some degree is reliant on this locally held knowledge as the training received in beekeeping is brief; therefore those people who already possess knowledge and experience in beekeeping have an advantage as they only need to learn how to use a different but similar hive than they are accustomed to. Several of the more successful beekeepers are women who have previously been involved in government sponsored beekeeping projects.

Individual Adaptive Management
One of the HCA beekeepers in the village of Mgandini has displayed a capacity to use her pervious knowledge, this beekeeper previously kept bees with a group that received free KTBH's and training from the MLFD. In Kwale heat is one of the most important factors promoting colonies to abscond, in addition to a lack of forage and water. As the area had been experiencing a prolonged drought she and most if not all HCA beekeepers in the CRSP project began providing water for her bees. She was, however, one of just a few beekeepers who were providing food for their bees (she did this in the form of a bowl of either a sugar-water, or mango or papaya juice atop each hive – though it would be better to put the bowl inside the hive atop the frames but under the lid). Additionally she has also woven shades made out of palm leaves to hang over her hives so as to protect them from the midday sun. Due to her management of her hives she has been able to keep most of her hives colonized where many other in the district have not.

Plate 13: Deterring Honey Badgers, Mwabila

Plate 14: HCA hive damaged by a honey badger, Mulola

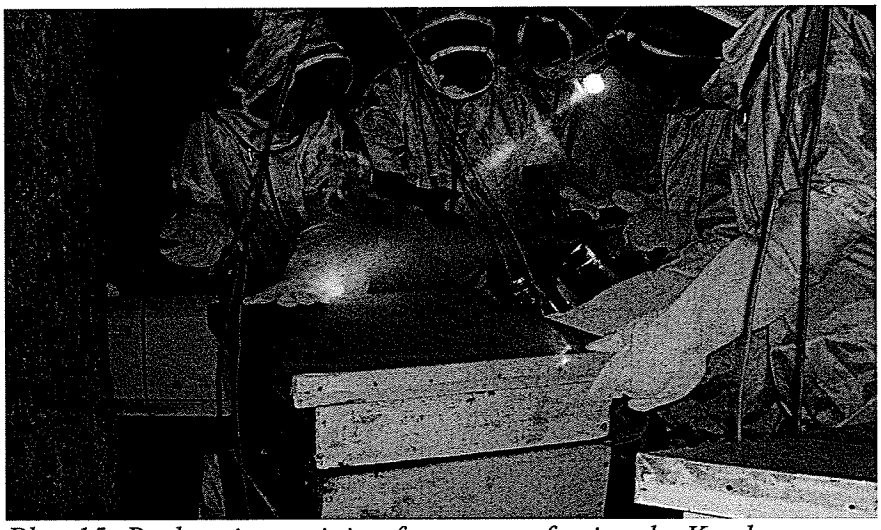


Plate15: Beekeeping training for paraprofessionals, Kwale

5.4.2 Capacity building

Kakamega

In Kakamega there has been little capacity building, via the project, a limited number of people (less than 1/6 of hive owners) have received beekeeping training in the proper management of MFHs, how to identify suitable sites for apiaries, and extraction methods. (Mung'oni 2004). The training was provided by HCA and CARD. However, even those who received training have little opportunity to use and practice this knowledge in the context of the project, as farmers are not actively involved in hive management. The government has in the past trained some beekeepers in the use of the KTBH (much of this knowledge is applicable to the MFHs). There was no involvement from any government ministry in the training of HCA beekeepers in Kakamega with MFHs. A relatively small number of people who were Beekeeping Officers during CARD's second phase of management received some training in beekeeping, though under CARD's third phase of management even these individuals do not have an opportunity to use this knowledge in the context of the HCA project.

Kwale

In Kwale there has been more opportunity and need for capacity building because farmers are responsible for managing their own hives. The initial training was provided by HCA. For subsequent training CRSP has contracted instructors from the Baraka Agricultural College in Rift Valley Province. More recently the MLFD has sent some of its field staff to be trained with this technology so that they can provide support for beekeepers. The VDOs were established to play a role in managing the projects at the

local level as well as empowering the villagers by giving them some responsibility and an opportunity to develop their management skills (this was done to facilitate a variety of CRSP projects and pre-dated the beekeeping project). There were also beekeepers that have received training from the government for the management of KTBHs that the MLFD was distributing in the past to interested groups. In early 2004 CRSP began training 'paraprofessionals' (1 HCA beekeeper per village) to act as the lead beekeeper in the village and to provide technical support to their fellow beekeepers. An instructor from the Baraka Agricultural College provided this training.

Para-professionals

Inadequate hive management is the single greatest problem plaguing the HCA project in Kwale (Saville and Acharaya 2004). The beekeepers have generally not been managing their hives well, and require additional training. Many hives were observed: hanging at angles; on wires that were too long allowing the hives to sway in the wind which can cause absconding; hanging too low to the ground making them vulnerable to honey badgers; only a few beekeepers were putting grease or used engine oil on the wires to deter ants; wax moths were not being combated; and only one beekeeper was observed feeding her bees. The lack of beekeeping leadership at the village level has contributed to the inadequate management of hives in the area and the subsequent poor performance of these hives. To counter this CRSP has decided to train a group of 'paraprofessionals' who will provide the leadership at the village level that has been sorely lacking.

The development of paraprofessionals began by selecting the best/most knowledgeable HCA beekeepers from each village and providing them with additional

training, provided by an instructor from the Baraka Agricultural College. The training consisted of a combination of theory and hands-on practicing setting up apiaries, inspecting the hives, dealing with pests, and harvesting. Perhaps most importantly the instructor demonstrated how one can handle the local bees without gloves and not get stung with sufficient application of smoke to the skin and proper handling techniques. This was significant, because fear of bees is still a factor amongst some beekeepers in the project (as many have little or no previous beekeeping experience) that in some villages has led to lack of management of hives when group-owned equipment has become damaged (a common problem in the interior areas where much of the vegetation has sharp thorns).

More important than the initial training will be the follow-up training and extension support. The original beekeepers received a few days of training but no extension support and this contributed to poor management and low honey yields (Saville and Acharaya 2004). Provided that the paraprofessionals are adequately supported by CRSP and the MLFD officers and there is oversight of the paraprofessionals by CRSP, they may be able to greatly improve the level of hive management in the project. Effective oversight of and adequate incentives for the paraprofessionals will be necessary as the Kakamega case can attest to with its problems with the beekeeping officers.

5.4.3 Learning

Kakamega

In the Kakamega project learning has occurred mostly at the local level where there has been some learning of beekeeping skills by individuals. Some of the project

participants (though not many) received beekeeping training that was provided initially by HCA and later by CARD. Training has mostly been given to those people who were Beekeepers and Assistant Beekeepers during *phase II* of CARD's management structure, and to a few land-owners who house HCA apiaries on their property (Mung'oni 2004). The beekeeping training according to those who received it consisted of 2-3 days of practical training in apiary location; hive inspection, and basic hive management. For some beekeeping was a wholly new skill and for others who already were beekeepers they learned how to use a new technology in beekeeping (the Movable Frame Hive). But on the whole most project participants have not learned any new skills from their involvement in the project. Though some have taken this new knowledge of MF hives to improve their KTBH's (i.e. by incorporating queen excluders).

Kwale

In Kwale there is a good exchange of learning between the CRSP staff and the government staff (there are government officers from the Ministry of Livestock and Fisheries Development, and the Ministry of Agriculture stationed at the CRSP office though the later are not involved directly with the beekeeping project). At the village level the learning that occurred in the project has to do mostly with aspects of beekeeping. This has come from the initial 3-day training sessions that all beekeepers received in 2000 and in 2003. At the village level there is an exchange of knowledge on beekeeping between individuals, but there is little-to-no exchange of knowledge from one village to other villages involved in beekeeping. The development of the VDOs was not prompted by the beekeeping project specifically though there is supposed to be link

between the VDO and the all development projects in the village (in practice these links have not been functional, though some members of the VDOs and VDCs are also beekeepers). Through their participation in the VDOs there has been some learning by villagers about how to organize self-help groups.

There has been no establishment of functional learning networks to share knowledge between beekeepers in different villages in Kwale, there is likely some knowledge shared between neighbours but not in an organized manner, the VDOs are supposed to fill this role but have thus far not been successful. The methods for controlling honey badgers for example have not been shared between beekeepers in different villages, nor has this information been transferred by CRSP effectively if at all to the beekeepers throughout the district. Due to the individual level of hive management in Kwale learning networks could greatly help the beekeepers, but as there is no effective communication between VDOs of different villages or between the VDOs/VDCs and CRSP no such learning networks have emerged.

5.5 Key Leadership People

Kakamega

The project has both benefited and suffered from the strong leadership that has existed at CARD. During its initial phase the strong leadership of the VSOs greatly helped the project. After they left there was a power vacuum as those who took over lacked the experience and resources that the VSOs possessed this discouraged many of the farmers involved with the project. New strong leaders did eventually emerge with the

Project Manager and the eventual HCA PO turning the project around, and creating an institutionalized management framework to be followed in their absence.

Voluntary Service Overseas

The VSO volunteers who acted as regional managers of CARD during their tenures were instrumental in bringing HCA to Kakamega. The VSO volunteers promoted the project in its early days through interaction with local authorities that became incorporated into the management committees of CARD. They established the initial project design and were also responsible for the intensive management the project received during the beginning and its good performance.

CARD Project Manger

The CARD Project Manager is the person in charge of the beekeeping project in Kakamega. He has been important to the continued success of the project and was instrumental in keeping the project going during a difficult period after the VSO volunteers left Kenya to return to the UK. The Project Manager is the one who devised the current management structure (Phase III) as the management structure established by the VSO volunteers before they left (Phase II) was failing.

The Project Manager is responsible for: providing information about the HCA project to interested farmers; taking orders for hives from HCA and delivering hives to apiaries in the villages where the owners reside; managing CARD's finances; dealing with questions and complaints from CARD members about the project; writing reports for government departments, district committees, and CARD's board of directors, and

making decisions about project management. He is also responsible for much of the administrative duties of CARD.

The CARD Project Manger is the communications hub of the project and he is the one who co-ordinates most aspects of the project in close collaboration with the HCA PO. He is also the one who makes decisions on how to improve the management of the hives and how monitoring of the project takes place.

HCA Project Officer

The current HCA Project Officer (PO) who previously was and still remains an individual beekeeper was important in promoting the project in his community. He is also responsible for forming the Ivihiga Beehive Group (IBG) in his village, a village level beekeeping group. His role changed during the course of the project (see table 5.1) as he formed the IBG and became chairman, later he was given a job as a beekeeping officer, and when the management structure changed he was eventually offered the job of HCA PO for the district on the recommendation of the CARD Project Manager, due to the leadership potential he demonstrated and his extensive knowledge of beekeeping.

The promotion of the current HCA PO from an individual beekeeper to a beekeeping officer, and then to HCA PO has allowed for information to be transferred from one locality where he was operating to the entire district as he was given the job of being the HCA PO. He has been able to use some of his knowledge on beekeeping to the benefit of the project.

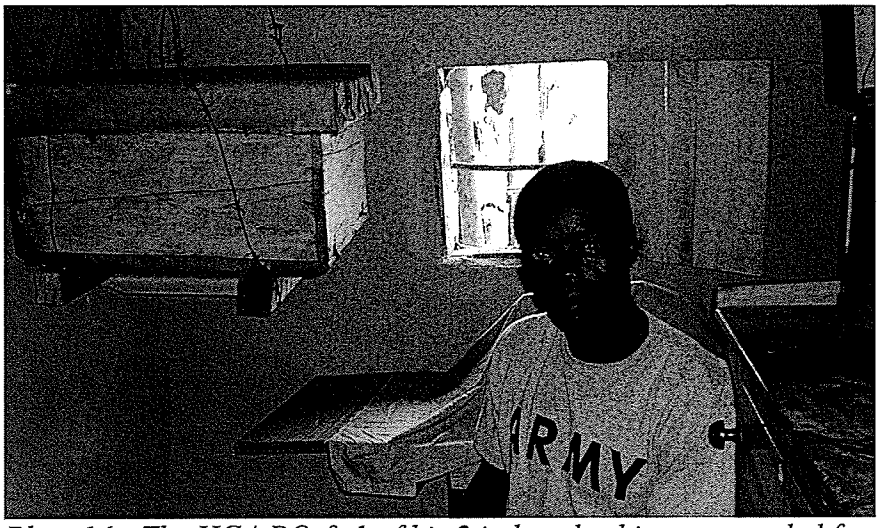


Plate 16: The HCA PO & 1 of his 2 indoor beehives suspended from ceiling, Ileho

Swarm Catchment

The Honey Care Africa PO has introduced a method of swarm catching that has been quite successful. During his experiences keeping bees for 25 years he had observed bees visiting toilet areas (Mmbakha 2004). The reason that bees are observed visiting toilet areas is that these are areas where bees are able to replenish minerals that they excrete, such as sodium and potassium (Roubik 1989). In addition to outhouses being a place that bees visit, by placing the hives, which are yellow (a colour that bees can see) atop the outhouse they are at a height that makes the hives highly visible to scout bees. The HCA PO has begun placing new hives atop toilets and has encountered excellent colonization success often having hives colonized by swarms within 1-2 days, the colonized hives are then moved to an apiary.

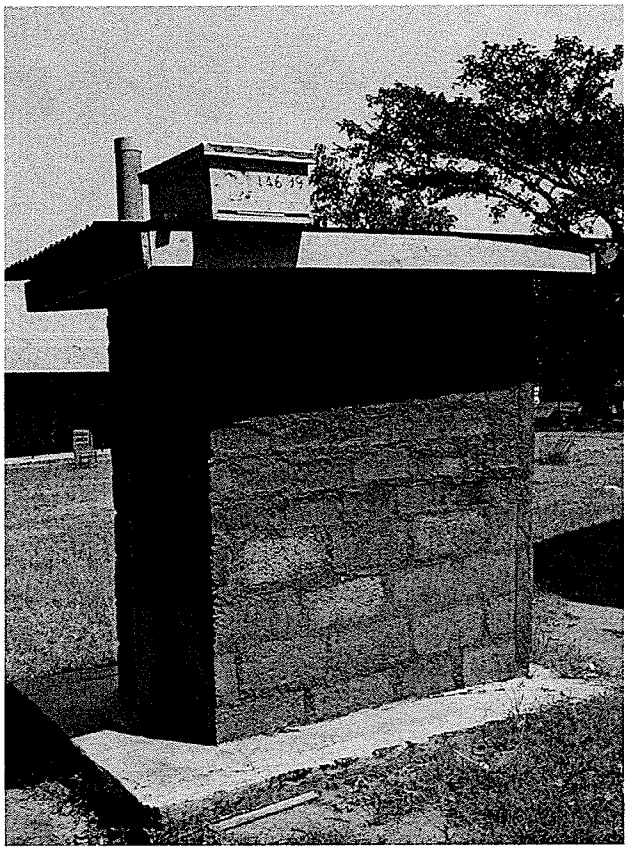


Plate 17: Swarm Catchment, Kakamega

Table 5.1: Role of Honey Care Project Officer – Kakamega

	Phase I 2000 –2002	Phase II Mid 2002 – Mid 2003	Phase III Mid 2003 - Present
Organization Affiliation	CARD	CARD IBG	CARD IBG HCA
Role in Organization	Individual Beekeeper; IBG Chairperson	CARD Beekeeping Officer	HCA Project Officer; IBG Chairperson
Contacts / Connections	Beekeepers (village level)	Beekeepers (village level); MLFD Divisional Officer	Beekeepers (District level); MLFD Divisional Officer, MLFD District Officer

Table data source: semi-structured interviews

Beekeeping Groups

There are few beekeeping groups in Kakamega that are involved with the HCA project. The Ivihiga Beehive Group is one, and has been important in promoting the project in its area and has helped to provide loans to its members who wish to purchase HCA hives. IBG is an organization that exists to help its members exchange information and techniques about beekeeping, and to help its members sell their honey locally and in nearby towns. IBG owns 2 HCA hives the profits from which go back to

Fear of Bees

The HCA PO who is also the IBG Chairman, has been instrumental in helping many of his neighbours to overcome their fear of bees (which is common in Kenya) and begin beekeeping, some in the HCA program others within the framework of IBG. This has been accomplished by showing them some of his hives; in particular the two top-bar hives that he has inside his house, in the next room from where the family eats and the children do their schoolwork. The hives are colonized and while there are windows in the room for bees to go in and out through, some bees invariably make their way into other rooms of the house. Further to this, one of the two hives has a wall made from glass and thus allows visitors to see inside the colonized hive so as to get an idea of what is going on inside. This has been very helpful in reducing the fear of bees that his neighbours and visitors have, as on several occasions in his village of Ileho new beekeepers stated that they no longer had such fear of bees because if he can keep two colonized hives inside his house then there is no fear in keeping a few hives on their property outside their house and some meters from it.

the group as a whole. Some members of IBG own HCA hives but many are traditional beekeepers that are not involved with the project. In other areas of the district other community self-help groups (not necessarily beekeeping groups) have been similarly important in their communities. Many of the groups that have become involved in the HCA projects are HIV/AIDS widows groups. These people are a particularly vulnerable group in Kenyan society and as such CARD has in some cases helped to organize these groups, has with donor money bought hives for groups of HIV/AIDS widows.

Local Authority

The chiefs, who are the local authority in the villages, were important only in that they must be informed of the establishment of any beekeeping groups (or other such community self-help groups) in their areas, and the chief's signature is needed for the necessary registration paperwork.

Ministry of Livestock and Fisheries Development

The government Ministry of Livestock and Fisheries Development (formerly the Ministry of Livestock and Agricultural Development) is responsible for the national government's involvement in beekeeping in Kenya. The MLFD was introduced to the HCA project in Kakamega in 2002 (Anjina 2004). Currently the MLFD is not yet contributing to the project in a meaningful manner. They do receive regular reports from CARD on the state of the project and have received some beekeeping suits and other equipment for inspecting hives from CARD as well (Anjina 2004, Mung'oni 2004). It is

hoped that in the future if resources allow the MLFD will better be able to provide assistance to the project (Anjina 2004).

Kwale

CRSP

There is a lack of local beekeeping leadership in many of the villages in the CRSP project area. The VDO system does not seem to be working effectively to communicate the concerns of the beekeepers to CRSP or to distribute information from CRSP to the beekeepers. The leadership that does exist has tended to come mostly from CRSP and the government staff stationed at the CRSP office. Unfortunately the CRSP staff do not have sufficiently frequent contact with the beekeepers. While the government staff have more frequent contact with the farmers they have many more responsibilities than just the CRSP projects of which the HCA project is just one of several. The new 'paraprofessionals' that CRSP is training should be able to provide the local level leadership that has been lacking.

HCA PO

There is no Honey Care Project Officer employed in Kwale. There is a HCA PO in Taita who in theory is responsible for the Kwale project as well, but Taita is too far for him to work in Kwale. The lack of a project officer means that Honey Care does not have a direct presence in the project. A project officer could provide extension service and training to beekeepers, and perhaps even serve to oversee the paraprofessionals that CRSP is training.

Local Authority

The chiefs and others in the local authority structure were included in the early stages of the project to get their approval for the formation of the VDOs and for the organization of barazas to introduce HCA to the interested communities, but that was the extent of their involvement.

MLFD

The MLFD is much more involved in the beekeeping project in Kwale than in Kakamega, with several ministry field staff stationed at the CRSP office. This is a beneficial arrangement for both parties as CRSP provides office space and transportation (motor-bikes) to the Ministry staff that the government is unable to provide, and in turn CRSP gets several field staff who have relevant training and close relationships with the farmers to help promote and support CRSP's projects. Many of the beekeepers were introduced to the project by the MLFD and look to them for support.

5.6 Funding

5.6.1 Funding for initial community organization and training

Kakamega

Initially CARD was a self-funded initiative formed by a number of residents of Kakamega District who wanted to do something to help their community. CARD is still to some extent self-funded, as all members must pay an annual fee to the organization, though CARD also receives funds from various international donors to help them

carryout their activities. The formation of the beekeeping groups such as IBG was typically self-funded by its members. CARD is now helping community groups to try and get funding from various government ministries including the MLFD for more beehives.

Original training workshops on beekeeping were paid for by CARD from funds given by international donors; the instructors were HCA staff. More recent training workshops have been conducted by the Project Manager at CARD who has taken a training of trainers course paid for by USIAD and has been contracted to do beekeeping training for the MLFD and some private companies (i.e. Mumias Sugar).

Kwale

The funding for the HCA project in Kwale has primarily come from CRSP, though for the purchase of the hives the VDO under the initial financing agreement had to come up with some of the money, through membership fees and contributions from members, this arrangement has changed more recently (HCA 2000b, KRSP 2000b). The beekeeping training courses were paid for by CRSP out of their budget.

5.6.2 Initial investments and office funding

Kakamega

The initial funding for CARD's beekeeping with HCA came from SIDA, VSO, and Assets - the parent organization of CARD (Kweyu 2003). CARD used these funds to purchase hives from HCA on behalf of farmers, though it was still necessary for the

individual farmers to come up with some capital to make a down payment for the hives previous to their being ordered.

The CARD office in the town of Kakamega is the only one used for the beekeeping project, it was in place prior to the commencement of the HCA project as CARD had existed since 1998 and has occupied the same office. Currently CARD does not have adequate funds to cover its expenses resulting in a situation where CARD has not been able to pay their rent, nor has CARD been able to maintain many employees. If the beekeeping project improves and expands then it has the potential to provide CARD with adequate funding to pay its employees and its rent (which has not been paid in 2 years – though the office building is owned by one of the founding members of CARD so they will not likely be evicted).

Since its inception, funding for CARD has come from various donors including: The Australian High Commission, The United States Embassy, and The European Union (Kweyu 2003). As well there have been 4 volunteers from VSO (Voluntary Service Overseas) that have worked in Project Manager capacity in groups of 2 until 2002. When the VSO's were with CARD they bought a second hand pick-up truck but when they left they were unable to donate it to CARD (Mung'oni 2004). So CARD now has 1 motorbike bought by the European Union for the Forest Conservation Program (beekeeping is part of this). As well CARD receives money from its members annual fees of 300KES, though payment of these is not always timely or forthcoming. The beekeeping project also contributes some monies to CARD as they get a commission of 20KES/kg harvested and there is also a small operation of 1-2 women who make bee-

suits for sale to Honey Care and other interested parties (agricultural colleges), which CARD receives a commission from (Mung'oni 2004).

Kwale

In Kwale the CRSP office is the hub of the beekeeping project. CRSP has an office, personnel, and vehicles some of which are tasked with supporting the beekeeping project. The CRSP office is in Mariakani and thus it is difficult to access for the residents of many villages in the district. The VDOs do not possess any offices or other facilities or vehicles, so their ability to support the beekeeping project is limited to other aspects.

CRSP funded the bulk of the initial investments (with monies received from international donors) with the remainder of the money coming from the VDOs (KRSP 2000b). The VDOs received this money from their members through membership fees and member contributions to the VDO for development projects.

5.6.3 Hive Purchase and Financing

Kakamega

In Kakamega the price of the hives has increased over the course of the project, in 2000 the price of a hive was 2900KES then it became 3250KES and in 2004 it became 3550KES – a difference of 600KES since the project began (JM, HCA farmer, Kakamega). Members can either pay the full amount or pay a deposit of 700 KES and take a loan for the remainder. A maximum of 2 loans are given to individuals and a maximum of 3 loans are given to groups (CARD 2003). Those who can afford the full

price are discouraged from taking loans, as CARD – the source of the loans has limited resources (Mung'oni 2004).

The farmers invest only their capital, not their labour in the beekeeping project. The contract between HCA and CARD (the beekeepers are all CARD members) reflects the arrangement between the 3 main stakeholders (HCA, CARD, and the farmers), HCA pays to CARD 110 KES/kg of honey, CARD in turn pays the farmers 90KES/kg keeping the remaining 20KES as a commission for the work CARD does managing the hives on behalf of the farmers (HCA 2000a, Mung'oni 2004).

The majority of participants in the Kakamega HCA project have been from the middle or upper wealth groups in the district – as the price of the hives is considered too high by many of the poorer people in the district. Though, with no minimum number of hives that must be purchased the Kakamega project has attracted participants from all wealth categories (see figure 5.10 – where shamba size is used as a proxy measure of relative wealth). The average shamba size of HCA farmers interviewed was 4.01 acres.

Figure 5.10 Shamba size of HCA beekeepers in Kakamega

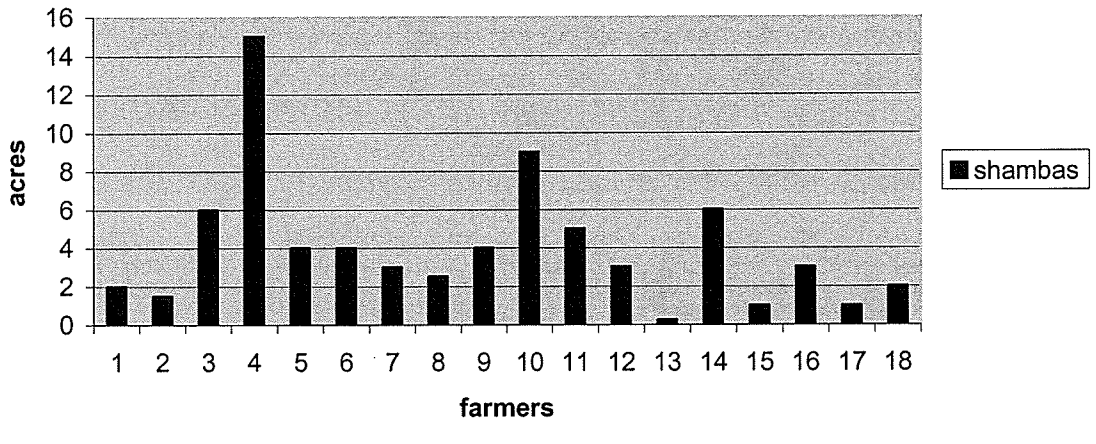


Figure data source: semi-structured interviews

Kwale

In Kwale the project has undergone some changes since its inception in 2000. The price of the honey was renegotiated with HCA and was raised from 80KES/kg to 100KES/kg in 2001 (KRSP 2003). More significantly the method of financing the hives has changed.

In the initial phase of the project starting in 2000, 220 hives were distributed to 55 beekeepers in 12 villages in Kwale (CRSP 2004). 5 farmers (beekeepers) from a village were required to buy 4 hives each (total of 20 hives per village) and to together purchase beekeeping equipment that would be owned communally by the 5 beekeepers in the VDO. The hives (and 1 super per hive) cost 3850 KES each initially with farmers putting up the price of 1 hive (3850 KES) and receiving a loan for the remaining money 11550 KES, the loans were to be repaid with the profits of the honey sold. Initially 40% of sales went to loan repayment when the price was renegotiated in 2001 the ratio changed to 50% of profits going to loan repayment (KRSP 2003). The price of hives (and 1 super per hive) has since increased to 4500KES, all hives other than the initial 220 were bought for this price – though they are heavily subsidized by CRSP. The price per hive is higher in Kwale than in Kakamega, this is because the price for Kwale includes the supers, which are the property of the beekeepers, in Kakamega HCA retains ownership of the supers currently.

As the beekeeping project progressed CRSP became aware that the price of the hives was a deterrent to the poorer members of the communities from becoming involved in the project. The majority of those who were involved with the project initially were wealthier members of their villages as they could better afford the investment of 4 hives

(see figure 5.11), the average shamba size of HCA beekeepers interviewed in Kwale was 5.04 acres, though the nature of land tenure in much of Kwale puts doubt on the usefulness of shamba size as a proxy measure of wealth. There may have also been a political aspect to project participation, as only 5 people from each VDO were allowed to purchase the HCA hives during the initial phase – the majority of HCA beekeepers interviewed who bought their hives in 2000 were members of their local VDC (the committee that controls the VDO).

Figure 5.11 Shamba size of HCA beekeepers in Kwale

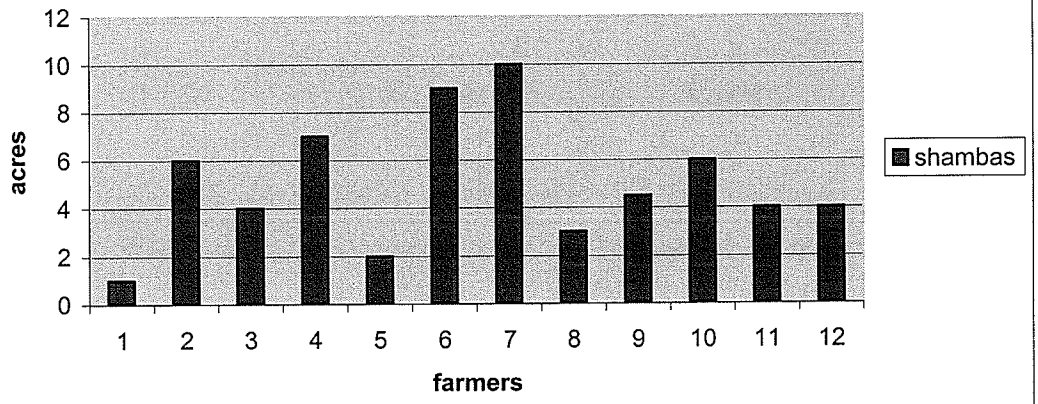


Figure data source: semi-structured interviews

In late 2003 CRSP changed the financing arrangement greatly, so that CRSP began providing a subsidy to the farmers of 85% of the hive value so the farmers only have to come up with the other 15% up front, and they would then own the hive wholly (Smith 2004). The price of the HCA hives in the Kwale project is 4500KES/hive and super; therefore the farmers only have to come up with 15%, which is 675KES. As well there is no minimum purchase so a farmer can buy a single hive if he/she wishes.

While, the financing changes have dramatically increased the number of hives in the program the changes do not seem to have made the program more accessible to the

poorest people in the area. The hives under the 15/85-subsidy policy are given on a supply driven basis; those households that can afford the 675KES can receive one or more hives (Smith 2004). Many households have requested multiple hives, and it has become apparent to CRSP that these households are from the middle and wealthier classes in the communities (Smith 2004). The poorest households cannot likely afford the 675KES up-front payment, as disposable income is scarce.

This method has certainly increased the number of HCA hives purchased by farmers in the district, however, changing the financing system so radically is likely to build animosity amongst those people who bought their hives under the previous system and are still trying to pay off their loans. This may promote defaulting on the loans. Furthermore such a large subsidy seriously undermines the economic sustainability of the project in Kwale; as such subsidies may not always be available to the beekeepers, particularly when CRSP finishes its work in the area at the end of its 10 years.

The subsidy of the hives by CRSP was an effort to make the project more accessible to the people living in Kwale by addressing one of the most common and persistent complaints about the project, that the hives are too expensive. However, there are problems with providing such a large subsidy to the beekeepers, and the effects of the subsidy program may not have been exactly what were expected, nonetheless, recipients of the 85% subsidized hives have good potential to benefit from their investments.

5.6.4 Human Resources and In-Kind Support

Kakamega

The only support the HCA project in Kakamega has received from local institutions was the promotion of the project through the church and local authorities (chiefs and assistant chiefs) at barazas (public meetings). CARD has an agreement in principal with the MLFD to receive help with some of the activities including inspection of hives but as of yet there has been no cooperation in the field such as using a government truck to transport supers from the apiaries to the office and back to again (CARD only has 1 motor bike and 2 bicycles, and HCA supplies their project officer in Kakamega with 1 motor bike and money for fuel). HCA comes to Kakamega monthly and picks up and delivers some supers from the field with their truck; however the driver who must also service other HCA projects in western Kenya is usually pressed for time and cannot lend full support to CARD in this task of transporting supers.

Kwale

The Kwale project received little assistance from pre-existing organizations with the only assistance from the authorities being the chiefs giving permission to form the VDOs. CRSP helped in the formation of the VDOs and aided the members in the writing of documents for the establishment of the VDOs as institutions within the villages. CRSP and HCA organized the project with various interested individuals in different villages throughout the district.

CRSP provided their services for free to the communities as that is their mandate and they are the organizers of the project. The MLFD also has provided their services to

the beekeepers though again this is their mandate (Mwanzighe 2004). The MLFD due to a lack of funding has not been able to support the beekeeping project as much as they might wish, and have entered a synergistic arrangement with CRSP whereby several Ministry staff are stationed at the CRSP office so that the two organizations can combine their strengths.

5.7 Summary

The HCA projects, despite their differing management structures, are similar in that they were both designed by the respective development organizations (CARD and CRSP) responsible for managing the projects not by the communities. However, as the projects have matured they have endeavoured to increase the level of involvement of communities in both cases, though there remains more involvement at the community level in Kwale than in Kakamega. The management structure established in Kwale where farmers manage their own hives is much more effective in building local capacity than the Kakamega project which does not involve farmers making beekeeping an economic investment but not an economic activity.

Hive financing in both cases was initially based on zero-interest loans provided by the development organizations with a 25% down payment from the farmers/beekeepers. This made the hives affordable to middle and upper wealth groups in the villages, but not to the poorest residents particularly in Kwale where there was a minimum of four hives was to be purchased per beekeeper. Considering the cost of Movable Frame Hives, equipment, and maintenance, it may not be an appropriate technology for the poorest

people in rural Kenya, for whom unless benefiting from heavy subsidies it is a high-risk endeavour.

The two case studies provide a look at how the different management structures established by CARD and CRSP have been affected by the vagaries of leadership. The Kakamega case displayed strong central leadership initially that was later replaced by an attempt at a more diffused leadership structure, which was not as successful and then was replaced by another strong central leadership structure. As the Kakamega project expands it will likely become necessary to diffuse the leadership somewhat again, though not necessarily in the same fashion as was used previously. The Kwale project has lacked strong leadership at the local and NGO levels, this has contributed to the poor performance of the project, though the situation can potentially be remedied by CRSP's development of para-professionals who will provide leadership at the village level – where it is most needed.

Not surprisingly there are a few key leadership figures that can have a large impact on the success of the beekeeping projects. At the level of the development organization it is important to have a committed Project Manager to monitor the project, make executive decisions, and to interact with other organizations. A full-time project officer is also indispensable to the HCA beekeeping projects to provide technical assistance. Thus leadership from HCA is a contributing factor to the success of the projects.

It has been recognized by both CARD and CRSP that there is a need for strong local level leadership. In the Kakamega case the need for local level leadership in the beekeeping project has been less serious as hive management is centralized, though even

at 600 hives the project would benefit from additional personnel to inspect and manage hives, this need will become more acute as the project continues to expand. In the Kwale project because the farmers are the beekeepers there is a greater need for local level leadership to improve the quality of hive management and thus honey yields by providing technical support to the less experienced and less successful beekeepers. This is particularly important because CRSP is not easily accessible to the beekeepers, and they could greatly benefit from someone in their community who could provide technical support. There are numerous traditional beekeepers in both case study locales that could be recruited and trained to provide technical support.

Chapter 6 Cross-Scale Linkages

6.1 Introduction

Holling et al. (1998) state that issues of natural resource and environmental management are neither large scale nor small scale, but rather they are cross-scale both spatially and temporally, non-linear in nature, and exhibit an evolutionary character. This theory suggests that many development projects require effective and efficient co-ordination between organizations located at different vertical and horizontal scales if they are to be successful.

A balance must be struck between centralized and local management of natural resources. If management is too centralized, information from the environmental feedbacks may be slow in reaching the level in the organization where decisions are made. The information that reaches this level is likely to be less detailed than what is observed at the site; likewise information traveling the opposite way through the hierarchy (down from the centre to the periphery) may also be slow and possibly incomplete. This situation is made worse where communication and transportation networks are limited or intermittently functional, as is the case in many areas of Kenya including both Kakamega and Kwale districts. Throughout Kenya the communications network is piecemeal with limited coverage and poor reliability, the roads are also in poor shape throughout the country and in both research areas many roads become impassable during the rainy seasons (though the situation is more severe in Kakamega than in Kwale). Such a situation makes it difficult to manage development projects remotely without a significant time lag.

Cross-scale linkages in resource management have the potential to allow for a meshing or at least, an accommodating of a variety of different interests held by a diversity of stakeholders, and for a more robust and extensive management regime to be created as different techniques can be better brought together. Ideally, cooperation across scales can result in a situation where the strengths of one institution can be used to offset the weaknesses of another (Berkes 2002, Oyugi 1985).

The HCA beekeeping projects in Kenya are built upon a three-way partnership between the private sector, development organizations, and small-scale farmers (Jiwa 2002). In practice this partnership is usually four-way, with the government (particularly the MLFD) being the fourth partner (see table 6.1, 6.2). The MLFD has an interest in all beekeeping projects in Kenya and has typically been introduced to the HCA projects by the NGO or CBO that manages the project at the local level, as at a minimum the MLFD must be informed of the beekeeping projects (Jiwa 2004).

Table 6.1: Cross-Scale representation of stakeholders in Kakamega HCA project

	Village	Division	District	Province	National	International
Honey Care					X	
HCA PO			X			
CARD			X			
Local Groups	X					
Forest Dept					X	
KWS					X	
MLFD					X	

Table data source: semi-structured interviews

X	Level at which head office of institution is based
	Level at which institution is active in relation to the HCA project
	Level at which institution is not active in relation to the HCA project

Table 6.2: Cross-Scale representation of stakeholders in Kwale HCA project

	Village	Division	District	Province	National	International
Honey Care					X	
CRSP			X			
AKF					X	
VDC	X					
VDO	X					
MLFD					X	

Table data source: semi-structured interviews

X	Level at which head office of institution is based
	Level at which institution is active in relation to the HCA project
	Level at which institution is not active in relation to the HCA project

6.2 Institutional Linkages Related to Project Facilitation

Kakamega

The pre-existing link between CARD and the communities in Kakamega District was crucial to the success of the beekeeping project as this linkage provided a vehicle through which HCA was able to introduce the project to communities. CARD, having been operating in Kakamega District since 1998 had already recruited many of the chiefs, assistant chiefs, and other community members in the thirteen project areas in the district. This network of communication established between the CARD and the local authorities members allowed CARD the opportunity to gather people together in the communities to promote the beekeeping project and to suport the establishment of beekeeping groups in the communities.

CARD is represented on the district development committee, and the district environment committee. Unfortunately this relationship has not yet benefited CARD's beekeeping operations. These committees do not meet as regularly as they should, and only expect reports on CARD's activities, as of yet they have not provided much useful

feedback or otherwise tried to link the beekeeping project to other activities in the district (Mung'oni 2004).

CARD established linkages with the relevant government ministries and departments such as the Ministry of Livestock and Fisheries Development (which has beekeeping in its portfolio), the Forest Department in the Ministry of Environment and Natural Resources, and the Kenya Wildlife Service in the Ministry of Tourism and Wildlife, the later two are responsible for managing the Kakamega Forest and are therefore concerned with the livelihood activities of the farmers surrounding the forest.

Kwale

Prior to the introduction of the HCA project CRSP already had established linkages with many villages in Kwale, this was accomplished during the creation of the VDOs to facilitate development projects. These linkages enabled the introduction of HCA to the farmers in these villages. The collaboration between CRSP and the government has been to the benefit of the project as officers from the Ministry of Livestock and Fisheries Development were able to use their connections with farmers to promote the project. The MLFD has an interest in beekeeping and had previously established a number of its own beekeeping projects in the district using KTBHs (most of which seem to have failed after a few seasons). The MLFD seems to have kept an open mind about the HCA project which uses a different technology than they supported and have embracing the project and offered what assistance they can to the HCA beekeepers in Kwale (Mwanzighe 2004).

6.3 Vertical Institutional Linkages

Kakamega

CARD has undergone multiple changes in the beekeeping project management structure that links CARD vertically to the farmers involved in the project. Changing circumstances and performance issues have forced CARD to alter its management structure. There have been three different management structures that were utilized at different times during the project's history.

Phase I (2000 – mid 2002)

During the initial project management structure the VSO volunteers and a few CARD volunteers preformed all the project management duties (see figure 6.1). The VSO volunteers had a pick-up truck which enabled them to work out of the office in town and still inspect the apiaries and collect and return supers in a timely fashion (though there were fewer hives at this time). The VSO volunteers, realizing that the truck would be unavailable to CARD once they were gone began establishing a different management structure for the project that could function without the vehicle. The VSO volunteers raised enough money to train a number of young people as beekeeping officers, about 18 in total (Mung'oni 2004).

Figure 6.1: CARD Management Structure - Phase I

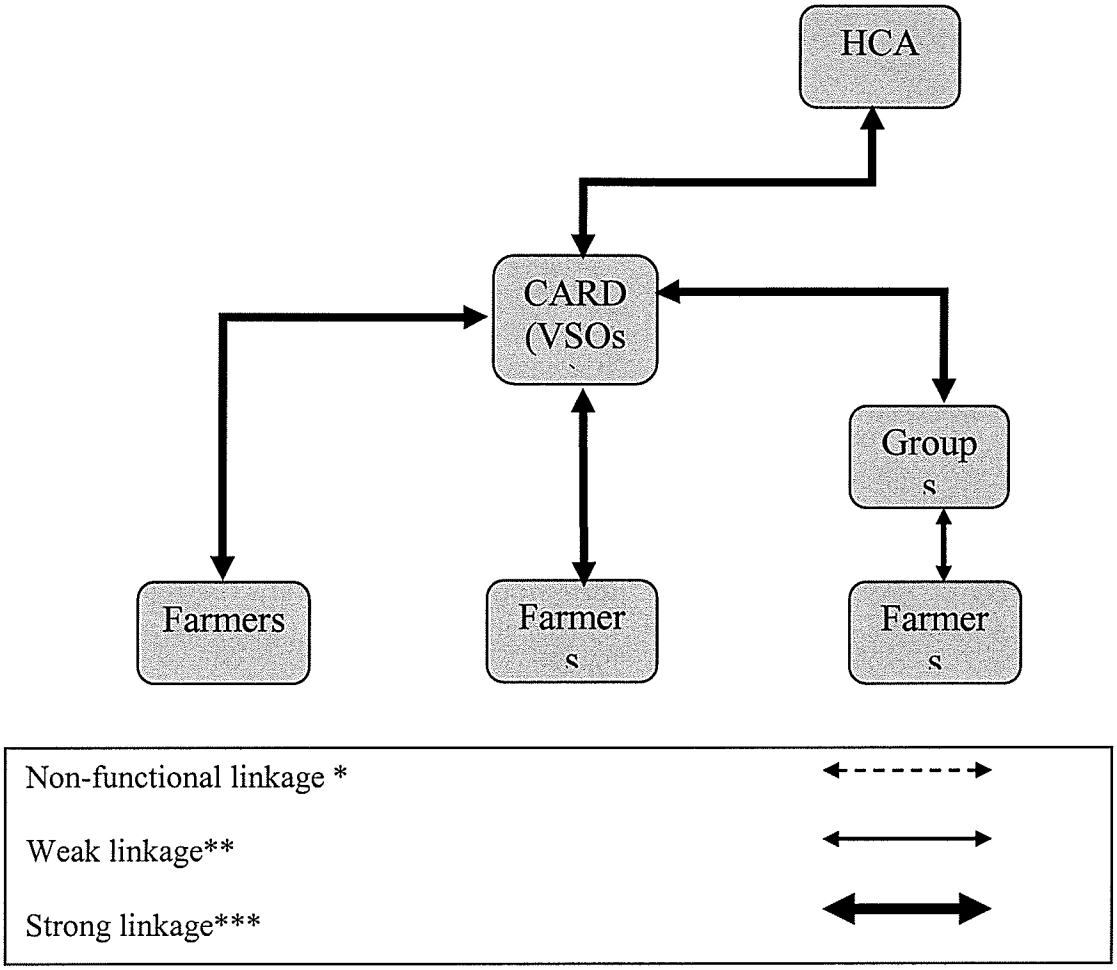


Figure data source: semi-structured interviews, Kweyu 2003

Figures 6.1 – 6.5

**Non-functional linkages* are linkages that have been established, but in practice are not utilized to perform the tasks expected for the operation of the HCA project.

***Weak linkages* are linkages that in reference to the HCA project are functional but not operating at a high capacity, these linkages are characterized by infrequent or irregular communication between the individuals/organizations in reference to the HCA project only; (this does not mean that the linkage is weak in reference to all matters – only in reference to the HCA project).

****Strong linkages* are linkages that are functioning at a high capacity in reference to the HCA projects.

Phase II (mid 2002 – mid 2003)

The 18 Beekeeping Officers trained in 2002 were divided into two groups, Beekeepers and Assistant Beekeepers under them (see figure 6.2). Beekeepers were to supervise a small number (2-4) of Assistant Beekeepers in an area. Assistant Beekeepers were each to be responsible for managing a single apiary containing 10 – 20 hives, usually located near their residence. The Beekeepers were to oversee the Assistant Beekeepers and to make regular reports back to the CARD office on the status of the hives in their area. Collection points were to be established in each area so that the Beekeeping Officers could easily transport the supers by bicycle or foot to these locations where they would be picked up by HCA with a truck (CARD 2003, Mmbakha 2004, Mung'oni 2004).

All Beekeeping Officers (Beekeepers and Assistant Beekeepers) were to be paid a salary of 300KES/month for their labour, though the beekeepers also received a commission of 10 KES/month for every hive in their area, and 10KES for each super harvested, Assistant Beekeepers were not paid any commission but actually did most of the work (Mung'oni 2004). CARD, not having sufficient funds to pay the Beekeeping Officers' salaries instead gave them each 1 hive at the start of this management phase for the 12 months work they would do (Mung'oni 2004, Mmbakha 2004). At the end of the 12 months most Beekeeping Officers wanted to be paid for the next 12 months rather than receive another hive, in part because they had not seen any harvests yet from the first hives given to them (Mung'oni 2004). A few Beekeeping Officers had not done their work and their hives were repossessed by CARD (3 hives were repossessed). Many

of the Beekeeping Officers were not working very hard, and the project's performance had consequently declined (Mung'oni 2004).

Figure 6.2: CARD Management Structure - Phase II

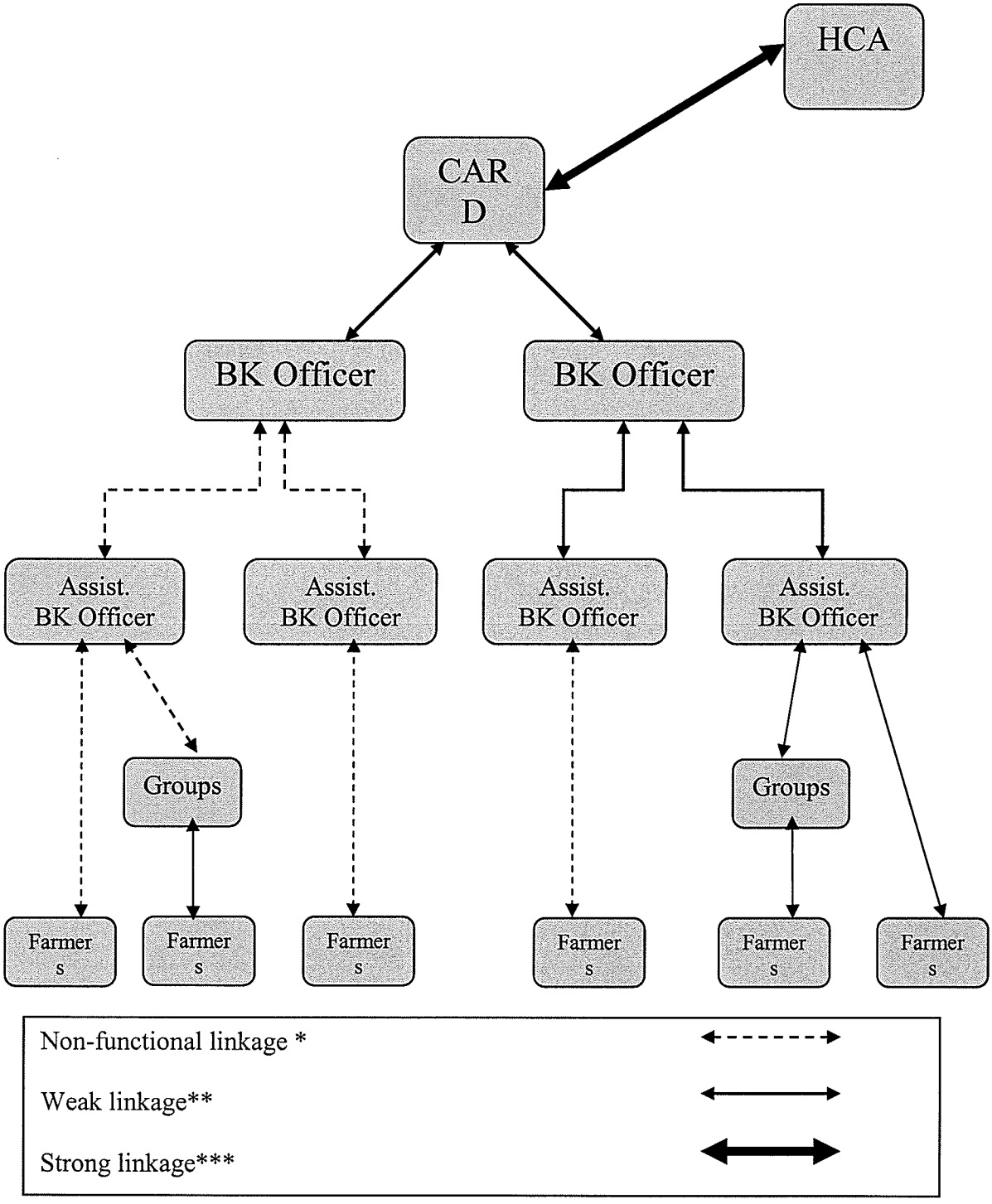


Figure data source: semi-structured interviews

In general this management structure of Beekeeping Officers had not worked very well, most Beekeeping Officers were not carrying out much oversight of Assistant Beekeepers so there was no verification of records. This lack of accountability and payment (motivation) created a situation where it was easy of the Beekeeping Officers to neglect their work. The end result was that the beehives were poorly managed for the most part, though there were exceptions (in Ileho and a few other areas the hives were well managed and harvests obtained). During this period honey yields declined despite an increase in the total number of hives and a greater number of hives with established and productive colonies, both of which should have lead to increased honey production providing there was proficient management of the hives.

Phase III (mid 2003 - present)

As the project was not earning enough money to pay the Beekeeping Officers and their performance had been unsatisfactory CARD decided that the management of the hives had to be centralized so that a smaller number of hard-working and committed individuals could administer the project (see figure 6.3). This smaller group was mostly chosen from the best of the Beekeeping Officers, though that title ceased to have meaning for the project under its new management structure. This new management scheme was made possible by the placement of a full-time HCA Project Officer in the division so that there could be at least one full-time paid individual who was responsible for hive inspection and management (his salary is paid for by HCA and he is provided a motor-bike and money for fuel). Without the HCA PO this management structure, which is

much like the initial management structure would not be able to function given the current resources available to CARD.

Figure 6.3: CARD Management Structure - Phase III

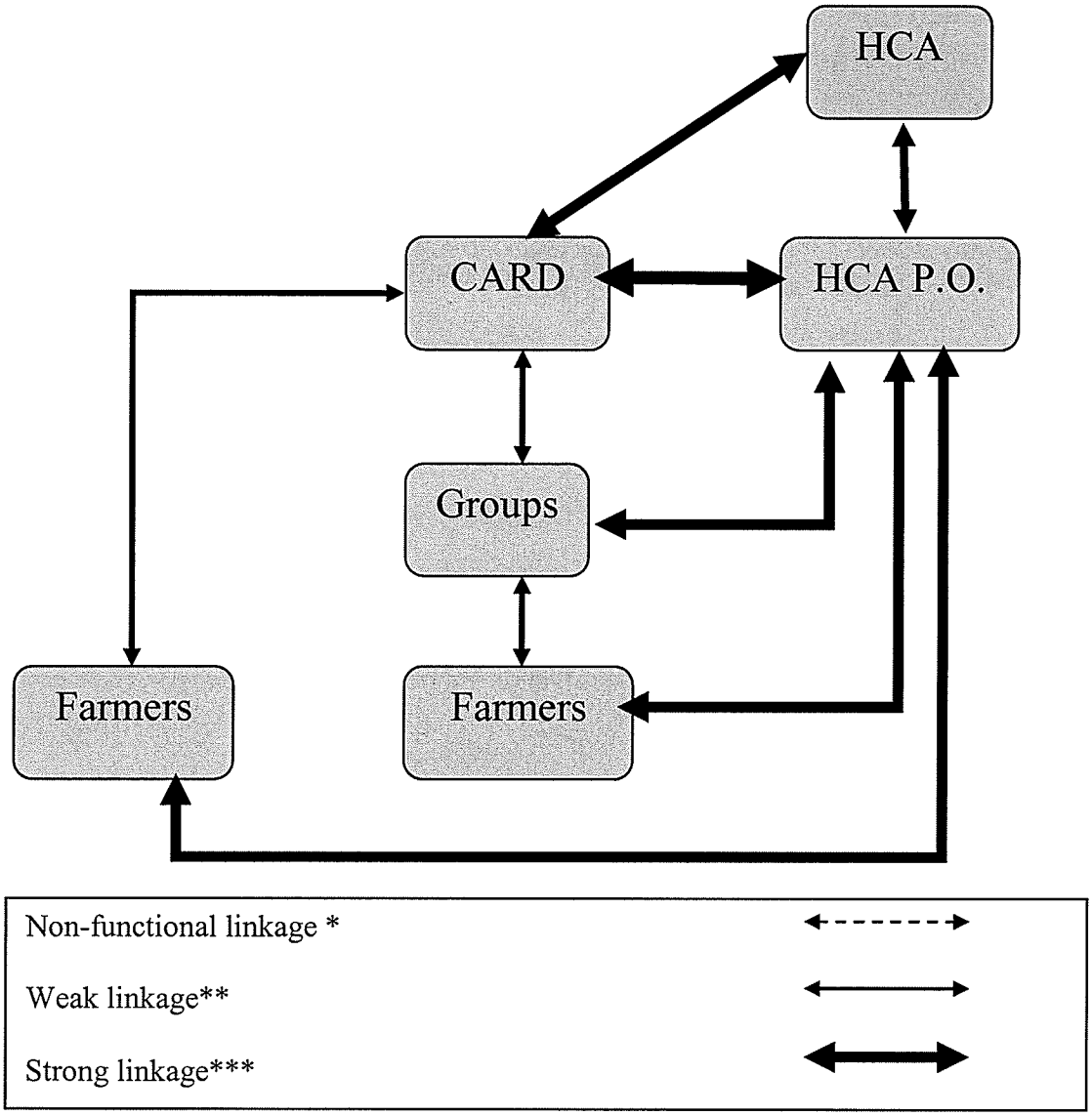


Figure data source: semi-structured interviews

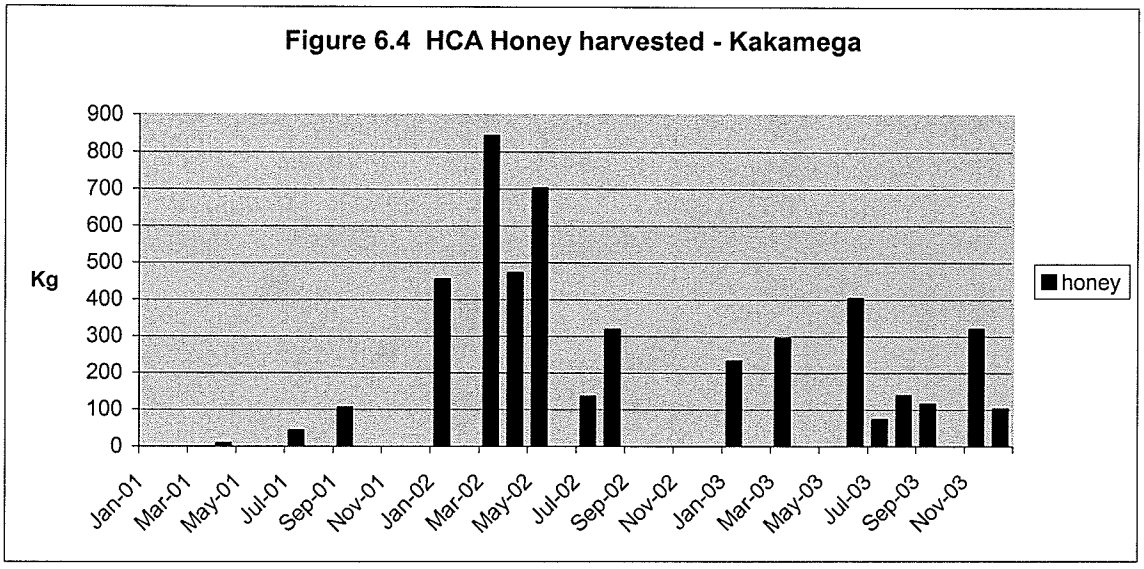


Figure data source: CARD 2004

The establishment of an HCA PO in the division came at CARD's request. This request coupled with the sharp decline in performance that the project had suffered (see figure 6.4), which was in HCA's best interest to reverse prompted HCA to act. Unfortunately, the individual who was first given the job of being the HCA PO in Kakamega did not perform his duties adequately so HCA terminated his employment and replaced him with the present Project Officer (Mung'oni 2004). The current management structure that CARD is using has been much more successful, though it is constantly being altered to make it more effective depending on how circumstances change.

6.3.1 CARD - Farmers

CARD enjoys good linkages with its farmers who have bought HCA hives (see figure 6.5). Being unable to employ anyone full-time to be in the field monitoring the project CARD is reliant upon volunteers, who are provided with only bicycles for transportation. Therefore CARD does not have the same level interaction with the farmers in the field, as does the HCA PO. However, farmers frequently visit the CARD

office (they usually must do so in order to receive the money for their honey), and this gives them an opportunity to express their thoughts and concerns related to the project. While some people were disappointed in the project, most project participants interviewed expressed a general satisfaction for the current state of the project though most also expressed dissatisfaction with how the project had performed during *Phase II.* The following comments were typical: "The Honey Care project is good because it doesn't require much work or much land". (MI, HCA farmer, Kakamega).

Diffusion of Beekeeping Information Vertically

At the beginning of both the Kakamega and Kwale HCA projects many of the hives were placed on wooden hive stands (Mmbakha 2004, Thoya 2004). The hives stands were prone to several problems. Firstly hive stands facilitate ants in reaching the hives. Ants are one of the most serious pests to apiculture in Africa (Paterson 2004). Secondly, the hives stands can be damaged by termites causing the hive to fall and the bees to abscond and potentially attack people or livestock nearby. Thirdly hive stands are also easily disturbed by livestock if the apiaries are not properly fenced (and few apiaries in Kakamega or Kwale are adequately fenced). Finally hive stands present easy prey for honey badgers. To overcome these difficulties the hives have all been switched to a system where they are hung from wires that are supported by a 'goal-post' style frame made out of wood treated with fire to deter termites. The wires are greased with used motor oil to prevent ants from reaching the hives. The goal-post system was disseminated by HCA to their project partners throughout Kenya (Jiwa 2004, Mung'oni 2004, Thoya 2004). The switch to hanging the hives was done early on in the project and all subsequent hives have been hung from trees or posts (Jiwa 2004).

6.3.2 CARD - HCA

The link between CARD and the HCA head office in Nairobi is solid, CARD's Program Manager has frequent communication with the HCA head office (see figure 6.5). This linkage is more important to the success of the project than the linkage of the HCA PO to the head office as the CARD Project Manager has more opportunity to contact the HCA head office and has a better large-scale view of the project than the HCA PO. This linkage is important for the timely

extraction of honey from the full supers that are taken from the field and stored at the CARD office. Since CARD does not own a centrifuge machine they are dependant on HCA sending one out with a truck that transports the honey back to Nairobi. Thus a good linkage between CARD and HCA is crucial to the success of the project as it allows for the honey to be harvested in timely manner so that the farmers can be paid and the supers returned to the hives quickly so as to maintain production. This linkage is the main communication connection between the project and the HCA office in Nairobi, it is the linkage through which HCA is notified when a truck should be sent to Kakamega to collect honey and through which new hives are ordered.

6.3.3 CARD – Beekeeping/Self-Help Groups

CARD's linkages to beekeeping/self-help groups are adequate for the most part, though they tend not to be any stronger than CARD's linkages with unaffiliated HCA farmers (see figure 6.5). There are a limited number of beekeeping/self-help groups that are involved in the HCA project in Kakamega, most farmers involved are independent (though they must become CARD members to be eligible to join the project). Those beekeeping/self-help groups that are involved with HCA such as IBG or the Matende Widows Group have various organizational structures, but all have vertical linkages within the group so that the concerns of the members can be addressed by the groups' leaders.

Figure 6.5: Cross-Scale interactions of stakeholders in Kakamega HCA project, 2004

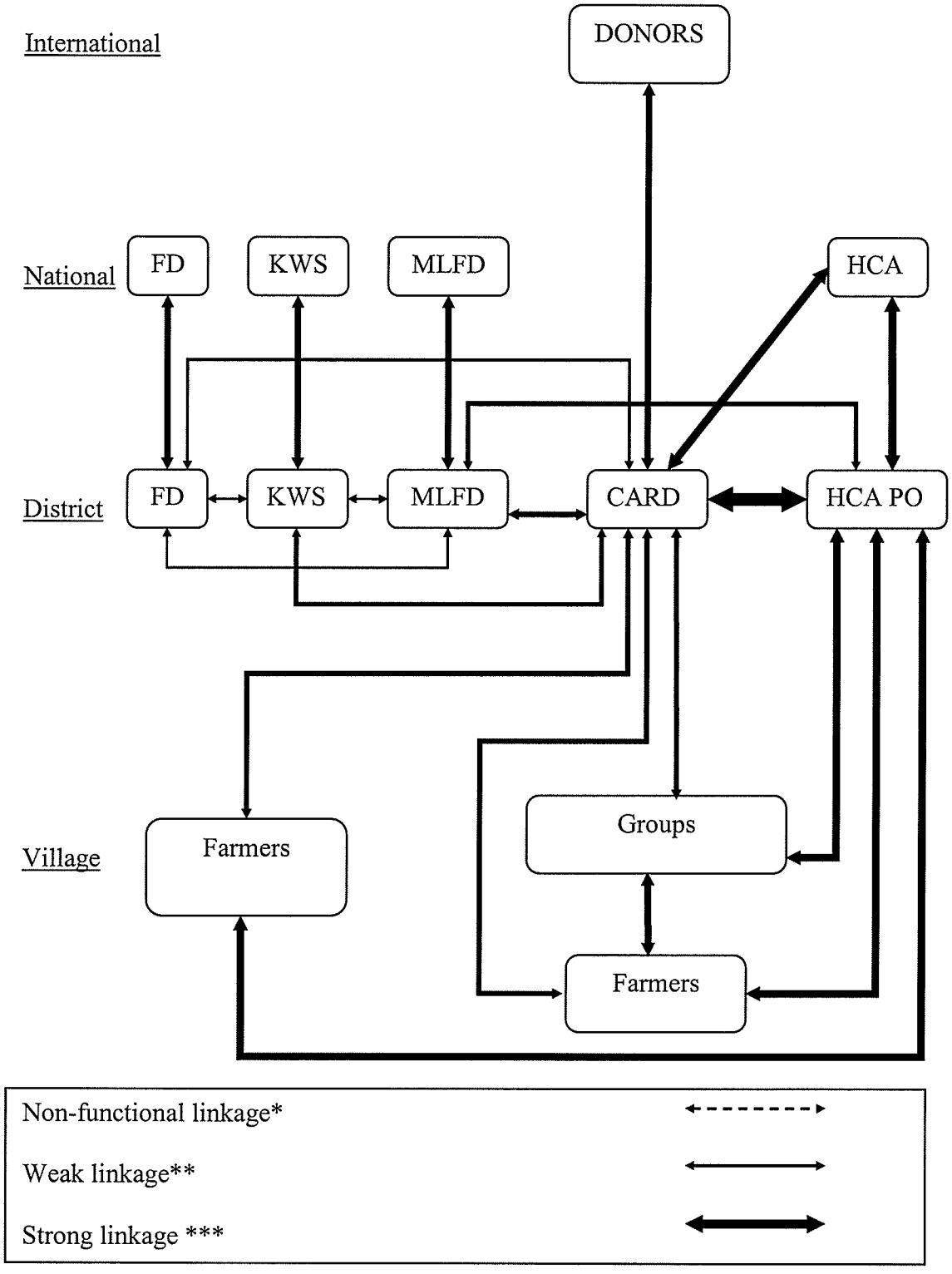


Figure data source: semi-structured interviews

6.3.4 HCA PO – Farmers

Probably the strongest vertical linkage connecting the farmers to the HCA project is via the HCA PO. This is because the HCA PO is inspecting hives full-time, and being nearly always out in the field he therefore has frequent interactions with the farmers participating in the HCA project particularly those who have HCA apiaries on their lands. As well, he is a small-scale farmer and beekeeper himself and some of the farmers involved in the project are his neighbours and people he has known for many years (Mmbakha 2004). His role as the chairman of IBG also brings him into close contact with many beekeepers in the area who are not necessarily involved with the HCA project.

6.3.5 HCA PO – HCA

The linkage between the HCA PO and the HCA head office in Nairobi is operating adequately. The PO makes regular reports to the HCA head office in Nairobi on the status of the project. This linkage is important as it provides the head office with up to date information on the status of the project. In the case of Kakamega there is regular communication between CARD and HCA, but if this were not the case then the HCA PO - HCA linkage would need to fulfil this role.

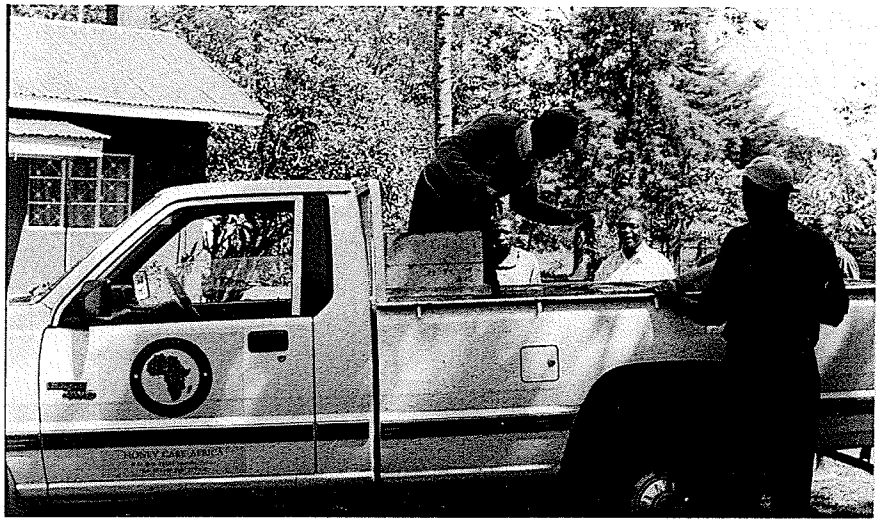


Plate 18: HCA driver and HCA PO pick up and return supers, Kakamega District.

Plate 19: CARD office, Kakamega

Plate 20: HCA office, Nairobi.

Kwale

CRSP's organizational structure has at the bottom of its hierarchy the Village Development Organizations (VDOs) made up of the farmers in a village who wish to join the VDO to access development projects. The Village Development Committees (VDCs) - the executive committee of the VDO, are made up of elected members of the VDO. The VDC sits above the VDO and is supposed to act as a conduit for communications to be passed from the farmers to CRSP and back (CRSP 2003). CRSP is the highest level of the hierarchy locally and it is linked vertically to the Aga Khan Foundation office in Nairobi at the top of the national hierarchy (see figure 6.6).

6.3.6 VDO (Beekeepers) – VDC - CRSP

In Kwale the beekeepers (VDO) are linked to CRSP through the elected members of their VDC, this linkage has not been functioning properly (see figure 6.6); resulting in a lack of timely communication between the beekeepers and CRSP (Waigi 2004). This linkage is the channel through which CRSP is informed of supers that are ready to be harvested, or that assistance and extension support are needed. The failure of this linkage has meant that CRSP has often been unaware of the difficulties that the

Supers not collected

The weak linkages between the beekeepers and CRSP have resulted in some instances of full supers not being collected from beekeepers. In one case 3 women beekeepers in the village of Bonje had supers ready for harvest, they informed the VDC to inform CRSP and HCA. The beekeepers waited, but no one came to collect the supers. Eventually they carried the supers full of honey on their heads to Mazeras and then by matatu to CRSP in Mariakani. At a later date a different beekeeper from Bonje had 2 supers to harvest, but CRSP did not come to collect these either, she instead cut the combs from the supers and sold the honey locally. In both cases the system failed the beekeepers. Due to the small number of supers ready for harvest HCA was not likely to send out a truck from Nairobi, so CRSP, which has adequate resources, should have picked up the supers and stored them in Mariakani until HCA sent out a truck.

beekeepers are facing, and has made it difficult for CRSP to monitor the status of the project.

This vertical linkage is crucial to the success of the project as it is supposed to be the primary way by which beekeepers communicate with CRSP. The beekeeping project requires effective communication for the harvesting of supers and the provision of extension support which is needed in Kwale as numerous hives have been damaged by honey badgers, ants, and wax moths, some of these hives need to be repaired and many need new wax foundations sheets.

The comments of one beekeeper in Mulola are representative of what many beekeepers said concerning their linkage to CRSP, "After the training in 2000, CRSP has only come out to inspect the apiary 3 times in 4 years, all 3 times were in the early stages of the project, first to make sure that the apiary was properly set up, then again to show how to make the change from putting the hives on stands to hanging them from posts, and then once more to make sure that the changes to the apiary had been made, but since then no one has come out to inspect the apiary" (RT, beekeeper, Mulola). Another beekeeper, in Bonje said that " It has been many months since I reported to the VDC that some of my hive frames were damaged by the *ngari* (honey badger) and still no one has come out to my shamba to see the damaged hives or to replace the damaged frames" (AP, beekeeper, Bonje). This linkage has been a major contributor to the difficulties of the project. The paraprofessionals that CRSP has begun to train may offer a method of circumventing or strengthening this malfunctioning linkage.

Figure 6.6 Cross-Scale interactions of stakeholders in Kwale HCA project 2004

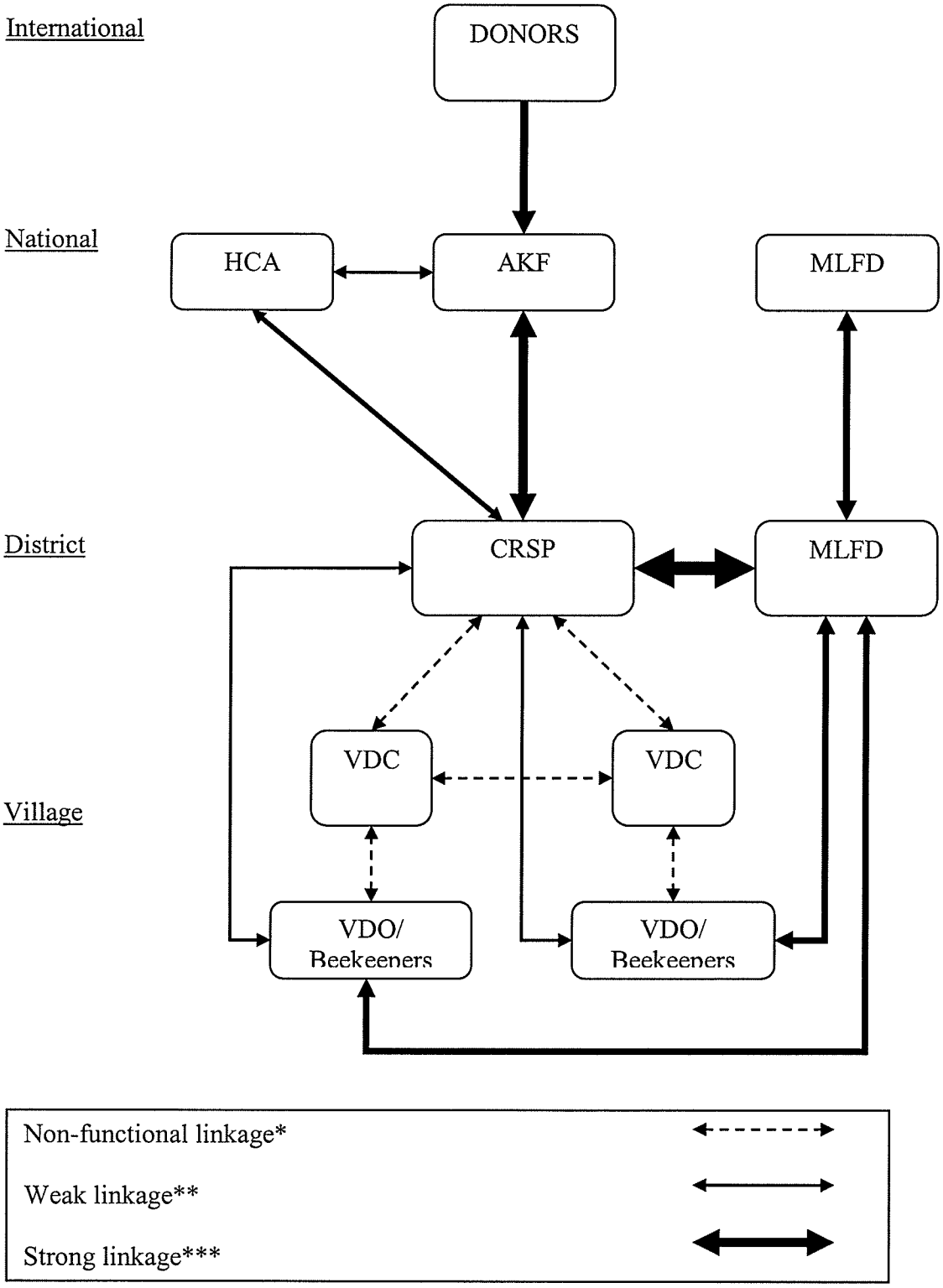


Figure data source: semi-structured interviews, CRSP 2003

6.3.7 MLFD - Beekeepers

The vertical linkage that exists between the beekeepers and the MLFD is functioning more effectively than the linkage between CRSP and the beekeepers via the VDO-VDC chain (see figure 6.6), as the Ministry field officers have more frequent contact with farmers some of whom are involved in the beekeeping project. "We see the government officers much more than we see CRSP" (MN, beekeeper, Mgandini). This frequent contact has been important for the project, as without this linkage there would be very little information being passed between CRSP and the HCA beekeepers in the district. This linkage has helped to overcome some of the difficulties caused by the failure of the VDO-VDC system of communication.

6.3.8 CRSP - AKF

There is a strong vertical linkage between CRSP and the AKF office in Nairobi (see figure 6.6), this linkage seems to have both helped and hindered the project to some degree. The head AKF office has not currently devolved much authority down to CRSP resulting in a situation where many decisions affecting CRSP's projects are made in Nairobi rather than in Mariakani (Waigi 2004). While the AKF head office must retain a certain amount of control over the CRSP field office, projects in Kwale cannot be effectively managed from Nairobi (especially due to the poor condition of the communication networks in Kenya), therefore it would likely benefit the project if CRSP enjoyed more freedom from the head AKF office than is currently the case, allowing CRSP to act more quickly to new information and changing circumstances.

6.4 Horizontal Institutional Linkages

Kakamega

6.4.1 CARD – HCA PO

The most important horizontal linkage affecting project performance in the Kakamega case is the close and strong link between CARD and the HCA Project Officer (see figure 6.5). The HCA PO (a resident of the district) is based out of the CARD office, and while he currently works for HCA he was previously a CARD employee (Beekeeping Officer) and received his current job on the recommendation of CARD (Jiwa 2004, Mung'oni 2004). This close relationship linking the HCA PO and CARD has contributed to the success of the project in several ways: much of the information from 'the field' about the state of the project is collected by the HCA PO; he is also responsible for passing information from farmers to CARD since CARD is unable to employ anyone full-time to inspect the apiaries (this work is primarily done by the HCA PO with help from CARD volunteers).

At the beginning of 2004 CARD was responsible for roughly 600 HCA hives, this number is steadily rising as the project's success is making it attractive to more people and some hive owners are investing a portion of their honey income in buying more hives. The HCA PO must work full-time to manage the 600+ hives - he will not be able to manage a significantly larger number of hives under the current management scheme (Mmbakha 2004, Mung'oni 2004). As the number of hives that CARD manages increases the system of management that currently exits will be subjected to greater pressure. One of the principal problems that CARD faces is the lack of vehicles to transport full supers from the apiaries to the office, and empty ones back to the apiaries.

CARD has 2 motor-bikes (only 1 of which is used full-time for inspections and transporting supers) only 3-4 full supers can be loaded onto the back of a motor-bike. This situation is made more difficult by the poor condition of the roads in the district and the distances involved as many of the apiaries are located far from each other and from the office in town. A pick-up truck will become necessary as the project expands, as is plainly seen by the manner in which CARD though they have developed an efficient schedule for inspections and super collection is barely able to keep up with the honey production. This situation receives regular but temporary relief with the arrival of a HCA truck to collect the honey, as this truck is used to help CARD transport supers, though this only happens about 1-3 days per month. In the future with a larger number of hives to manage CARD will need more regular access to a pick-up truck, though they will not likely have the resources to purchase one of their own. If this is the case CARD will have to establish some type of arrangement with one of the other stakeholders in the project to overcome this transportation difficulty.

6.4.2 CARD – MLFD

CARD's links to the MLFD offer a potential benefit to the project as the MLFD is interested in beekeeping and may in the future be able to provide CARD with some assistance in managing the project (see figure 6.5). To date no such assistance has been provided (Anjina 2004). Outside assistance may become more important in the future as the project expands. Therefore it would be greatly helpful if CARD could use their linkage with the MLFD to access a Ministry truck to help in the transporting of supers.

6.4.3 CARD - KWS

CARD has a fairly good relationship with the KWS (see figure 6.5). While the livelihood activities that CARD pursues and promotes for the people living near the forest are of interest to the KWS as managers of the forest, the linkage between CARD and KWS has been strengthened by the two organizations working in partnership on a project of road rehabilitation in the forest funded by the European Union through the BCP. This is not directly related to the beekeeping but the trust built through working together should be beneficial to CARD in the future dealing with the KWS. Additionally the beekeeping project may benefit from the improved transportation infrastructure, as the poor condition of the roads – especially those adjacent and within the forest is an impediment to the project. Though on the whole KWS has little to offer the beekeeping project directly as KWS's policy does not allow any economic activities to take place in the part of the forest that they administer.

Kwale

6.4.4 CRSP - MLFD

The key horizontal linkage in the Kwale case is the one between CRSP and the district level staff of the MLFD (see figure 6.6). The close and strong relationship that has been fostered between CRSP and the government officers (who are based out of the CRSP office) has allowed CRSP to utilize the connections that the government staff have with the farmers in the district to support several development projects. The Ministry benefits from the arrangement in the form of transportation for its staff, as due to funding shortages the MLFD is not able to provide its staff with vehicles so that they can perform

their duties. CRSP provides the ministry staff with motor-bikes so that they can get out to the field and do their job, as well as promote and provide assistance and instruction to farmers participating in the CRSP projects including beekeeping. As the government officers spend a great deal more time in the field talking to farmers (some of whom are HCA beekeepers) than CRSP staff do their contribution is important for CRSP to monitor the project. This linkage is one of the key ways that CRSP is able to collect information from the field. As well this arrangement makes closer coordination between the two institutions easier at least at lower levels in the command structure. Due to this close interaction there is an opportunity for learning between the staff of the two institutions, but it is unclear if any learning takes place at higher levels in the commands structure.

6.4.5 VDC - VDC

The system developed by CRSP of VDC's communicating with each other so that information can be transferred from one village to the next to the benefit of the development projects is not functioning properly (see figure 6.6). There is no evidence that VDC's from different villages are communicating with one another in reference to the beekeeping project or any other projects. This mechanism if it were functional could disseminate useful information to project participants, improve management of hives, and benefit other projects as well.

6.5 Impact of Policy on the Project

Kakamega

The policy of the Kenyan national government concerning the Kakamega Forest impacts the project in several ways. By making certain income sources (NTFP's) more difficult and dangerous to harvest, government policy may potentially drive some people toward the beekeeping project as a way to compensate for those losses. The ban on activity in the forest also deters traditional beekeepers from keeping their hives in the forest and makes it more difficult to obtain the wood to make the hives, making traditional beekeeping in Kakamega more difficult to continue. Finally the forest provides forage for the bees and as such the project is to a certain extent tied to the fate of the forest and government policy concerning the Kakamega National Forest Reserve.

Government reaction to HCA
In Kakamega and Kwale the introduction and promotion of Movable Frame Hives on a relatively large scale by HCA (over 600 hives in both districts) has prompted a reaction from the government. Due to HCA's impact on the beekeeping sector in Kenya the Ministry of Livestock and Fisheries Development has begun training some of its field officers with the MFH so that they can assist farmers who are now using this technology. This is mostly done by sending MLFD officers to attend courses offered by agricultural colleges such as the Baraka Agricultural College in Molo, Rift Valley province.

It is not clear if the CARD would be allowed to keep hives within the boundaries of the forest itself. The KWS does not allow any human activity in areas of the forest that are under its jurisdiction and would not allow CARD to locate hives within their area of the forest – though the warden has expressed interest in the project and hopes that it can help to alleviate pressure on the forest and teach some of the locals as to the forest's importance. The FD has in the past, allowed human activities in the forest and may allow beehives to be located in the area of the forest it controls.

Kwale

Several unsuccessful beekeeping projects using different designs of top-bar hives were observed in the district. The technological difference between a top-bar hive and Movable-frame hive is not as large as the difference between a log hive and a MFH. This previous government investment in training and awareness of beekeeping has likely made the adoption of HCA technology easier and more attractive for some rural people, especially women who were involved in the previous government and NGO beekeeping projects in Kwale. Additionally the close cooperation between the MLFD and CRSP has certainly had a positive affect on the project.

6.6 Summary

The HCA projects are reliant upon efficient cross-scale linkages that connect the village level beekeepers/farmers with the NGO/CBO and HCA. The effectiveness of these linkages is directly related to the performance of the beekeeping projects and the benefit that the farmers/beekeepers receive. Because HCA is based out of Nairobi it is important that there are strong linkages between the head office and their partners and staff in the field so that honey can be picked up and paid for in a timely manner and new hives can be delivered a soon as possible to the projects.

Young (1999) asserts that in projects reliant upon cross-scale linkages the key to success is allocating specific tasks to the social organizations situated at the appropriate scale and then taking steps to ensure that cross-scale interactions produce complimentary rather than conflicting actions. The *subsidiary principle*, which calls for management authority to be vested at the lowest level of social organization capable of dealing with

the pertinent issues may be used to determine the which tasks are allotted to which organizations. Considering the complexity associated with trying to mange a project with different stakeholders located at different scales, effective linkages between these stakeholders are therefore particularly important to the functioning of development projects and businesses; the Honey Care Africa projects are no exception.

The project structures of the two case studies while different are centred on the development organization being the link between HCA and the farmers. In the Kakamega case there is a HCA project officer who provides a more direct link between Honey Care and the farmers, but the primary linkage between the farmers and HCA is via CARD. In the Kwale case there is no HCA project officer, so CRSP is the only linkage between the farmers and Honey Care. If this linkage connecting the beekeepers to HCA does not function properly then the supers will not be harvested when they should be to maximize the honey yields and the benefits to the beekeepers. The vertical linkage between the farmers/beekeepers and HCA via the development organization is the most important cross-scale linkage in the projects. This linkage is crucial to the success of the projects, as no matter how good the management of the hives if the honey is not harvested in a timely fashion the beekeepers will not benefit from their arrangement.

Horizontal linkages are also important to the projects, though the most critical way that they are helping either of the projects at the time of the research was as a means of bypassing non-functional vertical linkages. In the Kwale case the horizontal linkage between CRSP and MLFD helps to overcome the failure of the vertical linkages between CRSP and the beekeepers. In the Kakamega case the strong horizontal linkage between CARD and the HCA PO allows for a small number of people to manage a large number

of hives. This horizontal linkage between the HCA PO and CARD also allows for better communication to exist between the development organization and HCA, which is crucial to the success of the projects.

A movable-frame hive requires relatively intensive management (compared to other hive technologies in Africa) in order for it to provide returns sufficient to justify its expense. MFHs are only superior to other 'lower-technology' hives if they are proficiently managed and supers can be removed for harvest and returned quickly. The technology being used in the project requires effective cross-scale linkages if it is to be used to its full potential. From the perspective of the beekeepers if effective linkages to HCA are lacking then they would be better off keeping bees in a cheaper technology such as a log or top-bar hive and selling their honey locally.

Chapter 7 Biodiversity Conservation and Rural Livelihoods

7.1 Introduction

This chapter reviews the impacts associated with the Honey Care Africa beekeeping projects on the local environments of the two case study locations. The HCA beekeeping projects are ICDPs that promote beekeeping, a livelihood activity that provides an environmental benefit. Beekeeping can help to conserve biodiversity mainly in three interconnected ways: increasing the number of honeybees in an area should improve the pollination success of numerous flowering plant species; the income generated from beekeeping can help to alleviate pressure on the local resource base; and there is a potential to alter the way the people view their local environment. The HCA projects have introduced a new hive technology that may displace traditional hives having an environmental impact. The research conducted being of a qualitative nature was unable to collect any hard data on environmental affects associated with the HCA projects.

Honeybees (*Apis mellifera*) are indigenous to East Africa and due to their generalist nature they are well suited to pollinate a wide variety of native flora in addition to many of the crops species that Kenyan farmers plant (Crane 1990). The pollination service of honeybees is the most direct way in which beekeeping benefits a conservation agenda (Scmidt and Edwards 1998, Nel and Illenger 2004).

The economic aspect of the beekeeping project has the potential to benefit and/or frustrate conservation. The income earned through the production of honey could promote the adoption of a conservation agenda as programs such as HCA that rely on natural resources provide a motivating factor to further conservation (Little 1994).

However, the money that beekeepers earn from their apiculture can be used at their own discretion; farmers can make investments that benefit their local environment (i.e. planting trees, allowing lands to be fallow, etc.) or conversely they may make investments in environmentally damaging technologies or activities (i.e. chemical pesticides, better saws for felling trees, etc).

Beekeeping also has the potential to teach people something new about their environment by providing a slightly different economic link between the individual and the local environment than farming does. In this sense beekeeping may encourage farmers to learn more about their environment and to manage it for more than just crops. There is evidence from several ICDPs in Africa that even modest amounts of income can have a large impact on local attitudes towards conservation (Alpert 1996). Because the income from the beekeeping is related to the local environmental this can provide an incentive to conserve biodiversity. However, in the end, short-term economic needs may override attitudes towards biodiversity conservation.

Some authors have suggested that the transition from log hives to top-bars or MFHs in Africa is desirable in an effort to reduce tree felling for log hive construction. This position is usually based on the assumption that log hive construction is an inefficient use of wood, that if made into lumber could produce more hives from the same number of trees (Adjare 1990). This assumes that these tree could easily be made into lumber of sufficient quality, which may not be a reasonable assumption in many rural areas of Kenya. As well, considering the long useable lifetime of a log hive (30-40 years) due in part to the thickness of the hive walls they do not need to be replaced nearly as often as MFH or top-bar hives do. Therefore over the long-term the environmental

benefits of abandoning log hives may not be so great as is sometimes suggested. However, some of the species harvested by traditional beekeepers in Kenya are threatened, and in this case it is desirable to promote a shift to hives made from fast-growing exotics from plantations.

7.2 Resource State

Kakamega

The Kakamega Forest has been subjected to both licensed commercial logging and uncontrolled/illegal logging for many years resulting in substantial deforestation, and degradation of the remaining forest. The borders of the forest have remained largely intact but between 1965 and 1991 the forest lost roughly 50% of its timber volume (KIFCON 1994).

Some areas where logging has occurred in the Kakamega Forest have been replanted under the management of the Forest Department, mostly with exotic tree species selected for their fast growth and quality of timber, though the Forest Department has not engaged in any planting activities in the past 10 years (Walubengo 2004). More recently the Forest Department encouraged local groups to establish nurseries of indigenous trees, the seedlings were to be purchased from the local groups for reforestation activities in the forest. The Forest Department due to budgetary difficulties failed to pay the communities for the trees in the nurseries and did not help to maintain the site as had been agreed; the result was that people lost interest in raising the seedlings and the trees were never planted inside the forest.

Residents of the Kakamega District are well aware of the extensive deforestation that has occurred. Many older residents noted that there had been a decrease in rainfall in some areas, as the forest had been cleared for shambas and now some areas that had been close to the forest are now much farther away from it. Nearly all people interviewed felt that the Kakamega Forest was being degraded by a combination of activities: charcoal production, illegal logging, and subsistence harvesting of firewood (the main cooking fuel in rural areas of the district), building materials and other NTFPs. Agricultural expansion into the forest was not considered to be a serious problem as it has been in the past. In general most people interviewed felt that protecting the forest is important for the future of agriculture in the area, though local people should be allowed to collect certain NTFPs in a controlled manner. Most respondents felt that the government was not particularly effective in protecting the forest, with those living in the KWS adjacent areas of the forest being more likely to see the forest protection as effective, than those living adjacent to areas administered by the Forest Department (see table 7.1).

Table 7.1 Local opinions on the state of the Kakamega Forest

The Forest is recovering under government protection	3
The Forest is stable under government protection	4
The Forest is being continually degraded, government protection is not effective	17

Table data source: semi-structured interviews

Despite the fact that they live adjacent to a large forest from which they continue to collect firewood many farmers fear that in the future the government will more effectively enforce the ban on collecting firewood and other resources in the forest. Farmers in Kakamega have begun to cultivate indigenous and exotic species of trees on

their lands for future household firewood and construction material needs. Some traditional beekeepers have even planted tree species used for the construction of log hives on their own lands as it is illegal to fell such trees in the forest to make log hives (though such activity undoubtedly continues, it is becoming increasingly risky to undertake).

Traditional Beekeepers and the Forest
One traditional beekeeper who has lived near the Kakamega Forest his whole life and has kept bees in log hives for more than 40 years has like many other traditional beekeepers been forced to reduce the number of hives he keeps. This is because he can no longer place his hives in the forest as he used to, and obtaining wood for new hives is becoming increasingly difficult. Previously he kept more than 60 log hives, now he keeps 28, because he has fewer places to locate his hives. The species of trees that he uses to make log hives are indigenous to the Kakamega Forest and are therefore protected. The ban on cutting trees in the forest makes the wood for log hives difficult and potentially risky to obtain. He has not been able to build any new hives since the ban on extracting resources from the forest has been in place, though he is determined to go into the forest anyway when his need becomes greater.

Kwale

The two climatic zones in Kwale District: the humid coastal belt and the semi-arid interior, have both experienced extensive deforestation though owing to the greater precipitation and larger extent of forest cover the humid coastal belt still contains some larger areas if continues tree cover. The interior areas of Kwale are mostly semi-arid and have been severely deforested. The deforestation is driven by a need for construction materials, income from charcoal sale and probably most significantly by use of firewood for cooking fuel (MPND 2000). Firewood is the primary cooking fuel for 97.8% of the Kwale District's population (KRSP 1997). There have been some efforts at organized and individual, tree planting but the rate at which trees are felled in the district is greater than the rate at which they are planted (KRSP 1997).

Furthermore, it can be expected that due to the low levels of precipitation those trees that are planted will grow slowly, and they may die if they are not drought resistant.

The dry conditions that have prevailed in Kwale District were highlighted in 2003 with the relative failure of both the short and long rains, and the late arrival of the long rains in 2004. The lack of precipitation has presented difficulties to the people living there both for their crops and for the harvesting of fuel wood much of which due to the deforestation now comes from small shrubs rather than trees.

The use of fire to prepare lands for farming is common in the Kwale District, despite efforts from the Ministry of Agriculture to persuade farmers to stop the practice, with the highest prevalence of this activity just before the long rains (MPND 2000). While burning stubble to prepare for planting does not normally result in the destruction of large trees many smaller trees and shrubs are burned in this manner and the activity is contributing to the problems of water retention and soil moisture that deforestation is associated with, additionally depending on wind conditions the smoke can cause colonies of bees to abscond.

7.3 Conservation/Improvement of Natural Resources

7.3.1 Pollination

Kakamega

The HCA beekeeping project has the potential to increase the local pollinator population through increased beekeeping and decreased bee mortality during harvesting with MFHs compared to log hives. The increased pollination service available should benefit the Kakamega Forest and surrounding agricultural lands. Forest-adjacent

beekeeping has the potential to help in the re-colonization of degraded areas of the forest by native vegetation as the bees visit the forest to forage for nectar. Though through pollination the bees may just as easily help exotic and invasive species (such as guava which has established itself in parts of the forest that have been degraded and deforested) to spread throughout the forest and the region.

Several farmers who live near HCA apiaries have reported increases in yields of fruit crops in particular. Similarly it is likely that the beekeeping project has helped to increase yields of numerous subsistence vegetable crops planted in the area that require biotic pollination. However, the two main cash crops in Kakamega - tea and sugar cane do not benefit from honeybee pollination.

Kwale

In Kwale the honeybees provide a pollination service to both the natural and the cultivated vegetation in the area, and thus benefit conservation objectives. The use of MFHs helps to reduce bee mortality during harvesting thus removing one check on bee population growth, and the use of management techniques that reduce absconding (i.e. providing water and food for bees), can potentially increase the pollinator population of the area which should help some species of vegetation to set seed and spread.

Beekeeping should benefit some of the crops planted by households in the area, particularly fruit trees such as, mango, citrus trees, cashew, and coconut palms. The two most abundant cash crops observed in Kwale (coconut and cashew) both benefit from insect pollination.

Plate 21: Charcoal production, Kakamega District

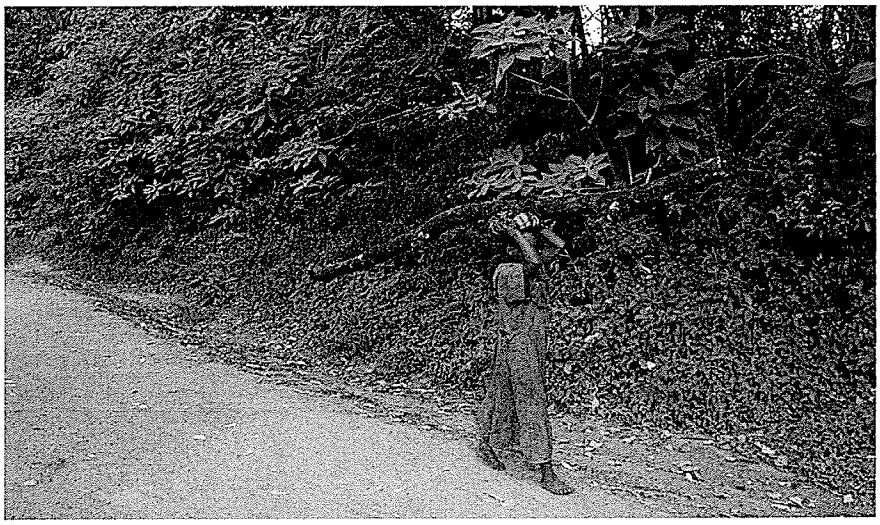


Plate 22: Firewood collection, Kakamega Forest

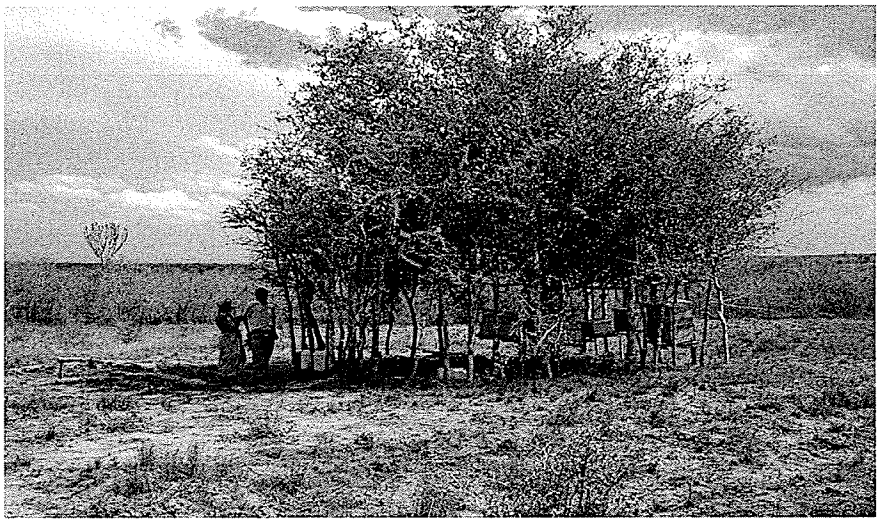


Plate 23: HCA apiary, Mulola..

The Kwale project is suffering from high rates of absconding due to drought conditions and inadequate management of the hives; with only about half of the hives colonized the project is not having as great an environmental impact as it could have (see figure 7.1).

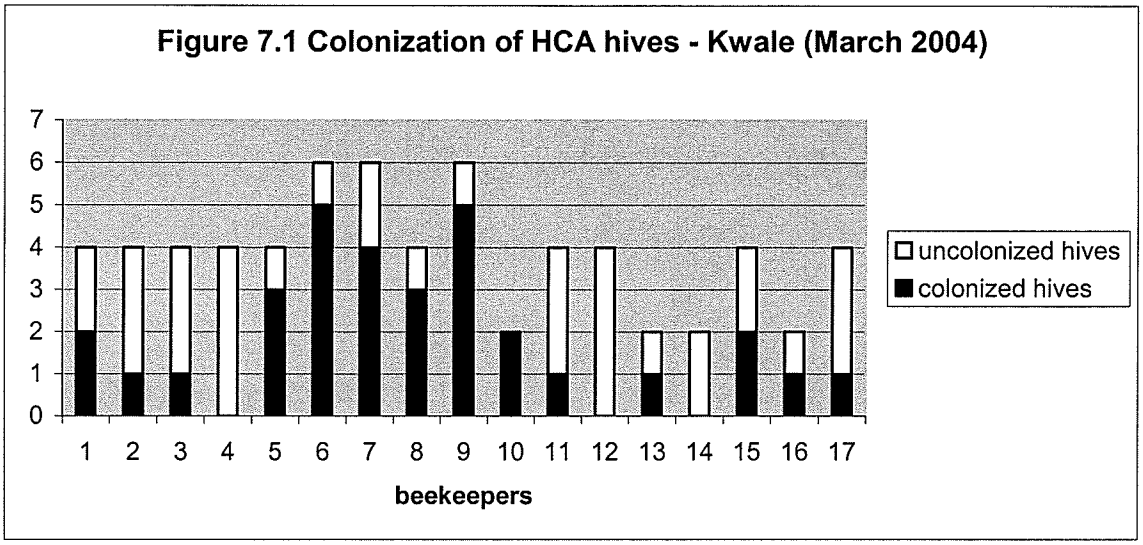


Figure data source: hive inspections by researcher& semi-structured interviews

7.3.2 Economics

Kakamega

Considering that farmers in the Kakamega project do not have to spend any time managing the hives the economic return was deemed to be satisfactory by most people interviewed. The returns that farmers have received in the Kakamega beekeeping project have been fairly good for most people during those periods where the project was being effectively managed though on the whole the return has not been what was expected (see figure 7.2). Under the loan arrangement the initial investment a farmer must make for 1 hive is 700KES. The farmer will not receive back 700KES into his pocket until 16kg of honey from the hive (worth 1760KES at 110KES/kg) has been harvested from the hive,

this is due to the 20KES/kg commission to CARD and the 50/50 split of the remaining 9OKES/kg going to loan repayment, and the farmer.

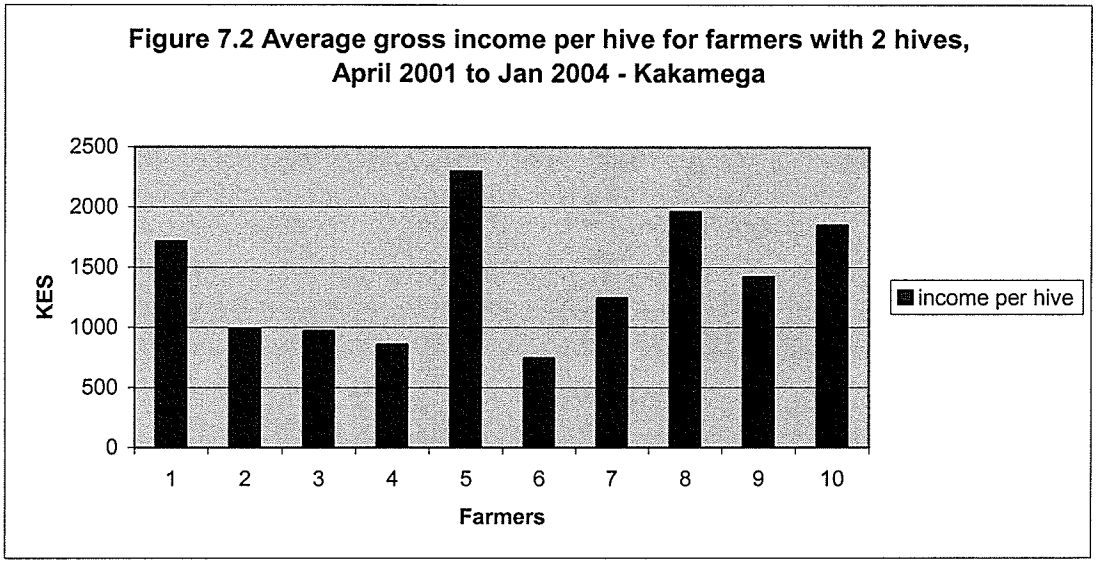


Figure data source: CARD 2004
1 USD = 76.55 KES (Jan 1/04)

Farmers interviewed felt that the prompt cash payments for their honey were one of the best features of the project, as this allowed the farmers to receive their money without having to deal with a bank as they would if they received the money in cheque form. The income from the beekeeping project is modest for those individuals with a few hives and seems to be inadequate in itself to discourage people from going to the forest to obtain resources they are accustomed to gathering, no interview respondents stated that they had stopped or limited their gathering of NTFPs from the forest as a result of their beekeeping income, instead saying that beekeeping had little impact on this part of their daily routines. The exception to this was some traditional beekeepers that make a substantial portion of their income from beekeeping; these individuals are very cognisant of how their activities affect their beekeeping.

Construction materials, fuel woods, wild foods and medicines, fodder and fibres are all direct use NTFPs that were observed being used on a regular basis by a many rural households in villages neighbouring the Kakamega Forest. Many households may not be able to afford substitutes for locally obtained products from the forest if they are even available. Thus income from other sources such as beekeeping may have little impact on the harvesting of NTFPs.

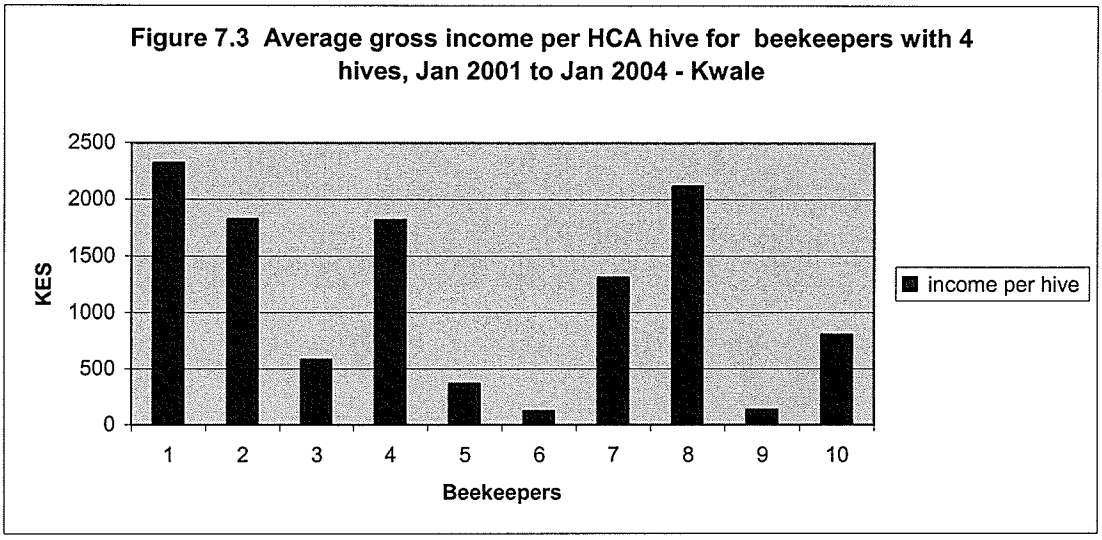
The government policy of barring resource extraction from the forest, despite the corruption, has more impact on effecting conservation, though the majority of interview respondents stated that they still go to the forest to collect various NTFPs, though they are more careful of their activities now. An example of this was that at a group interview session one of the participants was unable to attend the meeting as he had been arrested the previous day for illegally gathering firewood in the forest.

Kwale

The beekeepers participating in the Kwale project have experienced differing levels of success during the first 4 years. Some beekeepers have been able to manage their colonies successfully and others have not (see figure 7.3). While the income earned by the beekeepers has not been great, the return for investment of time was considered good by most beekeepers. HCA beekeepers in Kwale, in interviews conducted provided a range of 0.5 – 1.5 hours per week spent tending their hives.

For those beekeepers who bought their hives during the initial phase of the project their investment was 962.5 KES per hive. At 100KES/kg the farmer would have to harvest 19.5 kg per hive (worth 1950KES) in order to recoup the initial 25% investment

due to the 50/50 loan repayment scheme. Those who bought their hives more recently under the 15/85 subsidy system only need to harvest 7kg per hive (worth 700KES) to recoup their investment as there are no loan payments deducted from the profits.



1USD = 76.55 KES (Jan 1/04)
Figure data source: CRSP 2004a

While there are a small number of beekeepers that have earned significant income from the project in Kwale, due to the generally poor economic return that most beekeepers have received from the project the link between conservation and income has not been as firmly established as it could be. For the most part income earned from the beekeeping project in Kwale was used for subsistence needs or invested in livestock (see table 7.2).

Table 7.2 Uses of Honey Money - Kwale

Food	School Fees	Crop Seeds	Livestock (chickens, goats)	No response
7	2	1	5	6

Table data source: semi-structured interviews

The lump sum payments from the honey are appreciated by the beekeepers as this is one of the few activities that generates lump sums of cash that can be used to purchase

things that are otherwise too expensive to "save up for" such as livestock, or tin sheets to replace thatch roofs as money saved is typically used for subsistence needs, particularly for food when that grown by the farmers has been exhausted.

7.3.3 Environmental Attitudes – Actions

Kakamega

The HCA project has not had much impact on people's environmental perceptions in Kakamega. This can most likely be attributed to two main reasons: the project structure does not involve many of the project participants in the actual beekeeping; and there is a long history of beekeeping in the area, therefore many people were already aware of the relationship that exists between bees and the environment, so the HCA project has had little impact on increasing environmental awareness in Kakamega. The exception to this is found in some of the people who were trained as Beekeepers and Assistant Beekeepers – these were the only individuals interviewed who claimed to have developed a greater appreciation of the local environment as a result of the project. Beekeeping has encouraged some people to not burn the stubble from maize or sugar cane as this can induce bees to abscond from their hives, though those who are not involved in the beekeeping project or keep bees themselves on their lands are not so concerned about the effects of burning stubble and the practice is still relatively common. The main local threats identified by beekeepers to their beekeeping activities are shown in (figure 7.4).

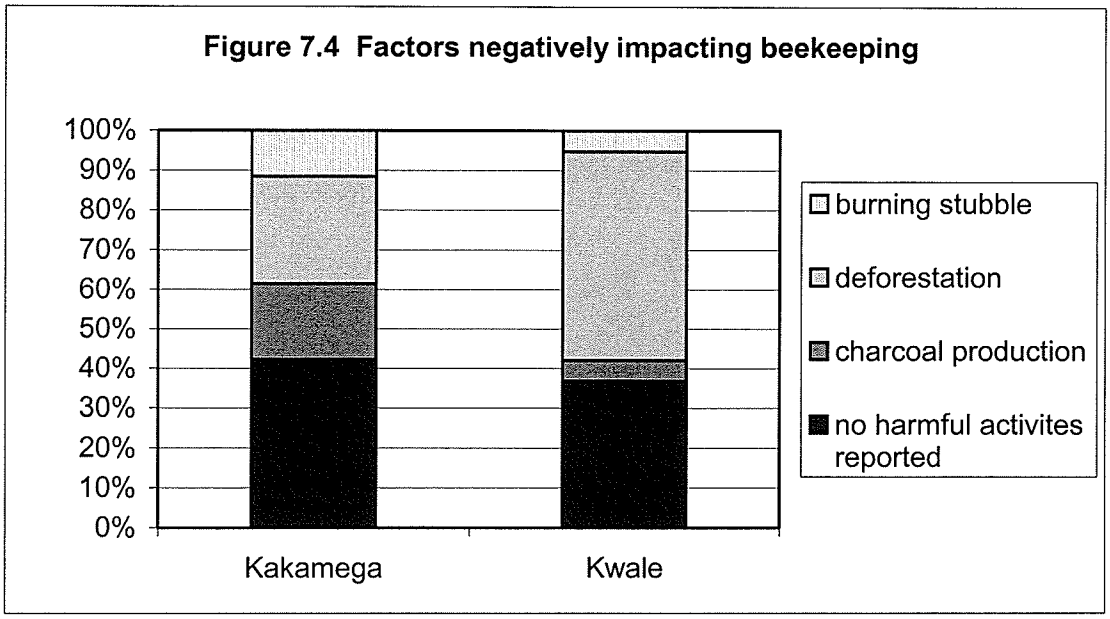


Figure data source: semi-structured interviews

Kwale

The beekeeping project in Kwale has a greater potential to change how people view their environment because the project participants are responsible for managing their own hives. This makes the connection between the environment and beekeeping more concrete for them. The state of extensive deforestation that exists in Kwale has made the connection between the bees and the trees much easier to see, especially when the bees abscond due to a lack of forage and this is reflected the greater importance given to charcoal and deforestation as activities that negatively impact beekeeping compared to Kakamega (see figure 7.4). The following quote was typical of what HCA beekeepers said about the relationship between the bees and the trees: "When the project first began the rains were good and the trees had many leaves for shade and flowers for the bees to feed, later when the rains did not come the bees left because there was no food and no shade for them" (CM, beekeeper Nihutu).

It seems that the HCA beekeeping project has increased environmental awareness somewhat (see table 7.3), but it is unlikely that there will be much direct impact on the local environment, as HCA beekeepers represent a small portion of the overall population in the district. The small number of project participants who had previous beekeeping experience may have affected the numbers as the HCA project was the first introduction to beekeeping that many farmers in Kwale had.

Table Impact of Beekeeping on Local Environmental Perceptions - Kwale

No Impact on view of environment	Altered view of environment	Altered view and behaviour
5	13*	3

Table data source: semi-structured interviews

*The 13 individuals included 3 traditional beekeepers not affiliated with the HCA project, and 3 of the 10 HCA beekeepers included had previously been involved with MLFD beekeeping projects.

For the 13 people (table 7.3) who claimed to have had their views of the local environment altered by their beekeeping experiences, the new knowledge of the environment is primarily confined to plants and animals that have direct affect on bees. The following is a typical example of what new knowledge has been gained by the HCA beekeepers: "Because of the beekeeping I have come to know about some plants that grow around this area that I did not know before, and now I see these plants have a use I did not know about" (YS, beekeeper Mulola).

The HCA project has prompted at least a few beekeepers to make changes in the way they interact with their environment in the course of their farming activities. The 3 beekeepers (table 7.3) that claim to have changed their behaviour have all on their own

initiative engaged in some tree planting and protection on their own lands to improve the habitat for their bee colonies. Two of the three beekeepers have also planted sunflowers and fruit trees specifically for bee forage, both these beekeepers are in the same village, though both said that the idea for planting bee forage came from their beekeeping training, not from one observing the other (WN, beekeeper Mgandini, and MN, beekeeper Mgandini).

Environmental Knowledge in Use
One of the beekeepers in Mgandini has used her knowledge of the local environment to relocate her apiary. The original site where she had placed the 4 hives she bought from HCA in 2000 was not sufficiently protected from livestock and the hives were disturbed by cattle and goats. In response to this she planted some trees around the apiary to form a live fence, but trees were slow in growing and were still too small to protect her hives. So in 2003 she moved her hives to a new site where the cattle are less likely to disturb the hives. Around her new apiary she has begun to plant some trees to form a live fence. Her selection of tree species to form the fence was based on her observations of the bees, the tree is a quick growing species that the bees forage from, and she has noted that the goats do not like this tree, which should help to keep them away from the hives.

Despite the fact that many farmers and beekeepers know the importance of trees as rainfall catchments and for bee forage there is little evidence seen of trees being planted in the district. If the deforestation persists soil erosion, soil fertility, drought, and desertification will likely make the land in most of the district incapable of supporting the people living there now and beekeeping will certainly suffer. The challenge is to link beekeeping with tree planting, and to encourage tree planting, afforestation, and agro-forestry district wide which is desperately needed (Mwanzighe 2004). Beekeepers in general should be considered as excellent candidates to get involved with afforestation/reforestation programs.

7.3.4 Technology

Kakamega

The use of MF hives in Kakamega has not had a noticeable impact on the state of the local environment. As of yet HCA hives have not replaced many log hives in Kakamega as most traditional beekeepers that have bought HCA hives have maintained at least some of their log hives. Deforestation is a serious issue throughout Kenya including Kakamega, though felling trees for log hives is not likely a serious cause of deforestation in the Kakamega Forest as multiple hives can be made from a single tree and the hives can last for 40 years or more, though this pressure is concentrated on a few species that are protected.

Kwale

The use of MF hives can potentially affect deforestation in Kwale District, as the HCA hives are not made from wood that is harvested locally. The log hives that are used by traditional beekeepers in the area are made from wood that is harvested locally. While the number of trees felled by traditional beekeepers for construction of log hives is low, the state of deforestation has become so sever in much of Kwale District that all efforts must be made to curb the rate of deforestation. "30 years ago there were many trees in Mgandini, but now they have mostly been cut down for firewood, charcoal, and construction materials to build houses" (SM, traditional beekeeper Mgandini). Deforestation in Kwale has reached the point where it is becoming very difficult for the traditional beekeepers to obtain the desirable species of tree of sufficient size to make log hives, forcing them to use less suitable species that make less durable hives that do not

last nearly as long as hives made from the preferred species, meaning that these hives will have to be replaced much sooner (see table 7.4).

Table 7.4 Type of Trees used to fashion log hives - Kwale

Species of Tree (*local dialect*)	*Mnazi*	*Mbambara*	*Mkupha*
Years Log Hive can be used for with only minor repairs	3-4	8-10	30+

Table data source: semi-structured interviews

Deforestation has also limited traditional beekeeping by reducing the number of suitable trees to place log hive in. The result has been that traditional beekeepers are keeping fewer hives than in the past, one traditional beekeeper stated: "Now I only keep 2 hives, but 8 years ago I had more than 20 log hives, some of these were lost or ruined in the flash floods from the El Nino rains in 1997 and I could not replace them. Now I only keep 2 hives because there are few trees to put hives in where they will be safe and not too far from good forage and water." (SM, traditional beekeeper Mgandini).

7.4 Summary

The HCA beekeeping projects in Kakamega and Kwale through the pollination service provided by the increased honeybee populations is likely benefiting a conservation agenda in both districts by pollinating indigenous flora. This is of course, the principal and most reliable way in which beekeeping projects provide a conservation benefit.

Beekeeping has been a source of supplementary income for the HCA beekeepers in both projects; with the majority of project participants in the two case studies not earning large amounts of income from the HCA beekeeping. The weight that farmers

give to beekeeping concerns when considering their other livelihood activities seems to be related to the importance of beekeeping in their overall income generation strategy, with those farmers/beekeepers who have earned more from the beekeeping being more concerned about the state of bee forage than those who have not benefited much from the project.

It remains to be seen if the income earned through these projects results in any environmental impacts. The income earned during the first few years of the projects has been better in Kakamega than in Kwale, though in both cases actions are being taken to improve the state of the project so that in the future farmers receive a better return on their investments. While the beekeeping project has created new revenue streams for project participants the issue of income relieving pressure on the local resource base is not always so simple. Even if disposable income for the local population increases substitutes for the products they harvest from the environment may not be available locally. The income earned from beekeeping may not affect the pressure being exerted on the resource base, though it could be used to invest in environmental improvements.

As for the issue of affecting attitudes, the project structure used in the Kwale case is much more effective in this manner than that used in the Kakamega case, as it more greatly involves the farmers in the beekeeping. Involvement in the actual act of beekeeping is important in making the transition from an abstract understanding of this aspect of the environment to a more real and concrete one. Though it would be beneficial to the projects if the development organization made an effort to link tree planting with beekeeping so as to promote the former.

The use of MFHs reduces the local pressure on trees for hives, but due to the shorter lifespan of MFHs more trees may be needed in total to maintain the same number of hives over a longer timeline. However, the use of exotic trees from lumber plantations could help to stem the loss of biodiversity. In Kwale the issue is more urgent than in Kakamega and the impact of switching technologies though it may be relatively small is still important.

Chapter 8 Conclusions

8.1 Introduction

This chapter serves to bring some of the results from the two case studies together in order to highlight some of the key conclusions that are drawn from the comparison of the two case studies. The comparison of the two case studies provides an opportunity to examine some of the ways that leadership and self-organization in particular are important to the success of ICDPs. The chapter begins by reviewing the research objectives outlined in Chapter 1 and then moves on to discuss the results. The chapter concludes by addressing how the projects relate to some of the literature reviewed in Chapter 2 and examines some of the lessons learned.

8.2 Addressing the Objectives of the study.

There were three objectives of this study:

1. The first objective of the study was to identify the actors (key personnel, community members, NGO staff, etc.) from within and outside the community that helped to get individual HCA projects organized and how their leadership impacted the projects.
2. The second objective of the study was to determine how the two HCA projects are linked to with institutions at other scales including: vertical linkages such as to the government at state/provincial, and national levels, non-governmental organizations (NGO's), private business, and community groups; and horizontal linkages such as how specific stakeholders within the projects interact with others across space.

3. The third objective of the study was to ascertain how if at all the HCA beekeeping projects have affected local perceptions and actions regarding the environment including biodiversity conservation.

8.3 Leadership/Self -Organization

Chapter 5 shows how leadership at different scales is a critical aspect of the HCA beekeeping projects. There are several different conclusions about leadership and self-organization that can be drawn from the study.

8.3.1 Project Inspiration

The development of HCA as a private company interested in promoting MFH beekeeping to produce a high quality honey supply for the domestic market of larger urban centres has provided a new model for beekeeping development projects in Kenya. HCA in both cases introduced the project to the development organization that would manage the project and provided the general project structure. HCA does not provide central management leadership to the projects, though they do attempt provide assistance when requested and disseminate information to the projects (i.e. the switching from the hive stands to the goal-post system was initiated by HCA).

8.3.2 Project Management Level Leadership

The level where leadership is most critical for the HCA beekeeping projects is at the level of the development organizations, because this is where project management and coordination occurs. The project manger (likely an individual with previous NGO or

CBO experience) is also the one best suited to communicate the needs of the project and to intact with other organizations at other scales. Alpert (1996) asserts that IDCPs have worked best where there have been highly committed individuals; this was reflected in the HCA beekeeping projects. Strong leadership at CARD resulted in good project performance until that leadership left and then the project suffered, later with renewed leadership the project has been able to regain the promise it showed initially. Weak leadership at CRSP has resulted in poor overall project performance and the discouragement of some project participants.

The comparison between the two highlights a key difference in the two case studies – the level of commitment to the project at the development organization level. In Kakamega there is a high level of commitment to the project from the management of CARD. This is because the beekeeping project is CARD's primary development activity and the only project that provides an economic return to the organization. CRSP has numerous projects underway (some of which involve more participants than the HCA project) and must divide its resources amongst them; as a result the beekeeping project has in the past not received the level of attention that it required. Not only is project level leadership critical to the success of the project, but so to is the commitment of those leaders to the project.

8.3.3 Local Level Leadership

Local level leadership has also proven to be important to the projects. In Kakamega under *Phase II* of the management structure the lack of local level leadership contributed to inadequate hive management and poor project performance. The

exception to this was in a few locations, particularly Ileho where the Beekeeper who was later to become the HCA PO effectively managed the hives in his area. Under CARD's other management structures local level leadership is not especially important. In Kwale local level leadership is critically important, as this is the level where hive management occurs. Many beekeepers in Kwale are not adequately managing their hives, though there are others who are. If these more successful beekeepers can become village beekeeping leaders as CRSP intends with their paraprofessional program then the general level of hive management can be improved.

8.3.4 Management Structure

The design of the project management structure affects the projects' overall performance, but it also affects the way in which skills and learning are, or are not gained. In Kakamega the beehives are professionally managed by CARD and the HCA PO, in Kwale the farmers are responsible for managing their own hives. This results in a situation where the overall level of hive management is better in Kakamega than in Kwale resulting in better honey yields (see figures 8.1 & 8.2), though there is more learning occurring in the Kwale project than in the Kakamega project.

Management of the CARD project is becoming too centralized; it is reliant upon a very small number of people, the CARD Project Manager and the HCA PO in particular. If one or both were to leave, the project may suffer from a leadership vacuum (this is a particular concern due to CARD's financial difficulties which make staff retention a problem). As well, the scale of the project may soon become too great for the HCA PO to keep up inspections and hive management. With 600 hives he was only able to inspect

each hive 2-3 times per month, as the project expands he will be unable to inspect the hives as often as they should be. Someone will have to be employed to assist the project officer in his inspections or the management structure will have to change again.

As the hives are only inspected 2-3 times per month by the HCA PO it could benefit the project if someone who lived near the apiary (either the land-owner where the apiary is located, or a neighbour) received beekeeping training and was given responsibility for briefly checking in on the apiary daily so that any damage/disturbances to the hives can either be rectified or reported to CARD or the HCA PO.

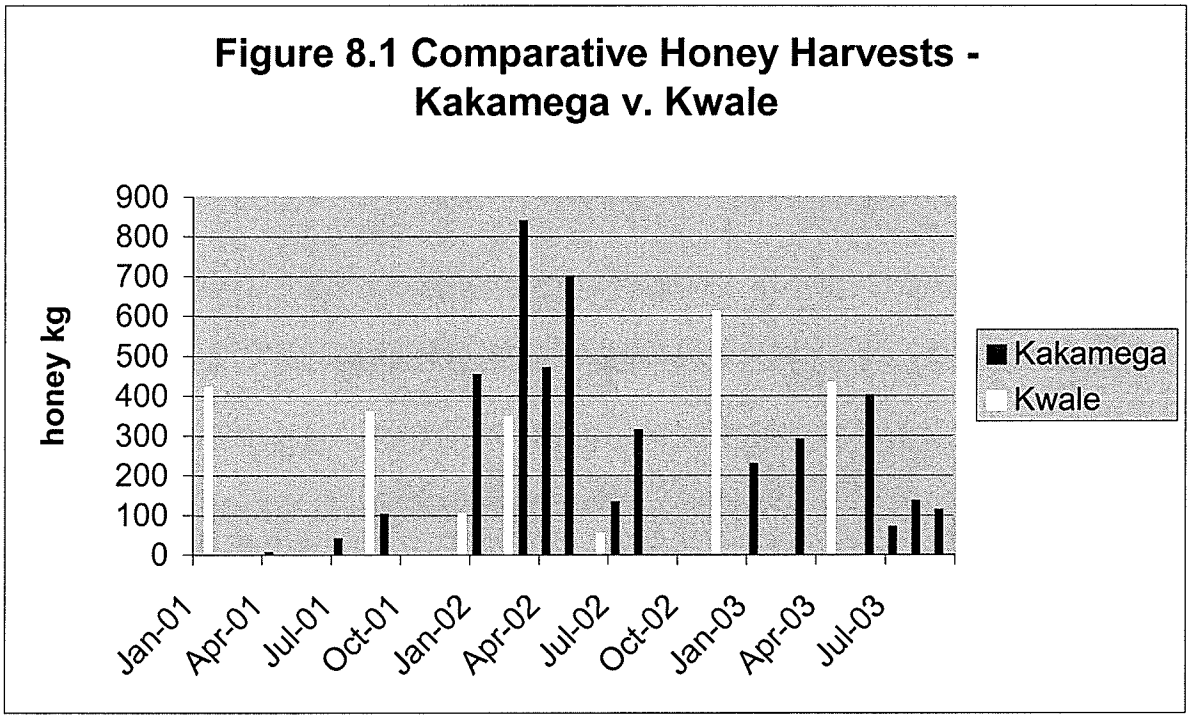


Figure data source: CARD 2004, CRSP 2004a

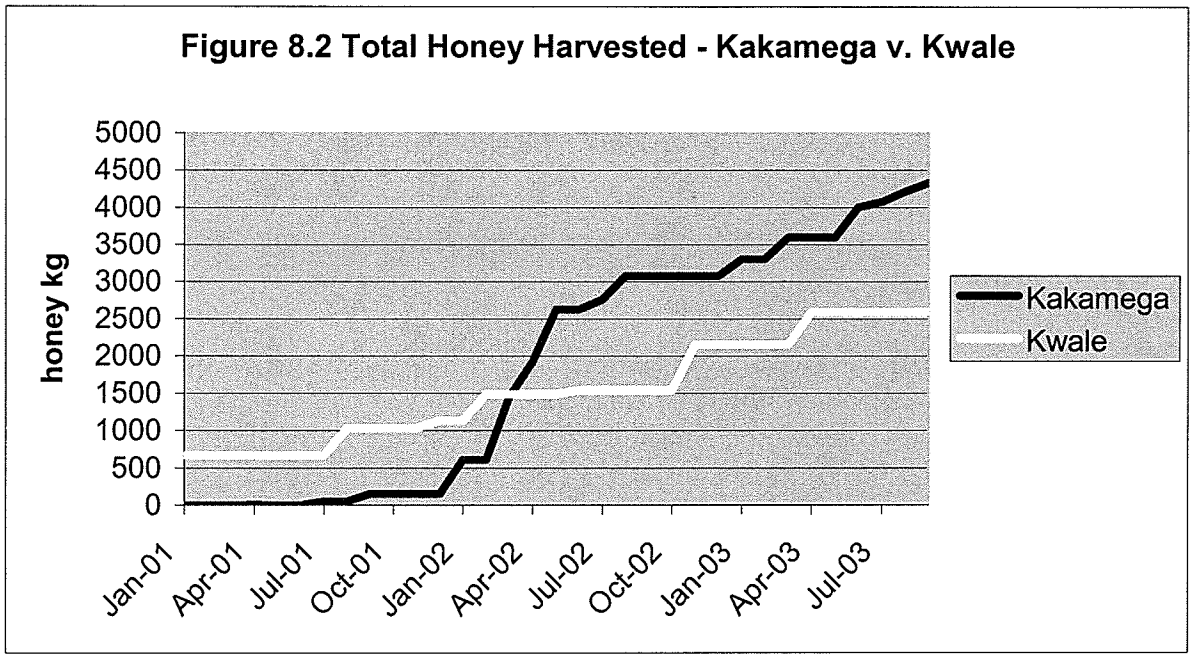


Figure data source: CARD 2004, CRSP 2004a

8.3.5 HCA Project Officer

One of the principal differences of leadership in the two case studies is the Honey Care Project Officer. The PO need not necessarily be from HCA (though this is desirable); the most important thing is for there to be an individual with the proper training and access to transportation that is employed full time to assist the project. In Kakamega there is a PO, in Kwale there is not. The HCA PO has been important to the success of the Kakamega project, though during the initial management structure the VSOs filled essentially the same role that the HCA PO does now. During the two periods when the CARD project was performing well there was someone acting as a project officer, and during the period when it was not performing as well there was no PO. The poor performance of the Kwale project may to some extent be attributed to the lack of a PO who could provide instruction and leadership to struggling beekeepers in Kwale.

Having a HCA PO also provides the beekeepers/farmers with an additional linkage to HCA. This is important for purposes of redundancy of cross-scale linkages, as not all linkages may be functional. Many NGOs, including CRSP intend their presence in the project areas to be temporary, after CRSP leaves Kwale, the project will have to change, but the farmers will still need someone to be their conduit to HCA, a project officer could perform this function.

If the HCA projects are to be seen as a model for replication, a project officer is desirable as a project officer guarantees as certain level of on-site commitment to the project by the private enterprise (i.e. HCA). This is important as otherwise under such a model the private sector company if it is also the supplier of the hardware (hives and equipment) can profitably walk away from the project after selling the hives, and never buy any honey. Thus it may be ill advised for communities and development organizations to enter into such projects without the display of commitment that comes with a full-time project officer. Though the scale of the project will also impact on this as it would not be cost effective to employ someone full time to manage a small number of hives.

8.3.6 Capacity Building

Sufficient capacity building is another lesson that can be realized from an examination of the HCA cases. In the Kakamega case as the management of the hives is centralized capacity building has not been as important as it is in the Kwale case. The farmer-based model of hive management used in Kwale provides better potential for new knowledge and skills to be learned by the project participants than the Kakamega project

structure, though the poor performance of the project in Kwale can be attributed in part to insufficient capacity building. Most of the HCA beekeepers in Kwale had limited or no experience with beekeeping previous to becoming involved with the project and were therefore relying on their initial training to teach them all the skills necessary to manage their hives. Unfortunately this training was brief due to the expense involved and the time that participants could spare, as the training was mostly not held in their home villages. This level of training may have been sufficient if there had been effective extension support provided to the beekeepers, but there was little support provided. CRSP has recently tried to remedy this situation by selecting one beekeeper from each village (para-professional) and providing this individual with additional training so that they can then provide assistance to the other beekeepers in their village. This is very important as this para-professional being a member of the village will be much more accessible to the other beekeepers than are CRSP or government staff.

8.4 Cross-scale linkages

Chapter 6 outlined some of the cross-scale linkages that are particularly important to the functioning of the HCA beekeeping projects. Due to the way the HCA beekeeping projects in Kenya are structured with their partnerships between organizations nested at different scales there must to be proficient co-ordination between the numerous partners for the projects to function well (see figures 6.1, 6.2).

The complex nature of the two HCA projects – demonstrated by the reliance on the efficient functioning of numerous cross-scale linkages has some implications for project sustainability. The failure of certain cross-scale linkages to function adequately

could have disastrous impacts on the entire project. A multiplicity of cross-scale linkages that are required to function well for a development project to succeed creates a precarious situation. However, a large number of cross-scale linkages within a project can also provide redundancy of linkages that can make such projects more stable and sustainable if functional linkages can be used to by-pass non-functional ones.

The project structure established in both HCA case studies is one that creates dependencies. In both cases, there is a large amount of dependency on HCA and the development organizations by the farmers involved, who could not easily find a substitute for either partner should the need arise. This presents the farmers with difficulties should they be unable to negotiate agreeable terms with HCA after their initial contract expires, as they may not be able to find an alternative buyer for their honey at a suitable price considering the quantity of honey and technological requirements (ie a centrifuge machine to extract the honey without damaging the wax foundation sheets); or should the development organization cease activities in the area, the farmers would then be forced to create a new organization to oversee the project if they wished to maintain their current relationship with HCA. If either scenario were to present itself the lack of power vested at the local level and the lack of any organization of beekeepers on a large scale within the project could have serious consequences for the sustainability of the project.

8.4.1 Vertical Linkages

The most important cross-scale linkage in both projects is the one between the development organization (the managers of the project) and the level where hive

management takes place (in Kakamega this is the HCA PO, in Kwale the beekeepers). This linkage has the greatest affect on gaining economic and environmental benefits from the beekeeping project. In the Kakamega case this linkage is functioning very well. The link between CARD and the HCA PO allows for the CARD Project Manager to have current information on all the hives in the project on a daily basis, so that he can make timely and appropriate decisions concerning the project, and so that supers can be harvested and returned as quickly as possible back to the apiaries so as to maximize honey production and thus income for the farmers. In the Kwale case the linkage is between CRSP and the beekeepers via the VDC, this linkage is not functioning properly. The consequences of this have been serious for the project, and may be the root cause of many of the project's problems. This linkage is the channel through which CRSP is informed of supers that are ready to be harvested, or that assistance and extension support are needed. The failure of this linkage has meant that CRSP has often been unaware of the difficulties that the beekeepers are facing, and has made it difficult for CRSP to monitor the status of the project. The system of VDOs and VDCs needs to be improved so that there is communication between the beekeepers and CRSP, in the interim CRSP should endeavour to increase their extension support as this will also provide an avenue for communication.

8.4.2 Horizontal Linkages

Horizontal linkages are also important to the projects, though the main way that they are helping the two projects currently is as a means of bypassing non-functional vertical linkages (though this requires other functional vertical linkages). In the Kwale

case the horizontal linkage between CRSP and MLFD has helped to overcome the failure of the vertical linkages between CRSP and the beekeepers. In Kakamega the linkage between the HCA PO and CARD serves a similar purpose, though it is not so necessary there as a means of bypassing other linkages.

Lack of adequate transportation capacity at CARD is one of the more difficult issues facing the project in Kakamega. A pick-up truck is necessary for the project to function and with only sparse access to one when HCA sends out a truck the project in Kakamega is not producing as much honey as it could if supers were more quickly transferred to the office and then back to the apiaries. CARD will need to use one of its horizontal linkages perhaps with the MLFD to gain access to a pick-up truck in the future if the project is to continue expanding.

In the Kwale case there is an interesting partnership between the CRSP and the government of Kenya, where CRSP provides office space (in Mariakani) and motor-bikes to government officers from the Ministry of Livestock and Fisheries Development that the government is unable to provide. This allows for the government staff to do their jobs more effectively and also promote and provide assistance to the CRSP projects in their area. The arrangement also ensures a close working relationship between the government and the NGO that has built trust between the two institutions to the benefit of both. The VDC-VDC horizontal linkages if they could be made more effective could be used to transmit knowledge about beekeeping from one location to another; this could benefit the project substantially and increase the general level of hive management.

8.5 Environmental Conservation

Chapter 7 examined some of the impacts that the two projects have had on their local environments. In both cases there was a lack of baseline environmental data to compare against which made impacts difficult to confidently identify. As well, the beekeeping projects have only been operating for a few years and there may be a longer lag-time before changes in the environment are noticed. Though it may be possible to get some idea of the environmental impacts of the beekeeping project by examining patterns of resource use over a period of time in the project areas, and by monitoring the reproductive success of certain flora species that require insect pollination and are visited by honeybees.

8.5.1 Pollination

Both projects have increased the number of honeybees in their project areas and this will improve the pollination success of numerous plant species. As honeybees are generalist pollinators and indigenous bees to East Africa they are able to pollinate a wide spectrum of native vegetation. The honeybees will also pollinate exotic vegetation species, many of the crops especially horticultural crops and fruit trees planted by farmers in Kenya are exotic and require biotic pollination, and there is evidence from several project participants that they have benefited from increased pollination services. The connection between bees and crop yields for farmers creates a synergy that can be used to further conservation efforts such as agro-forestry or reforestation/afforestation projects.

8.5.2 Income

Beekeeping provides income from the sale of honey, and it provides additional income to farmers from the improved yields of crops that benefit from the increased pollination service. It remains to be seen if the income earned through these projects results in any environmental impacts. The income earned during the first few years of the projects has been better in Kakamega than in Kwale (see figure 8.3). The revenue generated from beekeeping can help to alleviate pressure on the local resource base but the greater potential for beekeeping development projects to conserve biodiversity lies in the possibility of altering the way the local people view their environment, the income can make the connection between the health of the environment and livelihoods more tangible. The project structure used in the Kwale case is much more effective in affecting the way that project participants view their environment than that used in the Kakamega case, as it more greatly involves the farmers in the beekeeping.

Income from the two HCA beekeeping projects is primarily spent on meeting immediate household needs such as food, and housing improvements, as well as school fees, and those who can afford to invest some in other cash crops or livestock. In helping to alleviate rural poverty the projects seem to be effective to varying degrees, few people seem to have actually lost money on the project, though not all have recouped their initial investment, however, there is certainly potential for all beekeepers currently involved to make money from the project. Beekeeping for the majority of project participants is a secondary economic activity, but the income gained may be adequate to help get farmers through rough times where they otherwise may be forced to sell livestock or even land. As for the money earned helping to alleviate pressure on the local environments the

projects have not seemed to have much impact as of yet, though it may be that such effects take longer to manifest.

Figure 8.3 Money Earned from selling honey to HCA - Kakamega v. Kwale

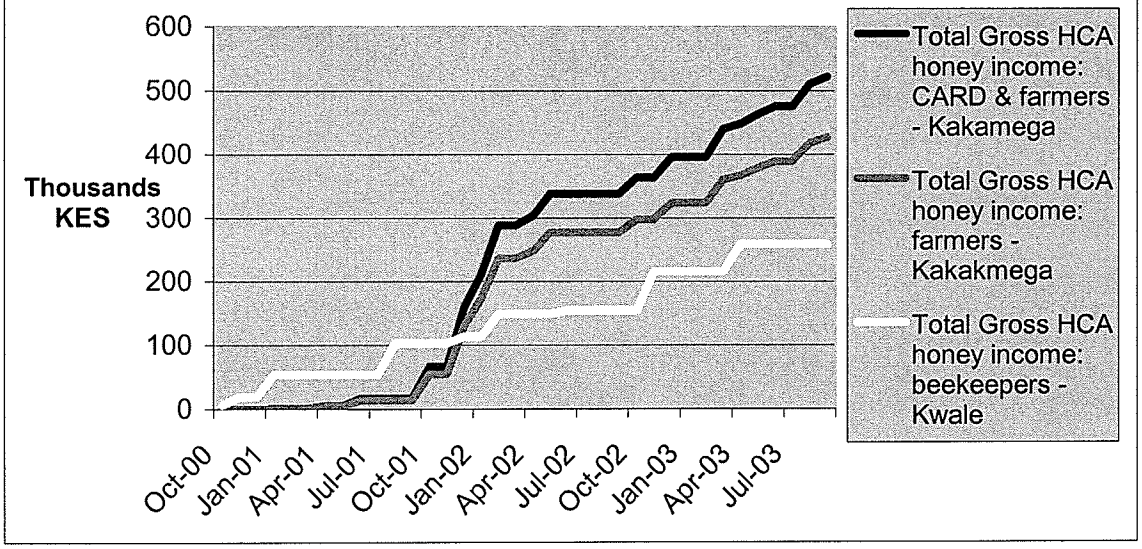


Figure data source: CARD 2004, CRSP2004a

8.5.3 Hive Technology

In both cases the use of HCA hives has to an extent the use of log hives. Though many of the traditional beekeepers who make and use log hives are not involved in the HCA projects others have become involved as they find it increasingly difficult to procure the proper wood to construct new hives. Deforestation is a widespread problem in Kenya, and the HCA hives at least are not made of rare indigenous tree species – rather they are made of pine. While in areas with abundant forest resources the felling of trees for log hives is not a serious problem as several hives can be made from a single tree, but in areas that are suffering from severe deforestation (i.e. Kwale) the issue is a serious one.

8.6 Theoretical Relevance of the Research

There are a number of lessons from the two HCA beekeeping projects that may have some relevance to the literature reviewed in Chapter 2. In particular they may be potentially transferable to other ICDP or CBC initiatives in similar socio-economic circumstances and of interest to those considering beekeeping development in Kenya, as while there have been numerous beekeeping projects initiated in the country few have been successful and many if not most have collapsed after a few years.

The Honey Care Africa projects provide an example of how private businesses, development organizations, government ministries, and small-scale farmers can work together to achieve economic development and biodiversity conservation. The two HCA projects are not true IDCPs (that see economic development and biodiversity conservation as equal goals) or CBC projects (focused on conservation and requiring strong community participation) as Alpert (1996) and Little (1994) defined them, though they are closer to the former than the later, as the HCA projects have economic development as the primary goal and biodiversity conservation as secondary. While the HCA projects primarily value economic development, the economic development is achieved in a manner that does provide conservation benefits, and has a stake in biodiversity conservation. The two HCA projects create both direct and indirect linkages between livelihoods and conservation.

Development strategies tend to be focused on the agricultural sector, in particular on increasing the income that farmers are earning from their current agricultural pursuits (Eicher 1992) rather than on transferring farmers to more productive/modern sectors of the economy, as had been the focus in the past (Livingstone 1986). Declining farm size

is a serious issue in Kenya that makes it difficult for rural farmers to maintain their livelihoods given the smaller amounts of land available to them through generations (Hackel 1999, Murton 1999). This is a problem that continues to worsen and will not likely see much relief in the immediate future due most significantly to demographic factors. Beekeeping in the manner of the HCA projects provides an avenue for small-scale farmers to increase their income from their existing land-base without giving up any areas under crops, and to potentially improve their crops yields as they benefit from the pollination service of the honeybees this will make such projects attractive to development agencies.

The availability of nectar throughout much if not all of the year is a requirement of successful tropical apiculture, and as many crops do not provide suitable/sufficient floral resources for honeybees, indigenous vegetation is economically important to the beekeeper. The profitability of the venture for beekeepers will be impacted by the quality of the local environment for honeybees. This direct linkage can provide an economic incentive to conserve biological diversity (Brown 2002) and constitutes the vehicle through which the HCA projects can best promote a conservation agenda at the village level.

In the Kakamega case, the government policies concerning the Kakamega Forest Reserve have created an indirect linkage between protection of the forest and the HCA project (Abbot et al. 2001). Through beekeeping income and pollination services - the value of the later in improved crop yields is likely to be greater than the value of the former, besides being is vitally important for many crops (Adjare 1990, Kevan 1999, MMA 1999), the HCA project is helping to increase the economic return that local

people obtain from their current livelihood pursuits, outside the area valued for its biodiversity.

While conservation is an important part of the long-term sustainability of the HCA projects it was not the prime motivating factor for the farmers, HCA, the MLFD, or the development organizations (though it may be for some of the international donors that support the development organizations) in participating in the two beekeeping projects. For local populations conservation while an admirable goal is often seen as a luxury and without suitable incentives they cannot afford to conserve biodiversity if it negatively impacts their livelihoods (Cox 1998, Chambers 1997, Koziell 2001).

This focus on economic development in an environmentally conscious manner better demonstrates the goodwill on the part of the development organizations towards the small-scale and subsistence farmers than would a project focused heavily on conservation at the expense of economic development (Abbot et al. 2001). This good will could in the future be parlayed into more strict conservation efforts as it is at the local level that successful examples can have the greatest impact on affecting people's attitudes towards the idea of sustainable development (Bridger et al. 1999). With a greater area of land under private or collective ownership than under some form of protection appeals to the land-owners and land-users hold the potential to achieve the greatest environmental changes, especially in a country such as Kenya that is largely agricultural and has a central government that is limited in its ability to enforce its land-use policies.

Private ownership of the beehives is the norm in the HCA projects but this is a significant change from the typical manner of beekeeping projects and many other types

of development projects in Kenya. There are both advantages and disadvantages to private ownership of the hives compared to collective ownership. One of the advantages is that privately owned hives are more likely to be effectively managed than group-owned hives, resulting in greater yields of honey and therefore more income for the beekeepers. There are many examples of failed beekeeping projects in Kenya using collectively owned hives which have not been properly managed due to a lack of motivation to manage the hives by individuals who only own receive a small portion of the proceeds. In Kwale this problem has surfaced in reference to the beekeeping equipment, all the beekeeping equipment is group-owned, and as such has not been well cared for. This has resulted in some beekeepers not having the protective equipment necessary for them to mange their hives.

Another advantage of private ownership of the hives is that the profits from the hives are given directly to the farmers who own the hives; this in particular has attracted numerous beekeepers to the HCA projects. Thus private ownership of the hives makes it difficult for one to reap benefits from another's investments providing the beekeepers with at least some security for their honey income.

The hives in HCA projects are sold to the farmers rather than gifted to them, as has often been the case with beekeeping and other types of development projects in the past. Selling the hives to the farmers has the advantage of only including in the project those individuals who are seriously interested in beekeeping and are therefore likely to manage their hives in a productive manner. This is of course also beneficial to HCA as the manufacturer of the hives. This highlights the principal disadvantage to private ownership of the hives - access to the project is limited to those individuals who have the

disposable income to risk on such a venture. Due to the price of the hives it has been the mostly wealthier and more politically active people who have become involved in the two HCA projects – particularly in the Kwale case where nearly all of the initial beekeepers were members of their local VDCs (this was due to the limited number of people allowed to participate in the Kwale project in its initial phase). The cost of participating in the HCA projects makes it an expensive and risky investment for most people in the project areas, it is the wealthier community members who can best afford to take these risks, so one should not be surprised that they do so in greater numbers than the poorer members of the communities who do not have the capital to invest in hives of their own, particularly in expensive MFHs.

The inclusion of private enterprise in these development projects has created a situation that differs from the traditional government or donor funded project. HCA being a private company that must generate a profit brings a different set of expectations to the project compared to those of a government ministry or an NGO, which typically do not have a profit motive. As a private company HCA helps to ensure that the project operates under realistic market conditions, and is economically sustainable, something often lacking in government or NGO driven projects. Of course there is a potential downside to private companies starting development projects, as there may be an opportunity for such a company to establish an exploitive relationship with the community members. In the HCA projects this danger is tempered by the NGO's/CBO's that are to act on behalf of the communities to ensure that they are not being unfairly exploited.

The argument can be made that HCA is using the development organizations to provide free labour for the company so that HCA can effectively collect honey from throughout the country without having to have an extensive network of employees. This is a valid criticism, but one must remember that HCA is not a charity, it is a corporation, and it is unrealistic to expect it to behave otherwise (HCA certainly does not have the capital and/or manpower to take over the beekeeping work done by all the development organizations it is partnered with throughout Kenya). Furthermore the relationship is not unfairly exploitative to the development organizations, which negotiate their terms with HCA and are helped to achieve the goals their donors put to them via their involvement with HCA, rather it is a relationship through which both organizations and rural farmers can and do benefit.

References

Abbot, J, D. Thomas, A.Gardner, S. Neba, M. Khen. 2001. Understanding the Links Between Conservation and Development in the Bamenda Highlands, Cameroon. *World Development* 29 (7): 1115-1136.

Adjare, S. 1990. *Beekeeping in Africa.* FAO Agricultural Services Bulletin 68/6. Rome: FAO

AKF, CRSP-K, and PI (Aga Khan Foundation Coastal Rural Support Programme (K) and Progressive Interventions). 2003. *Kenya Coast Market Assistance & Product Promotion (MAPPs) Programme.* Nairobi.

Agrawal, A. and C.C. Gibson. 1999. Enchantment and Disenchantment: The Role of Community in Natural Resource Conservation. *World Development* 27 (4): 629-649.

Altieri, M. 1999. The ecological role of biodiversity in agroecosystems. *Agriculture, Ecosystems and Environment* 74: 19-31.

Alpert, P. 1996. Integrated conservation and development projects. *Bioscience* 46 (11): 845-855.

Baydack, R. and H. Campa III. 1998. Setting the Context. In: *Practical Approaches to the Conservation of Biological Diversity.* R.K. Baydack, H. Campa III, and J.B. Haufler eds.) Washington D.C.: Island Press. pp. 3-16.

Berkes, F. 2002. Cross-Scale Institutional Linkages: Perspectives from the Bottom Up. In: *The Drama of the Commons.* (E. Ostrom, T. Dietz, N. Dolsak, P.C. Stern, S. Stonich and E.U. Weber eds.) Washington D.C.: National Academy Press. pp. 293-321.

Berkes, F. 2004. Rethinking Community-Based Conservation. *Conservation Biology* 18 (3): 621-630.

Bibangambah, J.R. 1985. Approaches to the Problem of Rural Poverty in Africa. In: *Challenging Rural Poverty: Experiences in Institution-Building and Popular Participation for Rural Development in Eastern Africa.* (F.G. Kiros ed.) Organization for Social Science Research in Eastern Africa. Trenton, N.J.: Africa World Press pp. 21-59.

Bradbear, N. 2004. *Beekeeping and sustainable livelihoods.* Rome: Agricultural Support Systems Division, Food and Agriculture Organization of the United Nations.

Bridger, J.C. and A.E. Luloff. 1999. Toward an interacitonal approach to sustainable

community development. *Journal of Rural Studies* 15: 377-387.

Bromley, D. 1994. Economic Dimensions of Community-based Conservation. In: *Natural Connections: Perspectives in Community-based Conservation.* (D. Western and R.M. Wright eds.) Island Press: Washington D.C. pp. 428-447.

Brosius, J., A. Tsing, and C. Zerner. 1998. Representing Communities: Histories and Politics of Community-Based Natural Resource Management. *Society and Natural Resources* 11: 157-168.

Browder, J. 2002. Conservation and Development Projects in the Brazilian Amazon: Lessons for the Community Initiative Program in Rondônia. *Environmental Management* 29 (6): 750-762.

Brown, K. 2002. Innovations for conservation and development. *The Geographical Journal*, 168 (1): 6-17.

Cane, J. 2001. Habitat Fragmentation and Native Bees: a Premature Verdict? *Conservation Ecology* 5 (1): 3. Available: http://www.consecol.org/vol3/iss2/art3/index.html [accessed Dec 2004].

CARD (Community Action for Rural Development), 2002. *Field Op – Monthly Records Summary* (internal CARD document). Kakamega.

CARD, 2003. *Beekeeping Management Procedures* (internal CARD document). Kakamega.

CARD, 2004. *Finance – Owners Accounts* (internal CARD document). Kakamega.

Chambers, R. 1994. Participatory Rural Appraisal (PRA): Analysis of Experience. *World Development* 22 (9): 1253-1268.

Chambers, R. 1997. *Whose Reality Counts?: Putting the first last.* London: Intermediate Technology Publications.

Chavangi, N. 1992. Household based tree planting activities for fuelwod supply in rural Kenya: The role of the Kenya Woodfuel Development Programme. In: *Development from Within: Survival in Rural Africa.* (D.R.F. Taylor and F. Mackenzie eds.) London: Routledge, pp.148-169.

CIA World Factbook. 2005. *Kenya.* Available: www.odci.gov/cia/publications/factbook/print/ke.html. [Accessed June 2005].

CRSP (Coastal Rural Support Programme). 2003. *From the Roots Up: The Village Development Organization Model.* Mariakani.

CRSP. 2004a. *Beehive Performance and Honey Production Trends*. (internal CRSP document). Mariakani.

CRSP 2004b. *Beekeeping Intervention Summary*. (internal CRSP document). Mariakani.

Cox, D. 1998. Community Rebuilding in the Philippines: A poverty Alleviation Program in Negros Occidental, 1990-1995. In: *Sustainable Community Development: Studies in Economic, Environmental, and Cultural Revitalization* (M.D. Hoff ed.) Boca Raton: Lewis Publishers, pp. 45-62.

Crane E. 1990. *Bees and Beekeeping: Science, Practice and World Resources.* Cornell University Press: Ithica.

Crane, E. 1999. *The World History of Beekeeping and Honey Hunting*. Routledge: New York.

Davidson, E. 2000. *You Can't Eat GNP: Economics As If Ecology Mattered.* Cambridge: Perseus Publishing.

Davis, A. 1992. Evaluating honey bees as pollinators of virgin flowers of *Echium plantagineum* L. (Boraginaceae) by pollen tube fluorescence. *Journal of Apicultural Research* 31 (2): 83-95.

Eicher, C. 1992. African Agricultural Development Strategies. In: *Alternative Development Strategies in SubSaharan Africa* (F. Stewart, S. Lall, and S. Wangwe eds.) New York: St. Martin's Press, pp. 79-102.

Environment Canada. 1996. *The Canadian biodiversity strategy*. Ottawa: Environment Canada.

Folke, C., C.S. Holling, and C. Perrings. 1996. Biological Diversity, Ecosystems, and the Human Scale. *Ecological Applications* 6 (4): 1018-1024.

Folke, C., F. Berkes, and J. Colding. 1998. Ecological practices and social mechanisms for building resilience and sustainability. In: *Linking Social and Ecological Systems: Institutional Learning for Resilience*. (F. Berkes, and C. Folke eds.) Cambridge University Press: Cambridge. pp. 414-436.

Government of Kenya. 1999. National Poverty Eradication Plan 1999-2015. Nairobi: Department of Development Co-ordination.

Government of Kenya. 2000. *Interim Poverty Reduction Strategy Paper (IPRSP) 2000-2003*. Available: http://poverty.worldbank.org/files/kenya%201PRSP.pdf [Accessed Oct. 2003].

Hackel, J. 1999. Community Conservation and the Future of Africa's Wildlife. *Conservation Biology* 13 (4): 726-734.

Hammarskjold, M. 2003. The Environment, Natural Resources and HIV/AIDS. Sida, Environment Policy Division. Available: http://www.sida.se/sida/jsp/sida.jsp?d=118&a=2932&language=en_US&searchWords=environment%20natural%20resources,%20HIV/AIDS [Accessed Nov 2005].

Hoff, M. 1998. Sustainable Community Development: Origins and Essential Elements of a New Approach. In: *Sustainable Community Development: Studies in Economic, Environmental, and Cultural Revitalization* (M.D. Hoff ed.) Boca Raton: Lewis Publishers, pp.5-24.

Holling, C.S., F. Berkes, and C. Folke. 1998. Ecological practices and social mechanisms for building resilience and sustainability. In: *Linking Social and Ecological Systems: Institutional Learning for Resilience.* (F. Berkes, and C. Folke eds.) Cambridge University Press: Cambridge. pp. 346-366.

HCA (Honey Care Africa) 2000a. *Memorandum of Understanding and Agreement on Honey Production and Marketing between CARD and HCA.* Nairobi.

HCA 2000b. *Memorandum of Understanding and Agreement on Honey Production and Marketing between KRSP and HCA.* Nairobi.

Igoe, J. 2003. *Conservation and Contested Landscapes: The Potential for Community-Based Conservation in East Africa and North America.* Available: http://www.iucn.org/themes/ceesp/Publications/SL/Potential%20for%20Community-Based%20 Conservation-%20Jim%20Igoe.pdf [Accessed June 2005].

Jacobs, M. 1993. *The Green Economy: Environment, Sustainable Development and the Politics of the Future.* Vancouver: UBC Press.

Jiwa, F. 2002. *Small Business for Sustainable Community Development*: Report of a Major Project submitted to the Faculty of Environmental Studies in partial fulfillment of the requirements for the degree of Master in Environmental Studies. North York: York University.

Johnson, C. 2001. Community Formation and Fisheries Conservation in Southern Thailand. *Development and Change* 32: 951-974.

KBA (Kenya Bee Keepers Association). 2001. *Strategic Plan 2001-2005.* Edited by B. Mburu and J. Muriuki. Nairobi.

Kevan, P. G. 1999. Pollinators as bioindicators of the state of environment: species, activity and diversity. *Agriculture, Ecosystems and Environment* 74: 373-393.

KHC (Kenya Honey Council). 2003. *Kenya Bee Products Growth & Expansion Programme: Pilot Phase Proposal and Appeal.* KHC: Nairobi.

KIFCON (Kenya Indigenous Forest Conservation Programme). 1994. *Kakamega Forest: The Official Guide.* Forest Dept., Nairobi.

Kimalu, P., N. Nafula, D. Manda, A. Bedi, G. Mwabu, M. Kimenyi. 2004. *A Review of the Health Sector in Kenya.* KIPPRA Working Paper No. 11. Nairobi: Kenya Institute for Public Policy Research and Analysis

Knappert, J. 1987. *East Africa: Kenya, Tanzania, & Uganda.* New Dehli: Vikas Publishing House.

Korten, D.C. 1995. *When Corporations Rule the World.* West Hartford: Kumarian Press.

Koziell, I. 2001. *Diversity not Adversity: Sustaining Livelihoods with Biodiversity.* Department for International Development.

Kumar, S. 2002. *Methods for Community Participation: A Complete Guide for Practitioners.* London: ITDG Publishing.

KRSP (Kwale Rural Support Programme). 1997. *Baseline Survey for the Kwale Rural Support Programme, A Project of the Aga Khan Foundation.* Mariakani.

KRSP. 2000a. *Kwale Rural Support Programme Project Proposal; Second Phase 2001-2006.* Mariakani.

KRSP. 2000b. *A Kwale Rural Support Programme Proposal on Bee Keeping Credit Initiative.* Mariakani.

KRSP. 2003. *Beekeeping Project Brief.* Mariakani.

Kweyu, D. 2003. *Experiences in Local Philanthropy in Kenya: No handouts Please! The Case of CARD Kakamega.* Nairobi: Kenya Community Development Foundation.

Leach, M., R. Mearns, and I. Scoones. 1997a. Challenges to Community-Based Sustainable Development: Dynamics, Entitlements, Institutions. *IDS Bulletin* 28 (4): 4-14.

Leach, M., R. Mearns, and I. Scoones. 1997b. Institutions, Consensus and Conflict: Implications for Policy and Practice. *IDS Bulletin* 28 (4): 90-95.

Little, P.D. 1994. The Link Between Local Participation and Improved Conservation: A

Review of Issues and Experiences. In: *Natural Connections: Perspectives in Community-based Conservation.* (D. Western and R.M. Wright eds.) Island Press: Washington D.C. pp. 347- 372.

Livingstone, I. 1986. *Rural Development, Employment and Incomes in Kenya.* International Labour Organization, Vermont: Gower Publishing Company.

Martin, E. C. 1975. The Use of Bees for Crop Pollination. *In The Hive and the Honey Bee* (Revised Edition). (Dadant & Sons eds.) Hamilton Illinois: Dadant & Sons. pp. 579-614.

Michaelidou, M., D. J. Decker, and J. P. Lassoie. 2002. The Interdependence of Ecosystem and Community Viability: A Theoretical Framework to Guide Research and Application. *Society and Natural Resources* 15: 599-616.

MMA. 1999. International Pollinators Initiative: The São Paulo Declaration on Pollinators. Report on the Recommendations of the Workshop on the Conservation and Sustainable Use of Pollinators in Agriculture with Emphasis on Bees. Brasília: Brazilian Ministry of the Environment.

MPND (Ministry of Planning and National Development). 1997. *Baseline Survey for Kwale Rural Support Programme (KRSP)* Final Report. Nairobi: Ministry of Planning and National Development.

MPND. 2000. *Kwale District Poverty Assessment Report.* Nairobi: Ministry of Planning and National Development.

Mitchell, N. 2004. BIOTA East Report No. 1. *The exploitation and disturbance history of Kakamega Forest, Western Kenya.* B. Blecher and H. Dalitz eds. Available: [http://www.biota-africa.org/Library/papers_east/boeb.pdf]

Morgan, W. 1973. *East Africa.* Longman: Group Ltd.: London.

Mosquin, T. 1997. *Management Guidelines for Invasive Alien Species in Canada's National Parks.* Available: http://www.ecosherics.net/AlienSpecnew.htm [Accessed Dec. 2002].

Mukherjee, N. 1993. *Participatory Rural Appraisal: Methodology and Applicaions.* New Delhi: Concept.

Muro, A. 1985. Women Commodity Producers and Proletariats: The Case of African Women. In: *Challenging Rural Poverty: Experiences in Institution-Building and Popular Participation for Rural Development in Eastern Africa.* (F.G. Kiros ed.) Organization for Social Science Research in Eastern Africa. Trenton, N.J.: Africa World Press pp.61-79.

Murphree, M.W. 1994. The Role of Institutions in Community-based Conservation. In: *Natural Connections: Perspectives in Community-based Conservation.* (D. Western and R.M. Wright eds.) Island Press: Washington D.C. pp. 403-427.

Murton, J. 1999. Population growth and poverty in Machakos District, Kenya. The Geographical Journal 165 (1): 37-46.

Mutangah, J.G. 2004. Forest Quality Indicators with Reference to Kakamega Forest, Kenya. Available: http://www.earthwatch.org/europe/limbe/upf.html [Accessed Aug 2004].

National Environment Management Authority (NEMA), Kenya. 2004. Kakamega. Available: http://www.nema.go.ke/Districts/KAKAMEGA.htm [Accessed July 2005]

Nel, E., P. Illgner, K. Wilkins, and M.P. Robertson. 2000. Rural Self-Reliance in Bondolfi, Zimbabwe: the role of beekeeping. The Geographical Journal 166 (1): 26-34.

Nel, E. and P. Illgner. 2004. The contribution of bees to livelihoods in southern Africa. In: *Rights, Resources and Rural Development: Community-based Natural Resource Management in Southern Africa.* (C. Fabricius and E. Koch with H. Magome and S. Turner eds.) Earthscan: London. pp. 127-134.

Nelson, J.G. 1991. Research in Human Ecology and Planning: An Interactive, Adaptive Approach. *The Canadian Geographer* 35 (2): 114-127.

Netting, R. and P. Stone. 1996. Agro-diversity on a Farming Frontier: Koyfar Smallholders on the Benue Plains of Central Nigeria. *Africa* 66 (1): 52-70.

Ojany, F. and Ogendo, R. 1973. *Kenya: A Study in Physical and Human Geography.* Longman Kenya Ltd.: Nairobi.

Ostrom, E., J. Burger, C.B. Field, R.B. Norgaard, D. Policansky. 1999. Revisiting the Commons: Local Lessons, Global Challenges. *Science* 284: 278-282.

Oyugi, W.O. 1985. Centre-Periphery Linkages in the Development Process: An Assessment of the Kenyan Experience. In: *Challenging Rural Poverty: Experiences in Institution-Building and Popular Participation for Rural Development in Eastern Africa.* (F.G. Kiros ed.) Organization for Social Science Research in Eastern Africa. Trenton, N.J.: Africa World Press pp.147-167.

Pagiola, S., J. Kellenberg, L. Vaidaeus, and J. Srivastava. 1998. Mainstreaming Biodiversity in Agricultural Development. *Finance and Development* 35: 38-41.

Paoletti, M.G. 1999. Using bioindicators based on biodiversity to assess landscape sustainability. *Agriculture, Ecosystems and Environment* 74: 1-18.

Paterson, P.D. 2000. *The Basis for Success in Beekeeping within Development Projects.* Available: http://www.taa.org.uk/WestCountry/paterson.htm [Accessed Nov 2004].

Quist-Arcton, O. 2002. *Honey Money: A New Approach To An Old Problem In Kenya.* Available: http://allafrica.com/sustainable/stories/200209020199.html [Accessed Jan. 2003].

Ridgeway, R. 1998. *The Shadow of Kilimanjaro: on foot across east africa.* London: Bloomsbury Publishing.

Roubik, D.W. 1989. *Ecology and Natural History of Tropical Bees.* Cambridge Univertisy Press: Cambridge.

Ruttner, F. 1975. Races of Bees. *In The Hive and the Honey Bee* (Revised Edition). (Dadant & Sons eds.) Hamilton Illinois: Dadant & Sons. pp.19-38.

Sanchez, P.A. and C.A. Palm. 1996. Nutrient cycling and agroforestry in Africa. *Unasylva* 185: 24-28.

Saville, N. and N. Acharaya. 2004. *Report of a field study of AKF's Coastal Rural Support Programme's Beekeeping intervention in Kwale District.* Progressive Interventions, Nairobi.

Scmidt, J.O. and J.F. Edwards. 1998. *Ecology of Feral and Africanized Honey Bees in Organ Pipe Cactus National Monument.* Presented at the First Conference on Research and Resource Management in Southern Arizona National Park Areas, 1998, Tucson Arizona.

Schroeder, R. 1999. Geographies of environmental intervention in Africa. *Progress in Human Geography* 23 (3): 359-378.

Shackleton, S. and C. Shackleton. 2004. Everyday resources are valuable enough for community-based natural resource management programme support: Evidence from South Africa. In: *Rights, Resources and Rural Development: Community-based Natural Resource Management in Southern Africa.* (C. Fabricius and E. Koch with H. Magome and S. Turner eds.) Earthscan: London. pp. 135-146.

Shiva, V. 1993. *Monocultures of the Mind: Understanding the Threats to Biological and Cultural Diversity.* International Development Research Centre, Ottawa.

Singh N., and P. Kalala. 1991. *Adaptive Strategies and Sustainable Livelihoods:*

Community Studies – Kenya. International Institute for Sustainable Development: Winnipeg.

Singh, R.P. and P.N. Singh. 1992. Impact of bee pollination on seed yield, carbohydrate composition and lipid composition of mustard seed. *Journal of Apicultural Research* 31 (3/4): 128-133.

Smith, R. 2004. Coastal Rural Support Programme (Kenya) Poverty focus programming: Issues, Analysis, and New Strategies. Mariakani: CRSP

Swift, M. 2004. Global Litter Invertebrate Decomposition Experiment: Kakamega Forest, Kenya. Available: http://www.nrel.colostate.edu/projects/glide/kenya.html [Accessed Aug 2004].

UNAIDS. 2005. *Kenya*. Available: http://www.unaids.org/en/geographical+area/by+country/kenya.asp. [Accessed Nov 2005].

UNDP (United Nations Development Program). 2003. *The Equator Initiative.* Available: http://www.undp.org.equatorinitiative [Accessed March 2003].

Wainwright, C. and W. Wehrmeyer. 1998. Success in Integrating Conservation and Development? A Study from Zambia. *World Development* 26 (6): 933-944.

Walubengo, D. 2004. *From Deforestation to Re-afforestation: turning around Kenya's forests*. Concept Paper of the Forest Action Network. Available: http://www.fanworld.org/art_fserv.html. [Accessed Sept. 2004].

Ward, W.E.F., and L.W. White. 1971. *East Africa: A Century of Change 1870-1970.* Africana Publishing: New York.

Western, D. 1994. Ecosystem Conservation and Rural Development: The Case of Amboseli. In: *Natural Connections: Perspectives in Community-based Conservation.* (D. Western and R.M. Wright eds.) Island Press: Washington D.C. pp. 15-52.

Westley, F. 1995. Governing Design: The Management of Socail Systems and Ecosystems Management. In: *Barriers & Bridges to the Renewal of Ecosystems and Institutions*. (C.H. Gunderson, C.S. Holling, and J.S. Leght eds.) Columbia University Press pp. 403-427.

Wilshusen, P.R., Brechin, S.R. C.L. Fortwangler, and P.C. West. 2002. Reinventing a Square Wheel: Critique of a Resurgent " Protection Paradigm" in International Biodiversity Conservation. *Society and Natural Resources* 15: 17-40.

Woodhouse, P. Governance & Local Environmental Management in Africa. *Review of African Political Economy* 74: 537-547.

Young, O. R. 2002. Institutional Interplay: The Environmental Consequences of Cross-Scale Interactions. In: *The Drama of the Commons*. (E. Ostrom, T. Dietz, N. Dolsak, P.C. Stern, S. Stonich and E.U. Weber eds.) Washington D.C.: National Academy Press. pp. 263-291.

Personal Communications

Anjina, H. 2004. *Personal Communic*ation. District Animal Production Officer, MLFD.

Jiwa, F. 2004. *Personal Communication*. General Manager, Honey Care Africa.

Mmbakha, H. 2004. *Personal Communication.* Honey Care Africa Project Officer, Kakamega.

Mung'oni, M. 2004. *Personal Communication*. Regional Project Manager, CARD.

Mwanzighe, E. 2004. *Personal Communication*. Divisional Livestock Extension Officer, MLFD.

Paterson, P.D. 2004. *Personal Communication*. Beekeeping Expert (co-developer of KTBH).

Saville, N. 2004. *Personal Communication*. Beekeeping Development Consultant with Progressive Interventions.

Thoya, C. 2004. Technical Interventions Officer, CRSP.

Waigi, G. 2004. Enterprise Development Officer, CRSP.

Map References

CRSP. 2004a. *HCA Villages Kwale/Kilifi*. CRSP-AKF: Mariakani.

CRSP. 2004b. *Kenya – Districts*. CRSP-AKF: Mariakani.

CRSP. 2004c. *Programme Area within Kwale District*. CRSP-AKF: Mariakani.

ICIPE. 2000. *Kakamega Forest – 2000*. Kakamega Forest Integrated Conservation Project, International Centre of Insect Physiology and Ecology. Available: http://www.nmh.si.edu/kakamega/landuse.html [Accessed Sept 2005].

ILRI, 2004. Kenya – Provinces. International Livestock Research Institute. Available: http://www.ilri.cgair.org/gis/search.asp?id=302 [Accessed Sept 2005].

Provincial Surveyor (Western). 2004. *Ikolmani Division*. 1:50 000, 1984 Survey of Kenya.

Appendix A Seasonal Calendars
Kakamega

January	Preparing fields		
February	Preparing fields, planting long rain crops (maize, beans)		Harvest Honey
March	Planting Long rain crops (maize beans)	Long Rains	Harvest Honey
April	Weeding	Long Rains	
May		Long Rains	
June	Preparing for short rain crops (sweet potatoes), harvesting some crops (beans)		
July	Planting short rain crops,		
August	Planting short rain crops,	Short Rains	Harvest Honey
September	Harvest maize, weeding other crops	Short Rains	
October	Harvest maize, weeding other crops		
November	Harvest short rain crops		
December	Harvest last of crops		Harvest Honey

Table data source: semi-structured interviews

Kwale

January	Harvest short rain crops		
February	Preparing fields,		
March	Preparing fields, Planting long rain crops (maize, beans, cowpeas)		
April	Planting long rain crops (maize, beans, cowpeas)	Long Rains	
May	Weeding	Long Rains	Harvest Honey
June	Weeding, planting green grams		Harvest Honey
July	Harvesting some crops (beans, cowpeas)		
August	Preparing fields,		
September	Harvest maize, Planting short rain crops (maize, cowpeas, green grams),		
October	Harvest Maize, Planting short rain crops	Short Rains	
November	Weeding	Short Rains	
December	Harvest short rain crops		Harvest Honey

Table data source: semi-structured interviews

Appendix B Notes on Beekeeping in Africa

Honeybee Biology

In East Africa, Crane (1990) identifies four races of *Apis mellifera* (the dominant commercial honeybee) that are indigenous to the area. Tropical *Apis mellifera* differ from temperate zone *Apis mellifera* in several ways: they are smaller, their colonies are more prone to swarming and absconding in times of dearth, as well they tend to be more aggressive. The aggressiveness of tropical bees is believed to be an example of an evolutionary adaptation to the many predators including insects, birds, and mammals that tropical bees must deal with (Crane 1990, Roubik 1989, Ruttner 1975). It has further been suggested that this aggressive behaviour has been affected by human selection; honey-hunters (who often destroy the colony in the process of harvesting) tend to seek out less aggressive colonies to collect honey from and avoided those that were known to be especially hostile (Crane 1999).

The African honeybee stores honey under less favourable conditions than the European honeybee, and it has thus adopted a foraging behaviour that is better adapted to consistently low resource availability, which may be due to lack of flora, and/or competitors for the floral resources (Roubik 1989). This behaviour means that African bees are more diverse in their nectar sources than European bees providing them with greater security of food source and a better ability to adapt to changing landscapes.

One limiting factor of tropical apiculture is that heavy honey storage is characteristic more common to temperate bees than tropical bees. Environmental factors are thought to be the largest contributing factor to this difference in behaviour. The lack of an extended dearth period comparable to a temperate-zone winter of several months is

the key. When resource conditions are poor tropical honeybees tend to abscond from their nests and migrate to better areas rather than storing enough honey to feed the colony while it waits out the season as temperate bees do (Ruttner 1975, Roubik 1989, Crane 1990). This strategy is not an option for temperate bees as the dearth period is one where the temperature is too low for the bees to leave the nest or to fly.

Foraging

Foraging by bees is usually thought of in terms of foraging costs and benefits, with the costs being the energy expended and the benefits being the quality and quantity of nectar harvested. Bees are central-place foragers, meaning they return to a previously occupied site (the hive) after foraging (Roubik 1989). The flight range of honeybees is an important consideration for determining the best location for an apiary. The flight range of bees varies depending on the topography of the land and the type of vegetation. Bees are able to cover greater distances in flat open lands compared to hilly and/or forested areas (Roubik 1989). Most foraging activity takes place at a distance of 1/3 to 1/2 the normal foraging range usually at a distance of 2-5km (Roubik 1989). Honeybees tend to forage early in the morning and in the evening when the temperature is cooler.

Pollination

Pollination is a critical process in almost all productive terrestrial ecosystems; it enhances fruit set and size, seed production and viability, seedling vigour, and the genetic diversity of plant populations. For many flowering plants pollination is achieved by

biotic means, in particular by insects. Bees are the dominant pollinators in most regions with an estimated 20,000 to 30,000 species worldwide (Willams et al 2001).

Flowering plants and the insects that pollinate them evolved together during the Cretaceous period and this mutually beneficial relationship has continued to the present day (Crane 1999, Martin 1975, Roubik 1989). This co-evolution has resulted in anatomical and behavioural fit between the flower and the pollinator (Kevan 1999). Plant communities and pollinators have evolved together to the point where many plant species are entirely dependant upon pollinators, and nearly all pollinators require floral resources for their survival (Schmidt and Edwards 1998). There is a large diversity of animals that visit flowers to forage - not all are effective pollinators; some merely remove the resources (nectar, pollen) without effecting pollination (Huryn 1997). Even amongst those floral visitors that are effective pollinators their efficiency differs based on how well the pollinator fits with the plant in question.

Honeybees are the pre-eminent generalist pollinators as they are able to efficiently exploit a very wide range of floral resources (Schmidt and Edwards 1998) and consistently increase the level of pollination in many crops; hence their widespread use for this end (Huryn 1997). Though they are found to be less efficient at pollinating certain plants than specialist pollinators some studies have shown honeybees to not adversely affect plant reproductive success, perhaps the large numbers of honeybees and their strong constancy to individual plant species compensates for their lower efficiency (Dupont et al. 2004, Huryn 1997).

Honeybees are the most valuable pollinators in agricultural systems (Kevan 1999). The value of the pollination service provided by honeybees far exceeds the value

of the hive products harvested and is vitally important for many crops (Adjare 1990, Kevan 1999). The estimated annual value of this pollination service in the U.S. is US $6-8 billion and the annual estimate worldwide is US $ 65-70 billion (MMA 1999).

Honeybee Habitat

Modern agricultural practices are thought to be negatively impacting native pollinator populations; specifically the conversion of land to monoculture crops alters areas such that they are no longer suitable habitat for native pollinators, this may be the greatest factor negatively affecting native pollinator populations. Despite the relatively low level of agricultural technology employed in most of Kenya the density and intensity of agricultural development in some areas (i.e. Kakamega District) is such that habitat for native pollinator species is being lost.

Non-crop forage is of high value to native pollinators. These plants provide food for the pollinators during the periods before and after crop plants are in bloom. Furthermore the areas where these plants grow provides undisturbed habitat for nest sites of native pollinators. Modern agriculture tends to undervalue such areas and where economically feasible replaces diverse plant communities with monocultures (some of which are incapable of sustaining populations of native pollinators), thus the habitat for native pollinators is destroyed. In areas where this practice has occurred populations of native pollinators have suffered and so have crop yields as the number of pollinators available to the crop declined (Kevan 1999).

Habitat for bee species must at the minimum consist of rewarding patches of floral resources and suitable nesting sites (which vary between species) within flight

range of each other (Cane 2001). For many bee species due to the length of time that their colony (or individuals) live their foraging seasons will persist for a longer period than any one species of plant may flower, thus they require patches of various flowers that bloom at different times of the year (Cane 2001). This is the case in the tropic where bees can be active year round.

Habitat fragmentation is a term usually used to describe a patchwork of suitable habitats separated from each other by areas of unsuitable habitat. For winged pollinators such as honeybees a patchwork of habitats may be entirely suitable provided the patches are not separated by such distances so as to prohibit the pollinators from moving from one patch to the next and back (Cane 2001).

Honeybees tend to be more insulated from the effects of habitat destruction than other pollinators by virtue of their frame-hive which are of course not subject to the same consequences as wild bee colonies that make their homes in natural hollows of trees that may be felled for timber or firewood. Nonetheless, honeybees are affected by the removal of natural vegetation that provides forage for the colony when domestic crops are not in bloom (Kevan 1999).

Seasonal Behaviour of Tropical Honeybees

In the tropical zone the annual flowering cycle is largely regulated by the rainfall pattern, and is more complex than in temperate zones as temperature is not such an important factor for triggering flower production. Typically in tropical areas with bimodal rainfall patterns (characteristic of equatorial regions) there are two main dearth periods for the bees per year – these are the rainy seasons, and two corresponding seasons

of great nectar availability that follow the rains. During the rainy season the ambient temperature is lower than during the dry season this keeps the bees inside the hive, and nectar becomes diluted by the rainwater and thus less desirable for the bees. With the end of the rains many plants begin to flower and provide the nectar and pollen that the bees require. The weather conditions are typically favourable for bees during this period as days are usually sunny and warm. The post-rainy period is the tropical equivalent of the 'nectar flow' in temperate zones though the bees tend to store less honey in the tropics during these periods than in temperate zones, In tropical areas dearth periods are not always caused by the rains, drought conditions also cause a dearth of resources needed by the bees, this is typical of arid and semi-arid regions of Africa (most of Kwale is such an area), though in these conditions colonies are more likely to migrate to areas receiving greater amounts of precipitation.

Beekeeping Technologies

Log Hives

In Kenya the most common type of hive in the country is the traditional log hive. The log hive is constructed by first felling a tree of a suitable species and diameter; the tree is then bucked (de-limbed) and sawn into sections that typically measure 1 – 1.5 meters in length. The logs are then split in half lengthwise. The inner part of each half is then chipped out leaving thick outer walls, until the end product is a pair of troughs; the two troughs are then fitted back together to form a hollow cylinder, closed at both ends. If the ends of the hive are not closed then covers are constructed and attached with wire or wooden pegs. Holes for the bees to enter and exit are drilled into the hive. The hive is

then 'treated' by the beekeeper with local plants to attract a swarm and placed in a tree where it will be more easily located by scout bees, and may benefit from the shade of the tree (though many trees in semi-arid areas of Kenya loss their leaves during the dry season when the hive most needs the shade), as well by placing the hive in a tree it is relatively safe from predators and thieves.

Log hives are the cheapest hive type as they are usually made by the beekeepers themselves from materials acquired at minimal cost, though they are also sold usually for about 1000-1500KES. Log hives are typically very strong and durable. Beekeepers select certain species of trees to make their hives out of and many traditional beekeepers have hives that they have used continuously for more than 30 years.

Log hives also tend to be quite large and as such they allow for the bees to store large quantities of honey, traditional beekeepers often harvest as much as 20 litres from a single hive. However, beekeeping with log hives makes it difficult to know the best time to harvest because the hives cannot be opened for inspections as the bees fix their combs to the walls causing some of them to break when the hive is opened.

The traditional method of extracting honey from the combs involves either squeezing the combs or melting them so that the wax and honey are collected in a single container; less skilled beekeepers may also include the brood combs containing brood and water, these will make the honey more perishable. More experienced beekeepers typically squeeze the combs and then strain the liquid through a series of cloths to remove particles. If the beekeeper melts the combs the liquid is collected in a container and left to cool with the beeswax hardening on top of the honey. The beeswax is then removed (and often discarded) so that the honey can be collected. This method can result

in poor quality honey, if the honey is heated to too high a temperature, or if the honey becomes contaminated by exposure to smoke, ash, and dirt from the fire, causing it to have a smoky and bitter flavour. Another problem with the traditional methods of honey harvesting is that the honeycomb is taken or destroyed requiring the bees to expend time, energy, and resources rebuilding the honey combs before they can begin to produce honey again, this situation can lead the bees to abscond, especially if the climatic conditions at the time are unfavourable. Additionally by harvesting the brood combs the beekeepers can significantly reduce the colony's population, which can promote the absconding of the surviving bees.

Kenya Top-Bar Hive

During the 1960s there were attempts to improve the productivity of beekeeping in tropical Africa. One such attempt was the development of the Kenya Top Bar Hive (KTBH) in 1965 by C. J. Tredwell and P. Paterson at Guelph University who built a hive based on the top bar design that was used in ancient Greece. Their top bar hive was a shallow rectangular wooden box with sloping long sides. The top-bar hive is similar to a Movable Frame Hive except that instead of frames there are top-bars that the bees build their combs hanging down from. All the top bars are the same length and width therefore they are interchangeable. The top bars are made to a specification of 35mm wide so that the bees build only one comb attached to each top bar. They are also made so that they fit close together, thus no bees can fly out when the hive cover or roof is removed, when a top bar is lifted, the bees can only fly out of the 35mm wide gap created by the top-bar's removal, this makes the bees easier to control with smoke, an important concern for

beekeepers in tropical Africa who have aggressive bees and limited access to protective clothing.

The KTBH can be inspected in much the same manner as a Langstroth hives because the comb is fixed only to the top-bar and not the hive walls (as in a log hive), however, the comb is only attached on one side – at the top, it can therefore be easily broken, especially by novice beekeepers as it is supported only on one side as opposed to four in a Movable Frame Hive. The honey cannot be harvested in a centrifuge, it can only be harvested by destroying the honey combs which decreases the efficiency of the hive for honey production, but like the log hive it produces good quantities of wax.

The KTBH may be seen as an intermediate technology that has been adopted as a compromise between modern and traditional beekeeping. In Kenya the KTBH has been widely introduced by the Kenyan government and development organizations. Top-bar hives are relatively cheap and can be made from locally available resources, with minimal technology; there is only one measurement that must be exact - the 35mm width of the top-bars (top bars should also have a ridge going along the middle of the underside to guide the bees in building the combs). KTBH hives typically cost between 2000 – 2500 KES.

Movable Frame Hives

Modern hives are based on the discovery by Lorenzo Lorraine Langstroth that when bees build their combs they always leave exactly the same amount of space (the 'bee space') between them. Modern hives have frames separated by this bee space, in which bees can build their combs. The frames are arranged so that they can be removed

individually without disturbing the other combs or crushing bees. This design also allows for several contiguous hive boxes to be stacked one atop another, with the queen confined to the lowest (brood) chamber by means of a small doorway called a 'queen excluder' that is too small for the queen to pass through though all other bees are able to use it. Because of this the upper boxes (supers) can only be reached by workers and therefore contain only honey-comb.

MFHs were introduced to Kenya in 1928, and by 1962 European settlers operated over 1000 such hives in the country. There are currently successful beekeepers using MF hives in Kenya though these are mostly hobbyists and operate on a limited scale (Paterson 2000). MFHs were not adopted by local beekeepers, due to the cost of the hive and the equipment required, and the fact that it was an unfamiliar technology, which could not be used in the same manner as traditional hives (hung in trees distant from each other) (Crane 1999). From 1967 on, the KTBH became the accepted hive for development projects in Kenya and was promoted both by the government and NGOs. This turned attention away from the MFH in Kenya and many African countries (Crane 1999). Where MFHs were introduced to local beekeepers it was usually by government or NGO projects that often were only successful while there were motivated individuals from the government department or NGO there to manage the project, and the projects usually deteriorated after the individual left (Crane 1999). MFHs are used successfully in North and South Africa, their record has not been so promising in Central Africa though there are examples of successful MFH beekeeping in Central Africa besides the HCA case such as in Rwanda and Burundi (Paterson 2000).

Plate 24: HCA apiary, Bukhungu

Plate 25: Shade woven from palm leaves, Mgandini

Plate 26: Traditional log hive, Ileho

Technology in Transition

The beekeeping sector is undergoing change in Kenya. Where once it was dominated by traditional beekeepers, other hive technologies (top-bars and movable frames) are starting to replace log hives. This is not the result of superior economics for more advanced hive designs as due to the low cost of log hives they tend offer the best economic return to their owners (Paterson 2004, Saville 2004). The decline in traditional beekeeping is primarily driven by theft (Paterson 2004). As the country becomes more densely populated traditional beekeepers are unable to place their hives over a wide area, the only safe place for their hives is close to their homes, which limits the number of hives that a traditional beekeeper can effectively keep. This was a common response amongst traditional beekeepers in both Kakamega and Kwale to explain why they keep fewer hives than they did in the past. Another reason for the decline in traditional beekeeping is that suitable trees to make log hives are becoming scarce in many areas of the country. The HCA system of beekeeping offers one alternative that can help to make up the shortfall of honey production and pollination services from the decline in traditional beekeeping.

Making the transition from a form of beekeeping that employs hives placed at low density (log hives) to one where hives are grouped close together in a high density apiary (KTBH, MFH) necessitates reconsidering some features of bee behaviour that were irrelevant under the low density system. One consideration that becomes important in the situation of an apiary is that bees will rob from other colonies of bees; this can become more prevalent when colonies are in close proximity and resources are scarce (Crane 1999). Similarly bees may fight over resources close to the apiary resulting in bee

mortality. This is most commonly a problem when improper feeding techniques are used – such as placing a bowl of sugar syrup in a central place in the apiary. By use of proper feeding techniques the problem of bees fighting over resources can be avoided - the bee food should be placed in a bowl under the lid of each occupied hive so that it is only accessible to bees in that hive.

Another aspect of bee behaviour to be considered is 'drifting', this is where bees return to a different hive from their own, and this can be a possible vector for disease or parasite transmission. Bees tend to drift into colonies at the end of a row, causing the populations of these colonies to swell at the expense of other colonies, which will become weaker, and in some cases may even die (Crane 1999). These factors are of particular concern for an operation such as HCA, especially as it is operated in Kakamega where there are numerous hives belonging to different people kept in the same apiary, often in rows which can promote drifting. Drifting can be controlled by arranging the hives in shorter rows and orienting them so that the entrances are not all facing the same direction, this will make it easier for the bees to distinguish 'their' hive from the other identical hives next to it.

Tropical Honeybee Management

There are a number of special considerations for tropical beekeepers that Crane (1990) outlines. In most areas hives must be kept as cool as possible (under permanent shade) as it is hot for most of the year and the sun is always high in the sky at midday. Tropical bees do not store as much honey as temperate bees do for times of dearth often preferring to abscond rather than wait for conditions to improve. Colonies of tropical

bees do not tend to grow as large as colonies of temperate bees do, and reproductive swarms are produced from relatively small colonies.

Feeding bees may be necessary to prevent colonies from absconding during times of dearth. Bees can be fed with syrup made of sugar and water, or alternatively syrup made from the juices of sweet fruits such as oranges or mangos, bees will even feed on damaged ripe mangos that have fallen to the ground (Crane 1990). The later may provide a convenient source of bee-food for beekeepers, as damaged fruits are not suitable for sale and mango trees are relatively common throughout much of Kenya - including both Kwale and Kakamega districts. In Kwale beekeepers were observed feeding bees with mangos. In Kakamega some beekeepers use jaggery to feed bees. Though, in general most Kenyan beekeepers do not feed their bees, as this was not traditionally done with log hives and has only been introduced as a management technique with KTBHs and MFHs.

Movable frame hives have certain advantages, for example bees are stimulated collect nectar if the hive contains combs with empty cells (Crane 1990). Thus adding a super can encourage bees to producing more honey to fill the empty combs. The extra space in the hive that is provided by adding a super has other benefits as well, by providing more area the hive temperature is lowered (a key consideration for equatorial beekeepers) and the extra space reduces the tendency of the colony to swarm. However, if the colony is weak, they may not be able to defend the larger area from pests such as the wax moth or ants (Crane 1990).

Heat can be a serious problem for African beekeepers. Colonies will make all efforts to maintain a constant temperature in the brood nest of about 35C (Crane 1990).

Thus if the ambient temperature is higher than this the colony will focus its effort on cooling the hive, diverting both energy and time that the bees could be foraging away from the collection of nectar and the production of honey. Therefore it is in the best interest of the beekeeper to provide shade for his hives so as to maximize the time and energy that his bees spend foraging.

Due to the high rate of reproductive swarming and of absconding by colonies of tropical *Apis mellifera* traditional beekeepers have typically populated their hives by catching swarms. In some areas bees fly along the same route during the same season each year, and experienced beekeepers sometimes become aware of these migratory paths and set out their hives to catch swarms accordingly (Crane 1990). HCA uses such a system to colonize their hives, often involving traditional beekeepers so as to capture their knowledge in this respect.

Bee Pests in Kenya

One of the most formidable bee predators in Kenya is the honey badger or ratel (*Mellivora capensis*), of which there are 15 subspecies worldwide. Honey badgers most likely discover bee nests by the sound, though they are also able to follow honey-guide birds to locate bee nests (Crane 1999). Honey badgers are very strong, they are able to bite and claw their way through the dead wood of a hollow tree that wild bees may nest in (depending of course on the thickness and type of wood), they also will dislodge traditional hives from their perches in trees and feed on the combs that become exposed from the hives' impact with the ground (Crane 1999). They are quite capable of destroying MF hives and this is a problem in areas where honey badgers are prevalent.

Ants are another serious threat to beekeeping in Africa, and one of the most significant pests to be dealt with in Kenya (Paterson 2004). Ants will rob a colony of its honey and sometimes kill bees in the process. Luckily, ants can be controlled. The goal-post system that HCA uses is quite suitable for controlling ants – the important aspect is preventing the ants from reaching the hives by hanging them from greased wires, which the ants cannot climb down. If the wires are not greased then they will not prevent ants from robbing from the hive. Vegetation must also be kept cut back in apiaries tall grass and other vegetation can allow ants to reach hives from the ground – this was a problem in some apiaries in the Kakamega HCA project.

Wax moths also a problem for beekeepers in Kenya. Wax moths are a pest that a strong colony should repel, but to which weak colonizes are susceptible. The female wax moth enters the hive and lays her eggs in the combs. The eggs hatch in three days and the larvae eat the wax and tunnel through destroying sections of the comb. They spin web-like cocoons around themselves to protect themselves from the bees. When the infestation becomes great enough the bees will abscond from the hive. The wax moth when it changes into its pupal stage it will damage the hive when it digs a hollow in the wood of the hive body or frame for its cocoon. Wax moths must be removed from the hives by beekeepers during inspections, and all traces of their cocoons must also be removed and the inside of the hive must be thoroughly cleaned.

Apiaries

Beehives are typically grouped together in apiaries for ease of management. Typically MFHs and KTBHs are kept in apiaries, log hives are usually not kept in

apiaries but rather scattered about in trees, though in some cases there are log hives put into apiaries, usually for security reasons.

Characteristics desirable in apiaries:

- Security of the hives and the bees inside from damage by animals both domestic and indigenous, as well as from human theft or interference. A live fence of trees or shrubs can provide some security as well as protecting the hives from the heat and wind.
- Relatively short distance for the beekeeper to walk to or otherwise access.
- Suitable distance from people's houses in case the bees become disturbed.
- Shelter from extreme heat (shade).
- Suitable forage that is within the bees' flight range for as much of the year as possible.
- Adequate distance from other apiaries so that there is not too much competition for resources.
- Suitable and reliable water source nearby, or alternatively the possibility of providing water within the apiary on a regular basis.

Appendix C: Questionnaire Surveys for semi-structured interviews

Interviews with NGO/Government Personnel

Self-Organization

1. What are the objectives/goals of your organization?
    a. How are these related to your involvement with the Honey Care beekeeping project?
2. How has your organization/office contributed to the success of the project?
3. Is there anything else your organization/office could do to contribute to the success of the project?
4. What social impacts have you witnessed that have resulted from the project?
5. Which individuals/groups were key in getting support from your organization/office?

Cross Scale

1. At what level of your organization/office does interaction with Honey Care, the community, government/NGO take place?
2. What is the substance of your interaction with communities that are keeping bees with Honey Care?
3. Has your involvement with the project had any impact on your organization/office? (changes of procedure, learning, new contacts, etc.)
4. What other groups are important to the success of the project?
    a. How do you collaborate with these groups?

Environment

1. Do you have any concerns about how changes in the local environment will affect beekeeping?
2. Are there any activities in the area that you feel are potentially harmful to beekeeping?
3. Have there been any changes in the local environment since the beekeeping project started?
4. What do you think the potential is for the beekeeping project to replace other more environmentally destructive activities as a source of income in the communities?

Honey Care

1. What is your general impression of the Honey Care project?
2. How do you think the project could be improved?

Interviews with HCA Beekeepers and other Community Members

General

1. How many years have you been keeping bees with Honey Care?
2. How many hives do you own?
3. How much time per week do you spend tending to your hives? (*Apiaries only*)
4. Have you been able to pay back the loan /recover the cost of your hives?
5. Had you ever kept bees in the past with a different type of hive?
6. What difference do you think this type of hive makes compared to traditional hive/KTBH?
    a. Is the Langstroth hive more profitable in terms of the price of honey vs the cost of the hive than other types of hives?
7. How many acres is your shamba?
8. What types of crops and animals do you grow/have on your shamba?

Self-Organization

1. How did you first hear/learn about Honey Care?
2. Why did you decide to become involved with the project?
3. What led to the founding of this group?
4. What are the objectives/goals of your group?
5. At what level of your group does interaction with Honey Care, NGO, government take place?
6. How has your organization contributed to the success of the project?
7. What other groups are important to the success of the project?
    a. How do you collaborate with these groups?
8. Did pre-existing organizations (NGO's local authority, government) play any role in the promotion or forming of the group?
    a. Did the role of any of these institutions change over the course of the project?
9. How is your group structured?
10. How is your group supported financially 1
11. What are the activities of the group?
12. How has your group changed since it was started? (more members, different goals/activities)
    a. What led to these changes?
13. Have you learned anything new from your involvement in the project?
14. What benefits and costs do farmers have from being part of this group?
15. Which people were important in organizing the project in the community?

Cross-Scale

1. Is your group connected with similar groups/projects in other communities in the district/division?
    a. What is the substance of your interaction with these communities?
2. How has involvement with Honey Care, NGO, government due to the project affected your group?

Environment

1. Do you have any concerns about how the changes in the local environment will affect beekeeping or your other economic pursuits?
2. Has beekeeping affected your view of the local environment?
3. Has beekeeping had any impact on the way you do your farming?
4. Have your economic activities changed at all as a result of your involvement with the beekeeping project?
5. Are there any activities in the area that you feel are potentially harmful to beekeeping?
6. Have there been any changes in the local environment since the beekeeping project started?
7. What do you think the potential is for the beekeeping project to replace other more environmentally destructive activities as a source of income in the communities?

Honey Care

1. What is your general impression of the Honey Care project?
2. Have you benefited from your involvement in the project?
3. How do you think the project could be improved?