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**DIVERGENCE OR CONVERGENCE? LOCAL ENVIRONMENTAL KNOWLEDGE,
SECONDARY SCHOOLS, AND ENVIRONMENTAL EDUCATION IN TANZANIA**

by

Christian M. DaSilva, B.E.S., B.Ed

A Thesis submitted to the Faculty of Graduate Studies and Research in partial fulfilment of
the requirements for the degree of

Master of Arts

Norman Paterson School of International Affairs

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Abstract

Based on research conducted with secondary schools and local people in four rural Tanzanian communities, this paper explores the linkages or absence of linkages between the environmental knowledge base of local people and the environmental education curriculum in schools. The environmental education curriculum is observed to be highly conventional and Western-knowledge based in terms of scientific principles and approaches, while the local knowledge base consistently refers to more esoteric spiritual or traditionally held concepts about the interaction of people and resources. The degree to which local environmental knowledge has been marginalized in favour of a Western, reductionist, objective and positivist framework is severe, and the gap observed between secondary schools and communities is significant. The use of Relaxed and Participatory Rural Appraisal Methodology (RRA/PRA) is found to be an appropriate research mechanism for documenting local or traditional environmental knowledge and analyzing the gap between this knowledge set and formal education.

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Newly emerging nation states in Africa, now governed by Western educated elites, have sought to transform peasant-based, traditional societies into competent players in a modern world by adopting the educational methods, content, and underlying value systems of their European colonizers. Attempts at "Africanisation," most notably those advocated by the early post-independence government of Tanzania, have withered and ultimately failed in the face of internal and external pressures to modernize rather than "Africanise."

Recently, two significant and related notions have become fashionable on the world stage. The first - sustainable development (SD) -- dominates the current development literature, often times obscuring the repetitive ideas of modernization, but sometimes revealing a measure of cultural revival and resistance that holds out the promise of a role for voices and ideas long marginalized by "experts." The second more modest idea is that which involves the re-vitalization and advocacy of EE as a means of dealing with environmental stress and degradation brought on by the processes of development and modernization.

Both SD and EE are fraught with contradiction. For example, Redclift (1987) argues that the use of the word sustainability to refer to a desirable objective "has served to obscure the contradictions that development implies for the environment." Unsustainable practices are rooted in the international economic system and sustainable development does not disavow capitalism as a form of economic organization.

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List of Abbreviations

FE	Environmental Education
GDP	Gross Domestic Product
HCT	Human Capital Theory
IEEP	International Environmental Education Programme
ICD	Institute of Curriculum Development
IK	Indigenous Knowledge
LEK	Local Environmental Knowledge
NEMC	National Environment Management Council
NEC	National Examination Council
NGOs	Non-Governmental Organizations
SD	Sustainable Development
UN	United Nations
UNEP	United Nations Environment Programme
UDSM	University of Dar es Salaam
WCED	World Commission on Environment and Development
WCST	Wildlife Conservation Society of Tanzania

Tanzania

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Regions and Districts of Tanzania

CHAPTER ONE INTRODUCTION

Recent awareness of the gravity of worldwide environmental problems, as evidenced by the United Nations (UN) summit on Environment and Development in 1992, has led to the rapid introduction of environmental concepts into subjects in the Tanzanian secondary education curriculum. This infusion of environmental education (EE) has outstripped the ability of policy makers and educators to reflect upon the content of EE materials in terms of their relevance to local or even national environmental issues and perspectives.

Due to the rapidity with which EE is gaining popularity, the idea of exploring local environmental knowledge in contrast with the concepts being taught in Tanzanian classrooms seemed timely. I hypothesized that a rich and varied, but highly marginalized, local environmental knowledge (LEK) existed at the community level that could be mixed with school-based efforts to the ultimate benefit of students, community members and, of course, the environment. To explore this hypothesis, my study looks at the teaching of EE in four secondary schools in the Tanzanian communities of Mtwara, Marangu, Sameh¹, and Morogoro, and contrasts the content of these programs with the LEK of the communities immediately adjacent to the schools. The study involves an examination of

¹To avoid confusion with the english word "same," I have taken the liberty of spelling the community name of "Same" phonetically so that it appears throughout the document as "Sameh "

school curriculum, teaching, school policies and structures, Western and indigenous knowledge systems, and various aspects of the "development" process generally.

1.1 Overview

It can be argued that the term "development" has become virtually synonymous with "modernization", and that the very thrust of conventional development thinking has been firmly based on a Western, reductionist, positivist, and objectivist² world view and system of knowledge (Banuri, 1990, Butz, 1991, Kabeer, 1994, Nyerere, 1982, Odora, 1992, Redclift, 1987).

This fundamentally reductionist, objectivist, and positivist framework, originally applied to the understanding of natural phenomena, has become well entrenched in dealing with social analysis where it is used to posit essentially narrow views of how things work. Extending the metaphor of a machine to the study of society, says Kabeer (1994:73), "has led to the partitioning of social reality into its component parts and an insistence on the separability of these parts -- of politics, culture, and economy." The role of education in "development" has served to further entrench scientific reductionism with repeated attempts to secure the promised benefits of modernization processes -- for politicians who insist upon them, and parents and students who desire to have them.

²Reductionism asserts that an understanding of complex phenomenon can be achieved by observing and analyzing elemental events. Objectivism dictates that the observer must separate his or herself from the phenomenon being observed, and positivism says that what is measurable is scientifically real and what is scientifically real is measurable (Wolfe, et al, 1991:11)

Newly emerging nation states in Africa, now governed by Western educated elites, have sought to transform peasant-based, traditional societies into competent players in a modern world by adopting the educational methods, content, and underlying value systems of their European colonizers. Attempts at "Africanisation," most notably those advocated by the early post-independence government of Tanzania, have withered and ultimately failed in the face of internal and external pressures to modernize rather than "Africanise."

Recently, two significant and related notions have become fashionable on the world stage. The first - sustainable development (SD) -- dominates the current development literature, often times obscuring the repetitive ideas of modernization, but sometimes revealing a measure of cultural revival and resistance that holds out the promise of a role for voices and ideas long marginalized by "experts." The second more modest idea is that which involves the re-vitalization and advocacy of EE as a means of dealing with environmental stress and degradation brought on by the processes of development and modernization.

Both SD and EE are fraught with contradiction. For example, Redclift (1987) argues that the use of the word sustainability to refer to a desirable objective "has served to obscure the contradictions that development implies for the environment." Unsustainable practices are rooted in the international economic system and sustainable development does not disavow capitalism as a form of economic organization.

Similarly, environmental education is a term which conjures up visions of a panacea - a progressive subject which teaches values and practices with the potential to reverse environmental degradation and promote harmonious and sustainable living. While EE cannot single-handedly lead to political, social or economic reform to the well-entrenched power structures of schools or states, it may have the potential to engender in people, particularly younger generations, an awareness and critical analysis of environmental problems, including their systemic root causes and possible solutions. It could be argued that the potential for EE to be an agent of change is even greater if the environmental concerns, beliefs, and ideas of local populations are recorded, acknowledged, and incorporated into EE initiatives targeted at those same populations or at people who will play important roles in the civil institutions that impact on local people.

In exploring this hypothesis, data are presented to illustrate the considerable gap which currently exists between local and school-based knowledge systems. I will argue that environmental education can and should be positioned as an alternative "wedge" within the Tanzanian secondary education system in an effort to highlight environmental issues, degradation, and resource management strategies, through a better understanding of the traditional environmental knowledge base found at the village and community levels. I will argue that EE can serve as a counter balance of community-based relevance to the dominant educational system rooted in the political economy of modernization and global capitalism, by acknowledging and valuing local knowledge systems. The following problem statements establish the fundamental questions addressed in this research:

1.2 Problem Statements:

1) With respect to the sustainability of rural communities, what level of congruity exists between local environmental knowledge and the environmental education efforts in Tanzanian secondary schools? 2) What are the epistemological, structural, institutional and policy issues affecting the school-community relationship with respect to local environmental knowledge and environmental education?

The answers to the problem statements shed light on the role of the Tanzanian secondary school in the community and the linkages, or lack thereof, between the epistemologies which form the basis of community and school-based knowledge about the environment respectively.

1.3 An International Perspective on Environmental Education.

Interest in EE has increased recently, due in part to the high profile EE received during the 1992 "Earth Summit" in Rio de Janeiro, Brazil and in the subsequent Agenda 21 document. This conference generated new impetus for "the development community to take a reflective look at the role indigenous knowledge systems can play in the...efforts to better understand the cultural and ecological dynamics of sustainable development" (Lalonde and Akhtar, 1994). In an atmosphere of high expectations and hopes for concrete solutions to gripping environmental problems, EE re-emerged as a relatively innocuous and politically palatable catch-all.

I say "re-emerged" because EE has been prominent on the world stage several times

before³. Beginning in Stockholm in 1972, a series of international conferences have, to varying degrees, dealt with the development, promotion, and legitimation of EE (for example, Stockholm, 1972, Belgrade, 1975, and Tblisi, 1980). Inspired by the Belgrade conference on EE in 1975, UNESCO and UNEP joined forces to create the International Environmental Education Programme or (IEEP). The IEEP is mandated to define EE, formulate goals and objectives, and design strategies for the development and promotion of EE among member states (Schneider, 1992). The IEEP also aims to promote values, attitudes and behaviours which foster ethics and responsibility with respect to the environment. Since the "Earth Summit," the IEEP has been further mandated to re-orient its EE work toward sustainable development.

Though the existence of the IEEP says much about the severity of environmental pressure and the international resolve to utilize education as a way of addressing environmental problems, the scope of the IEEP is too broad to utilize locally specific knowledge in curricula development⁴. The program has been successful in raising awareness, linking educators and policy makers, and developing general curriculum material to support national initiatives, but it has had little reach beyond that level. Therefore, in this research, it is the content, quality, and application of nationally designed EE curricula

³ For an extensive history of environmental education in the United Nations, see Meadows (1989:61-2).

⁴ In a paper entitled "What relationship do you see between "economic development and cultural and religious values and belief systems?," William Ryan (1995) concludes that development theorists from developing countries "generally see UN agencies as too bureaucratic and beholden to individual governments to deal with sensitive areas of research such as the relationship of local culture and religious values to development." People interviewed for this IDRC sponsored study expressed the hope that IDRC and other development institutions would "pioneer research . . . [about] the role of religious (spiritual, ethical) values and systems in human development, especially since UN agencies seem unable to handle it adequately"(1995:4)

vis-a-vis local communities that is investigated.

1.4 Toward a Critique and Definition of Environmental Education

As Jickling (1992) says, "...the field of environmental education...[is] a treasure hunt for an infinitely illusive abstract object"(1992:6). Although the term EE is used with apparent ubiquity by practitioners, policy makers, and researchers in many parts of the world, it lacks specific definition and clarity. The scope of EE ranges from international to local, informal to formal, and with as many different issues and approaches as there are programs. EE programs tend to emphasize multi and interdisciplinarity in the analysis of issues and solutions which is beneficial on the one hand, but which can also introduce new weaknesses. For example, Rathegeber (1994) argues that these multidisciplinary approaches are often "gender blind," assuming that all persons in a community have "more or less the same relationship with the surrounding environment" (1994:2), which is clearly not the case⁵.

Taking a "narrow" view of EE as practised in formal secondary school situations, it must be recognized that EE is just another branch of the education system, the main purpose of which is "the replication of society and the maintenance of a stable social order" (Fitzgerald, 1990:292). One must not be seduced by the ameliorative connotation of the

⁵For example, Ketel (1993) argues that the terms "gender" and "environment" are social and cultural constructs, where perceptions of the environment are dependent on human interaction in the environment. This being said, the sexual division of labour -- where women are responsible for fuelwood collection, agricultural activities, etc -- will lead to a highly differentiated relationship among men and women with respect to the environment(Rathegeber, 1994:5)

term "environmental education," for, like most developments in education, content and philosophy are "determined first and foremost by a mutually reinforcing mixture of power and money (Fitzgerald, 1990:292), while the influence from moral and ethical forces is limited. On the other hand, EE can be defined personally, locally, even nationally, and it can be viewed as a "starting point" in achieving environmental sustainability.

In establishing a definition of EE in the formal educational sector, I offer the following outline: Some EE programs are limited to disciplinary boundaries, while others attempt to bridge the natural and social sciences. EE can focus strictly on the physical processes at work in the natural environment, as is usually done in biology, physics and physical geography, or it can focus more on the human, social and economic systems which draw upon and influence natural systems. The latter approach would be more typically found in social studies, civics, and human geography. A further "school" of thought advocates an activist role for EE in changing human attitudes and behaviours to minimize human impact on the environment. All forms of EE can benefit from using the actual outdoor environment as a classroom to demonstrate processes, concepts, or to view impacts of human-environment interaction, whether they be positive or negative. To establish a point of reference for EE in this paper, I will adopt a definition by Johnson (1992). He writes.

A well designed EE programme should provide students of whatever level with learning experience that will enable them to develop the following: a) Intimate knowledge of ecological parameters, their nature, characteristics as well as means of qualitative and quantitative assessment. b) the ability to predict likely changes in the environment. c) the ability to propose suitable adaptive responses to changes in the environment and to appreciate and assess the limitations of such responses. d) ability to influence the power structure in communities in favour of making effective responses to environmental changes. e) critical thinking (1992:9).

1.5 A Special Role for Environmental Education in Developing Countries

Only 4% of all Tanzanian students were enrolled at the secondary level in 1991 according to the World Bank, (1994). The Tanzanian Ministry of Education (MOE), on the other hand, reports total secondary enrolment in public schools to be only 2.14% of total enrolment in 1992. The high World Bank figure may include private school enrolments. However, the paucity of accurate statistical data from Tanzania makes it difficult to be more precise. Whatever the true figure, it is clear that few students attain a secondary school education, and a much smaller fraction continues their studies at university or other post-secondary institutions. As a result of these prevailing educational demographics, secondary school graduates in Tanzania fill the majority of positions in the government and private sector.

Consequently, while EE is crucial at the primary levels, it is even more essential in secondary schools since graduates of this system will become important "change agents"-- the new teachers, municipal administrators, or agricultural extension officers of Tanzania. The secondary school as an institution has an extremely important role to play

in building awareness and linkages between students and local communities. Secondary school graduates must be willing to listen and able to dialogue about environmental concerns and possible solutions in a way that is cogent with the views of local people farmers, peasants, artisans etc. A serious examination of LEK, its methods of transmission, and means of survival through an EE curriculum in secondary schools may prove effective in establishing this dialogue.

Thai environmentalist, Witoon Permpoonngsacharoen (1992), suggests that basic questions be asked with respect to EE and local communities such as: what are the causes of environmental problems? Where do poor people fit in? How are they affected by environmental degradation? What do *they* [my emphasis] think about these problems? Conducting formal EE from a bottom-up perspective, therefore, necessitates more active and participatory strategies which, in turn, will lead to a more holistic understanding of issues.

People must be able to exchange information and ideas from what Gallopín (1991) calls the same "socio-ecological" perspective. Ideas that incorporate local ways of knowing, both in the description and amelioration of a problem, will be more effective and more readily accepted. Since EE acts on the values, attitudes and behaviours of learners, it is incumbent on the education system to ensure that EE reflects the values, attitudes and behaviours of the communities in which schools are situated. This paper explores the extent to which a socio-ecological dialogue is helped or hindered by the current school

community relationship.

1.6 Defining Local Environmental Knowledge

There is considerable mixing of terminology in the literature dealing with non-western knowledge systems. Traditional ecological or environmental knowledge (TEK) and indigenous knowledge (IK) are two examples of more commonly used expressions. The differences are mostly semantic, though some definition is warranted. Strictly speaking, traditional ... "refers to cultural continuity transmitted in the form of social attitudes, beliefs, principles and conventions of behaviour and practice derived from historical experience" (Berkes, 1993:3). Societies, however, continuously react and adapt to exogenous factors. The word "traditional" implies a more static experience which minimizes the usefulness of the word "traditional" in describing a dynamic, adaptive knowledge system.

Similarly, "ecological" knowledge is too narrowly confined to the disciplinary boundaries of biology or botany. A preferable definitional framework for this paper is a term which acknowledges contemporary influences on indigenous knowledge systems, but also encapsulates the socio-ecological dynamic -- something more akin to what Levi-Strauss has called the "science du concret" or native knowledge of the natural milieu (Birkes, 1993:3). Therefore, although many of the above mentioned terminologies will appear throughout this paper, the term I will use for the presentation of original material is local

environmental knowledge (LEK).

1.7 Local Environmental Knowledge as Environmental Education

Is there evidence that by recognizing and trying to utilize LEK in school curricula, environmental degradation might be reversed and societies moved further along the continuum toward sustainability? There is arguably a clear pattern of survival that suggests highly specialized and valuable local knowledge or wisdom. Again, Witoon Permpoonngsacharoen (1992), in speaking about educational alternatives in the Thai environmental movement, says:

Environmental education that builds on local knowledge in a way that is both appropriate and effective for solving current problems must start from the recognition that local people possess wisdom about dealing with their environment. Otherwise, how could they have survived for so many centuries, or in some cases, millennia? As such, the educator is obliged to study existing knowledge in order to understand how problems are dealt with traditionally (1992:4).

Admittedly, many traditional practices characterized as LEK are no longer sustainable given increasing populations, dwindling resources, and changing patterns of human settlement, production, and consumption. We must be careful not to automatically assume that what is *traditional* is necessarily sustainable or even desirable. For example, slash and burn agricultural methods, sustainable in a pastoralist culture, may be catastrophic in a sedentary production system. Weaknesses in LEK need to be recognized, but the knowledge system as a whole should not be automatically discounted

or marginalized because of its unconventionality.

Unfortunately, development processes everywhere have often run roughshod over indigenous practices or beliefs. As Redclift (1987) points out, "in the course of development, indigenous environmental knowledge is often lost because it becomes less relevant to the new situation and because it is systematically devalued by the process of specialization around competitive production for the market" (1987:151-2).

Secondary education systems have also specialized, rushing to provide the modern tools needed for market economies, industrial development, and technological innovation at the expense of intuitive ways of knowing. These economically-driven modalities of education are reflective of rational, scientific knowledge, culturally laden with the values and beliefs of western societies more typically detached from, rather than immersed in, the natural environment.

Educators know that just as there are different ways of learning, so too are there unique ways of knowing. Meadows (1989) writes:

Rationality is not the only human gift and it is not the only way of knowing something...a good farmer or forester knows much that is wordless about 'he soils, the plants, the animals, the trees - that understanding comes from familiarity, instinct, intuition, a sort of resonance with or tuning-in-to or empathetic observation of the living world (1989:30).

The challenge with regard to effective EE is to demonstrate its potential as a

transformative and empowering subject; a subject which can promote understanding of local knowledge in a way that permits its systematic translation to more formal settings without losing the intuitive integrity inherent in vehicles such as story telling, songs, dance and metaphor.

1.8 The Organization of the Paper

The remainder of the paper is organized in the following way. Chapter two presents the theoretical framework by exploring the literature around culture in the development process, education for development, and knowledge systems in general. Chapter three establishes the current environmental challenges facing Tanzania, as well as addressing the colonial and post-independence influences, such as villagization and Ujamaa, which have come to bear on the country's current system of education. The efforts at building EE in Tanzania will also be discussed in this chapter. Methodology is the theme of chapter four, where the research strategy and techniques utilized are discussed and limitations acknowledged. This chapter also includes detailed descriptions of the four schools and adjacent communities which formed the subject of the research. Chapters five and six deal with the presentation and discussion of the research findings respectively. Chapter six also includes some "lessons learned" and recommendations for further action and research.

CHAPTER TWO

THE THEORETICAL FRAMEWORK

This chapter will explore the considerable "gap" which exists between local environmental knowledge and the knowledge base which drives EE in secondary schools. The discourse in several related areas of the literature will reveal dichotomies which reinforce the gap between school and community rather than facilitating the sharing and transfer of knowledge which many would argue is critical for environmental sustainability (Barrow, 1991; Kabeer, 1994; Redclift, 1987). The data presented in chapter five will confirm the considerable disjunction between school and community -- a situation which is linked theoretically to the literature presented here. To begin, I will discuss the relevant literature in three broad but interrelated sections.

The framework traces the dichotomy created by the contrast of tradition and modernity through to the respective knowledge systems upon which the definitions of "traditional" and "modern" are based. Finally, the analysis examines the resultant dichotomy in the literature of "education for development." Section one, therefore, concerns culture and development within the paradigm of modernization. This discussion will explore the overarching dichotomy between tradition and modernity. Two related subjects in particular will be explored. The first is the emerging paradigm of sustainable development, and the second concerns environmental management and local participation. Section two deals with the nature of knowledge systems by examining some of the

epistemological differences between LEK and Western knowledge. Finally, section three of the framework concerns the influence of human capital and modernization theories on education in developing countries.

2.1 CULTURE AND DEVELOPMENT

Three decades of post-independence leadership in Tanzania, and indeed, much of Africa have proven insufficient to reverse or substantially change many of the social and economic processes set in motion by three times as many decades of colonialism. Development assistance has become institutionalized on the ground, and on the balance sheets of national budgets, and the economic, social and philosophical dictates of development experts have carried considerable authority over the years.

There have been "development" successes, but there is also considerable evidence of failure. Generally, economic dependence has increased under declining terms of trade and markets controlled by the North⁶. Distribution of material and income benefits of development remains unequal at best, and further concentrated in many cases. Food production is precarious, ill-structured and insufficient for the basic needs of people. "The environmental effects of liberalizing trade and stimulating agricultural exports... will continue to be harmful until more attention is paid to the ecological and cultural systems

⁶Throughout this paper I use the term "North" to refer to the western, industrialized countries of Europe, North America and Japan primarily. Similarly, I use the term "South" to refer to the under-consuming or less developed countries of Africa, Asia, and Latin America. I also use the terms developed and underdeveloped as well as "Third World," though I recognize the definitional problems all of these terms raise.

which convert 'natural resources' into livelihoods" (Redclift, 1987:60). More subtly, there is considerable empirical evidence that indigenous knowledge and techniques developed over centuries are rapidly disappearing⁷ (Arizpe, 1988; Gadgil et al, 1993). The shortcomings of development approaches have been acknowledged by many academics, politicians and development practitioners in both North and South, who are calling for new development strategies. In order for future development efforts to succeed, they say, consideration must be given to the "cultural dimension" of the process. Cultural factors in development include issues of local knowledge utilization, community participation, democracy, and appropriate forms of formal education, among others.

2.1.1 The Impact of Development

Willem Zeylstra (1975:14) argues that the religious origin and ideological content of development theory is reflected in its premise that the ideals of Western civilization are of universal value. "Development" has become a euphemism for modernization which, in turn, has become synonymous with Westernization. Development efforts of the last several decades have largely ignored the cultural dimension of the societies being "assisted," viewing these factors as a nuisance or impediment to modernization. Ironically, because the cultural dimension in development has been ignored for so long, theorists and practitioners are unsure as to how to reincorporate this dimension into

⁷ As traditional peoples become integrated into the global economy, they have lost their attachment to traditional resource catchments, as well as their relevant indigenous knowledge. Gadgil et al (1993) argue that this results in the "feedbacks between ecological carrying capacity, social self regulatory mechanisms, and the shared values of local institutions, (1993:156)" being disrupted.

development work.

Clearly a redefinition of what is meant by "development" is overdue. Thierry Verhelst (1990:63) talks about the search for "homeomorphous equivalents to the term development" -- terminology that would encapsulate the unassailable desire of people to "lead a **good** life" while recognizing culturally relative ways of articulating this desire. The challenge is to "radically relativize the concept of development" (Tooksnider, 1992). This imperative to change begs the question of how "development" has become so problematic? The answer lies partly in its origins.

The post World War II Marshall plan for the reconstruction of Europe is commonly seen as the genesis of the concept of development (Tooksnider, 1992). In the 1950s and early 1960s, "modernization theory" became an important focus of Western, and particularly American, academics and politicians who were anxious to demonstrate to emerging independent nations that development could and should occur under the "wing" of the West, rather than the Soviet Union (Webster, 1990:49). Based on a largely sociological analysis of the relative material accomplishments of traditional vs. modern societies, modernization theory became an expedient addition to the political rhetoric of the post-war, pre-independence climate of the time. Rostow's five stages of economic growth gave modernization theory further economic legitimacy, and a powerful linear metaphor

with which to assert a promise of an economic "take-off".⁸ This linear and mechanistic model was, according to Verhelst (1990), tainted with a strong measure of "social Darwinism". Cultural differences ...[were] merely a question of backwardness" (1990:11) on the developmental road from simple traditional societies to complex industrialized ones. During the 1970s and early 1980s, the basic needs approach gained a high degree of acceptance, particularly among large international NGOs and aid agencies, though the question remained as to who was determining what was needed and where (Streeten, 1987:32).

The decade of the 1980's saw a continuation of concern for basic human needs, but it also marked the arrival of hard-nosed structural adjustment programs coupled to a private enterprise doctrine. Liberal economic thinking was given an enormous boost by the collapse of the Soviet economy. Free trade, macro-economic stabilization, and the control of national government spending, often on social programs, are dominant themes which persist today. The counter-balancing force since the late eighties continues to be the emergence and growing strength of NGOs (Fowler, 1992:16). The discourse of sustainable development and events such as the 1992 "Earth Summit" have added a modest but noticeable voice of resistance to the dominant prescriptions for macro-

⁸Rostow's five stages of economic growth are, the traditional society, the preconditions for take-off, take-off, the drive to maturity, and the age of high mass-consumption (Rostow, 1960:4). According to Webster (1990), Rostow's work was derived from an analysis of the industrial revolution which he defined as a 'great watershed' in the life of modern societies, where obstacles to growth -- such as traditional values and belief systems -- are removed (1990:52)

⁹Morales-Gomez (1991) argues that "social Darwinism" also deeply influenced educational initiatives in Africa during both the colonial and post colonial periods. The dominant paradigm saw the Third-World "as a conglomerate of countries backward in their social organization and in their cultural evolution"(1991:42)-- a situation which was thought to be ameliorated by the propagation of Western-style schooling.

economic adjustment coming from the World Bank and IMF. What is the fate of notions like "indigenous knowledge" and "environmental education" in the changing tides of development theory? The paradigm of sustainable development shows signs of encouragement.

2.1.2 A Paradigm of Hope? Sustainable Development

Presently development theory is undergoing a transformation -- or at least a re-examination -- in an attempt to understand what has gone wrong in the last 50 years, and to try to find models of development which are less disruptive to existing systems and institutions, and more environmentally benign. The SD concept coined by the Bruntland Commission (1987), is now commonly prefixed to virtually all development related statements. It is popularly defined as "...development that meets the needs of the present without compromising the ability of future generations to meet their own needs"(1987:43). But does SD provide a framework that empowers people and encourages local participation? For example, might sustainable development lead to the re-structuring of formal schooling to make it more locally relevant through the "re-instatement" of local knowledge systems as worthy of learning? The discourse around sustainable development gives reason to be cautiously optimistic.

Sustainable development is most surely predicated on an international economic order, including the division of labour, the provision of commodities and manufactured goods,

and the tenets of free-market capitalism that existed at the time the World Conference on Environment and Development (WCED) produced its report, and which still exist today. The difference is, however, that the recognition of the environment as something other than a free economic good has been pushed to the foreground. Sustainable development, for all its cautious language and preservation of a fundamental growth model of development, does highlight the need to treat the environment as life-giving and life sustaining, and marries this awareness to many aspects of social and economic organization. As Redclift (1987) says, SD calls for a broader view of economics and ecology than has ever been attempted, together with the political commitment to ensure that development is sustainable.

With respect to education, the WCED (1987) prescribed that "education ... be improved in quality and in relevance to local conditions [and] ... impart knowledge relevant for the proper management of local resources"(1987:113). Arguing for a re-valuing of traditional or indigenous knowledge, the report called for education which cuts across "the social and natural sciences and the humanities, thus providing insights on the interaction between natural and human resources, between development and environment"(1987:113). Finally, the authors recommend that EE be "included in and run throughout other disciplines in the formal education curriculum..."(1987:113).

However enlightened these ideas may sound, the nine objectives for SD clearly present

some contradictions¹⁰. For example, is it possible to revive growth and conserve or enhance the resource base? What will be the nature of the merger between environment and economics --- servant and master perhaps? Is growth possible with a "re-oriented" use of technology? While it is beyond this paper to completely de-construct SD theory, some of these questions need to be addressed.

First, the acceptance of continued growth raises concern. Although the world has entertained the idea of a zero economic growth objective as suggested by the work of the Club of Rome group and the report entitled Limits to Growth (1972), the idea of continued economic growth obscures the fact that resource depletion results directly from certain types of growth. Furthermore, the premise of free market forces promoting efficiencies, economic growth, and with it, an end or reduction in the downward spiral¹¹ of poverty and environmental degradation, is too simplistic. As just one example, such liberal economic forces can stimulate agricultural exports which may require environmentally damaging inputs, may decrease biological diversity, and may exacerbate problems of land tenure and production of basic foodstuffs. Finally, Sachs (1992a)

¹⁰The nine objectives of the WCED definition of sustainable development are

1. Reviving growth
2. Changing the quality of growth
3. Meeting essential needs for jobs, food, energy, water and sanitation
4. Ensuring a sustainable level of population
5. Conserving and enhancing the resource base
6. Re-orienting technology and managing risk
7. Merging environment and economics in decision-making
8. Re-orienting international economic relations
9. Making development more participatory.

¹¹The idea of a downward spiral is that impoverished people are forced to act in a context of increasing desperation, usually with negative impacts on the resource base upon which their subsistence livelihoods are based. As the resource base degrades, the situation becomes more desperate as do the actions of the resource users. This process continues on in a downward spiral of increasingly negative cause and effect.

argues that the WCED, through its discourse of SD, has given renewed impetus to the idea of *managing* the environment. The commission has embraced what Sachs calls the "language of control." He writes:

...The message [is] that whoever wants long-term growth had better refrain from squandering all resources today, and this insight led to talk of 'the efficient management of resources.' By translating an indictment of growth into a problem of conserving resources, the conflict between growth and environment has been defused and turned into a managerial exercise. This is the fundamental contradiction in sustainable development which must be addressed (1992a;21).

There is still much debate raging around the idea of "sustainable development." I will reiterate, however, that sustainable development provides an opportunity, particularly with respect to whose concerns are given prominence. It is incumbent upon academics, researchers, development workers, and policy makers to ensure that the most progressive change possible within the theory of SD is realized. Some theorists are taking steps in that direction.

2.1.3 A Sustainable Development Framework

Many academics have developed their own interpretations of SD. Matowanyika¹² (1991) for example, offers a formula for SD which is contingent on several interdependent variables¹³. Matowanyika puts critical aspects of social and political life front and centre

¹² I first met Joseph Matowanyika when I was an undergraduate in Environmental Studies at the University of Waterloo, and he was completing his PhD. I had several discussions with him during this time about the development of his equation for sustainable development. I was reminded of his work in Wickham (1993).

¹³ Matowanyika's formula for sustainable development is: $SD = f(R, Ex, En, Po, Pe)$, where:
 SD = Sustainable development
 R = Resource base (biophysical and socio-economic)

in his definitional framework. For example, the endogenous factors of culture, religion, knowledge and belief systems are weighted equally with exogenous factors such as development ideologies, and international politics, and more neutral variables such as the resource base¹⁴. This kind of thinking is an attempt to move factors that have been marginalized by previous theories and approaches to development to a position where they may be considered. I would argue that sustainable development defined in this way provides an opportunity to address those aspects (like indigenous belief systems) that have not been given prominence in development literature or practice for some time. The next section focuses more specifically on how cultural factors have fared historically within the dominant development paradigm.

2.1.4 Tradition and Modernization

Nigerian sociologist Adigun Agbaje (1992) has advanced two notions of contemporary African society, one which he calls the primordial public, the other the civic. The primordial African public, he says, is rooted in tradition that includes deference to those designated to lead. The leader is charged with a high degree of moral responsibility to

Ex = Exogenous factors (i.e., external influences on resource management, technologies, philosophies and development ideologies)

En = Endogenous factors (i.e., internal socio-cultural, religious, knowledge, heritage and belief systems, local production and technological bases)

Po = Population factors (i.e., quantitative and qualitative changes, changes in consumption patterns)

Pe = Political and economic and social factors (i.e., power bases, equity, historical influences) (Wickham, 1993: 54)

¹⁴ In an unpublished study commissioned by IDRC, Ryan (1995) interviewed 188 people from every region of the world involved in development work. He reported that the cultural, religious, and belief systems of people in developing countries are almost always ignored and this has proven to be one of the major obstacles to "real" development. He says, "because the vast majority of people still believe in the 'sacred,' then the values, experience, and influence of local religious and ethical paradigms must be considered." Furthermore he says, "there is an urgent need to listen and trust more diligently the indigenous knowledge, culture, and experience of people in developing countries" (1995: 2).

use power for the good of the people. Abuse of this power "could lead to the people invoking ancestral spirits to revoke the right of the wielder of power to govern" (1992:49-50). In traditional African society, the community is paramount to the individual¹⁵.

Conversely, the civic public arises from a colonial culture which supplanted indigenous values and socio-political structures. Traditional structures of governance for the utilization of natural resources, and indigenous forms of education are but two examples of "institutions" displaced by "modernity." The result has been "a moral disorientation among the African people between the old and the new, a dualism neither well-aligned nor properly digested" (Agbaje,1992:49). This theory of dualism, says Banuri (1990), has been juxtaposed with the homogenous culture of industrialized societies and used to persistently imply the inferiority of traditional modes of existence.

For example, certain cultural attitudes have been attributed to the traditional individual and, by extension, to society at large. Generally, the traditional -- or primordial -- African has been described as fatalistic, cautious, superstitious, non-rational and pre-scientific (Palmer,1973:23). Individuals have been socialized to accept the superstitious and the supernatural as "real." Contrasted with the pervasive, positivist and secular notion of how "the world works," African culture has been labelled -- even by some Africans -- as irrational, illogical and backward. Cameroonian economist Daniel

¹⁵ This is precisely the premise upon which Julius Nyerere based his theories (and government policies) of "Education for Self-Reliance" and "Ujamaa." This will be discussed more fully in chapter three

Manguelle (translated by Ekher, 1992), furthers these criticisms in four of his seven stated cultural characteristics of Africans:

- 1) Africans remain a slave to their environment and to divine intervention.
- 2) Africans are rooted in their cultural ancestry and believe that the past will repeat itself.
- 3) In Africa, one is born dominant or dominated, the choice being determined by the Gods.
- 4) Africans belief in the power and validity of sorcery which impedes change in the society.

Furthermore, Manguelle (1992) argues that African culture impedes economic development and calls for reform which would capture the strengths of African culture and combine it with the strengths of foreign cultures. The South Commission¹⁶ (1992) echoes these views and argues that culture is an inheritance of the past that must be reassessed vis-a-vis the modernization process in order to survive. The fact that pressures to abandon aspects of traditional culture emanate from within Africa as well as from outside, does not bode well for the re-inclusion of notions such as LEK within development strategies.

The existence and persistence of a socio-cultural duality in Africa is mirrored by the duality observable in current development strategies. Some development projects,

¹⁶ The South Commission was established in 1987 under the leadership of former Tanzanian President Julius Nyerere and included delegates from twenty-six developing countries. The Commission issued a report in 1991 calling for wide ranging strategies to reduce poverty and improve the quality of life in the Third World

particularly those dealing with human resources such as education, health, nutrition, and family planning, are predicated on behavioral changes that require a re-alignment of values, traditions and norms. Other strategies address structural questions such as macro-economic adjustment and physical infrastructure, with little or no emphasis on behavioral change, though change invariably results. The latter is a structuralist view of development which sees behavioral change following "naturally" after transformations in power relations, resource allocations and institutional reform have been achieved. Development in practice can be said to be on a continuum, with the behaviouralist or social-psychological view at one end, and the structuralist, system-altering view at the other¹⁷.

Economists, for example might tend to focus on the structural changes that would allow enlightened self-interest to work freely thereby creating opportunities that need only a "rational" response from individuals to be realized. Other social scientists working from a behavioral/social-psychological perspective would focus on changing underlying values and beliefs as a prerequisite to behavioral acculturation. In fact, this is the usual predisposition of environmental educators. Regardless of the approach, development rooted in a modernization paradigm causes disruptive cultural change. There is displacement of traditional values by modern ones that can take the following forms:

¹⁷ In the middle, argues Lerner (1964 as cited in Webster, 1990) is the "transitional society," a society which has, through a combination of one or more of these development strategies, or through cultural diffusion from other parts of the world, been exposed to modernity. The transitional society "is defined by what it wants to become" (Webster, 1990:51)

- 1) **substitution** where traditional elements are replaced by modern ones.
- 2) **disappearance** of traditional models without replacement.
- 3) **enlargement** by adding new, modern and complex elements.
- 4) **fusion** where modern innovations amalgamate with traditional elements (Gbotokuma, 1992:15).

These modalities of cultural change, when unmanageable (i.e. too rapid or severe), lead to what Gbotokuma (1992) calls "cultural disintegration" (1992:17). With respect to education, resource management, and other more general aspects of development in Africa, it could be argued that all four modalities of cultural displacement -- substitution, disappearance, enlargement, and fusion -- have figured prominently.

I have been discussing the synonymous nature of development and modernization with a specific focus on the implications for culture in conventional development practice. Underdevelopment has typically been viewed as a pre-existing condition. African countries, it is assumed, are gradually moving toward modernization despite the traditional socio-economic systems which create obstacles to acculturation. Sustainable development, it is argued, represents an opportunity for marginalized people, their ideas, and their knowledge systems to play a more prominent role in development. One area where there is potential for local people to play a role, but which currently demonstrates a disregard for local culture, knowledge systems, and local participation, is the field of environmental management. Because environmental aspects of local knowledge systems are central to my thesis, it is to this topic that I now turn.

2.1.5 Environmental Management & Participation

In much of Africa today, there is a serious dissonance between people or institutions that are charged with environmental management and those people who rely on the resource base for their livelihoods. Resource managers and decision makers generally belong to the civic society described earlier. Conversely, people dependent on the resource base directly often possess experiential and localized knowledge of what their environment can provide or sustain. Western concepts of environmental management ignore these inputs. Instead they enforce views which Redclift (1987) calls "managerialist." He writes:

...what we mean by environmental management often ignores or devalues the experience of poor people in the developing countries, those who are usually closest to the problems. We are often in danger of importing solutions to environmental problems from the experience of developed countries, using methodologies and an epistemology which is of little relevance to different circumstances (1987:133).

Barrow (1991), in his work with dry land pastoralists in Kenya, puts forth a similar viewpoint:

...communities are the repositories of vast accumulations of traditional knowledge and experience. Their disappearance is a loss for larger society, which could learn a great deal from their traditional skills in sustainably managing very complex ecological systems. It is a terrible irony that as formal development reaches more deeply into rain forests, deserts and other isolated environments, it tends to destroy the only cultures that have proved able to thrive in these environments (1991:24).

Given increasing population and other pressures on an inequitably distributed and dwindling resource base, some form of environmental "management" is no doubt

required. However, effective environmental management would be better served with the participation, ideas and knowledge of local people. Participation can start with having local people explain the causes of resource degradation, a step Oakley (1991) argues will help people "identify more readily with the solutions" (1991:115).

The idea of local participation has gained momentum in the last decade as the signs of failure with conventional development practice have increased. There is, however, considerable rhetoric associated with the idea. On the one hand, participation can be seen by governments and development agencies as a way of improving the delivery and short-term success of a project, while no true sustainable participation is ever envisaged. This, says Oakley (1991:116-7), is merely a passive form of participation. On the other hand, participation as an "end in itself," with no predetermined set of outcomes driving it, may actually grow and strengthen to become an intrinsic part of the development process.

It has been argued that rural people have failed to conserve natural resources for a number of reasons. At one extreme, rural people have been accused of ignorance and inadequate knowledge for understanding resource use and impacts. Poverty and the desperate situation faced by many rural poor is also given as an explanation. At the other extreme, says Oakley (1991), is the impact of the increasingly sophisticated scientific and technological basis of development which, besides being highly detrimental to the natural resource base, excludes local participation by virtue of its technological complexity (1991:118-20). Non-participatory and managerialist approaches to resource utilization

have proven themselves to be out of step with local environmental strategies, and inappropriately conveyed. Redclift (1987) says:

If we want to know how ecological practices can be designed which are more compatible with social systems, we need to embrace the epistemologies of indigenous people, including their ways of organizing their knowledge of their environment. However, as Norgaard argues, traditional knowledge is location specific and only arrived at 'through a unique co-evolution between specific social and ecological systems'. This knowledge is not easy to incorporate into "scientific" knowledge since experiential learning requires an evolutionary rationale, and one which is different from that of bureaucratically managed institutions. (1987:151).

What appears to be occurring more recently is an increased emphasis on the "efficient management" or "sustainable management" of resources at the same time that the importance of indigenous knowledge is being recognized. Perhaps this terminology of "sustainable management" is just a new way of expressing a conventional approach. On the other hand, there are some hopeful signs within a sustainable development paradigm as stated earlier, that grassroots participation and local knowledge may play a more prominent role in environmental management. At this stage of the theoretical framework, a closer examination of Western and traditional or local knowledge is warranted.

2.2 THE NATURE OF KNOWLEDGE

At the risk of oversimplifying the case, the success or failure of knowledge systems, in terms of being valued and recognized, closely mirrors that of its adherents. The dominance of Western scientific knowledge over that of African pastoralists, for

example, is a reflection of the relative technological accomplishments of these two groups of people respectively. Western science, with its underpinnings in the industrial revolution, brings with it remarkable achievements in science and technology over a relatively short period of time. Indigenous knowledge systems, on the other hand, have endured for millennia, but have not demonstrated the same dramatic technological leaps. It is partly for this reason that local or indigenous knowledge systems have come to be regarded as inferior.

Western knowledge assumes a dominant, widely accepted form of rationality, so much so, that even those who acknowledge the existence and even the value of indigenous knowledge, often attempt to validate it through scientific methods such as counting, categorizing and classifying. The dominant Western form of rationality, with its related material successes, makes other forms of rationality appear inferior. Marglin (1992) argues that:

This modern, dominant form of rationality is disembedded from the body, from metaphorical thought, from ethical thought and from the world. The disembeddedness of rationality did not erase other modes of knowing but transformed them by creating boundaries such as that between the arts and humanities on the one hand and the sciences on the other (1992:24).

Adherents of Western knowledge find it difficult to accept indigenous knowledge as valid in an of itself (Wolfe et al. 1991). Local or indigenous knowledge lacks the objective and positivist qualities that characterize Western knowledge and what has grown between Western and local systems is a sense of superiority that Marglin (1992)

says..."constitute[s Western knowledge] with global aspirations and universal pretensions" (1992:25).

The reductionism of Western science is also rarely questioned. If it is challenged at all, it has come about only recently as scientists seek holistic solutions to environmental and other problems. Reductionism is a cornerstone of scientific rationality, a cherished principle of analysis and problem solving, but it is an approach to knowledge that is fraught with problems. Kabeer (1994) says, [reductionism]...works as a metaphor of nature and society as machine, rather than as organic whole; all systems are seen in terms of the same basic constituents, discrete, unrelated and atomistic (1994:73). Reductionism's simplicity as a form of analysis, with the promise of clear, measurable and verifiable outcomes, have contributed to its success as the dominant knowledge paradigm.

Systems of knowledge such as those held by traditional peoples and more deeply influenced by myth and ritual become viewed as superstition -- the very antithesis of Western knowledge. The meeting of the two, says Stephen Marglin (1990), ... "is often fatal for indigenous systems because the supreme confidence of Westerners or Westernized elites in their knowledge is coupled to the superior means of political and economic forces at their disposal" (1990:25). Is this attitude toward non-Western knowledge systems justified?

Much has been written about the differences between indigenous knowledge systems and western knowledge in terms of one being "holistic" or "intuitive," and the other being based on a reductionist, positivist world view (Barrow, 1991; Berkes, 1993; Brokenshaw, 1980, Gadgil et al,1993; Redclift, 1987; Rodney, 1981 etc). Bastick (1982 as cited in Wolfe, 1991) has developed an analysis of western and non-western knowledge systems that is based on the mode of thinking utilized by each knowledge system respectively. He argues that while people in Western cultures have been socialized to an analytical mode of thinking which is "conscious, cerebral, literate, and linear," most indigenous knowledge systems employ an intuitive mode of thinking (Wolfe et al, 1991:8). Bastick defines the intuitive mode of thinking in terms of its attributes, including the natural contrast with abstract reasoning and logic, its emotional involvement, the influence of experience, and the tendency to understand by feeling (Wolfe, et al, 1991:8). People trained and socialized in an analytical knowledge system, says Bastick (1982 as cited in Wolfe, 1991), "suppress or inhibit the use of intuitive thinking...[and] tend to rationalize the products of intuitive thought, such as hunches and gut reactions"(1991:8). Finally, Wolfe (1991) contends that to recognize and accept the differences between analytical and intuitive ways of knowing is to reject the assertion that scientifically generated knowledge is "logical" and "rational," and that indigenous, non-western knowledge is pre-logical or "irrational" (1991:10).

Knowledge systems also exhibit unique ways of codification, validation, mediums for knowledge transmission, and ways of distributing or utilizing the power of knowledge.

The two broad categories of knowledge being discussed here -- Western scientific knowledge, and local or traditional environmental knowledge -- can also be examined from the point of view of who is empowered by, and in control of, these respective systems. It is important to analyze knowledge systems from such a perspective.

Western knowledge is distinguishable by the formal recognition accorded to its practitioners and institutions. The systems of formal education in Africa, and certainly in Tanzania, are modelled on the West -- academically based, highly reliant on the absorption of theory and concepts and reliant entirely on objective examination for validation. This leads, as it does in North America, to rigid examinations, accreditation, diplomas, degrees etc. This system of accreditation is further validated by other government and quasi-government institutions who seek graduates of the education system, rewarding those who have gone the furthest, and usually requiring some "accreditation" as a minimum requirement for participation in these formal and important societal institutions. Those empowered by Western knowledge are those who master its requirements such as reading, writing and the successful completion of exams leading to diplomas. Traditional or local knowledge, if it has comparable power at all, has brokers who display it in more subtle ways. Talking with villagers, for example, one can detect a quiet confidence in the future expressed by an elder and based on his/her experience of the past, or a deep respect for certain individuals expressed by young people in a community.

Exploitation¹⁸ of, or at the very least, chronic disregard for, traditional forms of knowing have relegated these systems to a position of inferiority. Marglin (1992) recognizes the dichotomy between Western and Traditional or local knowledge. He calls Western knowledge "expert" knowledge, or E-knowledge:

...ideologically, Western culture has elevated E-knowledge to a superior position, sometimes to the point that T-knowledge is not only regarded as inferior knowledge, but as no knowledge at all. Except to the extent that T-knowledge can be justified by E-knowledge, it remains superstition, belief, prejudice (1992:14).

There is an assumption with E-knowledge that it has gained, through its inherent objectivity and historically neutral rationality, universality. Certainly, attempts to transfer this type of knowledge to the South are too numerous to count. The assumption that there are universal truths and that these truths are expressed in E-knowledge, is the central assumption in conventional, prescriptive approaches to development. It is the core of the managerialist approach to resource management discussed earlier. There are consequences for the widely accepted ranking of knowledge systems. Marglin (1992) writes of one such consequence:

...One of the dangers of removing human consciousness from the lived world it studies is that it produces a knowledge which ends up threatening that world. For those who make such a separation, forests become data repositories and the fate of the data comes to override the fate of the life of the forest (Marglin, F, 1992:29).

¹⁸ For example, Vandana Shiva (1991) writes about the issue of intellectual property rights. She says "Centuries of innovation are totally devalued to give monopoly rights on life forms to those who manipulate genes with new technologies, placing their contribution over and above the intellectual contribution of generations of Third World farmers for over 10,000 years in the areas of conservation, breeding domestication and development of plant and animal genetic resources. As Pat Mooney has argued, 'the argument that intellectual property is only recognizable when performed in laboratories with white lab coats is fundamentally a racist view of scientific development' (1991: 5-6).

Western knowledge has come to define and, indeed, has resulted in the modern, technologically advanced world of the twentieth century. Viewed from the perspective of local culture or indigenous epistemology, Western knowledge constitutes Freire's "oppressor." It is validated through the institutions and standards of modern science and given legitimacy, transferability, and global recognition through these conduits. This is both a strength and a weakness of Western knowledge. Juxtaposed with "parochial" localized knowledge systems, it is not hard to understand the success of Western knowledge.

There are a number of other points of comparison between Western and local knowledge such as how knowledge is typically transmitted and explained, what time-frame pervades the knowledge system, and so on. **Table 1** summarizes some of these differences:

Table 1: A Comparative Framework of Local and Western Knowledge

Comparison	Indigenous or Local Knowledge	Western Scientific Knowledge
Relationship	Subordinate	Dominant
Dominant mode of thinking	Intuitive (holistic)	Analytical (reductionist)
Communication	Oral (storytelling, subjective experiential)	Literate/didactic (academic, objective, positivist)
Data Creation	Slow/inconclusive	Fast/selective
Prediction	Short-term cycles (recognize the onset of long-term cycles)	Short-term linear (poor long-term analysis)
Explanation	Spiritual (the inexplicable)	Scientific inquiry (hypothesis, laws)

Biological Classification	Ecological (inconclusive, internally differentiating)	Genetic and hierarchical (differentiating)
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Adapted from: Lalonde, 1993 and originally found in Wolfe, et al, 1991.

This theoretical comparison tends to put LEK in a favourable light. However, there are several valid criticisms or characteristics of LEK that must be acknowledged Thrupp (1989) lists five:

1) Not Uniformly Spread: Individual aptitudes for learning, storing and generating knowledge differ. Specialized knowledge often belongs to only certain groups or individuals (i.e. male elders, midwives, traditional healers) and is not shared among all people. This often leads to knowledge and thus power imbalances within and among communities.

2) Implicit rather than conscious: Indigenous Knowledge (IK) is often intuitively practised through ritual belief systems, or trial-and-error actions and reactions, rarely is IK subject to complete and direct analytical experimentation.

3) Parochial in nature: IK is limited to what rural people can sense and measure directly through observation and comprehend using their own terms and concepts. This can limit a community's ability to adapt to changes.

4) Eroding: IK is increasingly being modified and/or lost as a result of outside contact and increased adaptation of, and reliance upon, external knowledge systems and technologies.

5) Inferiority complex: IK is often perceived by rural people themselves as banal knowledge. Embarrassed and shamed by their lack of formal education, they are often uncertain of the legitimacy and appropriateness of their own knowledge.

Another criticism, or point of contention with respect to LEK is whether or not indigenous knowledge systems are inherently "conservationist" or "non-conservationist." Two schools of thought dominate this debate, one being physical economic anthropology, which favours the non-conservationist view, the other being the ethno-ecological school, which contends that indigenous knowledge is either consciously or unconsciously conservationist (Wolfe et al, 1991:22).

Four possible positions fall within the continuum between the extreme views of each school and are discussed at length in Wolfe et al (1991). At one extreme is the physical-anthropological position which says that individuals seek to maximize their own position and do not employ self-regulatory mechanisms to conserve resources. Instead, resources are fully utilized to the limits of existing technology. A more moderate view asserts that indigenous knowledge sometimes leads to a sustainable use of resources given "small populations and simple technologies." A third view says that indigenous resource use is

sustainable because of an unconscious but instinctive ecological and conservationist world view. The dominant belief of "everything in the universe being alive and related" ensures that resources are not abused. Finally, at the other extreme is the ethno-ecological view which argues that indigenous resource users are deliberately and consciously conservationist and their management systems are designed to be sustainable (Wolfe et al, 1991:25).

A key mechanism for the potential inclusion of LEK in all aspects of development is the educational system. Education has a complex theoretical and practical place in the development discourse which warrants discussion.

2.3 EDUCATION FOR DEVELOPMENT

Arguably the most tangible legacy of Western influence in African society is that of formal education. African educational systems have grown paradoxical. Education is alternately criticized and praised, first as the culprit responsible for the irreversible acculturation process that has been forced on Africa, and next as the panacea for ameliorating underdevelopment. Two theories of development have strongly influenced the role designed for formal education namely, modernization -- which I have previously introduced -- and human capital theory. The impact of these theories are briefly explored,

as is the resultant dynamic of "oppressed-oppressor" as established by Paulo Freire¹⁹ and the continued influence of science and technology on the direction of education for development.

Human capital theory (HCT) is predicated on the belief that the skill set of the labour force, like other inputs into the modern industrial production process, require investment and upgrading. Educating people is considered an investment in, or even the creation of, a labour force -- of which the potential return is improved economic and industrial growth leading to national development. This theory attributes underdevelopment to a country's internal mis-allocation of "investment," particularly in terms of training, rather than to external or internationally systemic forces (Morales-Gomez,1991;Saint-Germain,1985). Education controlled by the state, says Saint-Germain (1985), was seen as "the indispensable instrument for improving the production capacities of a population"(1985:17), along with improved technology and technological efficiency. This theory prospered through the 1960s and early 1970s, but faced challenges when it became clear that improved education did not necessarily lead to better jobs, income, or standards of living for people in the South. According to Saint-Germain (1985), "the main criticism of HCT is that it overestimated the link between level of education and improved standards of living..."(1985:18).

¹⁹ Brazilian academic Paulo Freire has strongly influenced the theory of pedagogy, curriculum development, and adult education through works such as the "Pedagogy of the Oppressed (1970)," and the literacy campaigns he has organized in Latin America and Africa. Freire has, more than any other educational theorist, challenged the notion of "neutral" education. According to Freire, all learning and all forms of education "either contributes to the maintenance or transformation of existing relations of power and domination"(Hall And Sullivan, 1992:15).

Modernization theory, on the other hand, is based on the view that individuals in society must adopt modern values, standards, and demands, while at the same time, undergoing the necessary structural and institutional reforms, including appropriate basic and technical training for a modern labour force, as provided by formal education. Within modernization theory, says Saint-Germain (1985), "the school plays a fundamental role, not only in the transmission of knowledge, but also in the changing of values" (1985:18) from traditional to modern ones (**figure 1**).

Modernize ===== *Modern* ===== *Modern* ===== *Modern* ===== *Economic Development*
Institutions *Values* *Behaviour* *Society*

Figure 1: Modernization Theory and Education (adapted from Saint-Germain, 1985:18)

Because modernization is implicitly connected to some form of industrial revolution, the process must involve the introduction of modern education and other western "advances" to create the economic and social conditions that have proven effective in currently developed nations, in the hope that the "successes" can be replicated (Butz, 1991:147). This view of development and the role of education in achieving modernization pays little attention to the stresses and duality created between the "primordial" and the "civic", or the traditional and the modern (Agbaje, 1992; Banuri, 1990) aspects of a society as the process of transformation takes hold.

From a sociological point of view, both of these development theories have dictated a "functionalist" role for education, which sees the provision of basic skills in numeracy

and literacy, and in technical knowledge and modern methods of production, as tied to the occupational demands of industry and the aspirations of the state. Both human capital and modernization theories view education as a natural precursor of "development" or, in fact, as "education for development"²⁰ (Webster, 1990:119). Furthermore, the changing of values is also implied in both development perspectives where, "the reward system that structures educational careers is said to encourage a strong commitment towards self-discipline, hard work, and achievement, attitudes which are not only conducive to educational success, but also industrial productivity and innovation" (Webster, 1990:119).

In fact both the human capital and modernization theories of development, particularly as they have influenced education in the Third World, long ago provoked a response from dependency theorists such as Paulo Freire. Dependency theorists would hold the processes of modernization responsible for fostering a dependency relationship among developing and developed countries. This dependency, it is argued, ultimately leads to conditions of underdevelopment.

Freire's dependency framework, applied to adult education, literacy, and to educational efforts in the Third World generally, produces a description of the dichotomy between Western and indigenous education that can be characterized as, not only a dependency

²⁰ A succession of five-year plans in Tanzania increasingly placed emphasis on "education for development," particularly at the secondary school level. Fafunwa and Aisiku (1982) say that the content and objective of secondary education was geared toward the goal of economic and social advancement and toward educating the group of people who would "have an immediate impact on production during the life of the plan" (1982:259).

relationship, but as an oppressed-oppressor relationship. Freire's "pedagogy of the oppressed," is essentially concerned with the relationships between individuals, and classes within developing states, the dynamic between dominant and subordinate knowledge systems, technologies, economic systems, cultures, and of course, educational systems. The relationships he describes is between oppressed and oppressor, between something and "other."

When there exists a dominant-subordinate relationship between one person and another, or one class and another, or one educational system and another, then the struggle for re-humanization emerges. However, Freire (1987) says, "...the oppressed must not, in seeking to regain their humanity...become in turn oppressors of the oppressors, but rather restorers of the humanity of both" (1987:542).

The dynamics of coming to terms with an essentially foreign structure of education is not simply one of recognizing its weaknesses and deciding to reject it. Years of experience with an educational philosophy that has come to be viewed as superior affects the perception that African's have of themselves; "...[people are] impaired by their submersion in the reality of oppression. At this level, their perception of themselves as opposites of the oppressor does not yet signify engagement in a struggle to overcome the contradiction, the one pole aspires not to liberation, but to identification with its opposite pole" (Freire,1987:543).

This is very much the status of the struggle for a new role for education in the process of development. There are some who recognize that Third World education has, and continues to, "identify with its opposite pole;" so much so that, in fact, Third World education is greatly inculcated by a variety of Western educational ideas.

Most proponents of a developmental role for education have remained convinced of the efficacy of modernization and Western science and technology. These advocates, many of them influential Third World politicians or academics, argue for educational reform as though they understand and have indeed internalized the oppressed-oppressor context. They propose educational prescriptions for the advancement of their fellow countrymen. The concept of advancement, or its antithesis -- backwardness -- is often misguided. Arizpe (1988) for example, talks about the difference in ability of school children of the same age in a small area of Mexico to name indigenous plants. Non-Indian children could name 37 plants while Indian children could name 138, yet the Indian children are considered 'ignorant' and uneducated and in need of educational prescriptions for advancement. Advancement where? For whom? Other comments by Freire (1987) speak to this tendency to prescribe:

...a pedagogy...must be forged with, not for the oppressed (whether individuals or peoples) in the incessant struggle to regain their humanity....This is why...the pedagogy of the oppressed cannot be developed or practiced by the oppressors. It would be a contradiction in terms if the oppressors not only defended but actually implemented a liberating education (1987:544-548).

Those who advance educational change which favours Western science and technology

are not fully cognizant of the subordination to which their "undereducated" countrymen have thus far been subjected, simply through the marginalization and devaluation of their own local and indigenous knowledge frameworks. And Freire might also point out that such proponents, often Western educated elites, are not yet "conscientized"²¹ themselves. Even of revolutionary leadership, Freire (1987) says, "many of these leaders (perhaps due to natural and understandable biases against pedagogy), have ended up using the "educational" methods employed by the oppressor (1987:557)."

The South Commission's report (1991) calls for a "people-centred development" in which education plays a vital role. The Commission is clearly concerned about what it terms a knowledge gap between North and South:

Unless the South learns to *harness the forces of modern science and technology* [my italics], it has no chance of fulfilling its developmental aspirations or its yearning for an effective voice in the management of global interdependence. All its societies must therefore mount a determined effort to absorb, adapt, and assimilate new technological advances as part of their development strategies...the tree of knowledge can flourish only if it is securely planted in the educational system (South Commission, 1990:278).

Statements such as this leads one to believe that one "world view" continues to dominate, and it is the view from the West. Science and technology is believed to be the "panacea" for development, and the correct recipe for education. It is part of a strategy of "catching up" that has been promulgated for decades. Successive Third World leaders, and the

²¹ This term essentially means that one is aware or conscious of the inherently political nature of one's own actions. People must understand that they play a role in the class structure and hierarchies of society, and that their actions or views either reinforce or resist the dominant forces in society.

people they lead, have internalized the antithesis of development -- underdevelopment -- as the self-image and "cognitive foundation" (Sachs,1992b:5) of Southern nations. The school - community relationship in developing countries has come to represent a microcosm of the technological/non-technological divide. Schools are viewed as repositories of technological know-how, while local peasants view themselves and their communities as backward.

Wolfgang Sachs (1992) posits two ways in which society can shape its self-image, either as a person-to-person view or a person-to-things relationship. In the contemporary world in which the material marvels of the West are even more remarkable and definitely more visible to the larger world, we are clearly in a dominant people-things paradigm where "thoughts and aspirations revolve mainly around property, production...[and] the cult of things" (1992c:12).

The "liberating" form of education proposed by many for the long-awaited emergence of equity and justice in the Third World stems from this belief that technological "tools of progress" are essential for development. Indeed Sachs points out, "if there ever was a single doctrine uniting the elite in the North and South it [is that] more technology is always better than less" (Sachs,1992c:13). This technological seduction is so complete, that respected leaders from most of the Third World wholeheartedly endorse the science-technology-education prescription. The acculturative impact of technological imagery has successfully presented the tools of modern science as the "triumphant heirs

of primitive techniques"(Sachs, 1992c:14). Technology, and the science that inspires it, is thought to be the natural improvement upon traditional methods. Advanced, progressive, and modern, are persuasive words for people, societies, or systems which rely on polar opposite words like backward, primitive, and "traditional" to define their self-image. The challenge is to find ways of working that ensures both oppressor and oppressed have an opportunity for discovery, cultural awareness and conscientization. Of this struggle, Freire (1987) says the oppressed must work:

...together with those who show true solidarity [and] must acquire a critical awareness of oppression through the praxis of this struggle. One of the gravest obstacles to the achievement of liberation is that oppressive reality absorbs those within it and thereby acts to submerge men's (sic) consciousness (1987:546).

A liberation pedagogy (or andragogy since adult education must be seen as an important part of education for development) is difficult to achieve given the many other demands and expectations placed on formal education generally. Issues like population control, nutrition, and sanitation, to name a few, all jockey for time on the educational agenda. Even more importantly, the nearly omnipresent goal of modernization is never far from the core of most formal educational initiatives. However, Kleymeyer (1992) argues that in light of the continued forces of modernization, people must shop wisely through their own past. This, along with constructive self-criticism, he says, is "the only antidote to the corrosive self-doubt that accompanies modernization..."(1992: 27).

2.4 Summary

In this Chapter, I have argued that culture -- and by extension, knowledge systems -- have been largely ignored, and effectively marginalized by the dominant modernizing paradigm of development. As a result, much indigenous knowledge in Africa and elsewhere may be lost forever. Current practices of environmental or resource management are reflective of a Western knowledge bias and serve to further isolate LEK rather than to explore its inherent, experiential value. The tension between tradition and modernization was explored and a theory of duality, where primordial and civic structures co-exist, was outlined. The general characteristics of primordial or traditional African were examined and juxtaposed with the mechanistic and reductionistic basis of Western development theory. The literature illustrates how remote is the concept of utilizing traditional knowledge in conventional development efforts. However, sustainable development was introduced as a relatively new development paradigm which might provide more support and acknowledgement for traditional knowledge and culture. A framework showing endogenous factors balanced equally with exogenous ones was presented.

Characteristics which define the epistemologies of Western and local knowledge systems respectively, were discussed, including intuitive vs analytical modes of thinking, reductionism as opposed to holism, and related aspects of power and control of knowledge. Finally, a continuum which reflects opposing views about whether LEK is

inherently conservationist, or inherently non-conservationist was discussed, with four possible positions along the continuum presented.

Human capital and modernization theories of education in the development process were presented as having appealed more to Freire's "banking" concept of education where it is believed that national development is achieved by an educational system which provides for, or simply invests in, the appropriate skill sets for the "labour force." African education has evolved into a bureaucratic tool of modernization, the content of which is conceived of and controlled by Western-trained, indigenous elites. Finally, the theoretical framework sought to establish a middle ground that agrees with the overall design of the field research and Wickham's (1993) assertion that:

...Both types of knowledge [Western and Local or Indigenous] need to be examined, compared and contrasted to identify their beneficial aspects and distinguish which could be improved through the addition of the other. This notwithstanding, there needs to be an adjustment in the prevailing attitudes which generally excludes indigenous knowledge from the development research and planning process. Achieving sustainability will require independent and open minds and a blend of approaches and methods from all knowledge systems (1993:38).

CHAPTER THREE THE TANZANIAN CONTEXT

Tanzania was an appropriate choice for this study for a number of reasons. Like many of its African neighbours, Tanzania's environment is under extreme stress -- not in all areas of the country, but certainly in many rural areas and most urban and urban peripheries where pressures on dwindling resources have increased dramatically in recent years. Tanzania is also quite a unique player in the international arena. For the more than two decades that Julius Nyerere led the country, Tanzania's efforts were referred to as "the great African experiment"²². Utilizing traditional African culture and social organization to resist the trends of rapid industrialization and import substitution taking place in neighbouring countries, Nyerere attacked the "gap" between urban and rural living standards and decided that self-reliance, particularly in agriculture, was the mechanism of economic and social levelling²³. The post-independence rulers of Tanzania attempted a mix of old and new, traditionalism and socialism that held promise for many who watched her. Tanzania's long experience with colonialism, its middle eastern influences, the adoption and promotion of Swahili as the lingua franca, and its leadership in the Pan-African and Non-Aligned movements are all aspects of this country that make it an interesting focus for many types of research.

²² Yeager (1982) notes that in trying to achieve the correct political formula for Tanzania, Nyerere looked to the small and kinship-based societies of the pre colonial past and found "traditional consistencies that in his judgement could be adapted to serve the collective needs of the present "

²³ Probably no other statement from this charismatic leader indicates his resolve to build Tanzanian society from the bottom up better than the following "While other countries aim to reach the moon, we must aim to reach the villages" Yeager (1982:114)

In addition, the fact that, even today, Tanzania remains a primarily agrarian-based society -- traditional in many respects but struggling with forces of change and modernization -- makes this country uniquely suited to an analysis of LEK vis a vis elements of its formal education system. Finally, Tanzania's enthusiastic support for Agenda 21 and, in particular, its advocacy of EE, makes the country an important study site, especially if changes are to be made in the early stages of EE development that might maximize the effectiveness of EE toward sustainable resource use.

In this chapter, I will explore three aspects of Tanzania that are central to the thesis. The first is the state of the Tanzanian environment. This will be presented as an overview of the main issues and the extent of the "crisis." The second element concerns human resource development in the country such as the provision of education, health care, and literacy. In addition, this section will include a discussion of Tanzania's villagization and "Ujamaa" policies of the 1960's and 1970's. Finally, a more thorough discussion of the historical, political, and sociological aspects of the Tanzanian education system to the present day, including recent developments in EE, will be presented.

3.1 ENVIRONMENTAL ISSUES IN OVERVIEW

Tanzania is located just south of the equator along the Indian ocean, bordered in the north by Kenya, Mozambique in the south, and Burundi and Rwanda in the west. Tanzania's land area totals some 945,087 square kilometres -- an area roughly 2.5 times

the size of Newfoundland. Tanzania shares Lake Malawi with Malawi and Lake Tanganyika with Zaire. The Republic also includes the islands of Pemba, Mafia, and Zanzibar, though these Islands are culturally quite different from mainland Tanzania.

With a current population of only 27 million, Tanzania's land:people ratio would suggest a low population density. However, due to extreme variations in rainfall, soil fertility, forest cover and tsetse fly infestation, population densities vary widely throughout the country and are gradually becoming more concentrated, rising from 19.8 persons per square kilometre in 1978 to 24 persons per square kilometre in 1985. According to the UN (1993), population growth rates in Tanzania are estimated to be between 2.8% and 3.65%, while urban growth is closer to 8%. With an average growth rate of 3.36%, a doubling of Tanzania's population will occur in about 20 years. The villagization efforts of the 1970's have led to further concentration of populations. Agricultural policies favouring large-scale cropping systems, and misguided aid initiatives, have displaced people to more marginal lands with lower carrying capacities.²⁴

The Tanzanian economy is based primarily on agriculture with 83% of the economically active population employed in this sector. Agriculture currently accounts for 59% of GDP and 75% of foreign exchange earnings, mainly through the sale of agricultural commodities such as coffee, cloves, cotton, tea, cashews, sisal and tobacco (UN, 1993).

²⁴ For example, Solbrig and Young (1992) write extensively about the displacement of Barabaig pastoralists who have traditionally inhabited the Bostou plains of east central Tanzania. Their displacement was the result of a Canadian International Development Agency initiative to grow wheat on the plains. Today, production costs exceed international market prices, while the Barabaig have been forced to use dry-season lands year round resulting in continuous degradation and declining productivity.

Approximately 56% of Tanzania's total land area is utilized for agricultural activities. Most of this land (44%) is arable, though only 8% of the land is cultivated and 3% is irrigated. Uncultivated land is used almost solely for grazing livestock (Norconsult, 1994:2). Most families in Tanzania, including those in urban areas, practice some form of subsistence farming. Since Tanzania has long been an agrarian society, populations have settled according to indigenous knowledge of land suitability for agriculture. According to Rugumamu and Kishimba (1993:93-4), traditional environmental knowledge about trees and grasses and other soil fertility indicators figured prominently in site selections.

3.1.1 Forest Resources

The total forested area in Tanzania is estimated to be 28 million hectares, mainly savannah and intermediate woodlots. Reserve forests account for thirteen million hectares while village woodlots amount to only 200,000 hectares (Norconsult, 1994:2). It is in the area of forest resources that the greatest environmental degradation issues exist.

Many theorists (Harrison, 1987, Misana and Nyaki, 1993, Timberlake, 1985) blame rapid population growth for the increased pressure on forests, but other factors have contributed as well. Land tenure issues have pushed pastoralists and the poorest of Tanzanian peasants into increasingly marginal areas. Large-scale agricultural schemes and

government-run collective farms have resulted in savannah and previously forested areas being cultivated. Land is cleared for agriculture and livestock pasture, but trees are also heavily utilized for fuelwood and building materials.

In the past, vast areas of forested land were cleared of trees and bushes through burning to control tsetse fly infestation, and much of this land has never recovered. Although sanctioned burning for tsetse fly has stopped, I witnessed vast burnings in the Morogoro and Kilimanjaro regions during fieldwork in November 1993, purportedly to create new pasture and to eradicate ticks.

Deforestation for whatever reason has exposed soils to wind and water erosion and depleted soil fertility. Exposure of soils and prolonged cultivation has lowered the capacity of soils to retain water. Soils in many areas of Tanzania have become dry, but impervious to rainfall, increasing the potential for gully and sheet erosion (Misana and Nyaki 1993).

Hydrological cycles have also been seriously effected. Rivers, streams, and springs have dried up or become intermittent. According to Misana and Nyaki (1993), in the montane zone, over 90% of streams in forest reserves are now seasonal and the water quality outside these reserves is degraded by increased siltation from soil erosion. Ground water supplies have also diminished due to deforestation and water retention capacity. **Photo 1** shows the parched valley in which one of the study sites - Sameh - is located. It was

reported by an elder during the course of this research that elephants and rhinos were common to this once forested valley.

Photo 1: Dry Sameh Valley

Awareness of deforestation issues is quite high among rural and urban inhabitants of Tanzania²⁵. It is obvious in most villages that fuelwood is becoming scarce. In schools, students are forced to spend more and more of their time gathering fuelwood for the school kitchen. In towns and cities, fuelwood scarcity is reflected in higher prices for charcoal which street vendors use to fuel the numerous food kiosks that feed urban workers each day.

²⁵ I make this assertion based partially on informal conversations during many weeks of living in and visiting numerous villages in Tanzania. In addition, Swahili language radio programming and newspapers had regular features on the deforestation issue, so I am making what I believe to be reasonable assumptions about basic access to this kind of environmental information.

According to Misana and Nyaki (1993), although there were small village woodlots established during colonial times, it was not until the Arusha declaration of 1967 that village afforestation was declared a national programme. A large number of forestry schemes have begun under the national afforestation programme. However, grassroots participation has been limited and the programmes largely unsuccessful. On the surface, the main difficulty is said to be that "project designs often fail to address villagers other needs adequately"²⁶(1993:52). Villagers struggling to survive will not spend time and energy planting trees for which they see no end use apart from the remote benefit of decreased soil erosion and better water retention. Of course, issues of land tenure and political participation in decision making, while more difficult to link to cause and effect, undoubtedly factor into villager enthusiasm for tree-planting.

3.2 HUMAN RESOURCE DEVELOPMENT IN TANZANIA

A significant aspect of the "Tanzanian experiment" was its successful Freirian-style literacy campaigns of the 1960's and 70's. The adult literacy rate, according to the UNDP (1993), is now estimated to be about 65%, up from only 30% in the 1960's. In terms of formal education, however, just under half of Tanzanian children enter primary school despite massive efforts to achieve universal primary education. Spending on education as a percentage of GNP at 5.8% is higher than most other countries ranked low

²⁶ A further example of the failure to listen to local needs and concerns in afforestation efforts is cited in Misana and Nyaki (1993) where people in the Shinyanga region have resisted afforestation efforts because they believe forests harbour tsetse flies. Such "top down" planning not only fails to increase forested area, it also creates a fatigue at the village level for large scale environmental initiatives.

on the United Nations human development index. Of the approximately 800,000 students who completed primary school in 1992, only about 50,000 (6.25%) advanced to secondary Form I, and only 5,000 (.63%) of these will proceed to secondary form V and VI (advanced secondary level). Approximately 1,300 (.16%) of students from this original cohort will advance to university or some other tertiary institution (Ishumi 1993:9).

Life expectancy has risen from 41 years to 54. Although its per capita income of \$160 is less than half the regional average, Tanzania's rate of child mortality and nutritional status is comparable at 104 per thousand and 95% of daily calorie supply respectively. Over 80% of the population has access to health care and 90% of children are immunized (UNDP, 1993).

3.2.1 Ujamma and the Villagization Experiment

Nyerere believed strongly that the best way to achieve development in rural areas was through the establishment of well-organized villages under the rubric of Ujamma²⁷. The result was what Schuler (1993) calls "a massive dislocation and resettlement of not less than five million peasants from their former scattered homesteads into nucleated

²⁷Ujamma is the Swahili word given to a brand of African Socialism developed by Nyerere. According to Yeager (1982:46), Ujamma was intended to provide a moral justification for economic equality and democratic political participation, and came to form the core of Tanzania's developmental ideology. According to Liebenow (1987:4) however, "the essential egalitarianism that Nyerere saw as a feature of traditional African society and which was to be preserved under the Ujamma program was, to a considerable extent, an idealized view of the past. Many of the values and traditional institutions had in fact been subjected to steady erosion under the impact of Arab, German, and British rule."

settlements of, in principle, 250-600 households each" (1993:108). Starting in 1967, Nyerere urged farmers to form communities based on collective self-help. According to Yeager (1982:64-5), however, by 1974 less than one-fifth of the rural population lived in villages large enough to permit collectivization. The government was forced to adopt a two-tier strategy where villages with at least 250 households could seek recognition as an incorporated village which would also serve as a multi-purpose cooperative able to obtain investment credit. When a village was deemed to have reached an appropriate level of communal production and distribution, the village would be designated a "Ujamma" village with access to increased development assistance from the government.

The government progressed through three stages of coercion to facilitate this villagization process. From 1967-70, voluntary compliance was encouraged. From 1970-73 people were enticed to move with the promise of financial and technical assistance. From 1973 onwards, forced rapid villagization occurred. With less than 5% of the population in some 1,956 villages in 1970, these tactics resulted in 85% of the rural population (13 million people) living in 7,300 villages by 1978 (Yeager, 1982:64). These policies drastically impacted on rural settlement, land-use patterns, agricultural production, the natural environment, and the knowledge systems which sustained indigenous people's in their environments.

"Villagization" was a large scale effort to modernize and transform the traditional peasant society. Resettlement was designed to allow the efficient provision of health and

educational services, and to achieve economies of scale in the peasant mode of production. The villagization programme was intended to facilitate the linking of the peasantry with the state machinery. Resource management, land-use planning, and traditional Tanzanian communal society were all expected to flourish under Ujamaa. However, several of the stated objectives of the resettlement policy give one pause when viewed in relation to the impacts on LEK:

- ▶ To change people's traditional orientations: value system, social norms, status, division of labour, the role of women, and education.
- ▶ To accelerate the diffusion of information, particularly of modern farming techniques.
- ▶ To create viable villages along rural access roads to provide access to markets and services for remote homesteads.

Some of the government measures introduced to achieve resettlement objectives included:

- ▶ The provision of infrastructure and social services; for example, in 1977 the policy of universal primary education introduced compulsory school attendance.
- ▶ Creation of an agricultural extension service.

Although villagization has helped to achieve high rates of access to health services and, to a lesser extent, educational opportunities, the entire exercise only exacerbated problems of agricultural production and greatly increased processes of environmental degradation (Yeager, 1982). Carrying capacity for many village sites was sorely overlooked. For example, resource assessments were either poorly done or not done at all. According to Schuler (1993), the entire relocation, rather than facilitating a

transformation, merely reproduced the traditional smallholder land use and settlement pattern, only now in more confined village boundaries with higher population concentrations and the virtual absence of options to migrate. No land reform or land consolidation measures accompanied the imposed settlement policy (1993:11).

Lack of true participation from peasants and pastoralists involved in such a large scale relocation scheme has proven disastrous for the environment and the societies affected. This grand scheme to modernize traditional modes of production and to extend the instruments of modernization, such as schooling and agricultural extension services, has led to the erosion of knowledge systems and adaptation strategies that people had applied in their environments for millennia. Among other solutions put forward by land use planners and environmentalists to begin to reverse some of the damage caused by villagization, says Schuler (1993), is to encourage:

...[the reinvolvement] of the local population in planning, implementing and monitoring the progress of environmental action plans. So far the institutional hierarchy has ignored indigenous technical knowledge and prevented 'learning from below' (1993:123).

He argues further that:

...evidence from case studies in villages all over Tanzania confirm that smallholders are thoroughly familiar with common environmental problems: depletion of forests, declining soil fertility, soil erosion, and overgrazing. To integrate indigenous knowledge into environmental plans requires more direct means of communication...(1993:121).

3.3 EDUCATION IN TANZANIA

One will find both encouraging and discouraging signs in the most recent pronouncements from the Tanzanian government concerning the direction of formal education in the country²⁸. In this section I will examine some of these policy directions as well as some of the historical influences on Tanzanian education. I will also explore current thinking on the development of EE programs specifically.

3.3.1 Post Independence

There was comprehensive indigenous education long before the influences of European colonialism reached East Africa. Indigenous education, says Cameron (1970), taught children the rigid mores of the tribe and the skills necessary for a "pre-destined place in ...small-scale societ[ies]" (1970:14). A great emphasis was placed on respect for parents, relatives and elders as part of the indigenous education process. Julius Nyerere had a deep interest in education and educational policy through to the end of his Presidency in the mid-eighties. He too recognized the integrity and complexity of indigenous education. He writes in Fafunwa et al, (1982):

²⁸Two key documents articulate Tanzania's directions in education into the 21st century. They are *The Report of the Task Force on The Tanzanian Education System for the 21st Century* (1992), and the *Tanzania Integrated Education and Training Policy*, (1993)

The fact that pre-colonial Africa did not have 'schools'...did not mean that children were not educated....They learned the tribal history, and the tribe's relationship with other tribes and with the spirits, by listening to the stories of their elders. Through these means, and by the custom of sharing to which young people were taught to conform, the values of the society were transmitted (1982:236).

The influence of German and later British rule on Tanzanian education was profound²⁹, and it was this system, based on racial segregation between African and European and a world view born of the metropole, that Nyerere inherited in 1964. Of this inheritance, Nyerere wrote:

Colonial education in this country was...not transmitting the values and knowledge of Tanzanian society from one generation to the next: it was a deliberate attempt to change those values and to replace traditional knowledge by the knowledge from a different society (Fafunwa et al, 1982:237).

Nyerere attempted to reform the educational system to make it more relevant to Tanzanians. He articulated his views directly in the policy document entitled "Education for Self-Reliance"³⁰ (Nyerere, 1967). The President had embraced the traditional Tanzanian family as the basis for a modern and progressive socialist society having at

²⁹For example, Osaki (1994) notes that traditional African education was slowly replaced by Western-style education -- influenced by commissions such as the Phelps-Stokes which produced the influential "Education for Adaptation" report, followed by the British government in her colonies -- which treated subjects such as agriculture or animal husbandry as "low grade" but suitable for African children (1904:2). The perception of "outdoor" subjects like EE as inferior persists today and is part of the challenge faced by those wishing to include more environmental subject matter in the curriculum.

³⁰One of the most notable recommendations of the 1967 policy was the establishment of community schools. Buchert (1992) describes the community schools as an attempt to recreate for the modern context, a school based on the pre-colonial African way of transmitting mental and manual skills to children. Buchert studied two community schools and found that, while the original aim of promoting cooperation between school and community was generally achieved, constant changes to the objectives and personnel involved in the pilot schools diluted early successes with the concept. Buchert questions whether the more far reaching purpose of promoting joint school-community problem solving was ever achieved and cites structural reasons for his doubts. For example, the concept of the community school was constantly being changed at the national level, while implementation was poorly supervised and left entirely to the local communities. No comprehensive assessments or evaluations were utilized to monitor the community schools initiatives which were officially abandoned in 1982.

its core, three basic principles:

- ▶ Equality and respect for human dignity.
- ▶ Sharing of the resources which are produced by our efforts.
- ▶ Work by everyone and exploitation by none (Dodd, 1969:vii).

Nyerere wanted to completely overhaul the colonial system of education³¹ with its individualistic instincts, particularly at the level of primary education. He felt that the great majority of Tanzanians might never attend, never mind go beyond, primary school. For those who did, it would be a complete education in itself, preparing a person for life in the village. Primary education, he wrote, "must be a preparation for the life which the majority of children will lead" (quoted in Dodd, 1969:2). Reflecting on his achievements in the early 1980's, Nyerere still found the fundamental faults in the educational system which frustrated him at independence. Nyerere identified three persistent weaknesses (in Fafunwa et al 1982):

- 1) We are still providing an elitist education designed to meet the interests and needs of a very small portion of those who enter the school system.
- 2) *Tanzania's education [system], is such as to divorce its participants from the society it is supposed to be preparing them for. This is particularly true of secondary schools, which are almost entirely boarding schools (my emphasis).*
- 3) Our present system encourages school pupils in the idea that all knowledge which is worthwhile is acquired from books or from "educated people" - meaning those who have been through a formal education. The knowledge and wisdom of other [sic]old people is despised, and they themselves are regarded as being ignorant and of no account(1982:242).

³¹ From 1967 onwards, a number of reforms were implemented in pursuance of the objectives of self-reliance including changes to the curriculum, the administration of education, assessment, and the nature of the educational institution itself (Buchert, 1992)

While there is evidence to suggest that primary education in Tanzania has become more accessible and more relevant to local communities³², the secondary school system has not³³. Secondary education continues to hold out the promise for advancement in a modern bureaucratic state, improved social status, urban-based employment, and even the possibility of a university education. Educational policy makers today view the secondary education system as an instrument of modernization, a source of skilled workers prepared for a science and technology based economy. Tanzania's Integrated Education and Training Policy (1993) states that:

The acquisition of scientific and technological skills by the majority of school graduates as the country moves towards the 21st century... will ultimately have a direct bearing on the social and economic development of Tanzania. Specifically, it is assumed that by imparting scientific knowledge to the vast majority of school graduates, the country will be creating an adequate reservoir of manpower that will exploit substantially the abundant natural deposits which it is endowed with. In turn, the exploitation of the natural resources, should have positive implications for raising the general standards of living for the majority of the people (1993:65).

Naturally, students recognize that their chances for success in the context of a modernizing secondary school curriculum is to focus on academics and pass examinations. Parents and students view school as a way out of village life and a gateway

³² For example, total enrolment in standard seven in 1961 was 14,649. In 1991, the figure stood at 371,358. This remarkable increase in educational capacity has been accompanied by the construction of thousands of primary schools in local communities. Though I did not carry out observations in primary schools directly, I was told by community informants that primary schools focus much more on local economic and cultural activities such as agriculture, animal husbandry, and micro-enterprise.

³³ It is important to point out that adult and non-formal education initiatives respond more to the ideas expressed in Nyerere's "education for self reliance." For example, Tanzania's Integrated Education and Training Policy (1993:72) says "traditional expertise, experts and the apprenticeship system shall be recognized as a component of the vocational education and training system." The same policy document lists, as an objective for non-formal education, the ability "to sustain and further develop cultural identity through the transmission of cultural values, attitudes, and customs of society."

to good jobs, status, and wealth. National examinations act as a screen for students wanting to move from primary to secondary schools, from Standard IV to Form I within the secondary system, and from Form II into university. As a result, those who fail to pass to the next stage are held in less esteem than those who progress through the system. The implications of this competitive and elitist formula on what is taught and, indeed, what is viewed as relevant by students, teachers, parents, and community members is profound. This phenomenon is discussed in more detail in chapter six.

3.3.2 Environmental Education in Tanzania

Efforts to improve and promote EE in Tanzanian secondary schools have increased recently. A major study by Rajabu and Chediel (1993) sought to identify the key environmental issues which secondary school students and their teachers considered to be important in their daily activities. Specifically, the study attempted to measure the level of knowledge students and teachers had about the environment, what their attitudes were toward the environment, to identify what kinds of environmental conservation activities were being carried out by schools, and to identify teaching resources and methods being used in EE. The study focused on form II and IV students from 12 secondary schools throughout Tanzania. Among other things the study found that only 3.6% of students received environmental information through school work³⁴ and that "the

³⁴ Using focus groups, checklists and questionnaires, the KAP study looked for indicators of knowledge in the areas of forest, soil and wildlife conservation as well as sanitation, pollution, ecology, and marine resources. The report details the methodology and statistical results in a number of interesting areas (Rajabu, 1993).

environmental aspects contained in the syllabus were not effective in creating environmental awareness among students" (1993:25). The report was highly critical of the level of teacher knowledge about EE and the teaching methods being used. The final report listed the following recommendations:

- 1) Existing subjects and teacher education methods should be reviewed to reflect environmental reality with a focus on a deliberate selection and inclusion of objectives and content which will add to the learners' awareness and value of the environment.
- 2) There should be deliberate environmental activities in the schools which inculcate proper attitudes toward the environment.
- 3) Resource needs for EE in secondary schools should be established.
- 4) *A study should be conducted on traditional knowledge on the environment which could possibly be included in the school curriculum [my emphasis] (1993:25-6).*

This study is indicative of a growing emphasis on EE in Tanzania. There is an increased effort on the part of NGO's,³⁵ individuals within the Ministry of Education (MOE) and the Curriculum Development Institute (CDI), and the University of Dar es Salaam (UDSM), as well as teacher training colleges, to improve EE programming in secondary schools. EE forms a major part of Tanzania's National Conservation Strategy as outlined by the National Environment Management Council (NEMC). NGO's such as the World Wildlife Fund (WWF) are committing substantial resources to provide EE training to teachers and policy makers. Numerous documents collected during the course of this

³⁵ A mail survey was conducted during my 7 months of research in Tanzania which was targeted specifically at 28 Tanzanian NGOs. Among other things, the survey asked whether the organization considered environmental or conservation education to be part of their mandate. Eleven NGOs responded and all indicated that environmental education was part of their work.

research indicate a strong and renewed emphasis emanating from the UDSM, NGO's and various Ministry officials for improving EE design and delivery.³⁶

One persistent debate found within this literature concerns what EE strategies or approaches should be followed. For example, the IEEP newsletter stated that EE was "an integral part of the education process and should be centred on practical problems and be of an interdisciplinary character. It should aim at building up a sense of values, contribute to public well-being and concern itself with the survival of the human species"(1981:1). American ecologist Garrett Hardin, on the other hand, says that "a citizen of the modern world must...be able to ecilate³⁷ -- able to understand and use sustainably the complex environmental systems of which he or she is a part" (as cited in Meadows, 1989:5). These are but two views among hundreds, perhaps thousands, with respect to EE. Within the Tanzanian educational system, from the MOE and the CDI right through to teachers colleges and individual schools, there are differing ideas about how to design and implement EE. The implications of some of these design decisions with respect to linking EE and LFK will be explored further in chapter six.

³⁶ A number of unpublished papers and internal documents support this claim such as, (Osaki, 1992 and 1994, Bakola, 1992 and 1994, Rajabu, 1994, Kamara, 1991, Mchallo, 1992, Kikula and Mwalyosi, 1993, Katigula, 1991)

³⁷ An example of "ecilating" would be where an individual is able to calculate the impacts of an activity -- say forestry -- on the ecology of the area, wildlife habitat, nutrient cycles, wind currents, moisture retention etc.

CHAPTER FOUR METHODOLOGY AND RESEARCH STRATEGY

As a trained secondary school teacher interested in the role of education in development, Tanzania has long been an academic focus for me. Having worked with cross-cultural education NGOs in Indonesia and Guyana in the past³⁸, I was determined to strengthen and broaden my knowledge of development in different regions of the world by pursuing research in Tanzania. Through Carleton International and the Commonwealth University Students Academic Consortium agreement, of which Carleton University and the University of Dar es Salaam are signatories, I was able to spend 7 months in Tanzania from October 1993 - April 1994. I registered as a graduate student in the Faculty of Education, at the UDSM, but also worked in close affiliation with the National Environment Management Council. The Council is a quasi-governmental institution responsible for, among other things, the strengthening and promotion of EE in Tanzania. In addition, the International Development Research Centre (IDRC) in Ottawa provided funding through the Young Canadian Researchers Award Program.

4.1 EVOLUTION OF THE RESEARCH PROBLEM

Originally, I believed I would find evidence to support the hypothesis that LEK was, to

³⁸ The author has been a Project Leader with Canada World Youth in Indonesia and a volunteer with Canadian Crossroads International in Guyana

the ultimate detriment of the environment, marginalized by the current theory and practice of development, and that an example of this situation could be found by looking critically at failed tree planting initiatives in Tanzanian secondary schools. However, during the first several weeks of preliminary research, I found that the focus on tree-planting, while still relevant, was in fact considered "part of the problem" in Tanzania. Environment issues and tree planting have become virtually synonymous concepts for urban and rural based Tanzanians due, in part, to national-scale tree planting campaigns. There is much evidence to support the assertion that these tree planting campaigns in Tanzania have achieved far from adequate results (Misana and Nyaki, 1993). What I found during this period was a momentum building around the idea of environmental education. It became increasingly clear that a more complex understanding of human-environment interaction was needed and was being advocated by academics working in the area of EE in Tanzania (Bakobi, 01/11/93). The importance of EE in contributing to environmental sustainability was being stressed to me, and I was encouraged by advisors in Tanzania to focus my research efforts in this area.

In response, I refocused my question to look at LEK vis-a-vis the EE efforts being promulgated in secondary schools, but without losing the tree planting focus entirely. I deliberately selected schools which had environment clubs carrying out school based tree-planting initiatives. I still felt that the function and effectiveness of these clubs with respect to the community would reveal something about the linkages or absence thereof between community and school. Recent research in the field of traditional or indigenous

knowledge advocates "participatory community" or "action" research methodology (Johnson,1992:6). Therefore I sought a research methodology and strategy that would allow me to understand, if only partially, the nature and strength of LEK as well as school based EE in a participatory manner. In this chapter I will critically examine and acknowledge the limitations of the methodology employed.

4.2 THE METHODOLOGICAL FRAMEWORK

The objective of investigating LEK and its isolation from mainstream institutions reveals a bias toward a human-ecological analytical framework -- the study of the relationship between the natural and human worlds (Gerden and Mtallo, 1990). Of particular interest to my investigation, given its breadth rather than depth, were the general cultural beliefs, superstitions, values, taboos, and feelings associated with the environment that, while difficult for the outsider to fully comprehend, nonetheless give an indication of the scope and conviction of such beliefs, their conservation implications, and the degree to which they exist in isolation from the dominant, school based cultural-ecological belief system. As Wickham (1993) notes, beliefs, values and feelings constitute the essence of human ecology. However, "conventional production-centred views of development often suggest that at best, these (things) are unworthy of scientific consideration and, at worst, pose an obstacle to development" (1993:34).

Though this thesis is guided by a curiosity about the value of local knowledge, I was

cautious not to ignore its limitations. The comments of Richards (1980 as cited in Wickham, 1993) were instructive to my research design:

...The least that might be expected from dialectically opposed emphasis on indigenous knowledge...is that it would help to deflate the rhetorical humbug of 'modernization theory'...On the other hand the epistemology will have to be rigorous - a sentimental belief in "traditional values" and a gut feeling that the 'people know best' without knowing why and under what circumstances, will be equally unhelpful and damaging to the prospects for rural development in the long run (1993:29).

Essentially I wanted to compare and contrast knowledge and ideas about the environment in local communities with what I was able to observe and measure in secondary schools through interaction and observation of teachers and students as well as an analysis of the relevant curriculum.

I chose four secondary schools in rural communities and focused on Form V and VI students and teachers in those schools. In the community, I worked with local people living immediately around the schools. Elder women and men acted as my community informants, while teachers and students provided me with an understanding of school based EE. I utilized a combination of methodologies that could be characterized as being on a continuum between Relaxed Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) methodology, along with more conventional methods of qualitative educational research such as classroom observation and curriculum content analysis. RRA/PRA methods were used with both school and community informant groups so that a more accurate comparison would be possible. Research with each respective informant group was conducted separately.

A key objective of this research was to proceed in a way which was unobtrusive to the schools and communities involved, but that would also actively seek their participation in determining the questions asked. To some extent, this objective was realized. However, the fact that such grassroots participation was not entirely realized warrants a critical examination of the methodology and the strategy.

4.2.1 The RRA-PRA Continuum

Although initially I approached the fieldwork phase of the research committed to PRA methods, I have had cause to present the methodology, in retrospect, as something more accurately described as an RRA study which utilizes some PRA methods.

RRA emerged in the late 1970's and early 1980's as a method described as a "systematic yet semi-structured activity carried out in the field by a multidisciplinary team to quickly acquire new information" (Grandstaff and Grandstaff, 1987 as cited in Wickham, 1993:63). RRA began as, and continues to be, a way for outsiders to learn about communities. The purpose of the RRA exercise is to enable outsiders to gain information and insights from local people and about local conditions (Chambers and Guijt, 1995:6). Like its later evolutionary cousin -- PRA -- Relaxed Rural Appraisal provides a menu of techniques from which the researcher is encouraged to choose, adapt, experiment, make mistakes, and learn. Many of the techniques are recognizable from other social science methods such as social anthropology and agroecosystem analysis, but the difference is

in the guiding principles of RRA that it promote:

- 1) exploratory and progressive learning
- 2) rapid learning
- 3) multidisciplinary learning (Wickham, 1993).

PRA on the other hand emphasizes processes that empower people to change their own condition and situation. It is less extractive than RRA. Instead of providing a rapid and extensive body of information about a community, PRA emphasizes a process by which communities can articulate their knowledge and concerns, ultimately providing an avenue for creating their own solutions³⁹. **Appendix 1** lists PRA and RRA techniques respectively, and highlights those which were utilized in this research.

The literature around RRA and PRA emphasizes that the attitude of the researcher is the most important factor. Researchers must be willing to listen and learn rather than prescribe. They should inherently value the contribution local people have to make about their situation, and have the patience to learn and understand what they hear and see.

My research was driven mainly by academic requirements rather than finding applied solutions in the field. Given this context, I borrowed only parts of RRA and PRA methodology designed to be more comprehensive and applied in their application. Upon reflection, by listing the characteristics of both RRA and PRA together, I would argue

³⁹ Chambers (1994) lists five "streams" of research methodology which have come to influence PRA. Among them is "activist participatory research" which Chambers attributes to the work of Paulo Freire and, in particular, his book, "The Pedagogy of the Oppressed (1968)". Freire's insistence that poor and exploited people can and should be enabled to conduct their own analysis of their own reality has been extremely influential among a minority of development professionals and researchers (Chambers, 1994: 954).

RRA/PRA methods are extensive, visual and practical. Researchers are encouraged to select from "menus" of techniques and adapt and apply them to different research questions or situations. In this way, RRA/PRA has continued to evolve and grow in popularity amongst development researchers, resource planners, sociologists, geographers, and others. In this research, the following RRA-PRA tools were utilized:

- ▶ Individual and Focus Group Open-ended Interviews
- ▶ Community Time Lines
- ▶ Trend Graphing
- ▶ Seasonal Calenders
- ▶ Sketch mapping & Transects

4.3.1 Individual and Focus Group Open-ended Interviews

Community informants as well as students and ministry\NCO informants participated in semi-structured interviews. These interviews lasted between forty-five minutes and two hours each. I used a pre-determined interview schedule arrived at after initial testing with several informants. However, the schedule served only as a guide. Tangents and additional subjects and questions were explored in most interviews. Some questions were closed, requiring only a one-word response, but for the most part questions were open ended. Detailed notes of the informant responses were taken during the interviews and re-checked immediately following each interview.

4.3.2 Interviews with Elders

In-depth interviews were conducted with 3-4 elders per community. An even mix of male and female informants was sought. I reasoned that, because LEK is experiential and cumulative, the most informative individuals would be those with the most life-experience, namely elders. The interview schedule for this group consisted of twenty-three questions. Generally, interviews were conducted in the informants' homes. In most elder interviews, my research assistant asked the questions in the local vernacular and recorded responses in English. I was present to ask, through the assistant, supplemental questions or seek clarification where necessary.

4.3.3 Interviews with Students

Student focus groups were engaged in discussion using the same interview schedule as the one used with community elders. In each school, focus groups consisted of six, Form V and VI students. These levels are roughly the equivalent of grades 12 and 13 respectively in Ontario. This grade level was chosen because of the students' greater proficiency in English, and their longer experience in the community. I conducted these focus groups entirely in English without the aid of an assistant.

4.3.4 Interviews with Teachers

Approximately 3 interviews with teachers were conducted in each of the four schools. The interview schedule consisted of sixteen questions. Again, tangents and subsequent

questioning were added to the interview schedule during the interviews. Teachers of Geography, Biology, and Civics were the primary focus of my interviews and observations. The interviews provided data on difficulties facing teachers, views on EE curriculum, student and teacher attitudes toward the environment, and teaching conditions among other things. Interviews were conducted entirely in English without the aid of an assistant.

4.3.5 Community Time Lines

Time lines provide a history of major events recollected by an individual or group of individuals within a community. Dates of significant events are recorded chronologically to create a profile of changes over time. Community elders were asked individually to describe significant events in the community going back as far as they could remember. Student focus groups were asked to build their time line as a group. Both informant groups noted events which included, for example, droughts, epidemics, and significant political events such as the Arusha Declaration of 1967. Every attempt was made not to bias responses in any way.

4.3.6 Trend Graphing

Community informants and students were asked to describe the trends noticeable in their

community with respect to natural resource issues and environmental change in areas such as forest cover, crop harvests, rainfall, and soil erosion. Responses were plotted on a simple x-y graph with the guidance of the informant(s) until a graph resulted for which there was consensus.

4.3.7 Seasonal Calender

Community informants and student focus groups were asked to formulate with me a yearly calendar in which events such as rainy and dry seasons, planting and harvesting time, animal migrations, timing of traditional ceremonies, and so on, were noted. These calendars were useful for comparing knowledge sets between student and elder informants. These data are found in appendices only.

4.3.8 Sketch Mapping & Transects

Each school site and surrounding community was sketched in the field to provide a spatial context, particularly as it pertained to the local environment. The school and community surroundings play an important role in student perceptions of environmental degradation, and as potential learning environments. With the help of local informants, I sketched the spatial layout of the school and surrounding community and also captured this information in east-west and north-south transects. The main purpose of these techniques was to provide an environmental context, and to assess whether the immediate

surroundings were being, or could be used, for pedagogical purposes. Transects and sketches provide a visual context for understanding the environmental conditions in which both schools and communities carry out their respective actions. **Photo 2** shows an elder informant sketching information about the layout of the local community for me in the sand.

Photo 2: RRA Techniques in the Field

2

PM-1 3½"x4" PHOTOGRAPHIC MICROCOPY TARGET
NBS 1010a ANSI/ISO #2 EQUIVALENT

PRECISIONSM RESOLUTION TARGETS

4.4 QUALITATIVE RESEARCH TECHNIQUES

4.4.1 Curriculum Criticism

Curriculum criticism has been described as a multidisciplinary approach to the study of educational materials and settings (Ross, 1988, Bogdan and Biklen, 1988). In the context of this research, curriculum criticism has been used primarily in the observation of Geography, Biology, and General studies classes in all four schools involved in the study. In several schools, multiple observations in the same subject area were done, primarily to gain an understanding of the dominant pedagogical techniques being used in schools generally, and in certain subjects specifically. I was also looking for insights and evidence as to how the environmental aspects of three different curricula were being articulated. Course syllabi and teacher resource and supplementary materials are also subject to evaluation and criticism.

In carrying out classroom observations, Ross (1988) says, "the presence of the observer should change the setting as little as possible"(1988:164). In this respect, I strove to be as unobtrusive and non-disruptive as possible while observing interactions in the classroom. During observations I noted any statement, interaction, use of resource, type of subject matter, and timing that could contribute to my understanding of pedagogical

or environmental education phenomena. Borone, (1980, as cited in Ross 1988) says, "the exact words, actions and products of the participants forms the core of evidence upon which criticism is based"(1988:164)

Ross (1988) also talks about the value of what she calls "connoisseurship" in classroom observation. Though some ethnographers suggest that researchers should not study familiar settings, Ross argues that the act of appreciating and understanding subtle differences and interrelationships in a setting is what enables one to make comparisons to other settings (1988:165). As a trained secondary school teacher, I brought to this methodology a certain degree of "connoisseurship," though I do acknowledge that my expertise is in Canadian rather than Tanzanian classrooms, and I wish to fully recognize the full range of cultural and historical differences possible therein.

Approximately 2-3 detailed classroom observations per school (10-12 in total) were conducted. This provided data on teaching styles, classroom interactions, and curriculum content. In addition, course materials were collected such as curriculum guidelines, lesson plans, textbooks, and teacher's guides. This information provides the basis for analyzing current EE in Tanzanian secondary schools.

In terms of describing the educational setting and the event under observation, Ross (1988) says the critic should provide an accurate linguistic rendering of the observation that will "transport the reader to the scene, convey the pervasive qualities or

characteristics of the phenomenon, and evoke the feeling and nature of the educational experience (1988:166). This I have attempted to do in chapter five.

4.5 OTHER TECHNIQUES

The following other research techniques were utilized in this research:

- ▶ Photography
- ▶ Mail-out Survey of Tanzanian NGOs
- ▶ Government Statistics
- ▶ Training

4.5.1 Photography

As Bogdan and Biklen (1982) point out, "most social scientists neither accept nor reject photography outright [but rather] they ask, 'what value does it have for me and how can I make use of it in my own work'" (1982:102-3). I utilized photography in the hope that it would have value in explaining, or describing more precisely, aspects of my research. In this respect, for example, I use photographs to provide a better understanding of the RRA/PRA methods used, and a visual context for understanding the Tanzanian classroom, school grounds, and natural environment. In chapter five, photographs are presented to enhance the readers understanding of the phenomena and environment under study.

4.5.2 Mail-out Survey of Tanzanian NGOs

A mail survey was conducted over the duration of the fieldwork spanning 7 months from October 1993 to March 1994 which was targeted specifically at 28 Tanzanian NGOs of which eleven NGOs responded. The mail survey was designed to obtain information from Tanzanian or Tanzanian based NGOs regarding their environmental education activities and the degree to which these activities looked at local environmental knowledge. Among other things, the survey asked whether the organization considered environmental or conservation education to be part of their mandate. Originally envisioned as a preliminary survey to help direct the main part of my research, the data collected provided evidence about the existence or lack of mechanisms to research and collect LEK for any purpose.

4.5.3 Government Statistics

Statistics from the Tanzanian Ministry of Education provide information on the level of education, gender breakdown, the breakdown of Tanzanian to non-Tanzanian teachers, and the age of teachers in each of the four schools studied. In addition, overall enrolment numbers for the four schools are presented.

4.5.4 Training

Three fourth-year students from the University of Dar es Salaam (one female and two

males) were recruited to work as research assistants and trained to assist with some of the interview work with elder informants. I designed and carried out a one day workshop with the three assistants to explain my study, the overall methodology being used, and the set of questions we would be using with community informants in particular. The assistants participated in the initial review and re-drafting of questions to be used in the field, as they had first hand knowledge of the communities involved in the study. I was able to accompany two assistants in the field during data collection, while the third assistant worked on his own and reported the findings back to me. The use of research assistants enabled me to collect interview data in local vernaculars, thereby improving the comfort level and ability of informants to communicate esoteric concepts concerning the environment.

The collaborative process of working with research assistants made an important contribution toward the goal of applying this research within a sensitive and non-extractive framework. Research opportunities at the University of Dar es Salaam are quite limited, so an added benefit of this approach was that it created a training and professional development opportunity for three Tanzanian colleagues.

4.6 THE FOUR RESEARCH SITES

Initial interviews during the preliminary stage of the fieldwork indicated that the level of resources, teacher quality, and of course, ethnic and cultural factors differed greatly

throughout Tanzania. Taking this into account in the design of the fieldwork, I sought a representative sample of schools from different regions of the country. With limited resources and time, I settled on four schools and adjacent communities in the regions of Mtwara, Kilimanjaro (2 sites), and Morogoro.

4.6.1 Mtwara

Located in the Southern most region of Tanzania near the border with Mozambique, **Mtwara Secondary Day School** was the most isolated and economically depressed of the four sites. The school is a government owned day-school, meaning the students return home each evening. The school accommodates approximately 274 students (139 male and 135 female) in a small facility located on approximately 20 hectares of flat, cleared land. The school is located several kilometres from the town centre, and about 5 kilometres from the Indian ocean.

4.6.2 Kilimanjaro - Sameh district.

The first of two sites located in the Kilimanjaro region, **Sameh Boys Secondary School** is a large boys boarding school, with a few local males and females attending Form V as day students from the surrounding community. Boarded students number 514 males, with approximately 20 students living locally. Sameh district is located in the southern part of Kilimanjaro region, about 100km south of Mt. Kilimanjaro off the main highway

linking Dar es Salaam and Arusha. The school encompasses an area of about 10 acres at the base of a small mountain. The school grounds look down upon the town of Sameh, and the main north-south road and rail line linking Arusha and Dar es Salaam.

4.6.3 Kilimanjaro - Ashira

The second site in Kilimanjaro region is the **Ashira Girls Secondary School**. Ashira is a large all-girls secondary boarding school located in the foothills of Mt. Kilimanjaro. The school accommodates 601 students. The school is located in the district of Marangu which is in turn located in the northern portion of Kilimanjaro region close to the border with Kenya. Ashira Girls Secondary School encompasses a large area of approximately 35-50 acres, hilly, with a mixture of agricultural, housing, and forest uses taking place. The site overlooks the village of Marangu and the main road leading from Marangu up to the entrance to Kilimanjaro National Park.

4.6.4 Morogoro - Mzumbe

Morogoro is located very close to the geographic centre of Tanzania. The study site was **Mzumbe Boys Secondary School**, an all boys boarding school. This is the largest facility in the study, with a student population of 746. Located on approximately 10 acres, Mzumbe is situated on a flat, plateau-like area within view of the Uluguru mountains. There are several small, fresh-water lakes located just west of Morogoro.

Apart from this water source, the surrounding countryside is dry with scrub-like vegetation.

4.7 Limitations

Seeking to understand aspects of a local knowledge system is a difficult proposition. As someone outside the culture, I made strategic and methodological choices which, although informed by extensive reading in the area of RRA-PRA, ethnography, ethnobotany, African culture and education, were undoubtedly influenced by my own cultural "lenses." For example, I limited my "survey" of LEK to elder men and women in the communities, reasoning that these individuals would have the longest and deepest record of LEK. I also assumed that men and women would be "keepers" of different aspects of LEK, though I did not apply a gender framework to my analysis of social structures or the division of labour among community members. As a result, the data collected concerning elder knowledge about the environment was of a general rather than a gender specific nature. Similar limitations exist with respect to gender analysis of curriculum, teaching methods, and student perceptions. My strategy yielded data which are consistent across four communities, and rich in community history and environmental change, but are perhaps not as thorough about the gendered and or spiritual meaning behind various beliefs as could have perhaps been accomplished by a rigorous anthropological or ethnographic approach.

With respect to the student informants, I reasoned that upper-year students would provide the best insight into the secondary school system as a whole. While this was probably an accurate assumption, it would have been interesting to assess the knowledge that youth not attending school had about the local environment and compare this with the school based focus groups.

I utilized a "participatory" methodology, reasoning that in order to elicit detailed LEK from elder informants -- mainly rural farmers -- I would need to be flexible about the process of asking questions. I also felt it was important to provide alternative means of expression (and triangulation) other than the spoken word, hence the trend graphs and calenders done with elders and some students. "Participation" was achieved in the sense that I remained open to informant-driven changes in the direction of our discussions, issues raised, length of time spent on a particular subject and so on. However, the basic research questions were designed by me, and to the extent that I was looking for certain types of information to provide evidence to either support or refute my hypothesis, I claim a degree of caution in my use of the term "participatory" research.

There are aspects of translation and back-translation, particularly with elder informants that must be acknowledged. **Figure 2** illustrates the flow of information and the languages used throughout.

Figure 2 : Translation factors in data collection

Adapted from Wickam, 1993:59

These translation factors may have affected the data collected, though care was taken to clarify points with informants. A high degree of consistency was noted in the responses from elders. Nonetheless, the potential for translation error does exist.

While I believe my approach to the collection of qualitative data was successful, I must acknowledge that the generalizations I have made about LEK based on twenty informants spread throughout four communities could be challenged. I sought to explore the broad concept of LEK vis-a-vis formal school curricula, and the reliability of my data has depended on the individuals my assistants and I were able to speak with. Different

informants in a similarly designed study might provide different data and lead to different conclusions. Similarly, my school-based research relied on upper year students functioning in their second language -- English. Their degree of investment in the secondary school system, coupled with the presence of a "foreign" researcher conversing in the student's second language may have influenced the quality of their answers. Finally, the potential for miscommunication, incorrect assumptions, cultural bias, and translation errors are all potential limitations to the data collected, and the subsequent analysis and conclusions posited. I have endeavoured to check and re-check data wherever possible and to explore as many possible meanings and interpretations as time, resources, and ingenuity allowed. Ultimately, any mistakes in the representation or interpretation of the data are mine. I acknowledge these possibilities but I am also fully confident of the academic integrity of the research I have attempted. The next chapter concerns the presentation of my data.

CHAPTER FIVE

DATA PRESENTATION

In this chapter, I present data collected during field research in Tanzania, spanning a period from early October 1993 to April 1994. The data are presented in 6 parts. Each part is presented as a combination of data collected, along with preliminary discussion and interpretation. A more detailed discussion drawing upon the evidence in its entirety, and the literature reviewed, forms the basis of chapter six. However, the presentation and process of reflecting on the data begin here.

5.1 PART ONE: SCHOOLYARD SKETCH MAPS, TRANSECTS AND PHOTOGRAPHS

For each school site, sketch maps and transects were drawn and photographs taken to help illustrate the environmental context in which each school is situated. For this section of the data presentation, I have included only the sketches and transects from Mzumbe Secondary School in Morogoro. Sketch data from the other sites are quite similar so I have chosen to present only one set in the text. Additional data for all four research sites are included in appendices. Photographs from all four schools appear throughout this chapter where appropriate.

Figure 3 is a spatial sketch map of the Mzumbe school grounds and surrounding

community. **Figures 4 and 5** are transects of the same area. **Photo 3** illustrates degradation on the nearby foothills around Mzumbe Secondary school. This information taken together, provides the researcher with a physical perspective of the schools, and a geographical overview of the area. Of particular interest in this photograph is the accessibility of the school to heavily deforested lands. The transects demonstrate a varied environment, including diverse vegetation, forests, valleys, and agricultural activities immediately around the school.

Photo 3: Mzumbe School Grounds and Surroundings

Fig: 3: MZUMBE SEC SCHOOL - SKETCH MAP

Source: DANIDA, Rural Maintenance Unit-Dodoma.

Figure 4:

West-East Transect: Mzumbe Secondary School: Saturday 10:30 Am: 12.2.94.

LEGEND

1. thick forest dominantly acacia
2. generator house
3. valley with tall grass
4. slope with tall grass
5. Mzumbe book project
6. Tall trees with short grass
7. loose surface path
8. banana Shamba + tall grass
9. Mkwana village dormitories
10. Mkwana village store
11. mixed cultivated Shamba
12. thickets
13. Small valley

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FIGURE 5:

North - South Transect: Mzumbe Secondary School: Saturday 12.2.94: 10:20 Am.

LEGEND

1. Cultivated staff shambas	10. Demonstration orange trees
2. Short grass	11. Administrative Block
3. bare play ground (photos 2+6)	12. One storey class building for P.2 + 3
4. gardens (flowers)	13. Wide-trunk mango trees and tall grass
5. Staff social club	14. abandoned staff shambas
6. short grass and orange trees	15. Cultivated shambas
7. valley	16. Shrubs
8. bamboo trees	
9. Mzumbe Book Project	

5.2 PART TWO: SCHOOL STATISTICS

To add to the readers understanding of teacher and student demographics in the schools under study, the following table is presented.

Table 3: Statistics on Teachers and Students in 4 Schools

Statistic	Mzumbe (Morogoro)	Sameh SS (Sameh)	Saba Saba (Mtwara)	Ashira SS
Total number of students	746	514	274	601
Total number of teachers	39M + 7F = 46	21M + 12F = 33	18M + 3F = 21	20M + 16F = 36
Total number of teachers originally from the area	3	18	2	14
Average age of teachers on staff	40.8	NA	37.2	50
Teachers with Science education degrees	9	10	1	2
Teachers with just science degrees	3	0	0	0
Teachers with Arts education degrees	12	21	0	5
Teachers with arts degrees	0	2	0	0
Teachers with science diplomas	9	0	6	13
Teachers with arts diplomas	10	0	14	13
No Post-Secondary Qualifications	3	0	0	5

Discussion:

There are a disproportionate number of male teachers in the schools. This is true of the secondary level generally, even in all-girl schools. Until recently men have outnumbered women at the high school and post-secondary levels, so the disparity could be expected to show up in a profession such as teaching. Some would argue that the gendered

division of labour results in different uses, perspectives and knowledge about the environment, and as such, a predominantly male teaching staff could impact on the quality of an EE curriculum (Kettel, 1993; Rathegeber, 1994).

A number of teachers from Sameh and Ashira schools actually come from the Kilimanjaro region. It is a high priority for teachers to secure a teaching assignment in their home region, if not their birthplaces specifically. It was clear from interviews that there is a good deal of "politics" involved in having oneself placed at the school of ones choice. Accusations of nepotism and corruption with respect to teaching assignments were particularly prevalent during my stay at Sameh Secondary School.

The number of teachers at Saba Saba Secondary School with higher degrees is minimal. This school is located in a very remote part of Tanzania and is, without a doubt, considered a "hardship" posting. This practice of assigning teachers to hardship postings, of course, has impacts on morale, teaching quality, the performance of students on exams, and school reputation to name a few. Arts education degrees were most common among the staff of Sameh and Mzumbe, while science diplomas were the most frequent qualification among Ashira staff.

5.3 PART THREE: INTERVIEWS WITH COMMUNITY ELDERS AND STUDENT FOCUS GROUPS

Extensive individual interviews were conducted with 3-4 elders (an even mix of male and female whenever possible) from each of the four communities studied. Focus groups consisting of 5-6 students were held in each of the secondary schools located in the four communities. **Photo 4**, for example, shows the six students in the focus group from Sameh Secondary School along with their American Peace Corps teacher.

Photo 4: Student Focus Group from Sameh Secondary School

The four research sites respect the variables envisaged during the research design stage, such as geographic distribution, economic prosperity, and accessibility. In addition, the

schools represent a mix of day-schools and boarding schools accommodating just male or female students, as well as one co-educational environment (Saba Saba).

Informant interviews lasted between one and two hours. Though pre-determined questions were used, tangents were explored and additional questions were added during the course of interviewing. With the help of research assistants, interviews were conducted in the local vernacular. Responses to each question are organized by community, and separated with the responses of elders along the left column and responses from students along the right. **Italicized statements indicate agreement between elder and students responses.** Numbers appearing in brackets after a response indicates that more than one informant gave the same answer.

Q1. How long have you lived in this area?

ELDER				STUDENT
Morogoro	Sameh	Mtwara	Ashira	Morogoro
30 years	54 years	40 years	30 years	-average of less than 16 months for the group
21 years	78 years	73 years	49 years	Sameh
27 years	45 years	58 years	11 years	-average of 16 months
60 years	50 years	40 years	47 years	Mtwara
				-each of the six students gave an answer ranging from 5 - 14 years
				Ashira
				-five of six students had lived in the Kilimanjaro region for their entire lives, though none had been living at Ashira longer than 3 years

Discussion:

This question was asked to establish a baseline of experience that individuals could be expected to have in a given locale. The different responses from student and elder informants is explained by the fact that, with the exception of Mtwara, students come

from other parts of Tanzania and are boarded for their secondary school years. In Mtwara, students are local and responded accordingly. The fact that most students have relatively little experience in these communities influences their responses to subsequent questions. Later, where students cite examples of local beliefs, and where these comments differ greatly from the responses of the elders, experience in the community becomes an important factor.

Q2. What are the main occupations of people in this community?	
Elders	Students
Morogoro -agriculture(4), millet,paddy,maize -animal husbandry(2), goat rearing, guinea fowl -fishing(2) -the army(1)	Morogoro -agriculture -cultivation -livestock keeping
Sameh -cattle herding -goat, sheep raising -farming maize, beans, millet -working in schools(1)	Sameh -livestock raising -small business
Mtwara -hunting(4) -farming(4) -fishing	Mtwara -fishing, -agriculture -trading -government -business
Ashira -zero-grazing livestock(2) -mixed crop cultivation (banana,coffee,maize)(3)	Ashira -livestock -cropping

Discussion:

This question was asked to see if there were any significant omissions on the part of students about the livelihoods and occupations of people in the community. The question was also useful as a way of making the interviewer and informants feel comfortable before moving into more detailed discussion of environmental conditions, practices and beliefs. The answers given indicate that students generally identify correctly the main activities of people in the surrounding communities, though they do not name all

occupations, nor the sub-activities within an economic activity.

Q3. Can you tell me if there has been any changes in the local environment?	
Elders	Students
<p>Morogoro</p> <ul style="list-style-type: none"> -poor soil fertility -very low harvests <p>-rainy seasons are now very short seasons are becoming very unreliable there has been a tremendous change caused by decreased rainfall -charcoal dealers have cleared the forest on the hills -dried springs -occurrence of new diseases -decreased forest coverage -since 1981, unreliable, insufficient rainfall</p> <p>Sameh</p> <ul style="list-style-type: none"> -wet seasons have all but disappeared <p>-many years ago this was a high savannah with many trees, elephants, and plenty of Rhinoceros. There used to be plenty of rain, two rainy seasons, and good harvests. -rainfall was good up to about 1969-70. Since then, soil fertility has declined, harvests are very low, and there are acute shortages of water affecting people and livestock(2). -greater incidence of human and animal disease but many of the traditional medicinal herbs have been destroyed. -forest cover has declined. Most trees have been cut down. High winds and natural streams have dried up. -most of the trees in this area have been cut down</p> <p>Mtwara</p> <ul style="list-style-type: none"> -yes, changes in forest cover, water supply, disease, soil fertility(4) -yes, especially decreased rainfall. <p>Water supply is very scarce compared with the early 1900's. -soil is not fertile without the application of artificial fertilizers</p> <p>Ashira</p> <ul style="list-style-type: none"> -deterioration of forest cover(2), unreliable rainfall(2), changes in the seasons(3), soil erosion(2), declining soil fertility(2), declining coffee harvest (3), coffee diseases (2), extinction of local streams and springs(3), increasing temperature which improved the avocado harvest. 	<p>Morogoro</p> <ul style="list-style-type: none"> - we were told that Mzumbe used to experience rains in Nov-Dec, but it is now February and it has rained lightly only twice. -dirty water is causing severe disease such as typhoid, dysentery, and meningitis. <p>-soil fertility is declining due to bush-burning -there has been a decline in harvests and a rise in maize prices</p> <p>Sameh</p> <ul style="list-style-type: none"> -The students commented that the area had become continuously drier since they arrived. <p>Mtwara</p> <ul style="list-style-type: none"> -increase in population -it seems to have become hotter -there has definitely been a decrease in annual rainfall -decrease in soil fertility -outbreaks of disease <p>Ashira</p> <ul style="list-style-type: none"> -deterioration of forest cover, -unreliable rainfall

Discussion:

This was a fundamental question asked to ascertain informants' views of environmental change, and the time frame in which change did or did not occur. In general, as my line of questioning focused more on the details of the local environment and environmental change, the responses of the elder informants became consistently more detailed and

confidently delivered. During interviews, elders were more emphatic and dismayed when describing environmental degradation. Students tended to hesitate and confer with each other before stating that one aspect or another of the environment had indeed exhibited change. With respect to this question, the trend graphs developed between myself and the informants (and presented later in this chapter) further corroborate the interview data. Elder and student responses from three of four sites note similar issues (i.e., declining soil fertility, low harvests, and increasingly unreliable rainfall), though students do not cite as many or as detailed changes.

Responses from the community of Sameh are more divergent. This community was, by far, the most obviously denuded area of the four sites considered in this study, and the segregation of the school and community seemed most pronounced here as well. This is evident in the near total lack of comment from the student focus group in response to this question. Elders gave detailed accounts of the Sameh bio-region historically and juxtaposed it with conditions today. They noted declining rains, disappearing streams, declining soil fertility, loss of traditional plants and traditional medicines, and continuing deforestation. Students, on the other hand, noted only that the area had become drier since their arrival at the school.

Comparisons of the elder and student responses from Mtwara reveal much more consensus regarding significant environmental change. It is important to note that Mtwara is the only school in the study where students are local, indicating perhaps that

environmental concerns are shared by parents, students, and members of the community.

Q4. What reasons can you give for the changes?

Elders

Morogoro

- decrease in the forests that used to attract rainfall
- diseases are caused by our poor standard of living
- due to the fact that the world climate is changing
- we utilize the same soil for a very long time without any measure for preserving it
- the community does not have good, modern environmental knowledge
- primitive methods of production have affected forest cover , harvests, soil fertility, and water supply.
- seasons are unrenable due to dwindling forests.
- diseases are caused by our poor standard of living

Sameh

- There used to be so few people. Now there are many cutting trees, herding animals.
- animals have moved to the ruura river area
- lack of rainfall combined with high wind has destroyed soils and even people's homes
- natural streams have dried up, harvests have declined tremendously, and wind is blowing soil away

Mitwara

- severe deforestation as a result of demand for land for cultivation, settlement, charcoal, and lumber(4)
- soils are infertile due to frequent use without the application of fertilizers.
- many areas previously covered by forests are now open because of increased population.
- the water supply is now scarce, maybe because of deforestation.
- diseases are now many, though measures to prevent them are encouraging.
- soil is not as fertile as it was prior to 1970 because people have been using the same piece of land without renewing or fallowing.
- there is an improvement recently in harvests due to use of fertilizers
- water is now available due to government efforts to prevent people from cultivating at the source of rivers

Ashira

- continuous coffee cultivation since 1890 has caused soil infertility.
- use of chemical fertilizers
- unsustainable forest harvesting has damaged forests and streams(2)
- too much grass harvesting in catchment areas
- intensive cultivation(2)
- population pressure(2)

Students

Morogoro

- water is contaminated by villagers upstream
- burning of left-overs from the Mzumbe book project causes air pollution in the area
- failed crops are caused by soil infertility so people have to add fertilizers or manure when planting anything.

Sameh

No comment

Mitwara

- increased population is part of the problem

Ashira

- population growth

Discussion:

This question attempts to broach the subject of belief systems by looking for explanation

of environmental change. Reasons given by elder respondents in all four communities show considerably more explanatory detail than the students. Students in Morogoro offered entirely different reasons than the elder informants for environmental change in the area. With respect to Sameh, the total lack of response from students leads me to suggest that there is a direct relationship between the severity of the environmental situation (which has also impacted on the social and economic fabric of both the school and the community) and the degree of divergence between the responses of the two informant groups with respect to knowledge about environmental change and causes of change. The elder informants from Mtwara were also able to offer much more detailed information about the causes of environmental change. Change is, of course, a time sensitive phenomenon, and the cumulative experiential knowledge of older community members could be expected. The tendency of students from Mtwara and Ashira to cite only increased population as the main culprit, raises questions about the depth of critical analysis taking place in schools with respect to population issues.

Q5. What are the main environmental issues facing your community today?

Elders

Morogoro

not being able to plant due to lack of rain
drought(4), it has affected subsistence crop production leading to
hunger

soil erosion(3)

crop diseases(2)

human diseases(3), typhoid, malaria, cholera

toxic chemicals

illiteracy

the community is too poor for artificial irrigation

soil fertility /exhaustion(3)

Sameh

-natural streams have dried up

unreliable seasons

emergence of disease (human and animal)

-lack of rainfall(2)

the failure to replace trees after cutting

- fast moving wind erosion(2)

-deforestation

Mtwara

-Deforestation is the main issue(2)

-reduction of soil fertility

-reduction of soil fertility, water erosion during rainfall, unplanned
and unnecessary cutting of trees, and improper use of latrines

-disease , mainly TB

soil erosion(3) People are cultivating in sloped areas where water
erosion is most serious. Monoculture also causes soil erosion.

Ashira

-soil infertility(3)

-deforestation(2)

-unreliable seasons(2)

-unreliable rainfall

Students

Morogoro

-soil infertility is the most serious,
followed by water pollution

Sameh

-deforestation,

-overgrazing,

-wind erosion

Mtwara

-soil erosion

-dynamite fishing This has killed fish populations and caused an
increase in the price of fish

Ashira

-deforestation and unreliable rainfall

Discussion:

This question was asked to assess the level of agreement between students and local elders with respect to the most pertinent environmental issues. There are differing views of the "main" problem as defined by students and elders in all four communities presented. The richness and variety in the elder responses must be attributed to a depth of experience in these places. One exception is the mention of dynamite fishing by

student respondents but not elders in Mtwara. Popular opinion on the subject of dynamite fishing in Tanzania is indeed critical of the practice as extremely damaging to the environment. Perhaps elders interviewed in Mtwara either did not regard fishing as important to their livelihood, or else recognized economic realities ahead of environmental impact and did not feel it necessary (or prudent) to acknowledge the practice. Because elder interviews were conducted individually, it can be argued that the high degree of consensus among elder informants indicates a depth and reliability of elder sources of knowledge and awareness about the environment. I would argue that student responses are only as complete as they are, due to the relative advantage of being able to construct their responses in a focus group context.

Q6. Can you tell me about any methods which were used in the past which protected or conserved the environment?

Elders

Morogoro

old and respected people used to go out to our shrines and pray to our ancestors to bring rain and it used to rain regularly

Mndewa was a village head who prohibited clearing of forests.

Sultani and Mlawa were responsible for the deeds of their families and were to report any disturbance of forests to Mndewa for prosecution

-anyone who cut trees was prosecuted and fined

-fallow farming

-use of manure(2)

-terracing

-crop rotation

-shifting cultivation(2)

this was the only method required as land was plentiful and the people allowed the soils to regain their natural fertility

Sameh

-the Masai people used to use this land, but they roamed. The "pare" people protected forest areas in the mountains, but followed Masai practices in the lowland areas

-the preservation of forest is for traditional sacrifices, for help, for stopping calamities, for calling on rains, even to stop rain or bring forth certain calamities to prove "pare" power

-these "Mshitu" forests (clan controlled) were very effective in protecting the environment

-there used to be certain areas where newly married women were not allowed to cut wood. These were respected areas where the elders went to pray.

-there used to be "spirit trees" and medicinal trees that were not allowed to be cut. Elders were responsible for the forests

Mtwara

-bush fallowing and shifting cultivation were the main methods used in the past(4)

-tree planting was practiced on a small scale, especially for those trees believed to be a source of medicine.

-terracing to reduce water erosion was also practised(2)

Ashira

-protecting natural springs due to the belief that the water could heal the war-injured

-local migration to allow sustainable utilization of fuelwood

-cultivating on valley slopes was prohibited(2)

-terracing was encouraged

-mature trees were not inherited but, rather, were considered

Mangi's (Kings) tree(2).

-cutting of certain trees was prohibited (ie mninga & mringa)(2)

Students

Morogoro

-in the past no clearing of forests was permitted unless consent was given by the authorities

-it was believed that satan inhabited the forests, so people were afraid to go into thick forests. This fear resulted in conservation.

-the Madola tree was thought to be an "omen" tree and to cut it would bring misfortune.

-If the "Mpafa" tree was found, the land was believed to be fertile and good for agriculture, so it was conserved wherever it grew.

-people used to "pray" for rainfall by big trees which were believed to be holy places

Sameh

-No

Mtwara

-long ago, people used to use only nets and lines for fishing

-there used to be much more forest cover, but most trees have been cut

-farmers plough now where as before they used to do shifting cultivation

Ashira

-for every tree cut, people were encouraged to plant two

Discussion:

This questions attempts to uncover traditional beliefs or methods for environmental

conservation and produced a mixture of interesting responses. It is, however, rather difficult to ascertain if the students are providing local examples (local to the school they are attending), or examples learned at "home." Although I stressed very strongly in the interviews that I wanted students to respond with respect to their local school community, their desire to demonstrate their knowledge to me may have, on more than one occasion, taken precedence. Some concepts characterized as LEK may, indeed, be common in different areas of Tanzania. However, a more extensive anthropological or ethnographic study would be required to confirm this. Again, it is more than coincidence that Sameh is the most environmentally degraded and stressed environment of the four presented here, while at the same time there is a stark difference between what elders and students had to say about LEK. Students, in fact, were unable to provide any answer. They simply did not know. Both respondent groups from Morogoro make reference to spiritual or customary beliefs connected to forest utilization. In fact, most of the data which I would characterize as local environmental knowledge concerned spiritual belief related to forests. This was true of all four communities. Again, the level of detail in elder responses vis-a-vis students indicates a considerable difference in what is "known" by each group respectively.

Q7. Are any of these methods being passed to the younger generation?

Elders

Morogoro

the Mdewa or local chief provided a strong measure of environmental discipline but today, *"European" religion has discouraged the Mdewa*

-use of manure & terrace farming are practiced by the younger generation, but fallow and shifting cultivation is no longer possible due to population growth and land scarcity(3).

Sameh

-not really

-the church has discouraged ritual activities in the Mshitu.

-These ideas used to be passed on during "Ngasu" (initiation ceremonies for young girls and boys) but the younger people do not want to hear about restricted forests these days

-the collapse of these ceremonies have impeded the transmission of cultural knowledge

Mtwara

-practices are passed along orally through sayings and stories.

Ashira

-some traditions are passed at the initiative of the elders(2)

-no(2)

Students

Morogoro

-Yes, in some areas people still believe but *many are now christianized and educated and no longer hold these beliefs.*

Sameh

-No comment

Mtwara

-yes, many of the ideas are inherited

Ashira

-initiation ceremonies for young boys and girls are still practised by some people.

Discussion:

This question was asked to determine if any formal or informal mechanisms existed for transmitting LEK to students or other young people. There is evidence in Morogoro and Sameh that European or Christian belief systems discouraged the passing down of indigenous beliefs about the forests or other natural phenomenon. Such beliefs were deemed fundamentally pagan. As Sachs (1992a) says, "...the traditional [pagan] knowledge which has enabled the communities to survive has often been ignored in preference to book learning"(1992a:21). However, it can be argued that "pagan" beliefs had an important conservation impact. As Gadgil et al (1993) note, indigenous systems of knowledge develop based on decision rules of which the social group as a whole may not be fully aware. For instance, certain individuals in a tribe or social grouping may be

the primary informants of decision rules concerning the environment while other members of the group merely recognize the rule as a custom. Such a process "inevitably results in a co-mingling of knowledge, practice and belief which seems to characterize the conservation practices of indigenous people"(1993:155).

The fact that some informants claim that local knowledge is being passed to the younger generation begs the question of how? What are the mechanisms and how could they be researched and possibly strengthened. I would argue from my observations, that the mechanisms of transmission do not reach the schools, but rather, reach individual students in the informal context of the home and family. The study by Rajabu and Chedial (1993) described in chapter three confirms that only 3.6% of students receive environmental information through the school. If the transmission of environmental knowledge is representative of the general transmission patterns of traditional beliefs to the younger generation, then research on transmission mechanisms should begin outside the school institution.

Q8. Tell me about customs or beliefs about the environment in this area?

Elders

Morogoro

Tambiko: sacrificing under the Mwongo trees, particularly at Mgetya and Bunduki lake where our forefathers used to go and offer sacrifice

- Even during the driest seasons, rain still seems to fall on Ukwagule forest, so it is considered a shrine of all the Waluguru tribe
- community members believe that they have no control of environment. Any change is taken as either the will of God, or their past ancestors. For this reason, people pray, sacrifice their harvest, or slaughter an animal to please God or ancestors(2).
- dwindling forests, drought, and disease are considered punishment for people's sins by ancestors and God
- most people, especially elders, believe that everything is under the control of God and when faced with environmental problems they pray more

Sameh

-the beliefs concerning the forests and related rituals were prominent in this area. Now they are seen as archaic. Even plants with medicinal properties are not respected.

-beliefs about forests have disappeared, though a couple of clans still have untouched forests. Close to Sameh, most trees have been cut regardless of "clan forests." Even big trees where women used to pray for fertility have been cut.

Mtwara

- Natural forests are believed to be the source of medicine as well as rivers and streams(3).
- the sources of rivers are believed to be protected by God.
- because forests are the source of medicine, anyone cutting forests improperly would be punished by God.
- forests are the home of ancestors where rainfall originates.

Ashira

-Mchuoni, a sacred assembling place under a Mchuio tree which no one is even allowed to climb. It is believed that after death, ancestors live in that tree.

-Mrriri is a tree that is always conserved because it is known to have properties which heal infections(2)

-thick forest have always been thought of as home of dead ancestors, but christian beliefs have eroded this traditional belief.

-big trees are highly respected as the home of ancestors, and used as meeting places

Ngetsi herbs used for thread-worm infection; mosereka herbs used for stomach ache; kale herb used to treat asthma and ulcers.

-mlekio waterfall was believed to be inhabited by evil spirits, but is now used widely by people for swimming, washing, etc. This has polluted the water source(2).

Students

Morogoro

-No we can't because we are all newcomers to this area

Sameh

-The Mwarobaini tree grow in this area. These trees are good for about 40 different ailments. People plant them around their houses and tend not to cut them because of their medicinal benefits.

Mtwara

- big baobab trees used to be considered special, religious sites.
- there were many traditional plants to protect people from evil spirits. Islam and Christianity now discourage these beliefs.
- there is still much trading in medicinal plants

Ashira

-that forests are the home of ancestral spirits

Discussion:

This question was central to my research. It was asked at a point in the interview process

when both the informants and the interviewers felt comfortable. I was attempting to gather specific examples of local beliefs about the forests, water, seasons, and other aspects of the natural environment. The level of detail and consistent deference to environmental matters being in the domain of "God's will" is very clear in the elder responses. This religious link to the land, says Desjeux (1981) "is not a simple sentimental attachment, nor an irrational or obscure exotic custom, [rather], it refers back to a problem of experience, in the daily life of the peasant"(1981:15).

The co-mingling of knowledge and practice with belief needs to be first viewed objectively without condemnation by the outside observer, and then understood and perhaps decoded for the environmental ethic which pervades the belief. To do otherwise may lead to the characterization of beliefs as mere superstition rather than as the codes of conduct for entire social groups, part of which concerns environmental conservation and resource use. The use of certain trees as shrines to ensure rainfall, good harvests, and even fertility is a common theme in elder responses to this question. Taking this as one example, the custom of regarding these trees as religious shrines may have originated out of a perceived or prescribed need to maintain biodiversity (with respect to the tree species). On the other hand, the maintenance of biodiversity may just be a positive, yet unexpected, outcome of a purely spiritual dictate. In either case, understanding the rationale behind the religious belief is important because the beneficial environmental impact of the belief in practice cannot be overlooked

Q9. Are these beliefs still held?

Elders

Morogoro

Yes(3)

- These beliefs have been despised by the Christian and Moslem converts, but are still held on the hill tops where "pagan" people still live
such beliefs are diminishing because of contact with "educated" people in the local community.

Sameh

traditional sacrifice is not practiced often, due to modernity. Maybe this has angered the Gods and is the reason for the drought. The forests are still well protected by the clans.
-A few families hold on to these beliefs but they are regarded as primitive
-no(1)

Mtwara

-yes(4)

Ashira

-the Mchuoni and Mmri beliefs are still widely held Village meetings still take place at Mchuoni, where the large tree is found
-beliefs about medicinal herbs are still widely held
-No(2)

Students

Morogoro

-only by a few we think.

Sameh

-about this Mwarobaini tree, yes

Mtwara

-some of the knowledge about medicinal plants is still known

Ashira

-some people still believe that the forests are sacred

Discussion:

This question was asked to try to gauge the extent to which local or traditional beliefs were still deemed important. Responses to this question seem to indicate that the influences of both Islam and Christianity have eroded traditional beliefs. Despite this, many elders claim that traditional beliefs are still held. One elder informant posited that the erosion of traditional sacrifice due to "modernity" may be the reason for recent environmental degradation in her community. Students generally regarded themselves as being "outside" the category of "believer" but, in all four focus groups, felt quite confident that some elders still held strong traditional beliefs.

Q10. Is there a certain person (or people) in the community who is known to have special knowledge of the natural environment?

Elders

Morogoro

-No(1)

-Yes(2)

-Mzee Mtago was very famous and could predict events accurately. He is known to have predicted that "you will have to eat alien foods and sell yours in the future "

- Mzee Majaliwa is highly respected in the community as someone who can predict environmental changes.(2)

Sameh

-No(3)

Mtwara

-No

-Yes, Mzee Mwenye

-yes, the oldest people in the community are believed to have special knowledge of the natural environment.

Ashira

-yes - Mzee Yona Mamba (90 yrs old)

-yes - Mzee Yohane Lawwo

-no(2)

Students

Morogoro

-Yes, Mzee Joseph Kinaucha is said to know a lot about the history of this area and is always consulted in case of extraordinary events such as delayed rains

Sameh

-No

Mtwara

-Yes, Mzee Sandially knows much about the sea and Mzee Nantuatuma knows much about the forests

Ashira

-Not that we know of

Discussion:

This question was asked to try to determine a source or sources of concentrated and potentially rich LEK. There is a mix of yes and no responses from elders and students. Perhaps the identity of specially skilled individuals is known only to certain groups within the community to which those informants responding positively to my question, had access. It would seem, however, that students new to the community would be less likely to be privy to such information. Perhaps not all elders believe it is possible for specific individuals to have special knowledge of the environment. It is also possible that there were some cultural restrictions of which I was unaware that may have prevented individuals from divulging such information.

In retrospect, it might have been efficacious to try and determine which individuals

within a community were said to have specialized knowledge, and then spend as much time as possible with these individuals. The data presented under question 10, however, indicate that this might not have been as straightforward as it sounds, given that individuals in all three communities both confirm and dispute the existence of specialized individuals. It is noteworthy that neither informant group identified a common individual.

Q11. Do you receive information about environmental issues, conservation methods, tree planting etc.?

Elders

Morogoro

- No(1)
- Yes(3)
- through the village council and its hierarchy. Also from health and district authorities, *radio and newspapers*.
- yes, from agricultural and environmental officers from the Sokoine University of Agriculture.
- yes, but it is not followed by locals.

Sameh

- yes but rarely(2). Forestry and agricultural officials have given me information on the use of fertilizers and seeds. Fertilizers are expensive, however, and they make the land barren

Mtwara

- Yes, I am receiving information about environmental issues through radio, magazine(2), and speeches of government and party leaders (2)-- mainly on soil conservation methods, tree planting.
- there is a special program known as "misitu ni uhai" (life depends on forests) which comes through *Radio Tanzania Dar es Salaam*
- The Tanzanian Red Cross explains to us how to protect the environment but these ideas have not been well accepted. People are not educated about the importance of such programs.

Ashira

- yes, government campaigns concerning tree-planting(4)
- radio programs*, local meetings, and *newspapers* all emphasize conservation(3)

Students

Morogoro

- Yes, from the school authorities, movies by the WCST, *radio, newspapers* and school curriculum

Sameh

- Yes we have heard about ways of conserving the environment but we do not see them being practiced here.

Mtwara

- Yes, from the Malihai club, *Radio Tanzania*

Ashira

- yes, from the Malihai clubs, *radio and newspapers*

Discussion:

This question was asked to gauge the current external influences on the environmental awareness of both the students and the local community. Consistent affirmative responses were obtained from both elders and students with respect to this question. Tanzania's

relatively well developed rural extension structures and adult education efforts through "Radio Tanzania" are responsible for delivering national messages concerning tree planting and soil conservation mainly. These data show that information is "getting through" to local people, but not necessarily that it is being followed or even that it is viewed as valuable. With respect to Malihai clubs and clubs sponsored by the WCST, there seems to be no on-going activities at any of the 5 schools observed.

Q12. Are there any environmental programs or activities at the local Secondary school that you know about?

Elders	Students
<p>Morogoro -No(3) - only tree planting at the primary school. - I cannot tell because the school is not integrated with community activities at all.</p> <p>Sameh -yes(3), tree planting. This is an important activity but I think it is too slow. The area is almost a desert already</p> <p>Mtwara -Yes, tree planting activities(4), programs on how to use manure(2), and how to control erosion. -terracing(3). -educating people on how to apply fertilizers. -these school efforts are small scale compared to the demand for firewood, lumber, and settlement.</p> <p>Ashira -Yes, use of manure in school gardens, and tree nursery program -yes, a very active tree-planting program(2) -no</p>	<p>Morogoro -No</p> <p>Sameh -Yes, we have a Malihai club but it is dead. There was a program of tree planting but because of water shortages and grazing sheep destroying the seedlings, these efforts have ceased</p> <p>Mtwara -Yes, the Malihai club was established in 1992 under Mr Nyengedi. All students are members and the main activity is tree planting.</p> <p>Ashira -we have a malihai club with new equipment, but there has been nothing organized for a while now</p>

Discussion:

This question was asked to determine links among community members and schools, and to gauge whether schools and communities worked jointly on any issues. Community awareness of school activities is limited to tree planting and soil erosion. In fact, in the early stages of designing my research strategy, Bakobi (01/11/93) described this "tree

planting = environment" mentality as one of the obstacles to improved EE. It would seem, however, that the two concepts are still strongly associated. Tanzania has engaged in national campaigns for afforestation utilizing radio, literacy campaigns, and other forms of mass media and adult education for promotion. In the four schools observed, tree planting activities, although still promoted and seen as an important initiative for secondary schools, were observed to be completely inoperative. There is some vague awareness that schools should be doing tree planting and soil conservation, but upon closer examination at the school level, no efforts whatsoever were noted. While community informants generally believe that secondary schools are active in tree-planting, the students themselves confirm the absence of on-going activities. **Photo 5** shows the abandoned tree-planting efforts of a Malihai club at Sameh Secondary School.

Photo 5: Abandoned Malihai-club Tree-planting Initiative at Sameh Secondary School

5.4 PART FOUR: TIME LINES AND ENVIRONMENTAL TREND GRAPHS

There were a number of community time lines and environmental trend graphs gathered with informants which demonstrate the kinds of knowledge and the depth of understanding that different informant groups have about their local environment. In this section, examples of time lines and environmental trend graphs from elders and students at Mzumbe and Saba Saba Secondary Schools as well as from the adjacent communities of Morogoro and Mtwara respectively will be presented. Similar data from the Samch and Ashira sites can be found in **appendices 2-4**.

5.4.1 Morogoro

Table 4 is an example of one time line constructed with an elder from Morogoro. **Table 5** is the time line constructed with the Mzumbe Form V students in a focus group.

Table 4: Time Line 12/02/94 - Mzumbe elder, H.J. Jumbe

Date	Event
1939-45	-WWII
1940's	-forced cultivation of tobacco
1973-74	-great famine due to drought
1976	-a great traditional healer, Mkomma Mogella, died
1983-4	-prolonged drought
1974	-Tazara railway passes Morogoro
1982	-Mindu dam was completed
1974-present	-agricultural activity takes place on Mongwe hills
1993-4	-drought

Table 5: Time line 12/3/94 Mzumbe Student focus group

Date	Event
1974	-famine
1992	-famine
1993	-very heavy blowing winds
present	-cattle dying, lack of grasses for feed

Figures 7, 8, and 9 are environmental trend graphs drawn with elder informants to describe various environmental phenomena over time. **Figure 10** is a trend graph done with students. Commentary alongside the graphs was provided by the informants.

In the 1960's, Morogoro gained municipal status. During the 1970's charcoal production was allowed on hill slopes. The 1980's saw increased population pressure on vegetation cover.

Figure 7: Elder Trend Graph - Rainfall

During the 1960's-70's, tobacco monoculture was encouraged. Mixed cropping of maize and legumes was introduced in the 1970-80 period. In 1983-86 chemical fertilizers were widely used, but from 1987-90 there was reduced use of fertilizers due to dramatic price increases. From the 1990's to the present, there is a heavier reliance on farmyard manure.

Figure 8: Elder Trend Graph - Soil Fertility

From 1930-60, colonial measures restricted haphazard forest harvesting. During the post-independence period of the 1960-70's, the government issued permits to harvest forests unsustainably. Since 1980, illegal harvesting of forests for charcoal production has increased.

Figure 9: Elder Trend Graph - Crop Harvests. Source; Original fieldnotes, 10/01/94

Figure 10: Mzumbe Student Trend Graph-Forest Cover

No additional data given by the students. Note that the analysis spans a shorter time period.

5.4.2 Mtwara

Table 6 and 7 are time lines constructed with an elder informant and students from Saba Saba school in Mtwara respectively.

Table 6: Time Line 24/12/93 - Mtwara Elder Maria Nanyabo

Date	Event
1922	-Liloya flood
1951	-flood
1952	-Cata flood
1954	-drought and famine
	-establishment of TANU party
1961	-TANU established
1966	-migration of people to TZ from Mozambique
1967	-Arusha declaration. Many private enterprises nationalized
1970	-beginning of serious deforestation problems
1972	-villigization; export of wood charcoal to towns for income
1974	-famine; cashew nut improvement program starts
	-"agriculture is a matter of life and death" program starts
1978-9	-war with Uganda
1979-81	-economic hardship
1984	-famine
1991	-Mdanda flood

Table 7: Timeline 12/3/94 Saba Saba Student focus group

Date	Event
1984	-famine
1990	-flood where 100+ people died
	-volcanic eruptions near the Mkonde plateau
1991	-cholera outbreak
1993	-meningitis outbreak

Figures 11-13 are trend graphs drawn with elder informants, while **figure 14** was done with the Saba Saba student focus group. Commentary was provided by informants.

1930-60 Population was much smaller and demand for areas to settle was less. 1960-80 saw more charcoal production and deforestation. Government measures in the 1990s to prevent forest depletion and soil erosion helped the situation. Schools and farmers attempted tree-planting. More people in towns began using gas or electricity for cooking.

Figure 11: Elder Trend Graph-Deforestation

From 1930-70, rainfall was consistently high, particularly in the 1950-70 period. Since then, rainfall has been declining, I think probably because of cutting forests.

Figure 12: Elder Trend Graph-Rainfall

Continuous cropping of land started in the early 1950s and persists today. however, government measures to control soil erosion through terracing, crop rotation, and tree planting have, since the 1980s, started to improve the situation.

Figure 13: Elder Trend Graph-Soil Erosion

Figure 14: Student Trend Graph - Rainfall and Cashew Harvest

Rainfall and cashew harvests have been declining. There was a good harvest in 1991 due to access to pesticide.

Discussion:

The level of situational and temporal detail provided by elders in Morogoro and Mtwara is superior to that given by student informants. Elders are able to provide more detailed historical time lines and more explanation to accompany environmental trends. This method provided another way of illustrating similar information to that collected with informant interviews. All informants responded positively to this visual method

5.5 PART FIVE: CLASSROOM OBSERVATIONS OF ENVIRONMENTAL EDUCATION

Classroom observations were carried out in all four schools. Two observations from Mzumbe Secondary School, along with one each from Ashira and Mtwara schools are presented here. The observations presented are taken from Geography, Biology, General studies, and Civics classes. Each of these subject areas is purported to deal with aspects of environmental education, and my observations were designed to observe these elements as well as teaching styles, classroom atmosphere and teacher-student interaction. The observation data are divided into three columns. The first column tracks the time and topics covered. Column two notes classroom activities, while column three is used for observations and comments. The accompanying boxes describe two of the school settings. **Photo 6** shows one of the classrooms observed.

Photo 6: A Classroom Observation in Morogoro

Observation #1**School:** Mzumbe SS**Date:** 11/02/94**Class/Subject:** Geography**Teacher:** (Anonymity assured)**Setting:** Form III Classroom**Start Time/Finish Time:** 10:10 - 10:50am

Topic and Time	Activities Observed	Observers Comments
Introduction to Physical Geography: The Earth's Structure. 10:15am	Teacher asks if students know anything about the word "structure"	Ans: silence : How the earth appears? Teacher clarifies that it is how the earth is formed
Layers of the earth's crust 10:20am	Teacher is lecturing, talking about the ocean floor	No sketch diagrams provided to help explain No students attempt to question, so teacher is continuing to lecture
Relative densities of each layer 10:28am	lecture continues, talking about crust, mesosphere, and core.	after each layer the teacher checks for student understanding by asking "understood?" Students nod yes obediently.
Relative temperature of each layer 10:35am	Teacher explains that the core is hot, molten. Draws diagram from textbook, then refers to concepts mentioned above.	Repeatedly checks with students by saying "is this understood?" Students seem rather intimidated to say anything except "yes teacher".
Questions 10:40am	Students given opportunity to ask questions.	After long silence, one student timidly asks a question about the source of minerals in soils. Teacher answers vaguely. Asks students "is this understood" students respond "yes teacher"
Class ends 10:50am		

POST--OBSERVATION REFLECTIONS:**a) What was the balance between local/national/global issues during this observation?**

No such balance was attempted. The topic was theoretically presented, though the local example of the earth's structure -- the Ulugurru mountains -- were visible from the school but were not used in the explanations.

b) Was any reference made to the local community?

No

c) Was any reference made about personal actions concerning the environment?

Yes, the teacher mentioned how earth activities such as volcanoes and tremors can disturb human activities, but cautioned that people can do little to control volcanoes.

d) What was the main pedagogical approach used during this observation?

Lecture presentation dominated almost all of the 40 minute period. A diagram was drawn, though it was poorly done. Very little was done to solicit information and answers from students. The general technique of asking "is this understood" did not provide an accurate assessment of what students actually did understand. Students were reluctant to suggest answers during class.

Observation #2**School:** Mzumbe SS**Date:** 11/02/94**Class/Subject:** Biology**Teacher:** (Anonymity assured)**Setting:** Form III Classroom**Start Time/Finish Time:** 11:25-12noon

Topic and Time	Activities Observed	Observers Comments
"What is respiration" 11:25am	Teacher prepares diagrams on the chalk board. Teacher asks if students know how the body gets energy? No attempt by students to answer.	Students say it is the process of respiring, of breathing. Teacher acknowledges answers but explains that it is more a process of gas exchange.
Respiratory organs and structure 11:30am	The teacher accomplishes the lesson with a series of short questions and answers and by referring students to the diagram.	Teacher uses skilful tactics to solicit knowledge from previous lessons. Diagrams are well labelled
The process of respiration 11:35am	A straight lecture style now used by teacher	The way the process and reactions was presented to the students is too difficult for the form III students to understand. Teacher moves around room helping students
Classes of animals 11:40 am	Teachers provides the classes; mammals, amphibians, fishes, insects, arachnids, etc, and asks students for examples within each class.	Students are responding successfully to naming relevant types of animals in each class.
Characteristics of different respiration structures 11:50	Teacher lectures about lungs vs gills, etc and students listen and respond with short answers to questions posed by the teacher	Good presentation of relevant examples.

POST-OBSERVATION REFLECTIONS:

a) What was the balance between local/national/global issues during this observation?

Not applicable in this theoretical lesson.

b) Was any reference made to the local community?

Some, as students gave examples from their immediate environment such as goats, cows, housefly's, frogs etc.

c) Was any reference made about personal actions concerning the environment?

No

d) What was the main pedagogical approach used during this observation?

Use of diagrams, lecture, and referring to textbooks which students did have. This topic could have been taught more effectively if more experiential methods were used in conjunction with the lecture material. Teacher did not allow any time for students to ask questions. He was very directive and dominating in class. The students exhibited very little mastery of English language as observed in the way they answered questions. To compensate, the teacher should simplify his "teaching English."

Ashira Girls Secondary School has the identical types of one story, rectangular cement structures as other schools, used both as classrooms, and as dormitories. The similarities, however, end there. The campus rests on the lush, green foothills of Mt. Kilimanjaro. The climate is temperate, and evidence of the evening rains is pooled along the steep dirt path from Marangu town to the school. The campus is spacious and void of the thick forest cover that characterizes most of the area. Another large pile of firewood sits outside the school kitchen. Goats and cows graze freely around the school yard. The hills on the other side of the valley are bare, stripped of the tall pines that most surely grew there. I am here to observe geography classes at this all-girls school...

Box 1 Impression of Ashira Girls Secondary School

Observation #3**School:** Ashira Girls Secondary School**Date:** 19/01/94**Class/Subject:** General studies**Teacher:** (Anonymity Assured)**Setting:** Form VI classroom**Start Time/Finish Time:** 8:25-9:15

Topic and Time	Activities Observed	Observers Comments
<p>Introduction of me, and the topic; Geography - 8:25am</p> <p>Homework from yesterday - population pyramids</p>	<p>Teacher circulates and checks individual students homework.</p>	<p>Checking done in a friendly, joking manner initially</p> <p>Several admonishments for incomplete homework. Is this a widespread practice which accounts for the lack of confidence and assertiveness amongst students?</p>
<p>Is Africa overpopulated? 8:44am</p>	<p>Teacher writes the question on the board and asks students to write a short essay.</p> <p>Teacher almost immediately supersedes this activity by beginning a lecture on the balance between resources and population as well as new agricultural techniques, new energy sources.</p> <p>Teacher says people should switch to electricity, biogas, wind, solar? No consideration of poverty.</p>	<p>Has the teacher planned this lecture for my benefit?</p> <p>Lecture style stifles critical thinking or participation by students in the discussion.</p> <p>Teacher asks Beth, "what is the main cause of overpopulation?" Without giving Beth a chance to answer, he says "fertility, isn't it?"</p>

Lecture continues 8:55 am	Teachers lecture focuses on how Tanzania must deal with overpopulation	<p>Teacher advocated education and birth control.</p> <p>Teacher advocates modern agriculture, pesticide use, intensive agriculture and animal husbandry, reliance on agricultural extension officers. All of the above seem to be the antithesis of LEK.</p> <p>Teacher say, "local people, local peasants are stubborn and unwilling to adopt new technologies.</p> <p>In talking about alternative energy sources, the teacher made no connection between poverty-ability to pay-and alternative technology. Lecture was painfully simplistic.</p>
Lecture ends 9:15 am	Teacher assigns some reading for homework.	

POST--OBSERVATION REFLECTIONS:

a) What was the balance between local/national/global issues during this observation?

There was an emphasis on local issues. For example, the teacher used the town of Marangu as an example of overpopulation and pointed to the resultant impacts on the Kilimanjaro region of activities such as charcoal production, and use of firewood. However, the topic of "overpopulation" was not critically examined.

b) Was any reference made to the local community?

In explaining "carrying capacity," the teacher used the school dining hall as an example and drew a comparison between this and the land-resource base. He stated that the Kilimanjaro region was overpopulated.

c) Was any reference made about personal actions concerning the environment?

No

d) What was the main pedagogical approach used during this observation?

Teacher used a lecture format entirely, though he did use some local examples. The teacher spoke about the sub-division of land among sons to the moans of objection from

this all-girl class. He stated that girls get married and are not entitled to land. This teacher also openly criticized the villagization policies of the previous Tanzanian government. He said village resource assessments were needed, but were not done.

Such stark contrast to the desert conditions of Sameh. Mtwara, and the grounds of Saba Saba Day Secondary School are flat and lush. This school is by far the smallest of the four, with 4 or 5 one-storey buildings scattered over 10 acres. A mountain of piled firewood indicates the location of the kitchen. On several classroom doors written in well-smudged chalk are the words "speak only english here."

Box 2 Impressions of Saba Saba School

Observation #4

School:Saba Saba Secondary School

Date: 21/02/94

Class/Subject:Civics

Teacher: (Anonymity assured)

Setting:Form IV

Start Time/Finish Time:12:55-1:45

Topic and Time	Activities Observed	Observers Comments
Culture: Traditional dance, communicating cultural messages, and cultural taboo's 1pm	Teacher begins by asking students for examples of cultural taboo's. Students offer "can't talk back to elders" - "pregnant women should not eat eggs or the baby will be hairless" etc.	These examples provoke lots of laughter from students
1:05	Teacher directs the discussion asking if these "taboo's" are sensical? - the teacher explains that when the colonial powers ruled Tanzania, they were met with beliefs such as these. These beliefs were despised by the colonials and viewed as primitive.	Interestingly, the students strongly disavow any value in these taboo's
1:15	Teacher continues, explaining that the colonials imposed their own culture on the existing ones. Games and cultural events were often banned.	This lecture format is not giving students a chance to ask questions.
1:20	Teacher writes lengthy notes on the board describing the impact of the colonial period on indigenous culture.	Students taking notes. I look through the notebooks of a couple of students and note that today's lecture is in keeping with the topics of recent weeks.
1:45	Note writing ends, teacher wraps up class by saying the next lesson will look at the establishment of a "national culture" in Tanzania after independence.	

POST-OBSERVATION REFLECTIONS:

a) What was the balance between local/national/global issues during this observation?

This was an interesting class as it dealt with the imposition of a colonial culture over the existing traditions and administrative and cultural mechanisms. Potentially very pertinent to a discussion of environmental degradation, though no such linkage was ever made or attempted.

b) Was any reference made to the local community?

Yes, the lesson focused generally on Tanzanian local customs and traditions.

c) Was any reference made about personal actions concerning the environment?

No

d) What was the main pedagogical approach used during this observation?

Lecture and note writing. The potential to engage students in very interesting discussion was lost to the teacher's overbearing style and reliance on the lecture method.

5.6 PART SIX: SEMI-STRUCTURED INTERVIEWS WITH TEACHERS

Approximately three interviews with teachers were conducted in each of the four schools. The interview schedule consisted of sixteen questions. Again, tangents and subsequent questioning were explored during the course of interviewing. For presentation purposes, data were condensed to thirteen questions. This method provides data on difficulties facing teachers, views on EE curriculum, student and teacher attitudes toward the environment, and teaching conditions among other things.

Q1 How long have you been teaching? At this school?

TEACHER RESPONSE

Morogoro

13 years - 2 here

24 years - 6 here

7 years - 7 here

Samah

26 years - 2 here

7 Years - 7 here

9 years - 8 here

Mtwara

24 years - 1 5 here

9 years - 2 here (previously in primary teaching)

Ashira

6 years - 3 here

22 years - 16 here

22 years - 11 here

Discussion:

This question was asked to help determine the level of experience of teachers interviewed. It was also a comfortable question with which to begin interviews. The teachers interviewed seemed determined to obtain a teaching position in their "home" community. During an interview with Mr. Kazunga (01/27/94) of the Malihai clubs, he pointed out that the "school as an island" view permeates the thinking of students, teachers and local villagers. This concept relates to the feelings people have about their "house" as opposed to their "home," the latter being where people originate from and the former where they live to undertake employment. In the context of a secondary education system highly based on boarding schools and temporary accommodations for both teachers and students, this concept has wide implications. Both teachers and students exhibited attitudes of indifference or disregard for their "temporary" environment. This influences the seriousness with which EE and LEK is regarded.

Q2. In which subjects do you see EE being addressed?

Aggregated Responses

- Geography(10)
- Biology(9)
- General studies(3)
- Chemistry(2)
- civics(2)
- history
- physics

Discussion:

This question helped determine which curricula to focus on for an analysis of EE. Geography was highly ranked though, according to the ICD, the new general studies curriculum contains more EE. While the new General Studies curriculum was found to contain some EE components, the speed with which new texts, guidelines, and teacher training filters down to the schools is quite slow. Observations of the current curricula presented earlier generally revealed a strong emphasis on the scientific aspects of environmental processes with little or no discussion of the human-environment interface.

Q3. Have you attended any in-service or other specialized training to help you teach EE?

Aggregated Responses

- yes(4)
- a workshop organized by the WCST in June/July 1993
- an NEMC workshop on EE and desertification in 1990
- many years back, seminars in history but no EE involved
- no(7)
- I have had no in-service training since leaving university in 1970
- I am actively looking for a scholarship to study EE

Discussion:

This question was asked to determine the availability, frequency, and sources of training opportunities in EE for teachers. Four of eleven teachers responded affirmatively to this

question. There have been NGO efforts to promote EE through teacher training. Both the WCST and the NEMC in conjunction with WWF Tanzania have worked hard to reach district school superintendents, senior policy makers and, to a lesser extent, teachers. The director of the EE program within the NEMC, Bernard Bakobi (01/11/93), explained that with scarce resources available for EE training for any target group, higher level bureaucrats and policy makers were receiving most of the training that is available in the hope of promoting a "multiplier effect"⁴¹. Shuma (23/02/94), the coordinator of the WWF environmental education programme in Tanzania, stated that plans are underway to include EE in the curriculum of the Morogoro teacher training college. The usefulness of in-service training efforts will be examined briefly in chapter six. In general, these training efforts focus too much on reviewing Tanzania's most pressing environmental issues, and little or no time on effective pedagogy, community participation, or school - community linkages.

⁴¹ A multiplier effect in this context refers to the potential for the more senior bureaucrats and policy makers, once trained, to insist upon the introduction of similar training for teachers. The hope is that, by targeting more powerful, senior decision-makers, measures will be taken to strengthen EE training for less powerful groups.

Q4. What resources (books, displays, outdoor environments) do you use for teaching EE?

Aggregated Responses

- personal copy of "Man's Phys Environment"
- visits to national park, Mongo hills, Tanga/Lushoto
- biology textbooks
- charts left by the peace corp teachers
- there are NO approved general studies books which include EE
- there are very few resources that accompany the syllabus. Also the curriculum is already too full.
- most teachers teach toward the national examinations
- one teacher took his class to the local weather station to demonstrate different equipment for measuring rainfall, temperature, sunshine, etc.
- there was some coverage of env. issues in the old "siasa" textbooks and in political studies
- visits to "soil erosion" sites or similar excursions once per month.

Discussion:

This question was asked to determine if teachers regularly used the immediate school and local environment as a teaching resource, and if not, what other resources were at their disposal. The paucity of teaching resources for EE is clearly confirmed by the respondents. However, the natural environment, complete with examples of severe deforestation and erosion on the hillsides immediately surrounding some secondary schools were mentioned only once as potential teaching resources for EE. I refer the reader back to the site maps (**figure 3**) and transects (**figures 4-5**) as well as the photo of the Morogoro school grounds (**photo 3**) and surrounding community presented in section one of this chapter as an example.

Visits to national parks were mentioned. However, apart from the efforts of an American Peace Corps teacher in Sameh who carried out such a trip, I heard no other evidence that would indicate that field studies or trips to the parks are done. Resources

to carry out such trips are very hard to find, and teacher morale was observed to be so low, so as to make such extra-curricular efforts unlikely. In addition, teachers are most often not from the community in which they are teaching; this is a factor which Rathegeber (1994) argues "makes it difficult for teachers to use the local environment as a laboratory for investigation and analysis with their pupils" (1994:11-12).

Two individuals connected with the sanctioned environment/wildlife clubs which operate in secondary schools made claims about the effectiveness of their respective operations. Ottaru (08/11/93) and Wakimi (04/01/94) indicated that their clubs undertake school visits to present films and discussion on environmental and conservation issues on a regular basis. Again, my observations and discussions in schools confirmed the formation and/or existence of these clubs as legitimately authorized school clubs, but also confirmed that the clubs were entirely inactive.

Q5. Do you notice a growing concern or awareness in your students about environmental issues?

Morogoro

- Not much awareness(1)
- Yes(2)
- yes, especially with "A" level students
- Students do not respond positively when asked to do something related to preserving the env

Sameh

- Yes (1)
- Not really(2)
- I think their awareness is increasing as they notice changes to the environment
- most students come from other areas so they don't care about Sameh Students who come from parts of Tanzania where the environment is still healthy can't understand the need for conservation. Those who come from Sameh or other stressed environments can see the issues.
- syllabus is weak and students are not interested.

Mtwara

- yes, in some schools where I have taught there have been environmental clubs (malihai). In principle there is supposed to be a malihai club here.
- no, it is pretty much the same as always. There is not much interest in environmental problems.

Ashira

- Yes, students are aware of deforestation and population pressures
- Yes because students read the newspapers and listen to the radio, however, the syllabus does not allow time for activities like tyhe Malihai club. Env. issues should be given high priority
- No

Discussion:

There were a range of responses from teachers with respect to this question. Those teachers who claimed to have noticed an increasing awareness amongst students point to the "A" level classes mainly. Teachers who responded negatively place blame on the syllabus, the absence of functioning "Malihai" clubs, and general student apathy. I observed a consistent pre-occupation with national examinations by both teachers and students. My conversations with teachers revealed that the teachers feel compelled, naturally, to respond to student demands to prepare them as best as possible for the

national exams. There was a sense of immense pride and even competition amongst teachers with respect to which teacher's classes performed best on national examinations. This focus on national exams is further reinforced by the MOE and the national media through the publication and comparisons of performance by students and particular schools across the country. In this way, certain schools and regions have developed reputations corresponding to their record of performance on national exams. An example of the prominence of examination performance can be seen in **photo 7**, which shows the results on national examinations for each student, by name, at Ashira Girls Secondary School, Marangu.

Photo 7: Public Display of National Examination Results at Ashira SS

Q6. Are there any conservation or Environment clubs in the school?

Morogoro

Yes, the Wildlife Conservation Society of Tanzania (2)

No, just subject clubs

Sameh

Yes, we have a Malihai club concerned with tree planting(3) It is not effective because of so many destructive forces

(e.g goat keeping)

-There is also a hiking club started by the peace corp teacher

Mtwara

-There is supposed to be a malihai club

-No. There is a geography club and one topic in that club concerns the environment.

Ashira

Yes, the Malihai club(3)

Discussion:

This question was asked to determine the existence and effectiveness of environmental clubs in the schools. With the exception of Mzumbe Secondary School in Morogoro which had a WCST-sponsored conservation club, the other schools had "Malihai" clubs. In the case of Ashira and Sameh Secondary Schools, considerable resources were put into establishing seedling nurseries, with irrigation facilities, tools, pots, and fencing. In both cases, equipment was not being used or was in disrepair, and no activity whatsoever was observed. Water shortages and student disinterest were cited as the main reasons for the inactivity of the Malihai clubs. **Photo 5** (shown earlier) illustrated the stagnation of tree planting and tree nursery activities initiated by the Malihai clubs.

Q7. Are there any environmental projects involving this school and the community?

Morogoro

Not(3)

The group has been planning to establish a tree nursery but it has yet to be implemented.

Sameh

Not(2)

the Malihai club was active at one time, but it did not involve the community

just the tree nursery project but it is failing due to dryness
in fact, there is a Japanese NGO in this community doing
reforestation work, and we at the school know nothing about it

Mtwara

there are tree planting activities mobilized with the MNR and
having a community connection

-no

Ashira

-the Malihai clubs are supposed to supply seedlings to the
community(2)

-students in this school run small gardens and animal husbandry
(shamba projects), some of which is sold at the local market to
supplement school programs

Discussion:

This question was asked to elicit teacher's thoughts on school-community linkages. Responses to this question reiterate the importance of the Malihai clubs as the only organized initiative to mobilize students for positive environmental action, however, the responses also re-confirm the state of inactivity of the clubs and tree planting initiatives generally. It was surprising that, in the denuded environment surrounding Sameh Secondary School, no efforts had been made to link the school with a Japanese NGO identified as carrying out extensive tree-planting initiatives. My attempts to investigate the potential NGO-school linkage from the NGO perspective were unsuccessful, but I did observe the facilities and infrastructure that this NGO had established for their planting efforts. Some collaboration between the NGO and the school and, presumably, the

community, might have proved effective.

Ironically, in Sameh, the school was observed to be operating quite in contradiction to the idea of joint school-community environmental projects. The school kitchen required a considerable amount of fuel to prepare its meals of beans and rice for students. It was reported to me that, although the school was equipped with propane cookers and a fuel tank along with a budget for fuel, the budget was invariably exhausted (embezzled) in a matter of weeks and the students were subsequently sent out to the surrounding country side to cut and gather scarce wood for fuel.

Q8. Have you ever explored local environmental knowledge for the purpose of classroom teaching?

Morogoro

-no(3)

Sameh

-yes(1), in the old Siasa syllabus, we used to look at traditional methods. We would invite an elder to talk about traditional organization and about the German and British colonization.

-no(2).

Mtwara

-yes, I have in the past. The present curriculum does not go far enough to cover TEK.

-no I haven't, but many of those beliefs are held around here. For instance, most big trees are not to be cut down according to local beliefs.

Ashira

-yes, I try to give examples of traditional knowledge because people are forgetting our customs.

-one older teacher expressed the feeling that he is "really in two worlds," and he tries to talk about traditional beliefs about the forest and traditional irrigation systems.

Discussion:

This question was designed to gauge teacher interest in the idea of accessing TEK

Several teachers seemed genuinely intrigued by this question. I was somewhat surprised that these teachers claimed to have attempted to link their classroom activities with local knowledge through elders or sharing of stories. Most teachers believed that there was considerable value in discussing local practices and environmental knowledge. They did stress, however, the constraints imposed by a busy curriculum, pressures to prepare students for national exams, and the very real lack of resources. Although I observed enthusiasm from several teachers with respect to the idea of looking at LEK in class, I might argue that this comes from their own nostalgic enthusiasm for LEK. I also observed low morale amongst teachers which I suspect would outweigh their enthusiasm for LEK activities and would ultimately lead to inaction. Teachers are so poorly compensated in Tanzania that many had small "shambas," and often missed class to tend to their primary source of income.

Q9. Do students ever contribute local or traditional knowledge in the classroom?

Morogoro

-No(1)

-Yes, in discussion, students give examples from their home areas, for example, problems and solutions related to soil erosion (2)

Sameh

-Yes(2)

-Students often say, "where I come from

-No they don't. What they see is destruction of the environment and that is what they recount from their home communities

Mtwara

-Not really

-No

Ashira

-yes, sometimes

-No, they don't because "they are products of the modern world and are detached from what they should be doing. In this way our educational system is not related to our real national needs."

Discussion:

This question was asked to determine student interest in LEK. There was a mix of affirmative and negative responses to this question. Students are clearly exposed to, and aware of, local concepts and beliefs concerning the environment. Evidence from elder and student interviews reveals that some students are particularly aware of those beliefs learned from their home or their home environment as opposed to beliefs and knowledge from the community around their school. There is potential for interesting differences and rationales to emerge between the LEK a student from Mtwara, for example, might bring to her classmates at Ashira, and the LEK that exists in the community of Marangu. To the extent that LEK can be attributed to pre-existing environmental conditions in an area, the exploration of student ideas about LEK and LEK from the community surrounding the boarding school could provide a rich method for understanding localized

human-environment interaction and adaptation.

Q10. How are these contributions regarded by other students?

Morogoro

Appreciated by others and often motivates more discussion
Sometimes these contributions are appreciated, and sometimes laughed at depending on the topic (2)

Sameh

-Some ideas seem reasonable to students, but others seem ridiculous and are not entertained

Mtwara

Students will laugh thinking that such talk is ridiculous
N/A

Ashira

students with especially strong christian backgrounds strictly disregard traditional beliefs
-some students view these beliefs as amusing stories from the elders and fail to see the conservation aspects
-some students have asked, "why don't we adapt the old methods to today's problems?"

Discussion:

I asked this question as another way to try and understand student's feelings with respect to LEK, and their willingness to explore the subject. Unfortunately, the responses would suggest that raising LEK in the classroom generally leaves students open to ridicule.

Q11. In your view, what are the key factors constraining EE in Tanzanian Secondary schools?

Aggregated Responses

- Lack of resource materials(4)
- A lack of money(3)
- A lack of time
- Old textbooks
- Lack of common sense approaches to teaching EE
- Lack of close co-operation bwn secondary schools and the community(3)
- No money for field trips(3)
- No short in service seminars or workshops to update our knowledge in new aspects of geography and environment
- lack of visual aids and reading materials
- Lack of proper Environmental texts because EE is new in our school
- Students are completely focused on the national exams and nothing more(3)
- no EE questions on the final exams(3)
- Many teachers are not qualified to address the broad scientific and social science material in EE (2)
- There are no means for involving teachers of other subjects in the broad task of EE
- Syllabus is poorly structured and written and EE not emphasized (4)
- It is necessary to study other environments in order to understand one's own, however, there is no money for research or field trips

Discussion:

I asked this question to determine structural and institutional obstacles to the introduction of EE. At the root of observed low teacher morale are many of the issues listed in response to this question. Lack of texts, training, and resources were mentioned often. Key informants from the NEMC, the Ministry of Education and NGOs (Bakobi, Materu, Mushi, Osaki, Rajabu, Shuma, Wakimi) all mentioned lack of financial and other resources as a fundamental constraint to the development of effective EE programs. Dissatisfaction with the syllabus was also noted. Three teachers mentioned the lack of close cooperation with the community which, if one focuses just on the factors constraining EE in secondary schools, is potentially an existing source of teaching resources in and of itself.

Lack of resources starts at the national level and seems only to worsen at the school level. The NEMC, for example, has only 20 professional staff (Kibogoya, 29/10/93) based solely in Dar es Salaam, to deal with environmental issues, monitoring, and policy for the entire country. The Malihai clubs have only three staff persons to handle outreach to secondary schools throughout the country, and a serious shortage of vehicles and funds to get these staff to the schools. Resources for a Malihai newsletter and organized trips for students to national parks are also scarce (Ottaru, 08/11/93). Mishana (18/11/93), speaking about the initiatives of JET -- an NGO committed to conveying environmental information through the mass media -- pointed out that the availability of radios and batteries to power them make the effectiveness of even broad-based radio initiatives questionable.

In the four schools studied, the lack of resources was abundantly clear. One science teacher told me that any education poster he placed on the walls of his class was stolen within days. Equipment ranging from chalk and erasers to more elaborate scientific instruments had suffered a similar fate. In Samen, the presence of two large shipping containers in front of the main office raised my curiosity. When I asked about the contents, I was informed that they had contained thousands of dollars worth of microscopes and other laboratory equipment donated from Germany. According to this source, the keys were in the possession of certain school officials who were slowly selling the equipment for private gain.

Q12. What are the encouraging factors?

Aggregated Responses

- Increased Env. awareness of people due to media
 - My own convictions as a teacher(4)
 - The Malihai workshops
 - the obvious pressures on the environment leads me to want to "conscientize" students through education
 - our basic educational philosophy in Tanzania implies that we raise consciousness about the environment
 - A feeling that the environment should be kept in good condition
- It encourages me to teach about overgrazing, tree planting etc. It will ultimately help Tanzania.

Discussion:

Conversely, I asked this question to ascertain the positive factors upon which an effective EE curriculum might be built. Several of the teachers I spoke with were personally interested in and, in some cases, quite committed to developing and promoting EE. Their convictions about the importance of EE in schools enabled them to be critical about the institutional constraints which exist in their schools, educational system, and in the country generally. I must add one caveat. Out of economic necessity, several of the teachers who expressed deep concern about environmental degradation and discouragement over, for example, tree planting efforts by the Malihai clubs, were themselves keeping goats which were, in turn, accused as the prime culprit denuding seedlings and primary vegetation. I found this contradiction sadly ironic, particularly when some of the teachers seemed unable to recognize the direct environmental impact of their own economic activities.

Q13. Do you have anything else to add?

Aggregated

- Geography is considered unimportant and little funding is allocated to Geography department activities. If EE is to succeed, geography should be emphasized
- A course in EE should be an independent subject
- More solution-oriented knowledge should be emphasized
- alternatives to avoid the environmental impact should be worked out by higher authorities
- When new subjects are introduced into the syllabus such as "General Studies", teachers should be involved and resource materials should be available
- There should be an Environmental policy governing all schools in Tanzania. Schools should be model sites for Environmental rehabilitation in communities.
- Geography and Biology syllabus is not serious enough about desertification
- I don't understand how a hiking club will help students to understand or appreciate the environment
- The ICD and the MOE should make more of an effort to include EE in exams and curriculum
- Mahihai clubs could be much more effective in EE if they were not dependent on money from the outside

Discussion:

The first comment is particularly important given that the majority of teachers identified Geography as the main subject in which EE is taught. Wallace (27/01/94) indicated, in fact, that the head-office of the Mahihai clubs had sent questionnaires to some 40 secondary schools in Tanzania to solicit feedback about improvements to the Geography curriculum with a view to making it more environmentally relevant. At the time of the interview, Mr. Wallace was preparing to submit these suggestions to the ICD for review. The suggestion to make Tanzanian schools a model for environmental rehabilitation is an interesting one in my view, and will be discussed in more detail in my conclusions and recommendations section, as will the suggestion to include EE on national

examinations.

5.7 Summary of the Data Presentation

In this chapter, I have presented evidence to support the assertion that there is a dichotomy, or a considerable gap between secondary schools and their host communities, between elders and students, and between the fundamental knowledge base of schools and certain aspects of the community, particularly with respect to the environment. Schoolyard maps and transects, along with photographs presented throughout the chapter, serve to illustrate the environmental context in which this research occurs. In a country with extremely scarce resources devoted to education, it is argued that teaching strategies oriented toward the actual and immediate school environment, are warranted. School statistics illustrate the predominance of male teachers, and the disparity of teacher's qualifications among different schools and regions, as well as the varying sizes and gender breakdown of student populations in the four schools under study. Interview data from elders and students begins to establish the fundamental dichotomy between the respective knowledge base of both groups. The time lines and environmental trend graphs provide further evidence of a rich and complex LEK. While the evidence shows that students do share some of the "traditional" knowledge and beliefs of the elders, the latter group is able to articulate these beliefs more thoroughly, and with considerable conviction. It is the strength of these beliefs that leads me to suggest even more strongly that students must become familiar with community-based knowledge systems if they are

to be equal participants in the "socio-ecological" dialogue.

Classroom observations generally reveal inappropriate teaching methods and poorly designed environmental components of existing curriculum. An example of this is described in Box 3.

One of the clearest examples of the inappropriateness of the EE being taught in the secondary schools occurred while I was observing a Form V geography class. The teacher was lecturing about the "greenhouse effect" and, while the students were listening carefully and taking very thorough notes, I felt that they were not understanding the concept. Later, when I had several of the students together for my focus group interviews, I asked them about the "greenhouse effect" lecture. After some prodding, they admitted that they did not know what a "greenhouse" was. Of course, it struck me as a clear example of how a dominant Western concept (the greenhouse) has been so thoroughly adopted as the analogy used to explain a physical process, that we fail to question whether the analogy is appropriate in all teaching contexts.

Box 3: An example of Environmental Education in the classroom.

Finally, interviews with teachers reveal a number of frustrations with curriculum content and design, teacher training, school corruption, poor salaries, meagre resources, and a number of other impediments to real change in the schools. Evidence of genuine concern for the environment and support for the idea of including indigenous or local knowledge on the part of teachers, was also found.

CHAPTER SIX

DISCUSSION, LESSONS LEARNED, AND RECOMMENDATIONS

This chapter is divided into three parts. The first part breaks down the problem statement to address the epistemological, structural, institutional and policy related issues identified in this research and in so doing, expands on some of the discussion raised in chapter five. The second and third parts of this chapter will look at lessons learned and recommendations made respectively.

6.1 EXAMINING THE PROBLEM STATEMENT

My basic research question asks what level of congruity exists between LEK and the EE curriculum in secondary schools in Tanzania. What the data show is a considerable gap between local knowledge and the direction and content of EE and school curricula in general. In this section of the chapter, I will elaborate on the gap observed, and on the epistemological, structural, institutional, and policy factors which are partly responsible.

6.1.1 Congruity or Incongruity Between LEK and EE in Secondary Schools

The data show that there is indeed a high degree of disjunction or divergence between

the local knowledge base and the EE curriculum of secondary schools. The LEK documented in this study reveals a considerable awareness by local elders of environmental change, as well as deep-seated cultural or spiritual beliefs about natural resources. The data also provide evidence to suggest that there is both a respect and a disdain for LEK at the school and community level. Some local people and students regard local knowledge as backward, non-progressive, and unhelpful to their individual or collective aspirations. Conversely, interest among teachers, community members, some students, and bureaucrats with respect to closing or ameliorating the "gap" between local or indigenous environmental knowledge and secondary school EE, is strong.

Elders, while generally modest about the value of their local or indigenous knowledge in comparison to what they perceive secondary schools to be offering, nonetheless, spoke proudly and with considerable depth about environmental change over time and strategies for surviving in their environment. Several elders referred to secondary schools as being "out of touch," or "lost." In one interview where an elder had expressed this latter sentiment to me, I asked "doesn't this cause you concern for the passing down and long-term survival of traditional knowledge?" In response, the elder expressed to me his absolute conviction that at the "11th hour," so to speak, when the situation seems most grave, some students will reject the school, and come to the elder looking to embrace the old ways. It was both this prediction and the certainty of the elder's belief in this scenario occurring that strikes me as interesting.

Students, while possessing a rudimentary awareness of LEK in the communities in which they are being schooled, are clearly pre-occupied with learning only what they will be tested on in national examinations. Their opinion of LEK ranges from mild interest to complete ridicule, with the latter perception being more common.

Finally, I would characterize teachers, NGO officials and Ministry bureaucrats as being "caught in the middle." Many feel that LEK and secondary schooling should be reconciled through some mechanism. Several of these individuals expressed to me their fears about the loss of indigenous knowledge and the widespread lack of interest of young people generally, in learning about local or traditional beliefs. Many recognize the constraints of the system and are at a loss as to how to begin bridging the gap between schools and LEK.

6.1.2 Structural Issues

Several structural issues -- those pertaining to the design and function of the secondary school and the role of the school in the community -- add to the marginalization of LEK on the one hand, and the improbability of introducing a progressive EE curriculum which might reach out to the local community, on the other. Issues such as the pre-occupation with national examinations, the already crowded school curriculum, poor school-community linkages, and the nature of EE curricula and curriculum development are some of the structural issues explored.

6.1.2.1 National Examinations

The system of national examinations appears to be the largest single structural obstacle to real change to secondary school curriculum. Students and teachers concentrate most of their effort and resources squarely on preparing for national examinations to ensure continued progress of students through the system. Parents value success on examinations in the hope that their children will secure an office job and "advance" away from rural farm life. Teachers expressed a reluctance to spend any time whatsoever on course material that was not subject to examination. Very few teachers are nominated by the National Examinations Council (NEC) to help design or even mark examinations, and the entire process is well removed from the involvement of teachers or schools. These factors taken together make it very difficult to introduce changes to existing curriculum or new subject matter without a concomitant change in the process and content of examinable material.

One of the key problems with respect to such change is the near static state of the NEC. This institution, established by an act of Parliament in 1973, is responsible for setting, revising, and scoring national examinations independent of both the MOE and the ICD. As a result, agreement on, and communication about, changes to the curriculum is virtually non-existent, creating a severe structural bottleneck at the level of national examinations. This peculiar structure leaves the NEC as arguably the most powerful and influential player in Tanzania's secondary education system as it truly determines the pre-

occupations of students and teachers.

6.1.2.2 Links to the Community

This research provided considerable and consistent evidence to support the assertion that linkages between secondary schools and communities are very weak. Three of the four schools in this study were boarding schools, as are most secondary schools in Tanzania - a fact that has proven effective in reducing tribal tensions⁴², delivering the common Swahili language, and mixing Tanzanians from various parts of the country - but something which has left schools completely isolated from the host communities. Teachers strive to secure a post at a school in their home region, but if this happens at all, it can take many years. Most teachers, therefore, live in school-supplied housing and are themselves removed from the host communities. Extra-curricular activities or community service which involves schools and communities were observed to be non-existent.

6.1.2.3 Crowded Curriculum

In Tanzania, various interests compete for time in a relatively inflexible and already crowded secondary school curriculum. Schools are often seen as vehicles for the

⁴² According to Leibenow (1987), "What seemed to be upper most in Nyerere's mind at independence was holding the diverse and vast country together politically and forging a national society out of the 120 ethnic groups which had been arbitrarily thrown together into a single colonial dependency during the 19th century scramble for empire. Each ethnic group has its distinct language, historic memories, religious belief systems, symbols of group identity, and social and economic organization,(1987:3)" and the introduction of a *lingua Franca* was instrumental in the promotion of national unity

dissemination of social, political and cultural information, all of which are subject to the cyclical whims of politicians. Schools have been used as tools in the delivery of ideologically-driven government schemes and programmes⁴³. Environmental education is no different among competing interests and, as awareness of environmental degradation increases, so too have the calls for time on the school agenda, either as a designated course or through an integrative or infused approach. What the data from this study reveal is that, teachers in particular, feel frustrated by the present expectations of such a crowded curriculum. Issues of teacher morale aside, the prospect of introducing environmental issues into the existing curricula with little or no input from teachers in the design and implementation of the EE material, is doubtful. Teachers expressed a genuine concern for the environment and talked about doing their best to address pertinent issues in the classroom but the cumulative effect of many of these structural and institutional issues is such that effective EE has little chance of success.

6.1.2.4 Inappropriate EE Curriculum

Most EE experts in Tanzania criticize the compartmentalization of subject matter in the school system generally, and point out the inappropriateness of such an approach in light of the interdisciplinary and holistic nature of environmental problems and solutions (Bakobi, 1992, Msaki, 1993). The EE that is contained in Geography, Biology and

⁴³For example, Buchert (1992) points out that the community school experiment of the late 1960's "Education for Self-Reliance" policy was part of a larger social innovation that saw students as potential change agents and leaders in school community problem solving, particularly around agricultural issues. By 1976, the emphasis on primary modes of production were replaced by the priorities of re-distributing wealth and extending access to clean water, health, social services and education. Thus, the schools became a key mechanism for the introduction of basic services to the village (1992:131)

Civics curricula, for example, lacks coherence, integration, practicality, and most importantly, local or even national relevance. Current EE practices make very little use of the actual environment as a teaching resource. The divorce between ecology and culture is exacerbated rather than ameliorated by current EE programs.

An inter-ministerial committee formed by the NEMC in 1992, also studied the secondary school curriculum and, among other things, found that the components of EE appearing in some subjects lacked coherence, were repetitive and overlapping, and did not convey an accurate understanding of the consequences of human activity on the environment (Osaki, 1994:13). This was strongly confirmed by my observations as well. In addition, the current structure⁴⁴ of secondary schools is a hindrance in the development and promotion of EE. One official at NEMC described the climate for introducing EE in secondary schools this way:

Existing concepts in the curricula are geared towards equipping a student to make his/her own living. Studies are pursued in order to pass examinations, obtain academic certificates and hence earn a living. There are inadequate efforts to make education something interesting and worth pursuing even without a certificate, for example, the development of studies on environmental conservation as an extracurricular activity (NEMC, 1993:38).

6.1.2.5 The Curriculum Development Process

There are other major structural constraints as well. Teachers, for example, play little

⁴⁴ Structure in this context refers to the boarding school arrangement which disconnects students from the surrounding community, the paramount importance placed on national examinations as described earlier, and the government focus on a modernization paradigm in the educational system as articulated in recent policy documents (ie. Ishumi, 1993, The Tanzanian Task Force on Education, 1992).

or no role in the development of curriculum, nor do community members. Tanzania's system in this regard is highly centralized, with the MOE setting educational and curriculum policy, and the ICD operationalizing it. Neither level encourages or seeks significant input from teachers or community representatives. Teachers across a wide and varied range of localities are given a centrally designed curriculum, syllabuses, textbooks and suggested teaching methodologies. This, argues Punch and Bayona (1990) is a serious point of tension between teachers and local and regional realities. The value of teacher input into curriculum is important from a professional development point of view, but also "...is especially cogent if curriculum relevant to local needs, [and] associated with teacher participation in curriculum decision-making, is to be achieved" (1990:255).

Essentially what is lacking in the curriculum development process is what Odora (1992) calls "the cultures of learning model" (1992:79). This model emphasizes decentralization of educational content, not only to reduce ineffectiveness, but to encourage the development of inherent local capacity "in [fields such as] traditional health care, traditional...environmental protection, and other forms of indigenous knowledge"(1992:81). In Tanzania, this idea has been attempted unsuccessfully (the community schools experiment), essentially because of the political desire to centrally plan the national learning agenda rather than to devolve control to suit the student or school learning environment.

Another explanation of the disjunction in the development of curriculum is offered by Fitzgerald (1990) in what she refers to as the tendency of "normal bureaucracy" to centralize and standardize. This tendency, she says, causes a failure to acknowledge local conditions and instead results in an educational formula driven by the "thinking, values, methods, and behaviour" dominant in the bureaucracy and the professionals who run it.

6.1.3 Institutional Issues

Several issues within the school institution also exacerbate the gap between school and community and, by extension, the isolation of school-based "knowledge" from LFK. Issues such as administrative corruption, low teacher morale, the shortage of resources and training, the language of the schools, and the examples schools set in the community are discussed.

6.1.3.1 Corruption

Corruption is a serious issue influencing the function of the school institution. Several teachers reported to me that various forms of corruption -- from having to pay off Ministry officials and school principals in order to secure their desired teaching assignment, to school officials selling off donated laboratory equipment destined for schools -- are common. In one of my school sites, it was reported that the school budget

for propane -- used in the school kitchen -- was routinely embezzled in the first few months of each school year, leaving students with no choice but to cut wood for fuel from the rapidly diminishing local forests. This not only exacerbates the degradation of resources, it seriously taxes students' time for studies, thereby increasing their anxiety about being taught only those topics absolutely essential for passing national examinations. The prevalence of corruption has a demoralizing effect on the staff, many of whom have resigned themselves to the deteriorating situation. As a result teachers do only the bare minimum at school, while they concentrate their time and energy on other strategies for their economic survival.

6.1.3.2 Low Teacher Morale

Low teacher morale is, on one level, closely related to the previous discussion of institutional corruption. For example, teachers placed in the remote and depressed region of Mtwara were quite demoralized about their situation. They complained vigorously about the low pay and top-down management of school administrators and officials from the MOE.

Even those teachers posted at more desirable schools - such as Sameh -- complained of the poor pay, working and living conditions. Teachers also complained consistently about the lack of teaching resources. Opportunities for professional development training were virtually non-existent. Several teachers with more than 10 years experience reported that

they had never had the opportunity to further their training. Those teachers who have attended workshops have done so under the auspices of local or national NGOs, and this has come about only in the last few years. There is no easily discernible incentive for teachers to try to do "more with less" -- something that is clearly required to improve secondary education in the short-term.

6.1.3.3 Poor Teacher Training and Teaching Methods

Classroom observations confirmed much of what the National Task Force on Education (1992) has identified including:

Teaching at all levels is dominated by the lecture method, essentially, because alternatives such as "inquiry" approaches are unsuitable as they would slow the pace for covering overloaded syllabi. Materials and equipment needed to facilitate the use of other methods are not readily available.... At all levels, content is overcrowded and class-based since it is dictated by the urge to pursue higher education which is provided to a minority of students(1992:57).

With respect to the teaching of environmental education specifically, the methods being widely used in schools are not suitable. As I stated in chapter one, EE should develop an understanding of ecological parameters, qualitative and quantitative assessment, predictive abilities, and an understanding of local and national social structures which influence human-environment interaction. However, current teaching methods are more theoretical and lack the value-based approach necessary for nurturing the skills and sense of responsibility toward the environment. The existing curriculum does not give students

the opportunity to utilize the immediate environment around their schools, nor does it encourage students to participate actively in practical environmental problem-solving activities within the community. Presumably, teachers use methods which reflect the way they were taught, both in secondary school, and in their teacher training and it is, perhaps, at the teacher training level where more creative, and participatory teaching methods could be introduced.

6.1.3.4 Shortage of Resources

Shortage of teaching resources certainly contributes to low teacher morale, but it also seriously affects the quality and delivery of the educational experience in general. Financial resources for field trips are extremely scarce. Several teachers indicated that they would make use of national parks or other natural areas in the teaching of EE if resources were available. The only example of an organized field trip that came to my attention in 7 months of research working with four schools, was a trip to Mt. Kilimanjaro organized by a Peace Corp teacher at Sameh Secondary School. In order to achieve this trip, the teacher and students had to raise much of the monetary and physical resources themselves, and were assisted by the school only in the provision of transportation from the school to the base of the mountain. There is a paucity of non-financial resources as well. Appropriate teaching texts, posters and other display material, basic equipment laboratory equipment, and even chalk, paper, and pencils are all in short supply.

6.1.3.5 The School as an Environmental Model

Much of the literature about educational policy in Tanzania advocates the importance and potential usefulness of schools as "institutional change agents," (Nyerere, 1967, Task Force, 1992, Buchert, 1992) by creating demonstration sites for agricultural innovations or tree planting which can be observed and adopted by communities. The Malihai clubs of Tanzania which function within secondary schools work on the principle that their tree-planting efforts and the establishment of seedling nurseries will lead to greater involvement of community members in the activities inspired by students. While this is a popular concept, unfortunately, based on my observations both of physical evidence and of general attitudes, this concept is really popular myth. Students, and presumably parents, care about academic advancement. Students and most teachers view efforts such as tree-planting as theoretically sound, but practically preposterous. There are too many other demands, and no benefits tangible enough to draw a sustained effort from students. Community members, on the other hand, often cited school tree-planting programs, but were clearly not aware of the inactivity of these "efforts," leading me to surmise that the rhetoric around school-based environmental initiatives is more effective than the initiatives themselves.

6.1.3.6 The Swahili to English Transition

A factor which speaks to a number of issues such as the quality of classroom teaching,

the participation level of students, and performance on final examinations, as well as the alienation of school from the community is the transition from a Swahili to an English curriculum. Students through to Standard VII (equivalent to elementary school grades in Canada) function in Swahili with a couple of hours of English instruction per week. Though I did not study elementary schools specifically, I was told, and indeed it was apparent, that these schools were better integrated with the local community. For example, students attend their local elementary school, teachers are from the immediate community, and the curriculum focuses more on cultural matters, farming, and micro-enterprise.

When students enter secondary school, they must make a sudden transition to an English language curriculum. This transition is made more difficult by the relatively poor English skills of many of the secondary school teachers who were observed to "resort" to Swahili to describe concepts that the students would ultimately be accountable for through the study of English texts and examinations. As students gain confidence in English, they seem to also gain an increased feeling of superiority toward those who are "unschooled." Their command of English is a direct indication of their degree of advancement through a system that is promising a life very different from village life, and this establishes a differentiation between students and community members.

6.1.4 Policy Issues

There are several policy level issues which serve to reinforce the gap between school and community and between the respective epistemologies employed therein. Educational policies support a certain view of the secondary school within the Tanzanian state. In addition, government policy which delegates certain educational responsibilities has, in effect, created the structural constraints identified earlier. Specifically, policies concerning the general direction of secondary schooling and the control of curriculum design are explored.

6.1.4.1 Science and Technology Policy

Educational policy is driven by national and international economic and political objectives. Perhaps because so few people have the opportunity for secondary and post-secondary education in Tanzania, the emphasis on science and technology at this level is necessary. I have argued, however, that where Western science has failed Tanzania is with respect to understanding human-environment processes and minimizing environmental degradation. Of course, not all the blame can be placed on the "Western knowledge" paradigm. Political, social and economic forces have affected human land use patterns and resource demands. I would, however, argue that the science and technology prescription be examined critically, for I agree with Kauzeni (1992) when he says:

It is ... imperative that the concept of environment [be] brought closer to people's direct surroundings. It is worth remembering that any approach to environmental conservation that ignores or demeans people, or regards them as in any way dispensable, disposable, or susceptible of manipulation in the interests of any other objective is ideologically untenable, politically unwise and practically doomed to failure (1992:7).

Secondary education, which effectively separates "book knowledge" from the local knowledge base, and which values the former as superior to local knowledge runs the risk of alienating local communities from the graduates of secondary schools. This, I have argued earlier, is unwise given that the graduates of secondary schools will most certainly find themselves in positions of responsibility vis-a-vis local communities.

6.1.4.2 Centrally Designed Curriculum

As mentioned previously, the triumvirate of institutions responsible for secondary education in Tanzania includes the Institute for Curriculum Development, the National Examination Centre, and the Ministry of Education. The University of Dar es Salaam, in its role as an educator of teachers and academics, and with its occasional foray into the realm of educational policy, can be considered a serious fourth player in Tanzania's education system.

Apart from the considerable isolation among these important institutions, the curriculum development process is in itself hampered by bureaucratic paralysis and lack of adequate resources. The National Task Force on Education (1992) identified the following

problems related to policy development:

Usually, policy directions including curriculum change are not backed up by research findings. Reluctance to utilize research findings has therefore, sometimes given way to the introduction of professionally inappropriate curricular reforms and innovations dictated by, either partisan interests or, political whims rather than empirical cum scientific rationale(1992:17).

Furthermore, changes to curriculum, once complete, are difficult to implement nationally in the absence of any ownership from teachers or, at the very least, without accompanying training for teachers. Teachers reported being extremely frustrated with the curriculum development process. They are not asked for any input on existing curriculum or proposed changes. New curriculum is expected to be implemented by decree.

6.2 SUMMARY

The various epistemological, structural, institutional and policy related issues identified, first in the literature, then through the data presented, are consistent with, and reflective of, an approach to education -- education for development in fact -- that has been promulgated in Tanzania and, indeed, in much of the Third World for decades. The secondary school as an institution has been given a consistent role in the realization of state-driven development objectives, particularly in much of post-colonial Africa, where government ownership of the economy was common. This functionalist role played by

secondary education can be traced to human capital and modernization theories of development in the literature, but can also be seen in contemporary policy and educational objectives of the Tanzanian government today. The issues identified at the school level are really symptoms of a systemic, entrenched view of the function of education in achieving development. Unfortunately, despite the rhetorical shift to so called "sustainable development" in both Tanzanian and, externally motivated development efforts, the role and function of education remains unchanged. Perhaps the absence of change toward a more progressive secondary school system can be attributed to bureaucratic paralysis. I believe that in the case of Tanzania, there is genuine desire at many levels of the education system to introduce more holistic and effective curricula, particularly in the realm of environmental education and bureaucratic paralysis is an issue. However, I also believe that a philosophical re-visiting of the link between environment, economy, development, and education is overdue. The period of excluding local people, their ideas, and their knowledge systems has been a long one. The natural environment has degraded, and continues to degrade. Granted, there are many issues to explore with respect to why environmental degradation is occurring but I would argue that it is at least in part, due to the failure to link formal education with locally relevant concerns and knowledge, as well as to a truly sustainable economic agenda, and government policy concerning development. This research attempted such an analysis by tracing the identifiable dichotomy in the literature and in the field, between two different knowledge systems. This dichotomy begins in the overarching contrast between tradition and modernity or culture in development and in the fundamental epistemological

differences therein, and extends through to the dichotomous function of modern schooling based in a Western knowledge paradigm, but situated in a traditional locale. To this extent, I hope I have made some contribution to a newly emerging body of literature

6.3 LESSONS LEARNED

Most of the "lessons learned" pertain to the research methodology and strategy used. The experience of conceiving of a research problem, and collecting evidence around the problem statement, is an invaluable process for a researcher. While I learned many lessons during this process, I will limit my discussion to issues related to future field research design.

The first of these "lessons" is the importance of seeing the research plan through to completion. Undoubtably, I needed to spend some time in the field to be certain that the "problem" identified was indeed a "problem," and to entertain the multitude of factors that were difficult or impossible to "see" from Canada. After two months, however, I committed myself to my revised research strategy which focused on EE, elders, and students, despite the temptation to change direction at numerous times during the data collection. I decided that any weaknesses I felt about the research strategy after this initial period of testing and reflection would have to be acknowledged as limitations of the strategy. To have given in to my impulses to change in response to a dynamic influx of data would have made the research exercise unwieldy, and frustrating.

The second "lesson" concerns a specific methodological consideration. In planning future field work, I would allow for repeat visits to the research site or sites. In the course of this research, I was able to return to two of the four sites, which proved to be very beneficial. I was able to reflect on information collected during the initial visit and pursue follow-up questions or seek clarification in subsequent visits. My repeat presence in the community helped gain the trust of teachers, students, and local people, which in turn, made people more willing to speak with me frankly about my topic. I would plan for a sequence of repeat visits in any future research strategy.

The third "lesson" learned concerned the efficacy of identifying a principal informant(s) who helped interpret data after it was collected. There are perspectives and contexts that a key informant can provide which helps trigger new ways of thinking about the data. In my case, I built a very valuable relationship with a Professor in the education faculty at the UDSM. We spent a good deal of time discussing data I had collected in the schools and villages, and his insights were invaluable. In future, I would attempt to identify more principle informants so as to benefit from other interpretations of the data collected. Similarly, a fourth "lesson" concerns taking the time to identify the best informants. Though I was pleased with the input from the elder community informants, I would take more time in the future to decide which informants would be most suitable for the type of data being sought.

6.4 RECOMMENDATIONS

The following eleven recommendations stem from the cumulative process of reviewing the literature, identifying a problem, and spending many months in the field collecting data with which to answer the questions posed. The recommendations are organized according to three broad components of the research exercise, namely, local environmental knowledge, schools and examinations, and teaching methods and training.

6.4.1 Local Environmental Knowledge

Recommendation 1: More detailed anthropological and/or ethnographic research is needed to better understand and document LEK in Tanzania. My study "scratched the surface" of what is clearly a rich and detailed epistemological resource. This "resource of knowledge," like the natural resources to which much of it pertains, needs to be understood and protected. This can be partly achieved by further research.

Recommendation 2: Strategies must be developed for incorporating LEK into local and national activities such as resource management planning, agricultural extension work, and all levels of education both formal and informal. Given the important roles played by graduates of the secondary education system in Tanzania, particular attention should be given to bridging the gap between secondary school curriculum and LEK.

Recommendation 3: Interaction between local people, particularly elders, and students needs to be encouraged. The gap between what Rathegeber (1994:20) calls "home" knowledge and "school" knowledge needs to be closed. This could be accomplished in a number of ways including the development of teaching materials which recognize the daily environmental decision making undertaken by women and men (Rathegeber, 1994:20). A higher degree of cultural inclusion could be accomplished by inviting elders to speak to certain classes, and to lead field studies. Students should be encouraged to document local history, and do environmental trend analysis in cooperation with local elders.

Recommendation 4: Because EE is generally understood to be interdisciplinary in approach, an increased focus on LEK in secondary schools would be best handled within the context of a separate environmental education course. Alternatively, EE modules within existing courses such as Geography, which respect the interdisciplinarity of environmental issues, would suffice.

Recommendation 5: NGOs in Tanzania working in the area of LEK should be asked to share their documentation and research methods with teachers and students. Schools and local NGOs should be encouraged to collaborate in other ways to compensate for the paucity of state resources allocated to schools. In addition, NGOs should be encouraged to continue making efforts to extend EE training to teachers.

6.4.2 Schools and Exams

Recommendation 6: The value placed on environmental issues by teachers and students in secondary schools would be enhanced if national examinations recognized the importance of an interdisciplinary focus on environmental issues. Appropriate questions which test a student's ability to integrate, for example, aspects of biology and geography with concepts from history, social and general studies, would allow the student to describe social and scientific aspects of environmental issues. Credit should be considered for students taking part in non-academic, environment-related work in the local community.

Recommendation 7: Since it is difficult to introduce a new subject in the curriculum dealing with EE specifically, infusion of environmental issues into existing subjects should be accelerated, and cross-disciplinarity encouraged in teaching and, ultimately, in examination questions. Adopting an infusion approach for EE has a higher probability of success. It would be desirable to focus EE in one or two subject areas and strengthen the curriculum and teaching support considerably. Geography and Civics are the most appropriate subjects to encompass comprehensive EE that deals with human environment interaction and can most logically embrace LEK as part of a pedagogical approach.

Recommendation 8: Because schools themselves have considerable impact on the surrounding environment, and because schools can act as a model in a community,

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individual school policies governing actions in the environment (ie. fuelwood gathering and goat keeping) should be developed jointly between schools and communities. Decentralization with respect to the establishment of school policies might also encourage dialogue and other forms of collaboration between secondary schools and the communities in which they are located. Policy formulation should be the purview of the school administration including teachers, in cooperation with village or town councils, farmer's groups, and other locally-based interest groups.

Recommendation 9: The structure of the boarding school seems to create a "school as an island" phenomenon. To counter this, boarding schools should be the first focus of the aforementioned recommendations.

6.4.3 Teachers

Recommendation 10: High priority should be given to including EE modules in teacher training colleges, with a particular emphasis on experiential and pupil-centred teaching methods which utilize the local community and indigenous knowledge base.

Recommendation 11: Teachers should be offered in-service workshops on EE to support changes already made to the curriculum. Teaching strategies and workshops should emphasize low-cost resources such as the immediate schoolyard environment for teaching EE.

6.5 CONCLUSION

In general, where obvious gaps were observed to exist between student and elder groups, the potential for communication and sharing emerges. The data show consistently that the detailed observations and possible explanations for environmental change offered by elders are far more detailed than that attempted by students. As Anacleiti (1993) says:

People, in the last analysis, are the repository of local knowledge. In order to help them to develop, they must be enabled to tap that knowledge. The best way to do this is to help them extrapolate from what they know best, their culture (1993:47).

The data have both re-affirmed the depth of elders' knowledge and drawn attention to the lack of shared understanding by students. It is not merely a case of students being younger or uninterested. It is a question of institutional, structural, and perhaps even cultural, obstacles to the sharing of the elders' experience in the present secondary school institution.

I am not necessarily suggesting that the explanation and rationale of elders be adopted *carte blanche*. What I am suggesting is that the experience of the elders in these communities and others across Tanzania could serve as an important point of departure, a frame of reference for looking at community, national and global issues of environmental degradation.

Community Time-Line

SAMEH Elder
10/02/94 196

<u>DATE :</u>	<u>EVENTS</u>
192	at war
1930-31	"vziqhe" severe locust problem
1931-45	2nd world war
1953-5	Brought Independence
1961	'Kibab' 'Mqomo' famine
1974	famine
1984	

1961 'Kibab' 'Mqomo' famine
used to be a very good place to live
- even the old people (containing their)
and the young as well (containing their)
'Mqomo' was the best (containing their)

Community Time-Line

SAMEH Elder

<u>DATE :</u>	<u>EVENTS</u>
1939-45	2nd world war
1953-51	Brought Independence
1961	Mqomo famine
1974	famine
1984	

11/02/94

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Key Informant Interviews

Bakobi, B., 01/11/93, 1-2:30pm, Offices of the National Environment Management Council (NEMC), Dar es Salaam (DSM). Several subsequent meetings were held with Mr. Bakobi throughout my research.

Kibogoya, Mrs., 29/10/93, 11:30am, NEMC, DSM.

Mishana, Mr., 18/11/93, 9am, Offices of JET, DSM

Mtambilike, P., 28/10/93, 11-12noon, Offices of TAMWA, DSM.

Mushi, V., 03/01/94 2pm, Ministry of Education, DSM. Additional meetings were held with Ms. Mushi.

Nguya, C., 27/01/94, 8:30-10am, Arusha-Meru Secondary School, Arusha

Ottaru, P., 08/11/93, 9:30am, Offices of the Malihai Clubs of Tanzania, Arusha

Rajabu, A., 03/01/94, 9am, Ministry of Education, Dar es Salaam. Several subsequent meetings were held with Mr. Rajabu.

Shuma, M., 23/02/94, 10-11:30am, Offices of WWF Tanzania, DSM. Several subsequent meetings were held with Ms. Shuma.

Wakimi, A., 04/01/94, 9-10am, Offices of the Wildlife Conservation Society of Tanzania, DSM. Several additional meetings were held with Mrs. Wakimi.

Yona, Mrs., 16/11/93, 9:15-10am, Ministry of Education, DSM.

Appendix One: The Techniques of Relaxed Rural Appraisal and Participatory Rural Appraisal respectively.

Table 1 lists RRA techniques. The italicized items indicate techniques used in this research.

Table 1: RRA Techniques

<ul style="list-style-type: none"> ▶ activity sequence ▶ <i>ad hoc local research</i> ▶ aerial photographs ▶ aerial inspection ▶ <i>Calenders</i> ▶ <i>combining insights of</i> ▶ different disciplines ▶ cross-sectional studies ▶ <i>direct observation, looking for and questioning the unusual</i> ▶ <i>existing available information/reports and statistics</i> ▶ family profiles(combining anthropology, journalism, statistical methods) ▶ <i>group interviews with informal or select groups</i> 	<ul style="list-style-type: none"> ▶ <i>guided interviews</i> ▶ <i>identifying and learning from key informants</i> ▶ identifying and using key indicators ▶ <i>informal surveys</i> ▶ labour schedules ▶ <i>local terms, folk taxonomy, sayings</i> ▶ logic/decision tree ▶ longitudinal studies ▶ multi-disciplinary semi-structured interviews ▶ <i>on-the-spot mapping</i> ▶ <i>participant/direct observation</i> ▶ rural people as investigators ▶ "six helpers" who, when, what, where, how, why ▶ systematic observation using key indicators
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From: Adapted from Chambers et al as found in Wickham, 1993

Table 2 lists PRA techniques. Again, italicized items were utilized in this work.

Table 2: PRA Techniques

▶ activity profile, daily routines ▶ body mapping ▶ case studies and stories ▶ chapati (venn) diagrams ▶ contrasts and comparisons ▶ diagram exhibition ▶ direct matrix and pair-wise ranking or scoring ▶ <i>do-it-yourself, take part in activities</i> ▶ <i>ethnohistory, trend analysis, time lines</i> ▶ <i>existing secondary data</i> ▶ <i>field report writing</i> ▶ folklore, songs and poetry ▶ <i>follow-up on unexpected information</i> ▶ futures possible ▶ <i>group interviews/discussions</i> ▶ intriguing practices and beliefs ▶ <i>key informants/experts</i> ▶ key local indicators ▶ key probes ▶ <i>listening, asking, discussing, identifying</i> ▶ livelihood analysis ▶ local histories/profiles ▶ <i>local village researchers, investigators, interviewers, analysts</i> ▶ matrices	▶ night halts ▶ observe directly/see for yourself ▶ overlays on photographs and aerial photographs ▶ participatory modelling of primary resources ▶ participatory mapping ▶ participatory diagramming ▶ <i>participatory transects/group walks with key informants, observing</i> ▶ portraits, profiles, case-studies, stories ▶ quantification ▶ ranking by voting ▶ school essays ▶ <i>seasonal calenders</i>, diagramming, analyses ▶ self correcting notes and diaries ▶ <i>semi-structured interviews</i> ▶ shared presentation and analysis ▶ short and tight questionnaires ▶ team interactions ▶ traditional management systems and local resource collections//inventory ▶ types, sequencing and chains of interviews ▶ unplanned wanders ▶ wealth or well-being rankings ▶ <i>workshops, brainstorming</i>

Adapted from Chambers et al as found in Wickham, 1993

Appendix Two: Additional Data from Sameh

The following pages (194-201) contain additional data collected with elder and student informants in Sameh. Page 194 is a seasonal calander developed with the Sameh student focus group. Pages 195-201 include additional time lines and trend graphs developed with elders from the community.

Cable

- (c) yes.
- Syonie club (v.e. v.v.v.)

SOURCE: BUREAU OF FIELD NOTES, 10/22/1944

<u>Community</u>	<u>Time - line</u>	SMITH ELDER: <u>Mike Ciangi</u>
<u>DATE :</u>	<u>EVENTS</u>	
1946-50	_____	Drought for 4 yrs - famine (WWII) also - people taken to fight - no rain
1951-62	_____	good rain - they harvested a lot
1960-3	_____	especially 1963, drought & famine - no food
1964-70	_____	light rains
1970-74	_____	like harvesty famine, help from the gov't (food)
1974-80	_____	famine - no rain
1980-present	_____	No good rains. This has been lasting almost 10 yrs. poor harvest. No chance of how what will happen in future

SOURCE: FIELD NOTES, 11/02/94

Community TIME - LINE

SAMEH ELDER
10/02/94

196

<u>DATE :</u>	<u>EVENTS</u>
1912	1st world war
1930-31	"Kizighe" Severe locust problem
1931-45	2nd world war
1953-51	Brought
1961	Independence
1974	'Kibab' 'Mqomo' famine
1984	famine

1984 'Kibab' 'Mqomo' famine or were
used by the government to help to
mean the size of the famine. They
were given as ration to other, but the
'Mqomo' was the sack (containing flour)

Community TIME - LINE

SAMEH ELDER

<u>DATE :</u>	<u>EVENTS</u>
1939-45	2nd world war
1953-51	Brought
1961	Independence
1974	Mqomo famine
1984	famine

11/02/94

Community Time - Line

SAMEH ELDER

197

<u>DATE :</u>	<u>EVENTS</u>
1930 - 31	Severe Locust outbreak
1939 - 45	1st world war II
1950 - 52	drought caused after flood
1974	'Mqomo' famine
1984	famine

09/02/94

Community Time - Line SAMEH ELDER

<u>DATE :</u>	<u>EVENTS</u>
1885	M famine
1914	1st world war
1930 - 31	Nzota famine
1939 - 45	2nd world war
1950 - 51	drought
1961	Independence
1974	'Mqomo' famine
1984	famine

09/02/94

Community Time - Line - Sameh STUDENT
Focus Group.

DATE :

EVENTS

1974 → famine
 1982 → famine

Dec/93 ————— very heavy (unusually) blowing winds.
 1993 (very dusty)
 ↓
 now ————— cattle are dying, lack of grass,
 goats/sheeps dying.

Source: Original Field Notes, Feb. 10, 1994.

Topic: Forest Loss

SAMUEL ELDER
TREND GRAPHS

12/02/94

- 1930 - 50 Sustainable harvesting from forest
 1950 - 60 people begin charcoal business, exporting to City
 1960 - 70 Population increases, so does charcoal production
 1970 - 80 Some drought, fuel wood in short supply
 1980 - 90 many people switch to electric or gas / By law against cutting certain trees
 1990 - now → School and farmers begin tree planting

Topic: Soil Erosion.

- 1940 - 50 continuous cropping
 1950 - 60 forced terracing
 1960 - 70 terracing declined, dry years, poor harvest
 1970 - 80 more drought, economic hardship
 1990 - now Gov & NGOs helping with Soil Conservation

Topic:

RAINFALL

SARAH EIDER

12/02/94

- 1930 - 1950 sufficient rainfall
 1950 - 51 drought, less rainfall
 1960 - 1970 sustainable recovery
 1970 - 1980 drought with little recovery
 1980 - 1990 drought even after 10 yrs time
 1990 - now long recovery after programs on tree planting.

Topic: SIZE OF MAIN HARVEST.

- 1930 - 1950 Good harvest
 1950 - ~~1951~~ drought
 1960 - 1970 Good harvest
 1970 - 1974 drought / famine
 1975 - 1984 drought / famine
 1985 - now good harvest

Topic: conservation efforts by Govt or NGOs

- 1930 - 1950 - Sustainable Conservation
 1950 - 1960 - people begin charcoal - no efforts on conservation
 1960 - 1970 - population increase, no much effort on conservation
 1970 - 80 - drought
 1980 - 90 - By laws against cutting certain trees
 1990 - now - schools, farms, Govt & NGOs effort on tree planting.

Appendix Three: Additional Data from Ashira

The following pages (203-213) contain additional data collected with elder and student informants in in the Ashira Girls school and immediate community. Pages 203-5 include a sketch map and transects of the school area. Pages 206-11 include additional time lines and trend graphs developed with elders from the community. Pages 212-13 are seasonal calenders drawn with elders and students at Ashira.

LEGEND FOR FIELD SKETCH OF ASHRA GIRLS School.

204

- 1 - Teachers house
- 2 - "
- 3 - head mistress
- 4 - Domestic Science Bldg
- 5 - Domestic science
- 6 - chapel
- 7 - Teacher's private gardens
- 8 - Teacher's rooms
- 9 - school shop (soda etc run by girls)
- 10 - physics bldg + classrooms
- 11 - Library and accounts office
- 12 - Teachers lounge
- 13 - classes + headmistress office
- 14 - "Smart" area - Gardens, trees, paths, flowers etc.
- 15 - small dig area, chickens, pigs - (all student run projects)
- 16 - Muri Kari club plot area (nursery?)
- 17 - Teachers quarters
- 18 - "
- 19 - "
- 20 - kitchen, dining area
- 21 - Farm implements storage
- 22 - Girl's dormitory bldg.

Hillside
Village
Mixed Forest
Shrub
Meadow
Wood

East - West ; North - South
Insects at ASRICA fields
School and surroundings.
05/03/94

Community Time-Line (By Rev. J.P. Luma)

ASHIRA ELDER

07/03/94

206

DATE :

EVENTS

1923 - Strong hurricane originated from Masia and destroyed houses and the church.

1924 - Massacre of Mzee Nathaniel, the early black missionary

1927 - War with Mamba village in conflict for local water streams (canals)

1927-8 - Locust invasion causing great famine

~~1929-33~~

1934 - Outbreak of Epidemic measles whereby many children died.

- the public cemetery was started / ~~your name~~

1938 - Conflict on coffee price mechanism in which 33 Co-operative Societies in Moshi were demolished.

1939 - W.W II started

1940 - Forced terracing / contouring campaign by the Mangi (Mangi August).

1949-51 - Great famine

1974-75 - Great famine

1978 - Strong hurricane uprooted schools, houses and trees

1983 - Outbreak of fire in the village's forest

" - Infection on bananas (stem borer)

1990 - Infection on Syprus trees.

SOURCE: ORIGINAL FIELD NOTES.

Community Time - Line (By Mrs. Meleck Mphu
ASMEA ELDER

07/03/94

DATE :

EVENTS

1973-74 - Famine

1977-79 - Continuous intermittent earthquakes

1978-79 - Great hurricane

1978 - drought and famine

1983-84 - Famine.

SOURCE; ORIGINAL FIELD NOTES

Topic: Soil erosion

ASHIRA ELDEES'
TREND GRAPHS.
07-09/03/94

SOURCE: ORIGINAL
FIELD NOTES

- 1940 - 60 Forced terracing
- 1960 - 70 no terracing enforcement
- 1970 - 80 drought years and famine
- 1980 - 90 Fire in the village forest
- 1990 - now - infection on sycas trees and falling down

Topic: Forest cover

- 1930 - 40 Conservation strategies by Chagga Council
- 1940 - 50 Sustainable harvesting emphasized.
- 1950 - 60 poaching for hard-wood for furniture
- 1960 - 70 The Kibo hatch factory established (raw material)
- 1970 - 80 CBD affecting the forest hubs
- 1980 - 90 Govt issued permits for unsustainable harvesting of forests
- 1990 - now sycas infection

1940-50 enough forest cover to attract clouds

1950-60 dry year

1960-70 drought, increased temperature, unsustainable forest harvesting

1970-80 continued forest harvesting, CBD infecting in forests

1980 - now outbreak of fires, increased temps., Symples infection

Topic: Rainfed Seasons: booms and depressions: (b) and (d)

1930-40

1940-50 - (1945-51) great famine

1950-60 drought and famine (1951-54)

1960-70 drought (1963-68)

1970-80 drought (1974-78)

1980-1990 drought (1984-88)

1990 - now drought (1994 - prediction)

Topic: Size of Coffee harvest

ASHIRA ELDER
ENVIRONMENTAL TRENDS
GRAPHS
07-09/03/94

SOURCE: ORIGINAL
FIELD NOTES

1930 - 40 Still young tree trunks

1940 - 50 good harvests / mature trees

1950 - 60 drought, famine

1960 - 70 enough rains

1970 - 80 drought, CBD infection, poor quality insecticides

1980 - 90 drought, CBD infection, soil infertility

1990 - Now dry years

Topic: Soil Fertility

1930 - 1940 the use of natural manure

1940 - 50 forced terracing to control erosion

1950 - 60 application of natural manure, decline of terracing

1960 - 70 introduction of chemical fertilizer in upland farming

1970 - Now continued use of chemical fertilizer in maize farming

1930 - Now general monoculture

Topic: Water Supply (streams/canals/rivers)

1930 — 1960 - enough vegetation cover, bylaws to maintain streams

1960 — 70 - unsustainable forest harvesting but enough rains

1970 — 80 - unsustainable forest harvesting continues, tourism allowed in catchment areas, allocation of land in forested areas

1980 — 90 - no emphasis on maintaining streams, decline of water table

ASHRA GELS FOCUS GROUP

ns/03/04

SEASONAL CALENDAR

Disaster

- coffee berry disease (time unknown)

Animals

- There is no hunting for food.

Lands

For every tree you cut you must plant one

prohibited to burn bushes

can only kill wild animals with a permit

court (you break the laws)

Appendix Four: Additional Data from Mtwara

There is one additional piece of data provided for the community of Mtwara here in appendices.

Page 215 is a seasonal calender developed with a student focus group from Saba Saba secondary school.

IV ~~the~~ Studies
from Sabie Sabon
21/2/94 - 11:00 am

SECONDARY CALENDAR

used to be practiced in December, but the spirit has encouraged the shift to June & July so as to not interfere with planting.

- Medicinal
- HABOBAINI** - much used
 - treats stomach pain
 - headache
 - boil leaves & drink water (bitter)
 - ground leaves
 - boil & drink for stomach ache
 - roots of crocodile tree for bilharzia - boil roots & drink

NO HUNTING

- no specific seasons for fishing

Crops

- MAIZE
- CASSAVA
- groundnuts
- millet
- CASSIOW
- COCONUT

END

0 3-0 6-9 6

FIN