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Population Dynamics, Environment Changes, and Development Processes in Developing Countries

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1
Introduction

Abstract

This report represents an attempt to understand the linkage between population dynamics, environmental changes, and development processes with references to concrete case studies carried out in the rural areas in three developing countries in Africa, Asia, and Latin America. It emphasizes the need for a cautious look at the complexities of the nexus between demographic, ecological, and livelihood issues. There are multifaceted dimensions of population dynamics which interact with the environment and productive natural resources in different ways and in different contexts. Population changes have not been the determinant factor behind environmental deterioration in most cases. There have been also many efforts by local people to adjust to the evolving demographic and environmental situation. External forces namely the market and state institutions have played a significant role. They have intervened forcefully in resource use and management practices. They have also led to a concentration or movement of people in certain areas. Moreover, there has been a limited impact of attempts to change these processes through policy parameters because of the narrow focus mainly on fertility control or nature conservation. Most crucially, policy measures in general have failed to strengthen local livelihood prospects, as well as to create enough room for rural people to actively participate and mobilize around population, environment, or development issues. The report is organized in five chapters. The first chapter discusses different concepts and debates surrounding the population,

environment and development issues. This chapter also outlines the approach and scope of the study. The second chapter is concerned with an assessment of the interaction between environmental and demographic changes in the case study areas. The third chapter looks at the various "accommodation" practices that are developed at local levels, given environmental and demographic changes. The fourth chapter investigates the impact of external forces on demographic policies, resource management patterns, and livelihood provisioning. The last chapter summarizes the principal research findings.

Defining key Concepts

Over the last two decades, population dynamics, environmental changes and development processes in developing countries have been explored by economists, demographers, development planners, and ecologists alike. Nonetheless, little systematic attempt has been made to bring these three dimensions together and analyse them in particular socio-economic and ecological contexts. The literature dealing specifically with these interrelationships is still limited and, frequently, discussions on the subject have tended to be oversimplistic.

Part of the problem is that the dimensions of issues such as population, environment and development are extremely wide. They have often meant different things to different people. In order to provide conceptual clarity and place the analysis in proper perspective, this discussion will begin by briefly examining the key terms "population dynamics", "environmental changes" and "development processes".

Population Dynamics

Two components which have received prominence in the current demographic debate include the size and growth rate of the present population in developing countries. According to the medium-variant estimation, the population in developing countries as a whole rose from 1,766 to 4,203 million between 1950 and 1990. Currently, developing countries have nearly four-fifth of the world

population (Table 1). In the first half of 1950s, Africa, Asia and Latin America had an annual growth rate of 2.2, 1.9 and 2.7 percent respectively. By 1990, it is estimated to have changed to 3.0, 1.9 and 2.1 percent per annum respectively, with the average annual rate of growth for developing countries as a whole being 2.0 percent (United Nations, 1991:14).

If the 1950 and 1990 figures are compared, the population in developing countries has more than doubled in the last forty years. This has alarmed many specialists and development agencies. Others, on the other hand, are cautious in interpreting existing population trends, because data for many countries are largely based on estimates, and methods used in collecting or forecasting data have often proved inaccurate (Bridger and Soissons, 1970; Keyfitz, 1981; Anker and Farooq, 1984). There has often been a tendency to over-estimate population projections. For example, a forecast made by the U.N. in 1970 for the year 2000 was revised downward by almost 2 billion people; and the claim made by the US President's Commission on Population Growth and the American Future that the world fertility rate would be higher than in 1970 was refuted by the fact that birth rates began to fall within a year of this forecast (Simon, 1981:7). One recent interesting case is Nigeria where its first scientific census indicated that there were 20 million fewer people in the country than previously estimated (cf. Financial Times, 23 March 1992). Likewise, evidence suggests a reduced rate of population growth for Asia and Latin America in recent years, although growth rates for Africa are still ascending - primarily due to declining mortality and little fertility change (United Nations, 1991:15). The rate of population growth in Africa is expected to decline at the turn of the century (Population Information Network for Africa, 1990:3).

Table 1: Population scenario in developing countries

	Population size* (million)		**% of world Population+**		**Growth rate+**	
	1950	**1990**	**1950**	**1990**	**1950-55**	**1985-90**
Africa	222	642	8.8	12.1	2.2	3.0
Asia	1378	3113	54.7	58.8	1.9	1.9

Latin America	166	448	6.6	8.5	2.7	2.1

Source: * = United Nations, 1992; + United Nations, 1991.

Obviously, not all parts of the developing world are equally populated. By 1990, China had more people than Africa and Latin America combined; and India had the equivalent population of Africa and half of Latin America (United Nations, 1992: 22). Indonesia, Pakistan and Bangladesh are other countries with large populations, although the first two are also immense in their geographical sizes. In terms of cultivated land, Pakistan and Bangladesh have higher man-land ratios than China or India.

Density is another demographic aspect which need to be taken into account. Small countries such as Nepal, Rwanda, Burundi, Haiti, Dominican Republic and El Salvador have a relatively high population density. The situation becomes accentuated when a country's population is concentrated in certain locations. For example, in terms of agricultural land, the hill areas in Nepal have more people per square Kilometre than Bangladesh or Pakistan. The concentration of people in certain locations in a country is not an accident, but has evolved over time due to complex historical and socio-economic processes. Nor does it remain static. Out-migration to new agricultural frontiers or to urban areas has become a common phenomenon, although this can also be influenced by many "push" and "pull" factors, as well as by government development strategies.

Another important denominator of population variables is the quality of life measured in terms of opportunities for employment and income, food, shelter, education facilities, health care and individual liberties (Levi and Andersson, undated; UNDP, 1991; Dasgupta and Weale, 1992). Evidence suggest that the lack of access to the above items can critically influence the desire, need, and rationale of a rural household to have larger family (Chambers, 1987: 10). although there are also cases where fertility rates have risen in spite of improved living conditions (WDR, 1984:109). The local social structure, including religious and cultural values and gender relations, is another factor which influences demographic parameters. The position of women and

their potential role in household welfare, deciding family size and improving the household's economic and living conditions, have in particular been a subject of interest in recent years (Boserup, 1985; UNFPA, 1991; Joekes, 1989; Shaw, 1988). Some of these aspects will be referred to in the following discussion.

Environmental Dynamics

Recent discussions on the status of the environment in the 'Third World' have tended to focus mainly on the declining quantity and quality of a number of natural resources, namely land, forest and water. Future negative ecological and socio-economic consequences in particular are highlighted. A few of these environmental issues are discussed here.

The process of land degradation in developing countries is considered in the literature as an important environmental issue. This is often associated with soil erosion or desertification. The principal agents responsible for soil erosion are water, wind, gravity, and ice (cf. Chakela, 1981:11); the role of the first two agents have in particular been the subject of recent research and debate. It is emphasized that, as topsoil's in tropical countries are often thin and fragile, rainfall and associated increased run-off intensifies soil erosion. Detailed local level information on this aspect is so far available only for a few countries (Brown and Wolf, 1984:14). One way of determining the extent of soil erosion has been to measure the soil sediment load carried out by rivers into the oceans. For example, the Yellow river in China and the Ganges in India alone are estimated to carry over 3 million metric tons of soil to the oceans each year (El-Swaify and Dangler, 1978). Scientists asserts that only one-fourth of the soil lost through erosion might reach the sea (El-Swaify and Dangler, 1982; Degi et al., 1980; see also Brown and Wolf, 1984). Data on the rate of soil erosion by wind is even less accessible. It is suggested that areas with low precipitation and steady prevailing winds, at all levels from the upper air down to ground level, are especially exposed to wind erosion. Within developing countries,

the Sahara and Kalahari deserts in Africa are cited as the most vulnerable zones (Hudson, 1985:30).

Likewise, it is believed by some observers that desertification in the 1980s threatened as much as 35 percent of the world's land surface and 20 percent of its population (cf. Rhodes, 1991). Sub-Saharan Africa has particularly received attention in this respect. UNEP asserted that between 1958 and 1975, the Sahara desert expanded southward at an average of 6 Kilometres a year as a result of desertification (cf. Forse, 1989). However, a number of recent scientific studies have questioned this figure on both methodological and empirical grounds (Forse, 1989).

Water has become an emerging environmental issue in many countries. As far as the rural areas are concerned, the main problems remain the over-use, depletion and contamination of water. Although on global scale, water is essentially a renewable resource, its distribution and quality can have serious implications at local levels (ESCAP, 1990; WRI, 1990; UN Inter-Secretarial Group for Water Resources, 1992). Significant levels of water loss are observed in the arid regions of the world. Here, the land is unable to absorb the rainfall, which quickly evaporates in the atmosphere. An IUCN study, for example, indicated that the hydrological map of Africa which showed that land was unable to retain rainfall, coincided with its drought affected area in the mid-1980s (IUCN, 1990: 1). In other cases, the existing water sources are frequently overused. This has particularly been discussed in the case of India. In Tamil Nadu, for instance, excessive water pumping for irrigation has caused the water table to fall by 30 meters in a decade (Falkenmark, 1990; Moench, 1992). Similarly, where upstream watershed areas are rapidly degraded, depletion of water is also inevitable. In addition, the excessive use of chemical fertilizers and pesticides or dumping of industrial waste in local rivers or lakes has contaminated ground water. This has been a problem particularly in Latin America countries (Latin American and Caribbean Commission on Development and Environment, 1990:26).

Deforestation is probably the most discussed environmental issue in recent years. Within developing countries, increased drought, land degradation, floods, famine and rural poverty are increasingly intertwined with deforestation processes. There have also been concerns about the declining future livelihood prospects for forest-based and other groups or poor people. In developed countries, the concern about deforestation has increased, partly because of the accelerated rate of tropical deforestation and its assumed contribution to global warming and climate change (Barraclough and Ghimire, 1990; WWF, undated). The result of the FAO's recent survey of tropical forest resources indicates that by the end of the 1980s, the annual rate of tropical deforestation reached 17 million ha., with the yearly reduction of forest at 0.9 percent (FAO, 1991). The highest rates of deforestation have taken place (1.2% per annum) in Asia which retains no more than 16 per cent of the total forest area in developing countries, although it has to support nearly 59 percent of the world's population. On the other hand Latin America, which has half of the world's tropical forests, is experiencing deforestation on a large scale (nearly half of the total annual deforestation in developing countries). In Africa, the West and Central African regions are undergoing high levels of deforestation. Although these continental or regional data are helpful in understanding the general gravity of the problem, deforestation processes need to be understood at local and national levels. This is because the types and rates of forest exploitation differ widely in different localities, regions and countries. Furthermore, these areas can significantly differ in demographic and socio-economic characteristics, hence providing varying levels of pressure on forest areas.

The rural environment is not however merely composed of land, water and forest. The environment, in the wider sense of the term, consists of living organisms such as plants, animals and micro-organisms (see Figure 1). It also consists of non-living constituents as hydrosphere atmosphere and lithosphere. These latter elements are fundamental for the regulation of life-cycles for living organisms. Although there have been some recent

inquiries into the negative environmental effects on living organisms, known more commonly as biodiversity, many; issues remain unexplored. We do not yet know how living organisms, as well as non-living ones, have evolved over time; how they effect regional or global climatic or physical conditions, what kinds of long-term socio-economic consequences are likely to occur.

Figure 1: Some indicators of environmental degradation in major rural agroecological zones in developing countries

Mountain Areas
- increased landslips
- gully erosion
- terrace abandonment
- decline in species diversity in pastures and forests
- substitution of cattle by sheep and goats
- substitution of deep-rooted crops by shallow-rooted ones
- persistent decline in agricultural productivity
- increased distance and time involved in gathering fodder and fuelwood
- increased seasonal migration
- reduced fallowing, intercropping and crop diversification

Tropical Drylands
- sheet erosion, wind erosion (deflation)
- lowered water tables, groundwater salinisation
- growing prevalence of inferior annuals and thorny and woody shrubs (i.e. reduced availability of useful biomass)
- declining availability of common property resources

Tropical Moist Forests
- declining species diversity
- decline in forest area
- reduction in length and deterioration of vegetation composition of fallows
- decline in useful species present in bush and fallow
- gully erosion

Tropical wetlands
- decline in useful macrophytes through eutrophication, chemical pollution and presence of metals
- soil drying and hardening

Irrigated Lands
- waterlogging, salinisation
- mining of productive soil components (organic matter, available macro and micro-nutrients)

Rainfed Cropland
- sheet and gully; erosion
- declining productivity
- increased yield variability/increasing rainfall variability
- increasing crop disease and pest damage
- * reduced fallowing, intercropping and crop diversification

Source: Adapted from Jodha (1991) by Leach and Mearns, 1992

It may also be noted that, even within environmental issues relating specifically to soil, water, and forests, sufficient knowledge is lacking on many points. For instance, most scientific studies fail to show how much the quality and quantity of land, water and forest resources are affected by natural processes (such as changing climate, earthquakes, volcanoes, hurricanes, tornadoes) in comparison to effects from human activity. To the extent that human beings are culpable, under what historical and socio-economic circumstances have these processes evolved? Most crucially, which are the social groups that have been responsible? And, who has tended to lose and who has gained?

Moreover, the depletion of resources is not uniform to all locations. Some countries may have more resources, or those better suited to local use and production activities. There can be different types of demand on different resources by various social groups. Also, the wise use of and alterations in national resources can contribute to many diverse positive socio-economic benefits at local levels. For example, newly cleared land provides employment, food and income for people and may serve as an important mechanism for rural social mobility and progress. This may at the same time entail negative environment effects through deforestation. Furthermore, future projections of rapid environmental degradation based on past and present trends are not always accurate. There are many types of renewable natural resources such as forests; hence, the local community or even national/international initiatives can play an important role in protecting or regenerating or even national/international initiatives can play an important role in protecting or regenerating forests. A fuller analysis of environmental dynamics requires coming to terms with many of these complex issues. The current literature, dealing with rural environmental issues in developing countries, albeit substantial in quantity, relates mainly to the aspect of resources degradation.

Development Processes

The meaning of the term "development" is a complex one. It has often been referred to as the style of economic growth based on the rising level of income per capita. This was the dominant concept in the 1950s and 1960s amongst many scholars, government officials and development planners (Hauser, 1979;22). Since the early 1970s, particularly after the Second Development Debate launched by the United Nations, it has been recognized that "development" should not only cover economics, but also encompass many wider social security and welfare issues. It has been emphasized that,

> *"... the ultimate objective of development must be to bring about sustained improvement in the well-being of the individual and bestow benefits on all... It is essential to bring about a more equitable distribution of income and wealth for promoting both social justice and efficiency of production, to raise substantially the level of employment, to achieve a greater degree of income security, to expand the improve facilities for education, health, nutrition, housing and social welfare, and to safeguard the environment" (UNRISD, 1979:2).*

In other words, "development" should imply the fulfilling of basic needs with social justice, although on many occasions actual achievements have not corresponded to the goals stated above. Economic crises involving people's livelihoods, combined with widespread social injustice, has in fact been the major feature of rural societies in many developing countries (ILO, 1977; Esman, 1978; Chambers, 1983; Sinha, 1984; Griffin, 1985, Barraclough, 1991). In recent years, a leading economic and social development policy presumption has been to allow market forces to guide resource allocation, but there is also growing concern that this trend might affect both the physical environment and rural poverty negatively (e.g., Ghai, 1991). In this paper, the "development processes" relating to local livelihood provisioning are particularly investigated, although wider agricultural and rural development strategies, population policies, and management of natural resources are also assessed.

Understanding the Linkages

Having examined the concepts of "population dynamics", "environmental changes" and "development processes", some light may be shed now on the discussion surrounding the interrelationships between these variables. The literature on this aspect is highly incoherent, with numerous opposing perceptions and prescriptions. Arguments run from one extreme which holds that population growth leads to both economic decline per capita and increased environmental degradation, to the other side which maintains it contributes to economic growth and more sustainable management of natural resources. There are many middle views also. There are also specialists who assert that there are no apparent relationships between population and economic growth, and that other socio-economic and political factors might be more responsible for the current state of environmental degradation.

The original proponent who, provoked much of the debate on the links between population growth and economic well-being was the 18th century English economist, Malthus. He stated that population has a constant tendency to increase beyond the means of subsistence. He explained that the "arithmetic growth" of food resources could not keep up with the "geometric rate" of population growth-unless halted by preventive checks of "moral restraint, vice or misery" (Malthus, 1976).

The Malthusian school of though on population issues was at times influential in economic planning in developing countries, which generally began after the Second World War. Various development models attempted to show how it would be possible to boost economic growth under conditions of stable population increase. Scholars such as Lewis and Myrdal, albeit with slightly differing views on social issues, saw population rise as an obstacle to social welfare and general economic development (Lewis, 1955; Myrdal, 1968). Coals and Hoover constructed an elaborate model demonstrating a close relationship between lower birthrates and more savings available for productive reinvestment and per capita growth (Coale and Hoover, 1958). In the 1960s, particularly against the

background of acute food scarcity and famine acquired further impetus (Ohlin, 1992). In the 1970s and 1980s, this contention remained powerful amongst many national governments as well as international organizations desiring to promote strong population control measures. Renewed discussions along these lines have taken place in recent years in the context of frequent droughts and famines, and a high level of population growth in Sub-Saharan Africa (see IUCN, 1989; WCED, 1987; Repetto, 1987).

Some critics however argue that, in many developing countries, population growth has occurred together with rapid economic development (Simons, 1981; Srinivasan, 1988). For example, the Cote d'Ivoire had the fastest population growth and the most rapid economic growth per capita of any country in West Africa during the greater part of the last three decades (Barraclough and Ghimire, 1992). Similarly, Anker and Farooq note in the context of Sri Lanka, that, although eradication of malaria in the late 1940s contributed to a rapid decline in mortality rates, and hence rapid population growth, the increase in the quantity of labour has accelerated economic growth (Anker and Farooq, 1984: 267-8). This has also been the case in Nepal's Tarai region where rapid population growth combined with increased land 'colonization' led to a boost in food production, land revenue, and foreign exchange earnings through food exports (Blaikie et al., 1983; Ghimire, 1992). India and Pakistan have also been able to realize a slightly higher level of GDP growth relative to the rates of population growth (World Bank, 1992), although their GDPs in large part are depressed by civil wars, droughts and famines rather than population pressure alone.

There is also the argument that simultaneous efforts to reduce fertility can take place during the process of economic development and modernization. This view has been powerfully advanced by Davis, who, examining demographic patterns in Europe and Japan prior to the Second World War concluded:

> *"Regarding of nationality, language, and religion, each industrializing nation tended to postpone marriage, to increase celibacy, to resort to abortion, to practice*

> *contraception in some form, and to emigrate overseas" (Davis, 1963:351).*

Some scholars emphasize that this "multi-phasic demographic transition", as Davis called it, is evident in many developing countries, particularly those undergoing rapid industrialization or urbanization processes. Indeed, it is now commonly suggested that many households desire a reduced family size and fertility levels in most developing countries (Anker and Farooq, 1984:268; UNFPA, 1991a). One clear evidence of this is that fertility rates have fallen in all parts of the Third World outside Africa (World Bank, 1992).

There is a widely-held view that population growth also encourages intensification of labour and production, and therefore counter-balances the increase in population. Chayanov, based on the examination of the demographic and social structure of the Russian peasantry at the beginning of this century, had stated that peasant family size was positively correlated with the amount of land and other means of production held by the household. In other words, rising consumption requirements of the household as a result of population growth were met by the increased labour supply within the household (Chayanov, 1925, quoted in Shanin, 1971). Boserup later asserted that the methods of cultivation and systems of land use in traditional societies adapt to changing demographic conditions. She wrote:

> *"As the density of population in the area increases, the fertility of the soil can no longer be preserved by means of long fallow and it becomes necessary to introduce other systems which require a much larger agricultural labour force. By the gradual change from systems where each cultivated plot is matched by twenty similar plots under fallow to systems where no fallow is necessary, the population within a given area can double several times without having to face either starvation or lack of employment opportunities in agriculture" (Boserup, 1965:117).*

That increased population growth leads to the adoption of labour-intensive farming methods is demonstrated by many other studies (e.g., Hayami and Ruttan, 1971; Binswanger and Ruttan, 1978: see also Lee et al., 1988). Bilsborrow indicates that population growth results in the "extensification" of areas under cultivation, combined with increased irrigation facilities and multiple cropping, and a decreasing proportion of land lying fallow. He asserts that "such multiple responses suggest, on the one hand, that population pressure is present but, on the other, that there is still considerable room for positive or compensatory economic responses to increases in rural population density" (Billsborrow, 1987:198). He argues in his recent work, dealing particularly with the Latin American context, that this process of agricultural extension though has had many negative environmental consequences, especially deforestation (Billsborrow and Okoth-Ogendo, 1991; Pichon and Billsborrow, 1992).

Both the theories of "intensification" and "extensification" have certain limitations however. For "intensification" to succeed, there should be continued access to land with holdings above subsistence. This depends also upon the type of technology that is being adopted. On the other hand, "extensification" is only valid when virgin forest or other land is plentiful and easily accessible. The existence of untilled forest land does not mean that peasants are always permitted to clear it and establish their dwellings. Local customary regulations and, most crucially, institutional policies frequently play important roles in regulating or restricting the use and appropriation of land in forest frontier areas. Indeed, increased areas of remaining forests in most developing countries are now effectively transformed into strictly protected areas where farming activities are completely prohibited (Ghimire, 1991).

The concern about the interrelated consequences of rising population growth on the environment is another important aspect of discussion in the recent literature. One extreme view, for example, sees the present patterns of population growth as the number one threat to the terrestrial life of Earth for a billion years'. As Ehrlich and Ehrlich write:

> *"The explosive growth of the human population is the most significant terrestrial event of the past million millenia. Three and one-half billion people now inhabit the Earth, and every year this number increases by 70 million. Armed with weapons as diverse as thermonuclear bombs and DDT, this mass of humanity now threatens to destroy; most of the life on the planet. Mankind itself may stand on the brink of extinction; in its death throes it could take with it most of the other passengers of Spaceship Earth. No geological event in a billion years- not the emergence of mighty mountain ranges, nor the submergence of entire subcontinents, nor the occurrence of periodic glacial ages-has posed a threat to terrestrial life comparable to that of human overpopulation" (Ehrlich and Ehrlich, 1970:1).*

Although the concern about the diminishing equilibrium between population and natural resources is not new, renewed attention covering wider environmental issues has increased since the 1970. The early discussion chiefly focused on the "finiteness" of non-fuel minerals and energy, and to a limited extent on the issue of the "carrying capacity" of land for food production for a growing number of people (Meadows et al., 1972; UN, 1984). In the 1980s, however, much of the discussion centred around the issue of "degradation" of natural resources. WCED or the Brundtland Commission, for example, stated:

> *"There are also environmental trends that threaten to radically alter the planet, that threaten the lives of many species upon it, including the human species. Each year another 6 million hectares of productive dryland turns into worthless desert. Over three decades, this would amount to an area roughly as large as Saudi Arabia. More than 11 million hectares of forests are destroyed yearly, and this, over three decades, would equal an area about the size of India" (WCED, 1987:ES-2).*

WCED saw population growth and poverty as "a major cause and effect of environmental problems" (WCED, ibid.). This view is

generally shared by many international organizations (see e.g. UNEP, 1990; UNFPA, 1991a and 1991b; South Commission, 1990:134; IUCN, 1990; FAO, 1985). Recently, the issues of global warming and climate change, depletion of ozone layers, degradation of aquatic resources and loss of biodiversity have been further discussed at the international level (e.g. UNCED, 1992; The Economist, 30 May 1992; Financial Times, 2 June 1992). Although there is much controversy regarding the extent to which demographic changes are actually responsible for generating these environmental problems, recent discussions have generally further strengthened the "alarmist perspective". It will be demonstrated in the following discussion that, the relationships between population and environment are however much more complex than has been suggested above. They are frequently reinforced of diminished many structural processes and conditions.

Less discussed in the literature is the impact and interrelationship of development processes on population dynamics and environmental changes. However, in this area too, certain perspective exist. Regarding the demographic aspect, one view holds that interventions on the part of the State can do a great deal in terms of reducing fertility rates. Protagonists of this view cite the recent decline in fertility rates in developing countries in general and "successful" birth control experiences in Southeast Asia, the Caribbean and Central American countries (see e.g. Brown, 1983; UN, 1991). An opposing view however considers that State family planning associated with deliberate population control measures can do little to reduce fertility rates. It has been argued that fertility decline in the regions mentioned above has been influenced by improved social conditions (e.g. improved educational, health and welfare provisioning) rather than population control measures as such (Ohler, 1992). Yet another opinion has been that government population strategies can do more harm than good in handling population issues. For example, mandatory sterilization programmes can make governments and their development policies politically unpopular, and attempts to restrict or promote the transfer of

populations within the country can have several socio-economic and environmental costs.

There is a large body of emerging literature which indicates both direct and indirect relationships between government development strategies and growing environmental degradation in rural areas such as deforestation, soil erosion, degradation of pasture land, contamination of water resources, etc. The role of public policies in stimulating deforestation through poorly conceived land settlement programmes, road building, dam construction, mining and unsustainable and wasteful timber harvest practices, as well as fiscal and tax incentives to promote export crops, commercial livestock and the failure to implement land reform measures form the subject of recent discussions. (see Barraclough and Ghimire, 1990). The conventional approach to environmental protection has tended to rely on legislation, technology and financial means. These are complex issues and difficult to realize. Moreover, many interrelated social and political factors influencing human interaction with the environment are frequently ignored when development policies and programmes as designed and implemented (UNRISD, 1992). Failure to understand these linkages properly, means that institutional policies concerning both the economy and environment can be introduced or implemented based on wrong assumptions; alternatively, governments may undertake measures without considering their interrelated, long-term consequences (e.g. forced sterilization, enclosure of forest areas to establish strictly protected areas). The result is that frequently, neither the economic nor conservation goals are realized in the long-term.

From the above discussion, it can be seen that the relationship between population, environment and development processes are extremely complex. Yet most of the literature, even the most recent (e.g. IUCN, 1990; UNFPA, 1991a and 1991b; Ambio, 1992; World Bank, 1992; Population Report, May 1992) still considers this phenomenon primarily from a demographic perspective and indicates mainly the economic and environmental consequences of increased population on developing countries.

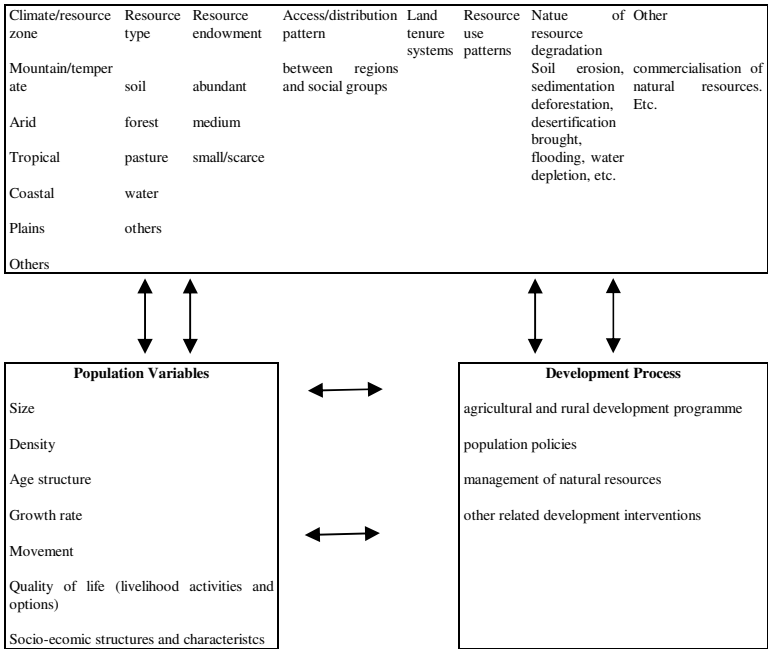
This view is rather deterministic and fails to give due attention to different processes, complexities and inter-causally of these relationships. Population is a key element in the relationship between environment and development, but not the sole one.

Figure 2 summarizes the broad variables of demographic, environmental and development processes. It can be seen that each of them is constituted with many sub-variables. In terms of population dynamics, its size, density, age structure, growth rate, movement, quality of life and socio-economic structure and characteristics should be considered, for each of these sub-variables can influence environmental changes as well as economic activities in different ways. There are also many environmental sub-variables such as different climatic zones, varying resource types, resource endowment, access and distribution patterns, land tenure, resource use system etc. These sub-variables are likely to be influenced not only by the size, density, growth rate and movement of the population, but also by the level of alternative sources of livelihood locally available (e.g. intensification of agriculture, availability of agricultural wage employment, off-farm employment, etc.) and the ability of national development strategies to strengthen these opportunities (e.g. initiation of agricultural reforms, extension of production support services, creation of employment, etc.). Similarly, institutional arrangements and policies relating to population planning, agricultural and rural development, and management of natural resources (e.g. policy measures to alter unsustainable resource use patterns, rehabilitation of degraded resources, environmental education, etc.) can critically influence both population dynamics and environmental changes.

Furthermore, there can be enormous local and regional variations in terms of resource endowment and use, social structures and political processes. State and local/regional government development policies can frequently be contradictory, reflecting conflicting interests and influences of different social groups. Also, global socio-economic and political conditions, as well as development approaches continuously change, making

adjustments necessary on the part of national as well as local/regional governments. In short, even if one considers all the variables listed in Figure 1, a global generalization of relationships between demography, environment and economic activities will have to be done with prudence.

Figure 2: Understanding linkages



The Approach and the Scope of the Study

Demographic dynamics, environmental changes and development processes are treated in this study in their "totality". It is assumed that each of these aspects contain many independent characteristics, but the end-results are

likely to be very different when different variables across the three categories (i.e. population, environment and development) interact. Rather than beginning with the assumption that population dynamics is the single major factor hindering economic progress and causing environmental degradation, the study has considered it fruitful to assess environmental changes that are taking place in a given area and then to examine the different roles that demographic and other factors have played in influencing these processes. In particular, the study has sought to investigate the following questions:

a. How do environmental changes occur in specific local socio-economic and ecological contexts? What role is played by demographic dynamics and related factors in promoting such changes?
b. Are some communities managing resources better than others? If so, why? What resource-use practices have made it possible to maintain a relative balance between resources and population over time, both at the household and community levels?
c. What livelihood options are available at the local level and how are they utilized? Are more sustainable resources utilization practices being adopted, given environmental and demographic changes?
d. What has been the role of external forces such as the state, aid agencies and market forces in managing population, promoting alternative livelihood opportunities contexts, and strengthening sustainable resource management practice?

In order to answer these questions systematically, the research focused on local level situations in Costa Rica, Pakistan and Uganda (1). These countries are confronted by many similar socio-economic and ecological issues and problems. In particular, they share the dominant socio-economic and environmental processes recurrent in their respective regions. However, there are also specific root causes of environmental

degradation and of government responses in each of these countries.

Costa Rica was chosen as a fairly successful example of the implementation of population and environmental conservation policy. In the mid-1960s, Costa Rica had a fertility rate of 6.3 children per women. By 1990, the country succeeded in lowering its fertility rate to 3.1 children per women. The annual population growth, which was amongst the highest in the region in the 1960s, has now come down to around 2 percent (Table 2). This demographic accomplishment was largely due to the improved educational and social programmes, rather than official population control measures. Successive governments have allocated substantial sums (up to 30 percent of the budget) to the fields of health and education (National Geographic, July 1981). A level of industrialization and, most crucially, rapid agricultural expansion in the 1950s and 1960s, combined with a somewhat better distribution of land and income than in most of Central America, allowed the country to gain a higher level of social development more swiftly than other countries in the region. However, the expanding agricultural sector, which also included cattle ranching, involved a large degree of environmental degradation in the country. For example, until the 1990s, the country has had one of the highest rates of deforestation in the world. Recent government policies along with the efforts of NGOs and international conservation groups and local communities seem to have restrained deforestation to a limited extent (Simons, 1988). Other positive government conservation efforts include biodiversity protection, soil conservation and the preservation of watershed areas, initiated mainly through external funding. As a result, Costa Rica is now considered by some authorities to be an example of successful environmental in Latin America.

Table 2: **General demographic and socio-economic features**

	Costa Rica	Pakistan	Uganda
Land use indicators			
Total land area Km ^{2}	51.000	771.000	200.000
% of land area (1989)			
Agriculture	10.0	27.0	34.0
Pasture	45.0	6.0	9.0
Forest	32.0	5.0	28.0
Other	12.0	62.0	29.0
Annual rate of deforestation % (1980-90)	6.9	0.4	0.8
Annual reforestation 10^3 ha (1981-85)	0.4	7.0	1.9
Protected areas (1991)			
by number	31.0	53.0	32.0
as % of total land area	12.2	4.6	7.9
Population indicators			
Pop. density per 1,000 ha arable land (1990)	595.0	1591.0	923.0
Population millions			
1960	1.2	50.0	6.6
1990	3.0	122.6	18.8
Population % (1990)			
Urban	47.0	32.0	10.0
Rural	53.0	68.0	90.0
Pop. growth rate %			
1965	2.7	3.1	3.0
1990	2.4	3.1	2.5
Fertility rate			
1965	6.3	7.0	7.0
1990	3.1	5.8	7.3
Contraceptive usage rate % (1985-87)	70.0	11.0	5.0
Per 1,000 live birth (1990)			
infant mortality	18.0	104.0	99.0
> 5 mortality rate	22.0	158.0	164.0
Life expectancy (1990)			
male	72.5	57.6	50.3
female	77.3	57.8	53.7
average	74.9	57.7	52.0
Socio-economic indicators			
GNP per capita USD (1990)	1900.0	380.0	220.0
Remittances from abroad as % of GNP (1989)	-.-	4.7	-.-
Production as % of GDP by sector (1990)			
agriculture	16.0	26.0	67.0
industry	26.0	25.0	7.0
manufacturing	19.0	17.0	4.0
services, etc.	58.0	49.0	26.0
Rural population with access to (1987-90)			
healthcare	63.0	35.0	57.0
potable water	84.0	35.0	18.0
sanitation	93.0	8.0	30.0

Literacy rate % (1990)			
total	93.0	35.0	48.0
male	93.0	47.0	62.0
female	93.0	21.0	35.0
Women as a % of total labour force (1988-90)	28.5	11.4	41.4

Source: World Development Report 1992. World Bank
Human Development Report 1992. UNDP
* = =Environmental Data Report. UNEP 1987

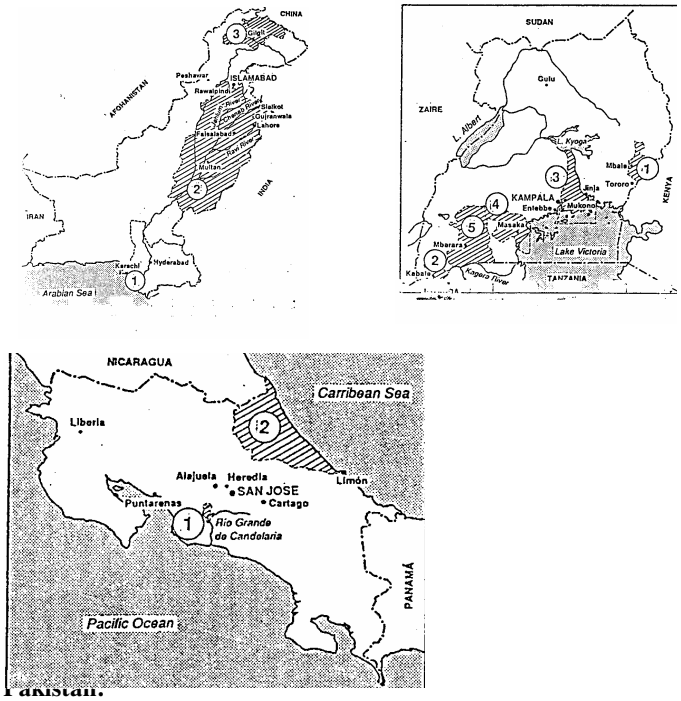
Pakistan is currently the world's sixth most populous country and in many respects fairly representative of its region. Despite a forty-year old family planning programme, fertility rates have not declined. Pakistan and Costa Rica had a comparable annual fertility rate of over 6 children per women in the 1960s. By 1990, while the fertility rate in Costa Rica declined dramatically, the average fertility rate in Pakistan still remains just 6 live births per women (Table 2). This statistical comparison is especially important as the current population of Pakistan is 122.6 million and the annual population growth rate is over 3 percent, although this figure is expected to decline slowly be the year 2000 (World Bank, 1992). The country so far has been able to maintain an economic growth rate superior to the increase of population. The GDP has grown at roughly 6 percent annum since the 1960s and per capita has more than doubled since 1972 (Pakistan National Report to UNCED, 1992). However, this advantage will be lost if economic growth stagnates or declines whilst population continues to increase. With respect to the environment, deforestation, soil erosion, depletion and contamination of water, waterlogging, and salinity have become critical issues in many rural locations. The country, for example has only 5 percent of its national territory under forests (Table 2). Government conservation policies, as in the field of population control, have generally proved to be unsuccessful.

Lastly, Uganda was chosen to reflect some of the demographic and environmental trends in Sub-Saharan Africa. In 1990, Uganda had a fertility rate of 7.3 children per women and an annual population growth rate of 2.5 percent (Table 2). The fertility rates have remained constant or even increased over the last thirty years. This is common phenomenon in Sub-Saharan countries.

Uganda is perhaps, unlike many of its neighbours, more endowed with a favourable climate and soil for agriculture; and the land-man ratio is still low. The main environmental issues are deforestation, soil erosion, degradation of pasture, conversion of wetland areas for cultivation, cattle breeding and brick kilns, and dumping of industrial wastes in lakes, rivers and country sides. The political instabilities of the past few years have taken their toll: certain powerful groups were permitted to extract natural resources exploitatively, and there was an institutional vacuum in the area of environmental management. The government has still no coherent population policy; nor has it any comprehensive social welfare programmes.

In order to avoid excessive generalizations and seek to generate new empirical material on the relationships between population, environment and development processes, the research in these countries focused on rural areas, concentrating on agricultural and land use management practices. But where relevant, rural-urban links were explored, as well as the wider national, regional and international contexts. At least two ecological zones (for example, mountain areas, plains, coastal strips or arid zones) were chosen in each country, and within each zone, two communities which were comparable in terms of certain population and environmental parameters were selected. Given the tight time schedule for the research, these local case studies relied more on qualitative methods than quantitative ones. Beside the review of available literature and other sources of information. primary data was collected through a limited degree of field work involving Rapid Rural Appraisal (RRA) and participatory observation methods. A few illustrative details on research sites may be useful here.

Map1: Research Site



Pakistan:

1. Coastal Area
2. Punjab
3. Northern Mountain Area (Gilgit District)

Uganda:

Mountain Areas

1. Mbale District
2. Kabale District

Lake Victoria Cresent

3. Mukono District
4. Masaka District

Semi-arid Zone

5. Mbarara

Costa Rica

1. Pacific Zone (Candelarita and Polka)
2. Atlantic Zone (Cocori Area)

Costa Rica

Case studies were conducted in Costa Rica covering a tropical watershed area in Pacific and a lowland area in the Atlantic zone (see Map 1).

The Pacific Zone

The study in the Pacific zone was carried out in two villages (Candelarita and Polka) in the Puriscal county, once known as the bread-basket of Costa Rica. Until the 1930s, the dominant agricultural system in the area was swidden farming which provided basic grains for self provisioning and for the market. Agricultural modernization and the introduction of agro-chemicals began at the end of the 1960s. Coffee expanded very rapidly to almost all the arable lands in the county. Tobacco was another cash crop actively promoted by the government as well as by international tobacco companies. The government even prohibited by law the cultivation of other plants that could have a negative impact on tobacco growth. The expansion of export corps forced Costa Rica to import basic grains from the US and Canada. In the Polka area, a rapid shift from swidden farming to cattle raising took place between 1960 and 1980. Cattle expansion was strongly promoted, especially after the opening of the American market in 1960. In 1984, more than two thirds of the area of Polka was covered with pasture, whilst annual and perennial crops predominated in Candelarita.

The expansion of cash crops and cattle raising occured at the expense of the forests. These developments, as well as to a limited extent the swidden cultivation practised by peasants, also caused soil deterioration and erosion. Another related environmental problem has been the contamination of soil and water as a result of the introduction of agro-chemicals. In recent years, a number of positive initiatives to correct some of these environmental problems have also occured in both communities. This aspect will be dealt with in detail in the third chapter.

The Atlantic Zone

The study in the Atlantic zone was carried out in the Cocori area, which is located in the Colorado district (Pococi county). Four communities were included in the study: Linda Vista and El Cedral on the eastern road and El Carmen and Aurora de Cocori on the western road. This area is located in the lowlands of the Atlantic Zone, forming a part of the Rio San Juan Watershed. The area still has some tropical wet forests, with a high diversity of fauna. Before 1960, timber extraction by large companies was prevalent in these forests. Agricultural colonization began in the 1960s. The first phase (1968-76) was characterized by taking possession of the land for small scale production, but differentiation quickly evolved as cash crops became popular and market forces entered rural areas. This phase was also marked by resource privatization systems of hunting and fishing. From 1973 onwards, forest removal for cattle pasture and commercial crops began more rapidly, combined with periods of frequent logging in the area. There is currently a great deal of conflict surrounding land rights amongst different social groups and the state.

The main environmental problem of the entire northern Atlantic zone is a rapid process of deforestation. Over 70 percent of the dense forest has been cleared since 1960 leaving some 80,000 ha. About 13,000 ha of this forest area is now included in the Tortuguero National Park. There has also been water and soil contamination from banana plantations. However, since 1985, limited conservation efforts including state policies to preserve tropical forest ecosystems have been implemented in the area.

Pakistan

The Pakistan study looked at three ecological different areas: the coastal area, the northern mountain region and the Punjab agricultural plains (see Map 1).

The Coastal Area

This is a study of two maritime villages, Rehri and Lad Basti near Karachi. Fishing is the main activity in the area. New fishing technologies were introduced which necessitated credit provisioning for fishermen in order to remain productive. Around 80 percent of the fisherman own no boats, but work mainly as labourers on the boats of others. Middlemen, who are frequently involved in lending money for boats and engines, purchase the fish from the fishermen and sell it to the Karachi market. Prior to the 1940s, the entire coastline where these villages are situated, was studded with mangrove forests. These forests today are under severe pressure from a reduction in fresh water flow, silt deposition, animal browsing, and overcutting of wood-mainly for household use. Apart from the degradation of mangroves, water contamination and shortage, and solid waste disposal are the other environmental problems prevalent in the area.

The Northern Mountain Region

The survey was carried out mainly in the Gilgit district, and covered eight villages. The average annual precipitation in these areas is less than 10 inches a year, thus giving rise to virtual desert conditions. The northern area of Pakistan was isolated until quite recently. The Karakoram Highway has now linked the isolated Northern area to the rest of the country. The local economy of the northern area is based on subsistence farming, and remittances from abroad. The area has experienced, amongst other environmental problems, deforestation and soil erosion.

The Punjab Agricultural Plains

Two case studies were undertaken in this region. The first case study was carried out in Chak 323 village in the central canal colony district of Toba Tek Singh (south-west Punjab). The village is irrigated by a perennial annual canal and tube-wells. It is a low-emigration village, with a medium concentration of owned and operated area. Mandher is the village studied in the northern Punjab district of Gujar Khan. The major change here over time has been demographic. The village has a very high level of out-migration. Approximately two-thirds of the

households have at least one family member residing elsewhere. A large section have migrated abroad to seek remittance income. A major "push" factor for this has been the low agricultural output in the area. The rainfall and the topography are conducive to only certain crops, including peanuts. Soil erosion is the main environmental problem in the village. In Chak 323, on the other hand, the subsoil water is highly salinated. Waterlogging is also a regional problem. These twin hazards have emerged as a result of the increase in canals in the region.

Uganda

Case studies in Uganda were carried out in five district covering three major ecological zones: mountain, wetland and semi-arid areas (see Map 1).

The mountain zone, Kabale and Mbale were the district chosen for the case studies within the Montana ecosystem. These districts have similar population pressures but are different in their cropping systems. Cereals, beans and field peas are the chief crops in Kabale. The farming system is also characterized by the production of sorghum as the main staple. Two villages, or parishes, were looked at, namely Muyebe and Kakore. The soil of Muyebe are rich and relatively well-managed. In Kakore, the hillsides are eroded and overgrazed. In Mbale, the agricultural system is based on Arabica coffee production combined with beans and bananas. The latter two are the main staple food. The two sites where surveys were carried out in this district were Bumalimba and Mooni. The soil in Bumalimba are better managed than Mooni, supporting a relatively sustainable type of farming system.

Lake Victoria Crescent

The research in this region focused on Mukono and Masaka districts, both adjacent to lake Victoria. These districts have a similar cropping pattern. Coffee and bananas are grown. There is a nearly identical population pressure in both districts, but with a significant difference regarding the relationship with the

surrounding forests and wetland resources. The study sites within the Mukono district were the parishes of Buwoola and Nsakya. Buwoola parish is more degraded than Nsakya as evidenced by exhausted soil and thin tree cover. The two study sites of the Masaka district were Kamwozi and Gulama. The soil is extremely infertile in Kamwozi. In Gulama, on the other hand, there was evidence of tree planting and soil conservation initiatives.

The Semi-arid Zone

The district of Mbarara was chosen from the semi-arid zone. The focus was on the county of Nyabushozi, in the heart of the district. Population density in the district is one of the lowest in the country. The area is characterized by low rainfall, severe long dry seasons, poor water catchment and overall scarcity of water. These conditions are better suited to livestock than crops. Consequently, pastoralism has been extensively practised, but the establishment of a growing number of game reserve/national parks in the area has squeezed people into smaller areas. The result is the overuse of pasture in many locations, as well as repeated conflicts with government officials over grazing areas. Bush burning for cultivation, grazing, hunting and firewood collection is another environmental issue. The combined result of overgrazing and bushfire is that, frequently, land becomes completely bare, causing what is known in Uganda as "the bare hills phenomenon".

In the subsequent discussion, we shall examine more closely some of the empirical material collected from these case studies. This will be supplemented by the secondary literature that has been reviewed. Moreover, this author has benefited from a field visit in Uganda, as well as discussions with the principal researcher from the three countries. The main purpose of this exercise has been to furnish ground for understanding the interrelationships between population dynamics, environmental changes and development processes.

Endnotes

1. The Costa Rican case study was conducted by Jens Bruggemann and Erik Sales Mandujano, with assistance from Peter Utting. In Pakistan, the study was undertaken by a team of researchers involving Tariq Banuri and Franck Amalric, Shahnaz Hameed, Maleeha H. Hussain, Sarah Javeed, Fawad Mahmood, Moazam Mahmood and Danish Mustafa. Finally, the Ugandan country case study was carried out by GAF Consult Ltd. Kampala. J.M.A. Opio-Odongo, E.N.B. Nsubaga and J.R. Bibangambah were the main researchers. Except where otherwise noted, the data used in this report is mainly derived from these studies.

2

Environmental Changes and Population Dynamics

This chapter examines the interrelationships between environment and population. The discussion is based on the information collected from the case studies. After looking at various environmental and demographic issues in the case study areas, the discussion will summarize the links that were observed between environmental degradation and population dynamics.

Principal Environmental and Demographic Issues in Case Study Areas

A number of key national and local-level environmental problems, which Costa Rica, Pakistan, and Uganda face today have briefly been mentioned in the introductory chapter. These, as well as other related environmental issues, are elaborated upon here. This will be accompanied by an assessment of the main population characteristics of different research sites. Demographic variables such as size, density, growth rate, and movement are especially examined. The changing fertility patterns are also highlighted. Furthermore, certain aspects regarding the quality of life and related local socio-economic structures are considered.

Costa Rica

The Pacific zone (Candelarita and Polka)

Environmental Issues

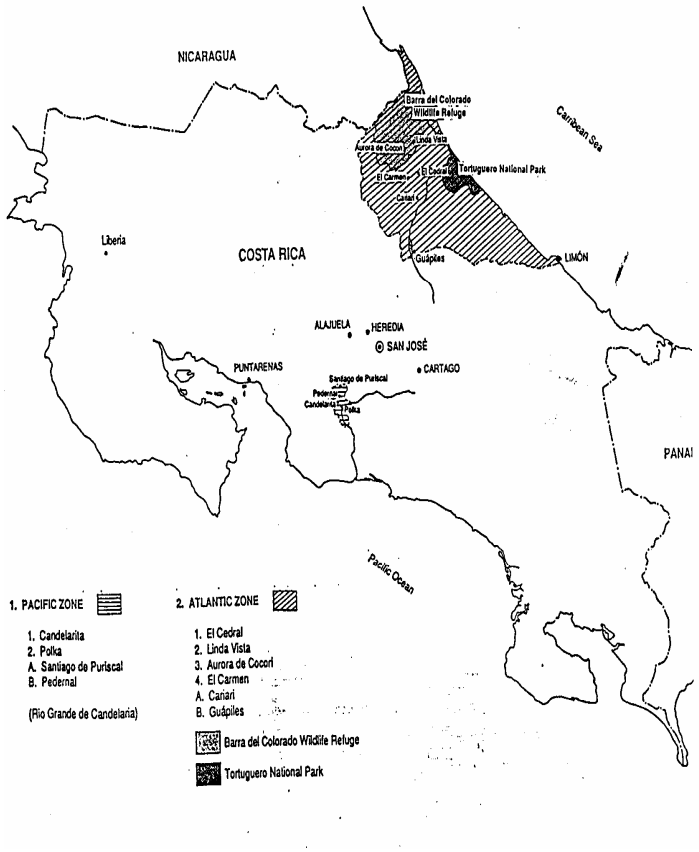
The principal ecological characteristic of the Candelarita and Polka villages is the mountain terrain, with a tropical humid climate (see Map 2). The village centres are situated at altitudes of between 800 and 1,000 metres high. The area has a long wet season from April to November. The annual precipitation is between 2,500 to 3,500mm. The region is greatly affected by earthquakes. The soil in both villages is deep with some clay accumulation in the subsoil, which makes it susceptible to landslides. Land use is governed by the slopes and many of these areas are too steep to allow cultivation. This area was originally; covered by dense, primary forests, with a very high level of biodiversity. By, 1990, only 40 hectares of this forest land remained in Polka, mainly along river banks. This rapid decline in forest cover in areas with high rainfall has meant in increased level of soil erosion. The reduction in forest cover has also caused water depletion.

These and many other environmental changes in the area have evolved together with changing landuse and production systems. Until the mid-19th century, only a few Indian families lived in the area. They relied on hunting and a limited amount of crop production for survival. The process of agricultural colonization brought in new arrivals, but both Indians and the settlers generally practised slash-and-burn cultivation with a long fallow period. Since the 1960s, the area has undergone rapid agricultural transformation accompanied by several negative ecological side-effects. Rapid cattle expansion took place in the area, especially in Polka, after Costa Rica's entry into the American beef market. Cattle raising quickly replaced swidden cultivation. Moreover, cattle grazing resulted in an increased level of soil-pores, erosion through increased exposure to rainfall and wind, and drought during the dry season.

Another important agricultural transformation was the introduction of cash crops. Tobacco and coffee were the principal cash crops introduced in the area. Tobacco in particular was cultivated without any vegetation cover; this resulted in a high level of soil erosion. In addition, tobacco curing required wood. Coffee expanded more rapidly than tobacco. Most of the coffee was grown on land, which had previously been devoted to food production. In the 1970s, new high-yielding varieties of coffee were introduced, which did not require the planting of trees to provide shade for coffee plants. Lack of shade cover thus led to increased soil erosion and reduced the peasants' wood provisioning.

The depletion of natural forests and the number of trees in the coffee fields has meant a growing scarcity of firewood and increased prices in many locations. In Candelarita, about one-fifth of the farmers are obliged to buy fuelwood. In Polka, the fuelwood scarcity has encouraged people to use electricity for cooking. The purchasing of wood and shifting to electricity has caused further financial burdens for certain households. An additional, negative impact of the expansion of these cash crops has been the growing use of agro-chemicals, which has led to the contamination of soil, water, and fish resources.

Map 2: Study Areas in Costa Rica



Population Profile

As Table 3 shows, in 1991, the total population of Candelarita was 514 persons, and the population density was 73 persons per square Kilometre. The population of Candelarita grew by only 1 percent between 1987 and 1991. The average family size was 5.4 persons. Some 46 percent of the women in the child-bearing bracket used the family planning programme. Agriculture has been the primary economic activity: about one quarter of the active population deriving their subsistence as

farmers and around one-fifth working as agricultural labourers. With respect to other living conditions, the village is electrified; around 80 percent of the houses were found in good condition. On average, there are four rooms, and about four people to a house. The village has a school that is nearly 100 years old. As a result, the literacy rates in the village are comparable to that of the national average, although only a few have attended higher education.

In 1991, Polka had a population of 124, and a population density of 11 persons per square Kilometre. The average family size was 5.6 persons. Between 1987 and 1991, there was a sharp decline in the village population, because of out-migration to San Jose and the banana plantations for wage employment. In 1991, only 27 percent of the child-bearing mothers used family planning methods (Table 3). Living conditions are harder here than in neighbouring Cnadelarita. The houses are made mainly of wood. The village school dates from 1960, although almost a quarter of the school-age children were found to be illiterate. The village also has a church, shops and football field.

The Atlantic zone (the Cocori area)

Environmental issues

The four villages in the lowlands of the Atlantic zone (i.e. El Cedral, Linda Vista, El Carmen and Aurora) also have a tropical, humid climate (see Map 2). The annual precipitation varies between 3,000 and 6,000 mm. There is no dry season. This area contains low hills and alluvial plains. Some soils are extremely fertile, being of volcanic origins. Other soils have a higher clay content and are less suitable for growing crops. The chief problem is the extremely high level of precipitation and waterlogging in certain areas.

This region contains a high diversity of flora and fauna: almost half of the country's reptile species, and many fish and mammal species are found here. The bird specie of the

northern Atlantic zone remain more numerous than in all the countries of Europe. Many of these species are believed to be at risk despite some recent attempts to create a Wildlife Refuge in the area.

In the Atlantic zone study sites too, the main environmental problem has been linked to the prevailing modes of resource utilization (see also Brooijmans and van Sluys, 1990). In the 1960s, timber extraction by logging companies was the main economic activity in the area. There was considerable in-migration between 1968 to 1978, and the development of new settlements. The banana companies also returned to the area. The soil was extremely fertile, and yields were high. Cultivation began essentially in the 1970s, although marketing problems dictated that crops be grown more land to cattle. Cattle raising was introduced even on small farms. This led to more environmental degradation than would have been the case with food crops.

Until the mid-1980s, half of Cocori area was under forests. Intensive logging activity, especially in the late 1980s, permitted many sawmills to run twenty-four hours a day. The peasants also sold the timber to logging companies. The logging companies then sold it to the sawmills. The peasants however received negligible prices. Even though only commercially suited trees were sought to be logged, a greater part of the forest was destroyed in the transportation process. At the same time, it was difficult for peasants to grow crops in the recently logged areas due to soil compactation, high water table, and rapid weed growth.

The government established the Barra del Colorado Wildlife Refuge in 1985 with a view to forest protection. The two northern villages of Linda Vista and Aurora subsequently became located within the Refuge. Ironically, the restrictions laid down on forest use increased the rate of deforestation in the area. The villagers, who depended upon hunting and fishing were suddenly required to obtain permits. At the same

time, unauthorized logging continued. The establishment of the Refuge was also opposed by the banana producers and cattle ranchers.

Table 3: General demographic and economic features of research sites in the Pacific zone (1991)

Village	Candelarita	Polka
Area Km^2	7.0	11.0
Total population	514.0	124.0
Pop. Density km^2	73.0	11.0
Total households	126.0	39.0
Average household size	5.4	5.6
Pop. growth (percent) rate (1987-90)	1.0	-11.0
Population over 11 years		
a) male	192.0	39.0
b) female	176.0	39.0
Literacy rate 1990		
a) * national (percent)	92.8	
Primary schools	1.0	1.0
Number of teachers	2.0	1.0
Number of students	89.0	24.0
Percentage of women using family planning	46.0	27.0
Economically active population (percent)		
Farmer	23	13
Farm labourer	27	18
Employed	1	1
Marchant	1	5
White Collar	0	0
Housewife	40	41
Student/other	9	22
Total	100	100

Source: Bruggemann and Sales Mandujano, 1992; cited from the Ministry of Health, Pedernal Post, Annual Balance 1991
* = *Human Development Report 1992,* UNDP

In short, the process of deforestation, forest encroachment, loss of wildlife, soil erosion, and to a lesser extent, contamination of soil, water and fish resources by pesticides from the banana and coffee plantations, have emerged as central environmental issues. Both research sites share many common environmental problems. The livelihood systems of many people are often threatened in the process. At times, this has led to increased social conflicts amongst different groups over the use of natural resources such as forests. However, the transformation of the natural environment

into an agricultural ecosystem and the increase in agricultural production has also brought about many positive changes in livelihood and employment; and the general quality of life has greatly improved in the space of a generation (e.g. better health care, piped water, brick houses, access to education).

Population Profile

In 1991, the total population of the four villages was the following: El Cedral (229), Linda Vista (162), El Carmen (56) and Aurora (69). The average family size was about 5 persons. The population growth was comparable to the national rate (around 2 percent). However, man-land ratio were significantly higher in El Cedral and Linda Vista (some 10 persons per square Kilometre), as compared to 4 persons in El Carmen and Aurora. About 57 percent of the women in El Cedral and 40 percent in Linda Vista used family planning methods (Table 4).

All the villages are generally poor. In Linda Vista and Aurora, large landholdings persist, many of the inhabitants work as wage labourers. In other villages, although free-holding has remained dominant, land percels are generally small. There has been a lack of off-farm employment. Due to the absence of reliable roads and access to the market, facilities such as healthcare, education, and opportunities for daily wage labouring in nearly urban areas is difficult to find. Living conditions, are comparable in most villages, although some are slightly better off than others. For example, in the village of Aurora, there is no healthpost, no school, and many houses are very basic, with roofs made of palm branches.

Pakistan

The Coastal Area

Environmental Issues

The two villages of Rehri and Lad Basti, studied in the coastal area, are situated on the banks of the Korangi Creek, very close to Karachi (see Map 3). The Korangi Creek is the most norhtwestern creek of the Indus Delta. The villages stand on a thin and shrinking buffer zone between part of the delta and Karachi. The buffer zone is 500 to 1000 meters wide.

As indicated earlier, the coast line, especially the southern province where Korangi Creek is located, is endowed with considerable areas of mangrove forest. These forests are central not only to the local ecology, but also to the subsistence provisioning through fish and shrimp catches, firewood collection and grazing (see also ADB, 1990).

A rapid degradation of mangrove has taken place in recent decades. For example, an estimate based on satellite images has revealed that these forests have been reduced from 260,000 hectares in 1977 to about 110,000 hectares in 1990. Two factors have been especially responsible for this process:

First, the construction of barrages on the river Indus, which has permitted rapid agricultural growth in the country, limits the supply of fresh water to the mangroves, thereby affecting the salinity level. The barrages also reduce the silt deposition brought by the Indus river. This silt had previously acted as a fertilizer to improve the physical texture of the soil - hence favouring the growth for trees.

Second, the mangrove forests, which represent the chief fuelwood source, are exploited by the villagers themselves, with little visible attempt at managing them sustainably. As fuelwood has become scarce in the vicinity, the well-to-do households have resorted to alternative forms of energy such as electricity or gas. Timber is also extracted from the mangroves for such purposes

as boat-anchorage, fencing material, fishing enclosures, etc. In addition, livestock namely goats, buffaloes and camels are grazed in the mangrove forests. In particular, the degradation of trees and vegetation caused by camel browsing has been a serious problem.

In many locations, fishing stocks have been depleted. This is in part due to the penetration of market forces in the fishing industry, as well as the absence of fishing regulations on the part of the government and local communities.

Table 4: General demographic and economic features of research sites in the Atlantic zone (1991)

Research sites	El Cedral	Linda Vista	El Carmen	Aurora
Total area Km2	20	16	16	18
Total population	229	162	56	69
Pop. density Km2	11	10	4	4
No. of households	49	29	12	14
Average family size	4.7	5.6	4.7	4.9
Men age 11+	70	55	n/a	n/a
Women age 11+	65	41	n/a	n/a
Literacy rate national %	92.8			
Family planning %	57	40	n/a	n/a
Average land holding (ha)	60	137	23	25

Source: Bruggemann and Salas Mandujano, 1992, cited from the Ministry of Health, Palmitas Health Post, 1991

New environmental problems have also appeared in these villages due to their close proximity to Karachi, which has emerged as a principal megalopolis and industrial centre in the country. As yet, the environmental problems of the Karachi area, which include air and marine pollution, have not affected the life of the villagers. The current situation is likely to change rapidly. The villages could be transformed into 'dumping ground' for toxic or non-toxic products. The disposal of village level wastes (particularly non-recyclable products) has already become a serious problem, with many streets and beaches strewn with plastic bags and other solid wastes.

The major environmental issue perceived by the villagers, however, is the lack of sufficient potable water. Lad Basti has water from a pipeline from Karachi. This was built in 1962, only after there had been some deaths reported due to bad water. In Rehri, people get water from community taps, but as this only comes once a day, it has to be stored and carefully managed.

Population Profile

In 1987, the total population of Rehri and Lad Basti was estimated to be 18,500 and 2,500 respectively. No comparable data is available on fertility rates and other indicators. However, households are generally large, around 9 to 10 people on average (Table 5). Despite their close proximity to Karachi, very few villagers practise family planning methods. In general, local people have been in favour of having large families, as this has meant more income earning members. The headman of Lad Basti, the wealthiest and most powerful man in the village, had 20 children from two wives.

Table 5: Population data: coastal area (1987)

	Rehri	**Lad Basti**
Total Population	20,000	3,000
Average household size	9	10

Source: Banuri et al., 1992

Both villages are overcrowded with people and livestock. There is little in the way of sanitation facilities, and waste is not systematically disposed. Potable water has been in short supply, and what can be obtained is of poor quality. The villages are well-connected to the outside world. There are schools, mosques, and some basic healthcare facilities. The status of women of women is very low. In both villages, the main livelihood constraints are the degradation of fish-resources and a growing level of indebtedness.

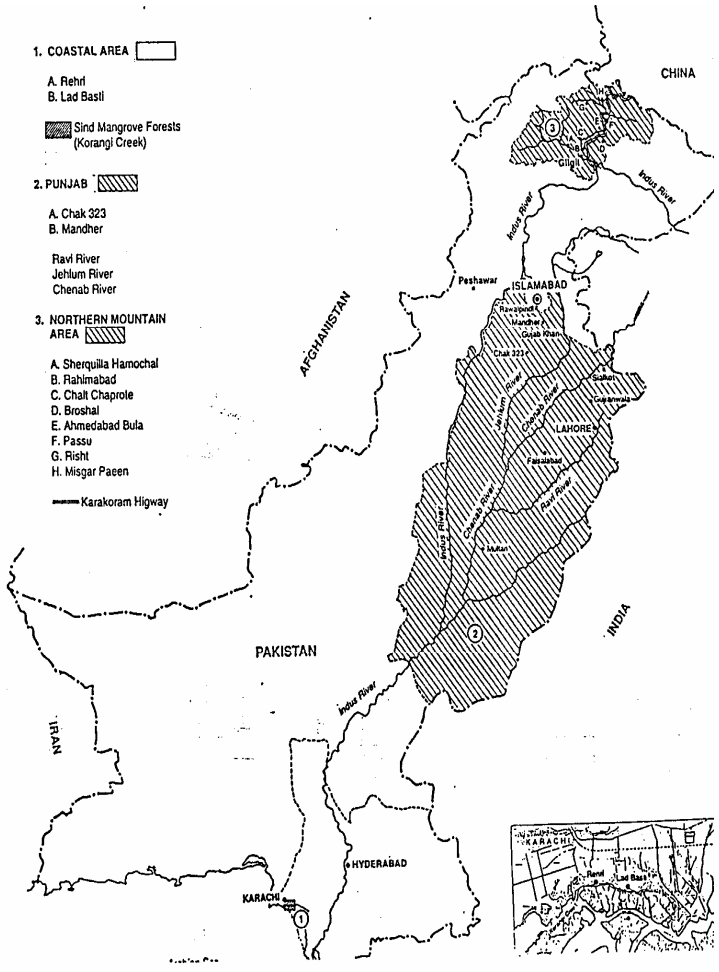
The Northern Mountain Area

Environmental issues

The climate in the northern area of Pakistan is described as a "mountain desert", but there are also variations in temperatures, and seasons (see Map 3). The general ecological conditions are very harsh; there is also a degree of geological instability and glacier movements which lead to natural land slides and erosion.

An irrigation channel divides the selected eight villages (i.e. Sherquilla Hamochal, Rahimabad II, Broshal, Ahmedabad Bala, Passu, Risht, Chalt Chaprote, and Misgar Paeen) into two ecological or economic zones. The area below the channel is the cultivated area, which is also used for settlement and dwelling. The area above the channel is mainly marginal land suitable for growing trees and winter grazing. But in certain locations, this area has been also reclaimed for agriculture. At higher elevations lie alpine forests and common property pastures.

Map 3: Study Areas in Pakistan



The resource endowment of these selected villages is quite poor. As annual precipitation is low, most of the villagers depend upon an integrated farming system which combines agriculture and livestock. The soil is generally of a poor quality. Land holding are small, and increasingly fragmented. This is part due to the

division between the male heirs and also the fact that each person needs a variety of "eco-niches" at different elevations in order to maximize benefits from the mixed farming system.

The two chief problems in the northern areas have been soil erosion and deforestation. The soil erosion, although in part a natural process, has increased in recent times as a result of human and livestock pressure, particularly in marginal locations. Deforestation has also becomes a serious problem. Most villagers are obliged to travel longer distances to get to the forest. In Sherquilla Hamochal village, for example, people are required to spend 21 hours to get to the forests, instead of the 9 hours previously spent. The villagers of Risht spend even longer to reach the forests. In other villages, the journey to fetch fuelwood has more than doubled (see Table 6). Beside the scarcity of fuelwood, deforestation has affected many aspects of, often delicately maintained, local production and subsistence systems.

Population Profile

The eight villages have varying population sizes. The villages of Sherquilla Hamochal and Risht have 32 and 30 households respectively, while Rahimabad II, Ahmedabad Bala, Passu and Misgar Paeen have between 70 to 80 households. Chalt Chaprote and Broshal, on the other hand, contain 583 and 105 households respectively; however these villages extend large geographical areas.

The household size also varies from 6.6 to 11.9 persons. Sherquilla Hamochal and Broshal have an average household size of 11.9 and 10.4 respectively, while Ahmedabad Bala, Risht and Misgar Paeen have an average household size of 7 or less (Table 7). All the villages, however, show fairly high fertility rates. The fertility rates are found to be considerably higher where access to healthcare is limited. Apparently, in Sherquilla Hamochal where the average family size is 11.9 persons, there was no access to contraception. The village of Broshal faces a similar situation (see Table 8). The sparse location of dispensaries and clinics

providing family planning services on the one hand, and the lack of safe, temporary or permanent sterlization methods on the other, are the principal constraints.

A desire to maintain higher fertility rates is also deeply rooted in economic and cultural *milieus.* The labour of a person and his children are their main subsistence assets. Moreover, older, working-age children supplement local livelihood requirements by out-migrating and sending home remittances. For most families, children are therefore a hedge against poverty and insecurity.

Culturally, there is a traditional bias towards male children, which encourages individual couples to continue having children until such time as they have produced a desirable number of boys. This practice sometime results in a large number of female children. A large family is also considered a symbol of superior 'status'. Furthermore, sterlization methods are seen as "immoral" in a religious sense, as these prevent birth and 'interfered in the work of God'.

The Punjab

Environmental Issues

The study in the Punjab attempted to compare an irrigated village, Chak 323, with a rain-fed one, called Mandher. Chak 323 is situated in the canal colonies in the South-West Punjab; Mandher is in the north of the province (see Map 3). The climate and resource endowment of these two villages are in many respects quite different. Chak 323 is located on a plain between three rivers. The soil is extremely fertile, and completely irrigated. The area has achieved remarkable agricultural growth over the years. However, the development of irrigation networks in the area has also brought about the twin environmental problems of salinity and waterlogging. It is believed that some 40,000 ha. of agricultural land is lost annually to salinity and waterlogging in the country. (Aslam, 1991:35). In some cases, this has already led to declining yields.

The village of Mandher, on the other hand, has a partially arid climate. The topography is marked mainly by high plateau's, with varying seasonal temperatures and rainfall. It has a very low irrigation potential. The soil is deficient in nitrogen and phosphorus. It is also shallow. There are no significant forests. Some local people grow trees on their farmland for firewood. Dung has been used increasingly as fuel in response to the shortage of fuelwood; and richer households have begun to substitute gas or kerosene for wood and dung. The combination of the lack of forest cover and the arid climate is that soil becomes susceptible to both wind and water erosion. As a result of this and other factors, this area has experienced very low agricultural growth.

Table 6: local perception of forest resources: Northern mountain area, Pakistan

Village	Distance to forest in past (hours)	Distance to forest now (hours)	Deforestation seen as problem (%)
Sherquilla	9.5	21.5	69.9
Rahimabad	3.0	5.0	70.0
Chalt	1.8	4.4	56.7
Broshal	3.1	6.3	100.0
Ahmedabad	5.2	12.8	76.7
Passu	2.6	6.3	90.0
Risht	4.7	29.1	80.0
Misgar	2.9	7.9	90.2
Average	4.1	11.6	79.2

Source: Banuri et at., 1992

Note: Table gives local people's estimates of the current time needed to reach forest resources and the time it use to take, although no precise data is given for what is called the past.

Table 7: Demographic data: Northern mountain area

Village	Pop Total	Number of Households	Household Size	Cultivated area in ha.
Sherquilla	380	32	11.9	32.5
Rahimabad II	560	70	8.0	240.0
Chalt	4400	583	7.5	4500.0
Broshal	1095	105	10.4	671.8
Ahmedabad	530	80	6.6	293.6
Passu	610	70	8.7	199.7
Risht	210	30	7.0	172.6
Misgar	500	72	6.9	80.0

Source: Banuri et al., 1992

Table 8: Perception on family planning: Northern mountain area

Village	Perceive pop. growth as problem (%)		Access to Contraception (%)		% would use if had access to contraception	
	M	F	M	F	M	F
Sherquilla	47.8	30.4	0.0	0.0	4.3	13.3
Rahimabad II	60.0	23.3	36.7	66.7	30.0	33.3
Chalt	76.7	43.3	13.3	10.0	13.3	23.3
Broshal	33.3	4.2	0.0	4.2	12.5	12.5
Ahmedabad	53.3	N.A.	19.0	N.A.	43.3	N.A.
Passu	70.0	50.0	36.7	26.7	16.7	20.0
Risht	76.7	53.3	13.3	6.7	43.3	33.3
Misgar	93.0	91.5	25.4	18.3	9.9	4.2
Average	63.9	49.3	18.1	18.9	21.7	20.0

Source: Banuri et al., 1992

Population Profile

The villages of Chak 323 and Mandher contain many similar demographic characteristics, but differ significantly in migration patterns and agricultural growth and employment prospects. As Table 9 shows, Chak 323 has 315 households, with a total population of 2,084. On average, the household consists of 6.6 persons. The population density is 310 persons per square Kilometre. The fertility rates are fairly high, as the village has about 55 percent of the population above the age of 15 years. At the same time, infant mortality has substantially declined, both as a result of improved healthcare, and a relatively high level of

education, for both boys and girls. Over the years, the village has experienced a high level of agricultural growth base on mechanization and adoption of high yielding seed varieties. One result of this modernization in agriculture is the growing number of landless. About 54 percent of the village population have no access to land. However, despite the displacement of the small peasantry, a high level of employment is generated by agricultural activity; and out-migration remains low.

Mandher has a total of 335 households, or 2,129 persons. The average household is about 6 persons. The annual population growth rate is estimated at around 2.4 percent. A high population density is clearly evident, as it increased from 160 persons per square Kilometre in 1961 to 295 in 1991 (Table 9). The village also has fairly a high mortality rate. This is in part explained by the absence of healthcare facilities, public or private. People need to travel relatively long-distances to urban centres in the event of serious illness.

Out-migration, especially of the male population, has been an established feature in Mandher. This is in large part due to lack of income an employment opportunities in the area. Agriculture is the main source of livelihood, but yield remain low due to the lack of irrigation. People have migrated out both to urban centres in the country, as well as abroad. In some cases, the "pull" factors (e.g. better employment prospects, higher wages, etc. in new destinations) have been equally powerful as "push" factors. This aspect will be further explored in the next chapter.

Uganda

The Mountain Areas

Environmental Issues

As mentioned earlier, the research in the mountain area was carried out in Kabale and Mbale districts (see Map 4). Kabale district is located in the Mufunbiro mountains range, in the southern-western corner of Uganda near border with Rwanda. It is a densely populated area, with some 250-300 persons per

square kilometre (see Table ;10). The average land holding is generally very small (i.e. 0.2 ha. per person). The farming system depends on annual crops, with sorghum as the main staple. Sweet potatoes, maize and cassava are also grown. In recent years, cabbage and tomatoes are being grown for the market.

The two sites which were chosen for the detailed studies in the district are called Muyebe and Kakore. In Muyebe, the soil is generally fertile and well looked after. In certain locations, the swamps have been reclaimed in order to set up dairy farming. This has sometimes negatively affected the swampland ecology and has resulted in further soil acidification. No natural forest exists in the area.

The soil in Kakore is of a poorer quality than in Muyebe. Terraces are built for agriculture, but frequently they are left damaged. In some locations the hillsides are severely eroded. There is no significant forest cover to conserve soil, or to provide upland watershed protection. The shortage of cultivable land in the vicinity has meant the utilization of marginal areas for agriculture. As a result, yields are low.

The second montane district of Mbale lies on the western slope of Mount Elgon near the Kenyan border. It ranges between 1,000 and 1,500 metres. This area has very fertile volcanic soil, and favourable rainfall patterns for agriculture. The average cultivated plot of land per household is 0.3 hectares. Data for this region shows that it maintains the highest level of cultivated land vis a vis the total land area per county in the country. Consequently, there is little surplus cultivable land left (Table 10). Peasants cultivate even the steepest slopes. This however has led them into conflict with the Forestry Department, as these areas are designated as gazetted forests.

Table 9: Basic demographic data: The Punjab

Mandher		Chak 323	
Acres	1,421	Acres	1,662
Total population*	2,129	Total population	2,084
Total number of households	355	Total number of households	315
Average size household	6	Average size hsouehold	6.6
Pop. growth rate	2.4		
Pop. density Km2		Pop. density Km2	310
1961	160		
1991	295	% of Pop. under 15 years of age	55
Literacy rate %	18	Literacy rate %	38
Primary school enrolment (1992)		Primary school enrolment (1992)	
male	359	male**	340
females	160	Females	150
Number of people educated beyond primary level	409	Number of people educated beyond Primary level	646
Percentage of families with		Number of people outmigrating	
member working		Male	38
outside village	64	Females	6
Livelihood (%)		Livelihood (%)	
agriculture	36	Agriculture	46
landless	12	Landless	54
wage labourers	21		
artisans	34		
c) retail trade	7		

Source: Banuri et al., 1992

Note: * = population total is minus non-residents

** = total includes primary and middle school enrolment

Map 4: Study Areas in Uganda

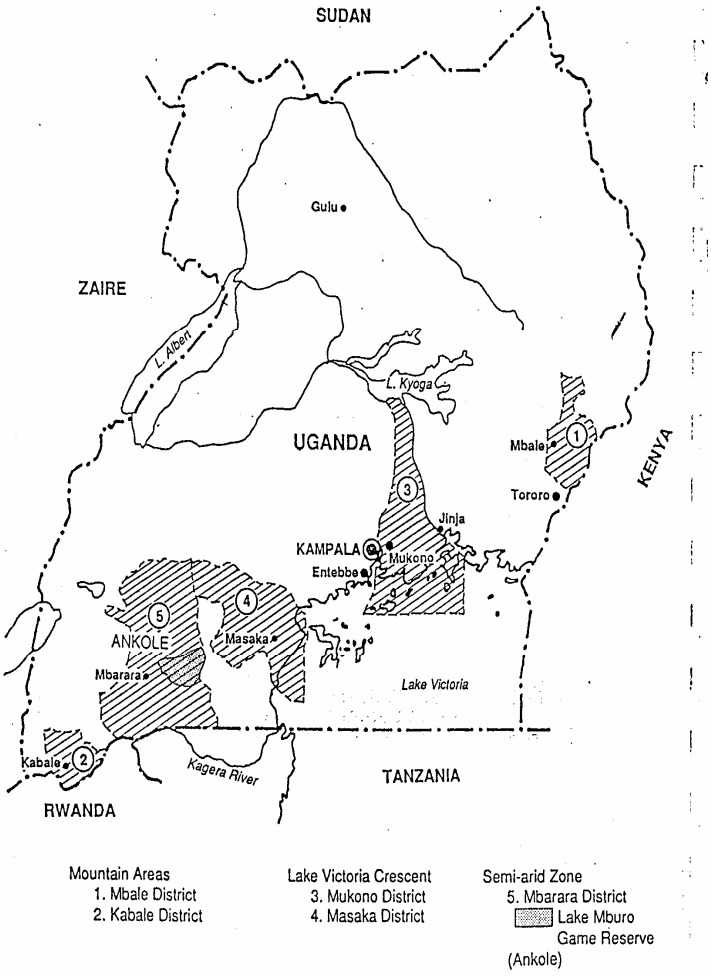


Table 10: Research site population and land use data: Uganda (1990)

District Site	Area Km^2	Total Pop.	Km^2 Pop. density	Growth rate % (1980-90)	Number of households	% land used*
KABALE						62.0
Kakore	12	3,585	298.75	2.55	754	
Muyebe	22	5,869	266.77	1.58	1,149	
MBALE						100.0
Mooni	13	10,687	822.08	2.64	2,482	
Bumalimba	18	10,304	572.44	3.53	2,264	
MASAKA						46.9
Kamwozi	28	5,810	207.50	2.50	1,253	
Gulama	15	3,688	245.87	2.74	885	
MUKONO						48.9
Buwoola	18	1,491	82.83	1.19	335	
Nsakya	76	4,991	65.67	2.57	1,381	
MBARARA						15.8

Mooni was one of the sites chosen for a detailed study. It is endowed with rich volcanic soil, but land holdings are extremely small. It is located next to Mbale municipality. This enables residents to supplement their agricultural income be market gardening. However, soil productivity has declined in recent years, largely as a result of the depletion of upland water sources. Furthermore, heavy rainfall leads to landslides. There is little forest cover in the Parish, and most of the adjacent forest lands have been declared as protected forests. Charcoal and timber are the two chief forest products much in demand, and their prices have risen in response to general scarcity. Besides these items, peasants seek to use government forest land for small scale crop, or vegetable production for the market. The result is that most of the forest areas are denuded.

Bumalimba was the other location in Mbale district where research was carried out. It is a relatively better-managed parish in environmental terms, despite a comparable land-man ratio to Mooni. As it contains banana plantations, and a higher proportion of vegetation, there is less pressure on the natural forest. Only a small proportion of the population extracts forest products for firewood or for building poles. The soil is better

managed here, although yields have declined. The central problem, as in the Mooni parish, is the shortage of cultivable land. Average land holdings are often below subsistence level.

Population Profile

As Table 10 indicates, the research site Kakore in the Kabale district has a total population of 3,585. The average household size is about 4.8. The population density is 299 persons per square Kilometre; and there is an annual growth rate of 2.6 percent.

Muyebe, the second research site, has a large population of 5,869, but its total land area is nearly double that of Kakore's. Muyebe's population growth rate is 1.6 percent per annum. The population density is 266.8 persons per square kilometre. The family size is about 5 persons.

There is a high percentage of illiteracy in both locations. Nearly 50 percent of the villagers have no formal education. Healthcare facilities are rudimentary. Although there have been some improvements in the infrastructure, the local economy is far from dynamic; and there exist few wage employment possibilities.

The Mooni and Bumalimba research sites in the Mbale district have one of the highest rates of population density in Uganda. Mooni parish has a population density of 822 persons per square kilometre, with a total population of 10,687. The population growth rates is estimated to be 2.6 percent per annum.

Bumalimba's total population is 10,304. It has a slightly lower population density than Mooni, of 572.44 persons per square kilometre. The land area which encompasses the parish of Bumalimba is nearly one-third larger than Mooni. But the annual population growth rates are higher than Mooni, at 3.53 per annum.

There has been a fair amount of infrastructural development in the Mbale district. Some wage employment opportunities exist in the urban areas. The area has also been integrated into the dynamic economy of neighbouring Kenya. In general, the Mbale district has a high literacy rate, although the fertility rates have not declined, parallel to the rise in education. This is largely due to the strong presence of the prevailing Muslim culture and the practices of polygamy.

Lake Victoria Crescent

Environmental Issues

Lake Victoria crescent is an important ecological zone in Uganda (see Map 4). It is a lowland area, with altitudes generally around 1,000 metres. It has a high level of rainfall, warm temperatures, and productive soil. This combination makes it favourable for agriculture. Robusta coffee and bananas are the main crops. Other crops such as tea, sugar, sweet potatoes, and many types of fruits are also grown. It is the greenest part of Uganda, with some of the remaining tracts of tropical moist forests.

Masaka was one of the two districts where the survey was undertaken. This district has well-developed institutional and physical infrastructure, fostering the commercialization of agriculture.

Gulama and Kamwozi were the two study sites in the district. Gulama has more fertile soil than Kamwozi. Although this parish lacks natural forests, people have planted trees on their private lands. Mulching and bunding is applied to conserve soil. This parish has been chosen by the Department of Agriculture as a demonstration site for soil conservation initiatives.

Kamwozi parish on the other hand has rather infertile soil; and soil conservation initiatives are less visible. Two forest reserves (Nabukonge and Wabitembe) and some private forests such as the one at Norozari Mission, owned by the Church, are located near this parish. Many of these forests have been encroached by

different groups of people for crop production, charcoal making, and timber extraction.

The shortage of accessible land and the decline in soil productivity are the chief environmental problems in both parishes. Although the district as a whole still has over half of its territory under potentially cultivable land (see Table 10), most of these areas are included in the forest reserves. The next pressing problem is the need for additional income. The latter is the main factor explaining the encroachment on the forests for charcoal production. The charcoal trade is vital to the life of the villagers, and one which supplements their income.

The district of Mukono has many similar environmental and agricultural characteristics to those of Masaka. The two sites chosen for the study in this district were Buwoola and Nsakya. These two parishes have comparable resource endowments, but the soil is exhausted, and there are few trees left in Buwoola. The main crops are coffee and bananas, but there are also some large-scale tea and sugar estates. The labourers on these estates have tended to encroach on the forest reserves to supplement their income. The decline in soil productivity has been the chief environmental problem. This is a critical issue, as average land holdings are below two-thirds of a hectare.

Another important environmental aspect is the contamination of lake Victoria by breweries and textile, sugar, leather tanning, and fish industries. A government publication asserts that breweries discharge into the lake some 5,000 m^3 of waste per day; the textile industries emit 2,000 m^3 of waste mixed with bleaching agents per day; and the 430 m^3 of waste from the leather tanning factories (Ministry of Energy, Minerals and Environment Protection, 1991:29-30). The sugar and fish industries also leak a comparable amount of waste, although not all of it is toxic. Some of these wastes are also dumped in the river Nile (ibid:29).

Population Profile

As Table 10 indicates, Kamwozi parish, one of the two sites studied in the Masaka district, has a population of 5,810, and a fairly high population density of 207.5 persons per square kilometre. The average household size is about 4.5; and the population growth rate is 2.5 per annum.

The total population of the second site, Gulama is around 3,688. It has a higher population density than Kamwozi, of 246 persons per square kilometre. This is further exacerbated by a high rate of population growth of 2.7 percent per annum.

Within the Mukono district, Buwoola has a total population of 1,491. The population density is at 82.8 persons per square kilometre. The annual growth rate is the lowest amongst the research sites, at 1.2, primarily as a result of out-migration to urban centres.

The Nsakya site has a total population of 4,991, but it is over four times the size of Buwoola parish. Consequently, the population density is only 65.7 persons per square kilometre. However, Nsakya has a higher population growth than Buwoola at 2.6 percent per annum. This is due to the in-migration of people, primarily attracted by the possibilities of wage employment in the tea and sugar estates, as well as by the prospects of unauthorized cultivation in the nearby forest reserve.

Literacy rates, economic activities, and healthcare facilities in this district are broadly comparable to those of the Mbale district. The major differences include a close proximity to the urban centres like Kampala and Jinja, which sometimes afford people greater access to wage or salaried employment.

The semi-arid Zone
Environmental Issues

The research in this ecological belt was carried out in the Nyabushozi county of the Mbarara district (see Map 4). This county belongs to a wide belt of pastoral lands. This area has low rainfall, and a very short rainy season. Hence, it is not very conducive to agriculture. The population is mainly dependent on livestock. The pastoralists, many of whom belong to the Bahima ethnic group, raise cattle which provide milk and also cash, when sold. Most of the cattle have an extremely low productivity: a household of 10 would need about 100 cattle to meet its subsistence requirements.

The environmental problems in the area include sheet and gully erosion, reduced water availability, and a large degree of encroachment on the nearby Lake Mburo National Park. Certain parts of the plains and the hills are so severely overgrazed that they are bare of all vegetation. These environmental problems have a long history. The pastoralists have twice lost access to their traditional grazing lands and therefore have been forced to overgraze the rest.

The government-run Ankole scheme, which began soon after Independence, represented an effort to rid the area of the tsetse fly. The government evacuated all the cattle from the area, and burned the bushes to stop the fly from spreading. The government then decided to set up commercial cattle ranching in this area. The original plan was to include the traditional pastoral communities in this new scheme. However, the pastoralists were instead forced to migrate from their lands, and the ranches were allocated to more powerful segments of the population.

In the mid-1960s, land around the Lake Mburo was turned into a forest reserve, and the local people were forbidden from grazing there. In the early 1980s, the reserve was raised to the status of a national Park in order to promote tourism and to preserve the savanna ecosystem. Over 300 pastoral households were evicted

without any provision for alternative livelihoods. In the mid-1980s due to their sustained opposition, the pastoralists were permitted to remain in certain parts of the park. However, the Lake Mburo- the main source of water for cattle, was kept within the park. This has led to a continual conflict between the pastoralists and the park administration. As a result, neither are the forests well protected, nor are the pastoral groups allowed to maximize their livelihood opportunities.

Population Profile

The case study does not provide population data on the Nyabushozi county of this district. However, the district level data supplied by the government census indicates that the Mbarara district has a population of about 1 million. The average growth rate is about 4.1 per annum. In terms of the population density, there are 65 persons per square kilometre (Ministry of Energy, Minerals and Environment Protection, 1991:64). However, this includes the population of urban areas as well. The Nyabushozi county in general is sparsely populated, and the people rely mainly on pastoralism. The living conditions are very poor. There exist few wage employment possibilities, and access to education and healthcare is also limited.

Links Between Environment and Population

The above discussion outlined the principal environmental and demographic parameters in the case study sites. Detailed empirical material is lacking on many issues. For example, although most of the rural environmental issues, such as soil erosion, deforestation, water depletion or contamination, were considered, data are lacking to show the exact extent of many of these processes and their wider social and environmental impacts. The socio-economic dynamics that led to such environmental consequences, as well as which rural social groups were obliged to bear the costs, are also aspects which have not been clearly analysed.

The demographic data is limited in all of the three country case studies. The Costa Rica study has a mass of useful information. However, there is no site-specific detailed data on migration and the movement of people from one are to another. The Pakistan study, on the other hand, does not provide data on rates of population growth. There is no way to gauge how the population in the different villages has changed. Consequently, an adequate comparison with the other case studies cannot be made. Similarly, the Uganda study has no site level population data on the Nyabushozi county in Mbarara district (the semi-arid zone). It contains no information on migration. Furthermore, data are lacking in such vital areas as fertility rates and access to family rates and access to family planning or healthcare.

The bulk of the information generated from the case studies on both environmental and demographic aspects has essentially been indicative and qualitative. Comparing possible links between environment and population is also problematic methodologically. Each aspect contains many variables, interlocked in a very complex manner. There exists no straightforward linear relationship between such variables. In addition, a number of research sites in different ecological zones included several villages. For example, the Cocori site in Costa Rica covered four villages, the northern mountain site in Pakistan covered eight villages and Ugandan case studies in the mountain and lake Victoria crescent areas each covered eight villages or parishes. Each of these villages is endowed with differing natural resource bases and confront many specific environmental problems. They also retain divergent demographic characteristics. Given this situation, comparisons between different sites are difficult. Hence, generalizations about the linkages between environment and population across the sites, or countries must be made with great care. Nonetheless, the three country case studies have highlighted a number of interesting points which might be worth summarizing here.

The Costa Rican study demonstrates that environmental decline cannot principally be attributed to population dynamics. Most case study area have a population growth of around 2 percent per annum; fertility rates have dramatically declined; and out-migration to urban areas which sometimes leads to overall decline in the population size such as in Polka, have been important demographic features. Yet these "positive" population dynamics have not resulted in equally comparable "positive" environmental changes.

In conditions only total numbers and population density, one would have expected a much higher rate of deforestation in Candelarita than in Polka. However, the reverse has been true. The crucial issue has been the form of land; use and management prevalent in different area. There has been far less soil erosion and a greater number of trees in Candelarita because the chief crop is coffee with multi-purpose shade trees. In Polka, on the other hand, most of the land; has been devoted to pasture since the 1960s, especially on large holdings of mainly absentee landowners. As indicated earlier, cattle ranching is one of the most damaging forms of land use, frequently causing deforestation, soil compaction, and erosion. It is also more difficult to re-forest these areas.

The market has played a vital role in determining forms of land use. The farmers in this region entered commercial farming in the early years of the century. Fluctuating prices tended to dictate how they would use their land. Maize prices have been low compared to different cash crops; hence the farmers preferred to cultivate small areas with food crops and devote most of the land to cash crops.

This pattern has also been repeated in an area as recently colonised as the Cocori villages. The soil in many locations is so fertile that estimated yields for food crops are very high. Yet the farmers face low prices and the difficulties of marketing their produce. They therefore turn to cattle breeding as the best way to generate income. Beside the

majority of farmers, there are also *latifundistas* engaged in producing cash crops or raising cattle on large consolidated holdings or areas; their interest revolves primarily around increased capital accumulation, with little or no concern for environmental protection.

The Pakistan study does not indicate a direct causal link between population growth and environmental degradation. The villages with the largest households do not necessarily face, or realize, the gravest environmental risks. The response of the communities in the Gilgit villages, when confronted by the problems of deforestation, are not always uniform. In Misgar Paeen, the northern-most village, 90 percent of the villagers considered deforestation to be the chief problem, compared to only 56.7 percent of the villagers in Chalt Chaprote, which is furthest from the forests (see Table 3). These two villages together illustrated another major difference: in Misgar the villagers blamed themselves for the depletion of the forests; the inhabitants of Chalt ousted the lumbering company whom they held responsible for running the forest and decided to manage it themselves.

Another paradox is that even when the villagers recognised an existing environmental problem, this concern did not necessarily translate itself into community-based action to protect the environment, or to lower fertility rates thereby lessening the pressure on the existing resources such as the forests. The degree of sensitivity to the environment varied greatly. The Gilgit villagers could see how the hour spent in search of firewood has lengthened in the space of generation. In the fishing villages, while the people were acutely aware of their day to day environmental problems, like getting enough water, fuel or adequate waste disposal, they were less concerned with the threat to the mangrove forests. In fact, they seemed to be under the impression that the mangroves were growing back, not being depleted as was the case.

High fertility rates have been common across all research sites. The lack of access to health services has been one of the important constraints to fertility decline. The other crucial factor is the slow spread of education, especially women's' education. In the Punjab, Chak 323 is an dispensary near by. However the gains of modernization are unequally distributed: many landless families have lower incomes, less education and larger families. These people need children as wage earners and security in their old age.

In contrast, the relatively well-off village of Chalt Chaprote in Gilgit district still has large households. Despite high school enrolment and good access to the outside world through a road, the villagers do not seem keen to pursue family control measures.

To have more children has meant more possibilities for generating income. This axiom is followed equally in the fishing villages where average household sizes consists of 9 or 10 members. In Lad Basti, for example, there are health services, educational facilities, and proximity to the megalopolis, Karachi. Yet ties to the environment remain tenuous, and the responsibility for its management is placed elsewhere. Clean water, waste disposal are all problems to be solved by the headman, who acts as an intermediary between the villagers and the government.

The closest links between people, population factors and the environment emerge in the isolated, resource-poor villages of Gilgit. Here, people seem keen to use contraception, and eager to stretch their meagre resources base as far as possible. This study reveals the inverse relationship between cropped area and yields. Villages with less land will invest more family labour to extract the maximum yields possible. This may well jeopardise future generations; if people are forced to employ their children in their fields, they cannot go to school and this will have a ripple effect on the population structure.

The study also shows that people fully explore possibilities of alternate source of employment, rather than reducing fertility rates. For example, agriculture was previously the main source of income in Gilgit. Remittances have now taken over the role, relegating agriculture to second place. In both cases, an increasing amount of labour power is sought. In some cases, such as in Mandher village in Punjab, people seemed to have turned their backs on agriculture. Basically only women and men above 45 years of age are left in the village. While agriculture still provides up to 50 percent of the local income, little of the remittance money is ploughed back into agriculture or any productive investments in the Village. Yield in the village would have grown if irrigation were possible like in Chak 323. In the latter village too, though to a lesser extent, migration has been a well-proven escape valve. The interesting point is that despite education and many contacts with the outside world, the fertility rates and household sizes in both villages remain high.

The Ugandan study has also been unable to establish any strong, direct link between population pressure an environmental degradation. The main factor behind the environmental degradation has been the struggle over the remaining natural resources. This contest involves many sets of actors, or "stake-holders", who all have varying degrees of interest in the resources at stake. In private ranchers and the individuals and companies with vested interest in tourism.

Therefore, the links between environment and population do not emerge clearly. As mentioned earlier, some vital statistics in the study are missing. Nonetheless, the main causal factor of environmental degradation cannot be total population figures: Mooni, for example has a lower population than Bumalimba, but is more degraded, environmentally. This is also the case with Buwoola and Nsakya. The only poorly-managed site with a large total population is Kamwozi.

However, the picture changes somewhat, when one looks at population is densities. All the degraded sites have higher population densities than the neighbouring parishes. They also have another common problem, namely, poor soil at the outset. Furthermore, people are frequently forced to dwell in fixed areas. Access to remaining land resources in severely curtailed by the establishment of forest reserves and parks. The consequent result is the overuse and exhaustion of available land, forest, and pasture resources. Some of these issues will be discussed in detail in the following chapters.

3

The Processes of Adjustment Between Population Levels, Resources, and Livelihoods

This chapter looks at local level responses to changing demographic, environmental, and economic conditions. The discussion will first explore accommodation practices related to population dynamics and environmental changes, particularly with a view to examining how local communities attempt to maintain a relative balance between population and resources. This will be followed by an inquiry into livelihood adjustments. The key issues for investigation are: What livelihood options have been available in the research sites and how are they utilized? Are there more sustainable resource utilization practices being adopted, given environmental and demographic changes?

Other additional conceptual questions include: What is meant by "local"? What are its social and spatial characteristics? Who responds, to what extent, and to what effect? Should there be a specific time frame? Any attempt to answer these questions satisfactorily would require an exhaustive, comparative study carried out over a long period of time. The scope of the present study is limited to exploring the experiences of the local communities in the case study areas.

Costa Rica

Costa Rica is generally regarded as a "successful" case amongst developing countries, with respect to both human and natural resources management. In this section, this assertion is scrutinized by focusing on the local level "accommodation" processes. We begin by analysing peoples' responses to population changes.

Some background information on population dynamics in the case study areas has been presented in the preceding chapter. One of the salient features observed in both the Pacific and Atlantic zones is the low rate of population growth, around 2 percent annum. In certain locations, nearly 50 percent of women in the child-bearing age bracket practise family planning methods. The national level fertility rate has come down to 3.1 births per women (Table 2). There has also been a sharp decline in infant mortality and a rapid rise in life expectancy (ibid.).

Apart from Candelarita (with the population density of 73 persons per square kilometre), all the other research sites have density rates of between 4 to 11 persons per square kilometre. These places constitute one of the areas with the lowest man-land ratio levels in the country. Migration has played an important role in changing demographic patterns. There has been a migratory flow out of Polka, while the Atlantic area has received great numbers of new residents.

In most of the case study sites, the principal demographic response of the community has been the reduction in fertility. Further accommodations are made by out-migrating. However, it is difficult to establish with any precision, if these responses have been triggered primarily by population pressure or influenced by broader social and economic considerations. The existence of low level population density raises doubts on the incentives for reducing family size. It seems certain, though, that improved education and healthcare supplied people with wider choices. By

reducing the size of their families, couples have sought to provide superior living conditions for themselves and their children.

Local communities have reacted in varying ways to changing environmental circumstances. In the Pacific zone, it seems that the perception of many people towards the environment has changed over the past 15 years. Peasants are conscious; of the loss of soil fertility and the need for reforestation. At time, they have been more receptive to official environmental programmes.

In 1979, the government declared Puriscal County an "environmental emergency zone", and focused on deforestation as the principal problem (Thrupp, 1981:99). The government, along with many external funding and research agencies, actively promoted tree planting programmes. Beside planting trees on the degraded 'public' lands, farmers were encouraged to plant trees on their private plots. Up until 1991, some 736 hectares were 'reforested' in the area. The participation of local communities in these schemes was somewhat lukewarm.

In the late 1980s, the government, again supported by external aid agencies, initiated another environmental project. This involved the promotion of soil conservation and the reduction in the agro-chemical run-off on tobacco fields. This programme also initiated reforestation activities, and by the late 1980s, about 975 hectares were reforested. However, the erosion rates still remained excessively high, and the terraces and ditches reduced the agro-chemical run-off only slightly. Most peasants found the labour demand for conservation unaffordable, and some opted out of producing tobacco and moved to perennial crops. This was, to some extent, prompted by the relatively cheap loans disbursed through the EEC funded conservation programme.

The decrease in firewood and timber availability has led to certain important changes in the daily lives of the villagers of Candelarita and Polka. This problem has been acute especially in Candelarita where people are increasingly required to purchase wood in the market or switch to other fuels such as electricity or

gas. However, these costly options are beyond the reach of the majority of peasants. Deforestation has also led to a shortage of timber and the rise in prices. Those who can afford to buy their timber form the neighbouring town of Santiago. Timber shortage is most acutely felt by the small peasants or labourers without access to their own trees. The shade trees planted in the coffee fields have been an important source of wood for many peasant households. However, in recent years, new hybrid varieties of coffee (not needing shade to grow) are promoted through externally funded conservation programmes in order to establish perennial land use systems.

The shortage of drinking water is another local level environmental issue. In Candelarita, water is piped from Santiago since 1985. In Polka, the water comes from the spring; it is stored in tanks and then piped to people's houses. In both villages, the provisioning of water by the government is the direct result of organized pressure by the community. However, during the dry months, water is still a problem in both villages. In Candelarita, women are required to line up for water early each morning. In Polka, on the other hand, the water tank is often empty. This has prompted some people to dig their own wells and others to travel to distant springs.

The responses of the communities in the Atlantic zone to their environment have been marked by many contradictions and inconsistencies. As this area represents one of the dynamic agricultural frontiers, it has experienced a substantial in-migration of people in search of larger plots of land, as well as wage employment in the banana plantations. Some new residents apparently attempted to supplement their income by selling timber to logging companies. On the whole, banana cultivation has remained the main agricultural or economic activity. It has provided work for considerable numbers of people, and high foreign exchange earnings for the government (The Tico Times, 6 December 1991). The cultivation of banana has expanded very rapidly in recent years in response to external market demands.

Amongst the migrants, large families are in a better economic position than small families. Far away from larger settlement areas offering wage employment and in the absence of capital, the availability of family labour becomes the determinant factor in developing and sustaining a framing system in the recently colonized area. Furthermore, this allows people to seek additional employment in the timber industry or in banana plantations.

Although the overall land-man ratio in the Atlantic zone is still low, the government has been concerned that the in-migration of a growing number of people in the area, combined with logging and banana cultivation activities, would threaten the remaining forests. A forestry law was enacted in 1986 restricting the use of forests. The most important move by the government in this period was the creation of the Barra del Colorado Wildlife Refuge. This action affected the villages of Linda Vista and Aurora the most, as they are located inside the Refuge. The establishment of the protected area was done without taking the livelihood requirements of the local people into account. Consequently, it has provoked a great deal of social conflict. Peasants have refused to follow protection regulations. They have organized many protests, and with the help of a lawyer, have also attempted to take legal measures against the Wildlife Refuge. This legal action, at least, has halted the eviction of peasants from the Refuge.

The government has also taken the initiative to promote reforestation, particularly in areas where forests have been cleared through illegal logging. Timber extraction has in fact increased in the region in recent years, because peasants fear that more forest areas would be incorporated into the Refuge, and that they would be prohibited from using the remaining forest resources. A number of technical and fiscal incentives are also provided in order to encourage peasants to plant trees. However, the peasants interested in the reforestation scheme, needed to possess formal land-title and a rather elaborate management plan, which is generally costly. The scheme therefore has acquired the

participation of mainly large landowners or individuals with spare capital. Finally, only a few of these reforestation projects have been 'successfully' implemented in the area.

The peasants have completely differed from the government in their priorities for resource use. They have sought to develop and consolidate farming systems in order to ensure their livelihood. Additional survival strategy has involved seeking of wage employment in the banana plantations. They have joined with the big banana companies to foil the government's conservation measures. This conflictual situation has jeopardized both official conservation goals and local livelihood options.

The changes in population, resources, and government development strategies have prompted people to adapt their livelihoods in different ways. In most cases, certain modifications are made out of practical necessity, while in other cases, complete changes are sought. As forest areas available for peasants have began to shrink, peasants are required to drastically reduce the fallow period for swidden agriculture. To maximize production, beans are planted on marginal lands, slopes, or under shrubs, which is known as the system of "frijol tapado". In order to exploit land resources more intensively, farmers have also integrated maize into their "frijol tapado" system. The intensification of production of beans and maize was also prompted because there is little farm land left outside of the protected area for food production. Moreover, most of the productive farmland is devoted to export-oriented cash crops.

Peasants have also sought to extend new areas under cultivation when feasible. This is done both by bringing marginal land under agriculture, or migrating to new agricultural frontiers. Out-migration in particular has been a major option for peasants when they fail to make a living, or when better economic and living conditions look hopeful in the new destinations.

In the Atlantic zone, out-migration has also occurred within the region. People have moved mainly to areas where larger land

plots could be possessed, or where wage employment is available. Many people from other parts of the country migrate into the area for similar purposes.

Out-migration has usually been a reaction to changes in the forms of livelihood or a search for new opportunities. This has also been strongly influenced by government development policies. For example, the out-migration experienced in the Pacific research sites has in large part been due to the introduction of cattle ranching. The cattle ranching was supported by the government, as beef market prices were stable. However, cattle ranching has many negative repercussions at the local level. Firstly, it is very extensive in terms of employment possibilities. Secondly, the spread in cattle ranching has driven up land prices and peasants are unable to pay such high rents. Finally, many large ranchers fail to fence in their cattle, leaving herds to roam freely and destroy peasants' crops. Many similar negative impacts are generated by tobacco and coffee production in the area. Most of the migrants have chosen the Northern Atlantic region because the prospects for land settlement as well as wage employment are better there.

As will be discussed in detail in the next chapter, the government development strategies have deeply affected the daily lives of many people in both regions. Peasants have generally been responsive to the government's development projects. Initially, most peasants felt that their living conditions would improve if they adopted the government development policies and programmes. Thus, peasant participation in tobacco, coffee and banana cultivation, and cattle ranching remained high. At times, these activities have been lucrative. But when prices drop and their existing level of living is threatened, certain adjustments are indispensable. Crops have frequently been altered such as from maize to tobacco, or tobacco to coffee. When prices of cash crops decline, farmers turn to cattle breeding. Banana cultivation is also weighed, as an option, to all the other viable land use options conservation programmes when credit, technical assistance, or employment is offered.

Lastly, peasants are increasingly required to seek wage employment to maintain their standard of living. Larger cattle ranches and coffee estates have occasionally provided a small amount of wage employment. Banana plantations, however, has recently been the main additional source of income, especially on the Atlantic coast. The industry has generally been dynamic and provides considerably higher wage rates than other sectors. High rates of in-migration can largely be attributed to the better pay offered by the banana plantations. Wage employment is also sought in nearby urban centres as well as in San Jose. However, this is constrained due to the fact that people need to travel long distances. Furthermore, they lack the necessary education and skills; and there is an increasing competition for employment amongst the urban dwellers themselves.

Pakistan

The local level responses in Pakistan have, in many respects, been different from those just explored in Costa Rica, although there are some common themes. The areas studied: the coastal area, the Northern mountain region, and the Punjab, have brought many varied findings in terms of local level responses from region to region. In all research sites, local level attitudes have largely been determined by high demographic density combined with a limited resource base for subsistence. Other influential factors have been the increasing penetration of market forces and growing state intervention, and the inability of these institutions or forces to bring about improved economic or environmental conditions for local communities.

The central demographic feature in all the case study areas has been the high fertility rate. The spread of education and improved health conditions sometimes has helped to reduce mortality rates, but this has not brought about any significant drop in the fertility level. High fertility rates have led to an expanding population size. The additional hands are used to fully utilize available resources or to seek wage employment. Out-migration for the purpose of earning remittances has been another important process.

The demographic responses common throughout the case study areas might be summarized as follows: the local people have generally

been conscious of the fact that their population is growing, but they have not considered it to be a huge dilemma. The population size and growth rates are perceived as a problem in relation to the dwindling natural base, but solutions do not require a reduction in fertility rates. Considerable numbers of people are also aware of the family planning measures. The main problems in this respect has been the unavailable of contraception. There is also a very low level of use of family planning methods in the rural areas. The core issue is the bias towards larger families, as larger families have meant increased production, economic security, and, frequently, an opportunity to break away from poverty. Hence, both cultural persuasions and economic necessity combine to fuel population growth.

It may be useful, here, to further examine the issue of migration. As has been noted in the previous chapter, there has been a high average of out-migration of adults, mainly men, from the Northern mountain area villages. The decision to migrate seems to depend mainly on the desire to earn supplementary income to support the family. The degree of dependence on outside remittances has however varied from village to village. In most cases, out-migration is closely tied to the prevailing income level and agricultural yields rather than the size of holdings or household.

The two Punjab villages, with similar demographic structures, have experienced completely opposite migration patterns. In spite of the excessive land concentration and high incidence of landlessness, in Chak 323, the agricultural sector has been very dynamic, generating a significant level of farm employment. This is particularly crucial for the landless in the village. Consequently, there has existed no strong motivation to emigrate both amongst the landowning and landless households. In Mandher, on the other hand, there has been a low rate of agricultural growth. Many villagers, in return, have chosen to abandon the poor, rain-fed agriculture to a secondary position, and relied more on outside remittances. Approximately two thirds of the households have a family member living and working outside the village. The remittances are primarily use to finance household consumption and little is used for productive agricultural investment. However, a significant amount of it is invested in education for

children with a view to procuring salaried job opportunities in the bureaucracy or abroad.

The coastal villages provide yet another dilemma. Despite a high population density and the proximity to Karachi, there has not been much evidence of out-migration from these villages. In fact, the communities seem to function as fairly independent entities, although they have obviously been closely tied to the wider market structure - with middlemen as intermediaries. Out-migration has not been the principal solution to problems raised by either population hardships. In the coastal area, depletion of mangroves, overfishing, water shortage, and litter disposal have been the main environmental issues. But the strength of the responses to each of these issues has differed greatly.
As IUCN survey carried out earlier on the people's perception of the environment in Rehri village showed some interesting results. Regarding the disappearance or reduction of the mangroves, no one thought they would disappear, 91.7 percent said they would not, while 8.3 percent responded with "don't know." Regarding the change in the mangrove forest over the last three years, 61.5 percent thought it was more dense, 1.8 percent said it was less dense, 24.8 percent said there was no change, and 11.9 percent did not know. Similarly, in terms of the ban on prawn and shrimp fishing, 12.8 percent of the villagers were willing to observe the ban (see Table 11).

The villagers have been equally apathetic when it comes to regulating their water supply. Several people had died because of bad drinking water in the past years. There have also been cases of cholera. The main action undertaken by the villagers has been to complain to the headman. Nothing has been done, however. There exist few community-level initiatives, they dismissed the whole idea by arguing that it was the government's responsibility to find a solution.

On the issue of solid waste disposal, people again said it was not their responsibility to do anything, and hence tend to throw their waste out of the door into the streets. The municipality cleans the villages once a week, but this is not enough for proper waste disposal. This

situation has been more acute in Rehri than in Lad Basti, because the population in Rehri is much greater.

The local level responses to the environment in the North has been slightly more encouraging than in the coastal villages. The Aga Khan Rural Support Programme (AKRSP) has played a positive role in reviving certain forms of traditional resource management (see also World Bank, 1990; Banuri and Mahmood, 1992). This is done by mainly working "within" the existing social structure, thereby allowing the villagers to use their traditional systems of decision making and collective management. The case study mentions a number a number of relatively successful programmes in different villages. For example, a forest protection programme has been initiated in Chalt Chaprote. In Ahmedabad Bala, a micro-hydel power plant has been set up. In Passu, a protective spur and an irrigation channel have been constructed; and in Misgar ac collective yak farm has been established. Similarly, in Passu, local communities have mobilized themselves to protect their land against further erosion. This was accompanied by the construction of an irrigation channel.

One specific example of positive environmental management, which is not directly linked to AKRSP or other NGOs, is found in the Risht village. Here the local people, themselves, have introduced strictly enforced household quotas for fuelwood form the natural forest. The forests have become; so depleted that the people are required to travel increasing distances to get to them.

The local level responses to environmental degradation in the two Punjab villages on the other hand are very limited. In Chak 323, salinity and waterlogging have been the main issues. The scale of these problems is so immense that individual farmer can do little to change them. The government is expected to find solutions. In Mandher, some farmers have been inclined to plant trees on their private lands to fulfil fuelwood needs, while others have begun to use dung, gar or kerosene. Soil erosion is another serious problem. Little household or community level initiatives are observed on this front.

Livelihood adjustments different from region to region. This variation is determined by the availability of productive resources and the influence of "modernization", rather than by demographic factors. For example, in the coastal area, the process of modernization within the fishing industry has brought about many changes. Fishing still remains the vital subsistence activity. Over the last thirty years, the fishing industry has undergone a rapid technological transformation and commercialization. This has been stimulated by the growing international demand for Pakistani shrimps and the rapid growth in the national poultry industry requiring fishmeal. Over the past decade, fish production in the coastal area has grown at the rate of 6 percent per annum. In the late 1980s, it consisted of 2 to 2.5 percent of the country's total annual export earnings (Pakistan National Report to UNCED, 1992:36).

Table 11: People's perception of the environment in Rehri

Attitude of fishermen regarding the ban on prawn/shrimp fishing.		
	good: 12.8%	bad: 87.2%
Fishermen's observation of ban,		
	observe: 23.4%	not observe: 76.6%
Use of mangrove trees for fuel/firewood,		
	use: 91.7%	not use: 8.3%
Respondent perception regarding disappearance/reduction of mangroves,		
	will disappear: 0%	not disappear: 91.7%
	don't know: 8.3%	
Respondent perception regarding the change in growth of mangroves over the last three years,		
	more dense: 61.5%	less dense: 1.8%
	no change: 24.8%	don't know: 11.9%

Source: IUCN (1987)

Modernization in Rehri and Lad Basti explains the presence of larger trawlers and more sophisticated equipment items (like ice for transport to Karachi) which the fishermen cannot afford. It indebtedness amongst fishermen. The middlemen who gives credit and connects the village to the outside world are the beneficiaries. In short, despite attempts to improve livelihood through actively participating in the modernization process or

market-led change, many households have become even more vulnerable than before.

In the Northern villages, one of the chief ways local farmers have responded to population increase is by intensifying production based on existing resources. The communities work harder to maximize production. This is frequently complemented by an increased use of chemical fertilizers, improved seeds, new crops, and technologies. This had led to some increase in land productivity. However, none of the surveyed villages are able to produce sufficient grain to sustain the local population. People are required to engage increasingly in off-farm employment to supplement their farm income. However, as off-farm employment in the area is limited, people are required to migrate to far-away urban centres or abroad.

The villagers' attempts to strengthen the economic base in the two Punjabi village has also varied significantly. In Chak 323, the main change in livelihood has been the rapid growth in agricultural productivity. This was brought about by the vast expansion in irrigation facilities, combined with the improved farm technology. In contrast to this situation, agricultural development has been very slow in Mandher. As a response to a low level of farm productivity, there has been a very high incidence of out-migration from the village. At least one member of most households has left the village. Remittances finance a large part of the village's cash and food requirements. However, as indicated earlier, the use of remittance income is heavily biased towards consumption rather than investment or savings.

Uganda

Local level accommodation processes to growing population, environmental degradation, and declining standards of living are also evident in Uganda, although many crucial data are lacking to establish their exact extent or long term implications. Nonetheless, from the information currently available, we can form some idea of how people conform to their surroundings. Responses have tended to vary from region to region, and most of

them seemed to have occurred rather spontaneously in order to address immediate problems.

Regarding the response to population changes, most people do not seem to perceive population growth as an issue; hence they see no reason to reduce fertility rates. As multiple production systems are employed and technology remains rudimentary, there are all incentives to maintain large families. The lack of modern healthcare facilities means that parents are never sure of how many of their children would eventually survive. Children are needed to share in the subsistence provisioning activities of the family, as well as a support in old age. A large family; is also seen as a symbol of higher social status. Furthermore, in certain locations such as in the Mbale district, polygamy exists. All these factors stimulate a high rate of population growth.

One demographic trend observed in the study is that people often migrate out of the high density regions such as the east and Southwest mountain districts to lower altitudes and sparsely populated districts. Unfortunately, data are lacking to confirm if this is because of population pressure, or due to the possibility of acquiring more land in the new location. A combination of these two factors is probably responsible for people's decisions to move. A limited degree of inter-district population mobility has occurred also as a result of people searching for refuge from civil was or ethno-political conflicts. However, this type of migration has remained sporadic. The majority of people generally return home after home after a period of time.

Local level responses to the environment have been mixed. On the one hand, the studies show that some people are engaged in soil conservation measures and tree planting such as in Gulami parish in the district of Masaka. Mulching and bunding is applied to conserve soil, and the lack of natural forests in the area has prompted people to plant trees on their private land. Terracing is a common practice in the southwestern Kabale district. Fruit trees are planted in increasing numbers in order to supplement diets,

provide fuelwood, and income by fruit sales. This is particularly the case in areas near urban centres, connected by good roads.

On the other hand, many activities have been detrimental to the environment. One of the main environmental concerns in Uganda is bushfires. This is one of the important ways for the rural population to gather fuelwood more easily, as well as to hunt, to let new pasture grow, and to extend cultivation. Forests are also affected by charcoal making and the uncontrolled use of wood for brick kilns. Similarly, there is a high demand for wood in urban areas for housing and construction.

Forest encroachment for settlement and cultivation has been a widespread phenomenon, particularly around the lake Victoria. Extensive forest encroachment began in the 1970s and expanded in the 1980s when political instability prevailed. In some of the forest reserves such as the Mabira reserve, the government has successfully evicted settlers. In other protected areas it has proved to be more difficult (Hamilton, 1988).

One such example is the Lake Mburo National Park. This area was previously used by pastoralists. In the early 1980s, the government declared it a protected area. The government also converted part of this land to commercial ranching. This generated a great deal of conflict between pastoralists and government, as well as between pastoralists and ranchers. The government, in the late 1980s, conceded to the demand by the pastoralists to have at least a part of the land re-allocated to them. However, the principal water source for cattle was kept within the park boundary. In addition, the area allocated to the pastoralists was too small to graze their herds. Consequently, certain areas have become over-grazed. Gully erosion and water depletion-especially during the dry season, have also been experienced.

Another negative environmental action is draining of wetland areas for cattle breeding, cultivation, and brick making. Many groups of people are involved in these activities. Brick making, for example, has been a lucrative business as a result of the

growth of the housing industry. The swamps are excavated for clay by brick making kilns. Powerful individuals own and operate this kilns, although it is the ordinary people who actually work for them.

The negative effects of many of these activities are not unknown to local communities. In most sites, people have been aware of the problems of soil erosion, water shortage, deforestation, or recent restrictions on the use of forest areas. However, they have usually been unable to modify their behaviour into more positive environmental initiatives.

The actions of the local people need to be looked at especially in the light of prevailing agricultural practices, cultural values, and the livelihood options perceived by the people themselves. For example, bushfires simplify the tasks of firewood collection, hunting, cultivation, and pasture regeneration. It requires little labour, so that household members can be employed for other production activities. Similarly, in areas where little off-farm employment exists, charcoal making for the market can greatly supplement the household income. A high demand of charcoal within urban areas by fixed-income groups due to the erratic electricity supply, low availability of gas, high price of paraffin, and the high costs of cookers and stoves, has meant a ready market for charcoal.

Open extensive pastoralism is also well-suited to the savanna ecology. Considering their total dependence on cattle, it is not surprising that many pastoral groups over-graze certain pasture areas. This process is especially exacerbated when a large part of the rangeland is sealed off for official conservation purpose. Unauthorized forest settlement is another attempt to strengthen livelihoods, as this allows access to land, food provisioning, employment, and income. In order to increase household income, many groups of peasants have also been actively involved in cattle breeding and cultivation activities in wetland areas. However, as indicated earlier, the actions of the rich and more powerful elements of the society have been more important, than

those of the peasants, in terms of seriously disturbing the wetland ecology. This is because the scale of operation of the former is larger and many of them do not need to live in the area forever; hence they do not feel responsible to the local environment.

Beside these activities, various other "safety nets" are constructed to enhance livelihood strategies. In some areas, new crops have been adopted, or crop combinations are altered in order to accommodate increased food and other requirements. Bananas (the main staple food) are often intercropped with potatoes and maize. Crop substitution has also taken place depending upon the market and other criteria. For instance, in areas where peasants grew cotton or coffee, unstable prices led many peasants to shift to food crop production, namely bananas (see e.g. Raikes, 1988:98). When markets are favourable, peasants have concentrated on vegetable and fruit production. This is the case in the Mbale district, parts of the Kabale district, and the whole of Lake Victoria crescent. In the Lake Victoria area, many households are involved in fishing for their own consumption and for sale. In this area, rural households are increasingly engaged in petty trading. Some of the peasant households in the frontier areas even specialize in illegally selling their products across the border in Rwanda or Kenya. This is especially the case in Kenya, where prices of agricultural products are higher.

Finally, rural households have always been keen to fully explore the possibilities of acquiring wage employment. When they manage to do so, it successfully supplements their meagre farm income. The tea and sugar estates in the Lake Victoria crescent represent the main destinations of those searching for wage employment. The existence of forest land suitable for settlement and crop production in the area makes migration in and around the tea and sugar estates even more attractive. In the lake area, some people are also able to work in the fish industry. Similarly, Kampala and Jinja remain important locations for seeking casual employment. These urban centres however lack economic dynamism, and competition for employment is extremely rigorous. Limited amounts of wage or salaried employment exists

within the housing and construction industry and the bureaucracy. However, employment in most cases remains unstable, and wages paid are so low that workers frequently need to bring food from their respective villages.

Summary

In the preceding discussion, an attempt has been made to shed some light on the local level responses to population dynamics, environmental changes, and livelihood requirements in the case study areas. Responses in all three countries have been both positive and negative. More lucid insights could have been helpful on many aspects. The main handicap has been the lack of information. Furthermore, local level response as an analytical theme is too vague, as they are neither gradual nor linear.

With respect to the population changes, the local level responses in Costa Rica appear somewhat promising. Fertility rates have been successfully lowered, and further demographic accommodations are made through out-migration. The comfortable land-man ratio in most rural areas and a somewhat better land distribution has also helped to some extent to contain both the growth and movement of people. Pakistan and Uganda, on the other hand, local level accommodation practices in large part have revolved around having large families. These attitudes are deeply rooted in local culture and household economic necessity. Out-migration however has provided some demographic relief in certain communities in both countries, especially in Pakistan.

One common way which the local communities in all three countries have responded to population growth is the intensification of production activities, although the degree of success has greatly varied. Where peasants saw potential social or economic gains to be made, they frequently modified cropping and land use patterns. For example, to take full advantage of market demand, peasants in Costa Rica have constantly moved from one cash crop to another, or from crop production to cattle

breeding. Similarly, in the Punjab villages in Pakistan, many groups of peasants have energetically participated in the agricultural modernization processes in order to benefit from the agricultural extension programmes. In Uganda too, the depressed market price of cotton and coffee has led peasants to shift to banana cultivation.

Peasants have also sought to bring additional land under cultivation to improve living conditions. In Costa Rica, the Northern Atlantic zone has been a dynamic agricultural frontier, and a large number of peasants have been able to establish better dwellings and larger plots there. Given a very high population density, the prospects for land extensification in Pakistan is limited. Peasants have sometimes extended cultivation to marginal areas. In Uganda, this prospect exists especially in and around the lake Victoria crescent. However, both in Costa Rica and Uganda, peasants' aspirations to new land are increasingly restrained as a result of the establishment of national parks and forest reserves.

In all the three countries, seeking wage employment has been the most widespread response in terms of livelihood adjustment. Wage employment in agriculture or other rural production sectors, as well as urban areas and the bureaucracy are fully explored, although outside employment prospects often depend on factors such as a household's knowledge about the availability of work, family contacts, and the economic ability to pursue such employment. In the case of Pakistan, a large number of rural people have also migrated to the Gulf or developed countries to work as migrant workers.

The picture is more confusing regarding local level responses to environmental changes. It seems that many rural dwellers are informed of such environmental issues as soil erosion and deforestation. Yet, in the majority of cases, this awareness has not been translated into positive environmental initiatives. Even in the few cases where local level participation has been encouraging such as in the Pacific zone in Costa Rica or Northern

mountain villages in Pakistan, many contradictory trends are present. Peasants, at times, participated in the conservation programmes merely to take advantage of credit or other extension facilities.

On the whole, most peasants' survival strategies have generally revolved around exploiting the available natural resources more forcefully, when required to maintain a balance between population and the resources at their disposal. This has often resulted in negative environmental changes such as soil erosion, forest encroachment, pasture degradation, etc. The absence of livelihood alternatives is the main catalyst for these consequences, although resources alienation, breakdown in the customary resource management practices, and the type of development strategies which these countries have adopted have also critically influenced this process.

4
The Role of External Forces

The process of rural or agricultural transformation in all case study areas in Costa Rica, Pakistan, and Uganda have been marked by growing contacts with such external forces as merchants, traders, government officials, development workers, teachers, absentee large land/estate owners, etc.. These forces have frequently been associated with such institutions as the state, NGOs, international development agencies, donor governments, national industries, trades unions, multinational corporations, and so forth. However, not all of them have been equally active in all case study areas, nor is their influence evenly spread over all sectors (i.e. population, environment, and development). Furthermore, their impacts have not been uniformly positive or negative in all sites or sectors. These aspects are closely looked at in this chapter.

Costa Rica

There are few programmes which have directly focused on fertility control in the case study areas. Generally speaking, the average household is about 5 persons. Approximately 50 percent of the women of reproduction age seem to use contraceptives; one exception is Polka in the Pacific zone, where only 27 percent of the women use family planning methods. The size of a family and the use of contraceptives has depended on access to education, modern healthcare facilities, and economic development. Interestingly enough, Polka has lagged behind all the other research sites in these criteria. There is a considerable degree of illiteracy in the village. As healthcare facilities within

within Polka are very basic, and the villager are required to go to the neighbouring towns to get adequate treatment. Most household are economically weak. Off-farm employment is non-existent. Marketing of agricultural products is difficult, as the village lacks a good road or a direct connection to market centres. In short, the living conditions are harder than in the other villages covered in the survey.

The demographic transitions observed in the case study areas have been, in most respects, consistent with the national experience. The government population policy since the 1960s has emphasized integrated family welfare programmes (e.g. improved education, health conditions, and employment creation). In recent years, the government, usually with the help of foreign aid agencies, has also attempted to introduce education on demographic issues in the schools and improved child healthcare and family planning programmes in low-income regions (UNFPA, 1991c).

To a limited extent, the government has also been able to influence the spatial distribution of population in the country. The Central Valley is the most populated region, inhabited by nearly the half of the country's population (ibid). By initiating land settlement and agricultural development programmes in forest frontier areas, the government, since 1950s, has encouraged a large number of people to move out of this region. However, the rapid process of modernization and urbanization in the Central region, especially in San Jose, and the possibility of acquiring wage employment in the region has tended to attract rural people in increasing numbers in recent years. This is frequently compounded by the fall in prices of agricultural products, reduced employment, and rising consumerism in rural areas.

The fact that external forces have played a leading role in the field of environment is evident in all the case study areas. The chief environmental problems, as remarked earlier, are deforestation, soil erosion, and the contamination of soil and

water by the use of agro-chemicals. Similarly, some watershed areas are seriously depleted; and there has been a threat to a number of wildlife species. Many of these environmental problems are the direct outcome of the government's market-oriented development strategies.

In the Pacific zone, tobacco was the first export crop to be grown. It was initially introduced by the government with the backing of the transnational companies in the 1920s. Tobacco cultivation soon spread. In fact, the region soon became known as the "tobacco zone". At first, tobacco proved to be a lucrative crop. From the producers point of view, it was the crop with the highest net income per hectare. Yet, peasants observed that it could not be grown in successive years without applying a high level of expensive agro-chemicals. The prices fluctuated constantly. Furthermore, as tobacco fields lacked tree cover and terracing, productive top-soil tended to erode. Consequently, tobacco cultivation lost its momentum.

At first there was a shift from tobacco production to coffee growing. However, cattle ranching soon displaced coffee, especially in Polka. As cattle expansion progressed, a great deal of land areas, then under swidden cultivation, was also brought under pasture. Many peasants were dispossessed of their land and required to move further into the forest. Between 1950 and 1984, the total area under pasture in Costa Rica increased from 12 to 33 percent of the total land area, whilst the share of forest cover declined by 35 to 16 percent of the country's landmass (MIRENEM, 1990:4). A high demand for Central American beef in the United States was the principal stimulus for this process. Costa Rican beef exports, in fact, grew from 7.9 million kg in 1960 to around 44.0 million kg in 1977 (Thrupp, 1980:63). This generated foreign exchange earnings; the government, therefore, allocated between 1966 to 1970 alone some 74 million colones for the promotion of cattle, and only 40 million colones for agriculture (cf. ibid:35). International agencies have also provided technical and financial assistance to the government to promote cattle ranching.

Many similar negative environmental effects have occurred in the Atlantic zone, too, as a result of the influence of the market-oriented government development strategies. The principal economic activity prior to the 1960s was logging which was detrimental to the environment. Evidence shows that some 50,000 ha of forest had been logged by 1960; and this process has continued in the recent decades (MIRENEM et al., 1991).

Land settlements were promoted in the Atlantic villages in the mid-1960s. Two factors were chiefly responsible for this process: the high population concentration in the Central Valley which prompted peasants to leave; and the active support of the government behind agricultural modernization. Between 1968 and 1978, in particular, the area experienced a high in-migration of people. The migrants cleared to the logging companies or saw mills. Once the land was cleared, peasants began growing food crops. The soil productivity has been high in this area. However, the absence of market outlets meant that peasants could not sell their "surplus" products. An increasing need for cash and the state's financial and technical support for cattle raising meant that peasants found it more logical to opt for cattle ranching.

Banana cultivation was a parallel development during this period. This was encouraged by the expansion of large banana companies in the area, and relatively good banana prices. Some of the banana companies also established their own plantations where a significant number of peasants were able to seek wage employment. Labourers in the banana plantations could receive much higher wages than in agriculture. However, banana companies not only caused deforestation, but also contaminated the soil and water through the use of agro-chemicals.

In recent years, a number of 'environmentally friendly' measures have been promoted in recent years by external forces. The Costa Rican state, supported by international development and conservation agencies, has again taken the lead. For example, in the Pacific zone, the government declared the Puriscal county on

"environmental emergency zone" in the late 1970s, and aimed to reduce pressure on the remaining forests, as well as to conserve soil and make households self-sufficient in wood by the initiation of afforestation programmes.
The government also sought to pursue more stringent laws prohibiting the unauthorized use of forests. In the early 1980s, in collaboration with the US-AID, the government launched a comprehensive watershed management plan for Puriscal county. The main activities of this plan consisted of tree planting soil conservation measures in tobacco holdings.

Agencies like CATIE and GTZ also supplied some inputs to the above initiative, particularly by providing local level information on agroforestry possibilities. Based on this, GTZ later became involved in the implementation of a Agroforestry Development Project. During this time, the EEC funded another soil conservation and reforestation programme. The main purpose of this project was the conservation of soil in tobacco holdings by constructing terraces and ditches, and by planting trees. Furthermore, it sought to motivate farmers to cultivate perennial crops, mainly coffee, in the place of tobacco. In recent years, the government has initiated an even more comprehensive Peasants' Forestry Development Programme with the assistance by these and other aid agencies.

However, there is a discrepancy between the stated goals and the actual outcomes of resource conservation programmes. Most measures relating to the protection of natural forests, tree planting, and soil conservation are generally "top-down", reflecting mainly official conservation concerns. From the point of view of peasants, these programmes demanded additional labour or financial resources. The conservation programmes at times directly threatened the existing modes of livelihood such as the prohibition in the use of forest resources. Understandably, peasant participation in these programmes has remained low.

In the Atlantic zone, the outside intervention with regard to environmental protection revolved mainly around a) the creation

of the Barra del Colarado Wildlife Refuge; b) the promulgation of a Forestry Act to restrict use; and c) the promotion of tree planting activities. Many international conservation agencies have actively been involved in these schemes.

Most of these conservation measures have produced a great deal of social conflict, and have totally lacked popular participation. In particular, the creation of the Wildlife Refuge and the subsequent attempt by the authorities to remove the villagers of Linda Vista and Aurora met with strong local resistance. There has also been a general fear amongst villagers that increasing restrictions on the use of forests would be imposed by the government. The recent attempt to create a "biological corridor" or a cross-border conservation area, between Costa Rica an Nicaragua has further fuelled this fear. The rich and the poor alike have come together to oppose official conservation schemes; and they have been assisted by many outside agents including lumber companies, banana planters and peasant unions. The project to create the "biological corridor" has been promoted by international conservation agencies such as the IUCN, and forms part of the Tropical Forestry Action Plan for Costa Rica.

Meanwhile, the Forestry Act prohibits the use of forest areas for crop production. It allows only selective cutting of trees by farmers with legal title to the land. Most farmers in the Atlantic zone do not have formal land ownership titles. Permits are required to extract wood from the government forest areas. Obtaining these permits is both costly and time-consuming. Peasants in most cases therefore choose to extract wood illegally.

Reafforestation activities have been promoted as an alternative to local wood demands. Incentives are provided by disbursing subsidized credits and exemption from land taxes. The main complication is that peasants are required to again present proof of land ownership and a relatively elaborate management plan in order to plant trees. This has disfavoured the average peasant. Only the wealthier farmers, who are mainly attracted by cheap credits and financial incentives, have benefited from this scheme.

The tree planting programmes have also suffered because little care is given to seedlings once they are planted (Bruggemann, 1991 and Brooijmans & Van Sluys, 1990). Consequently, the reafforestation projects have been unable to significantly reduce the pressure on the forest.

Local livelihood options have also been influenced by outside forces. Many examples of the changing pattern of production and land use brought on by external forces have been cited earlier. Agricultural modernization, promoted by the state and external aid agencies, has become a vehicle for incorporating rural people into the market. By participating in the market-oriented government development strategies, certain groups of peasants have occasionally made economic gains such as through tobacco and coffee cultivation. However, these gains have remained short-lived, as prices of these products have tended to fluctuate enormously. In the Atlantic zone, banana cultivation has enjoyed relatively stable prices. Some households have also been able to secure wage employment in the banana plantations. Cattle breeding, too, has resulted in high financial returns, although it is labour extensive. As ranching requires a high level initial investment which many peasants lack, economic benefits are concentrated amongst the upper enclave of rural society. At the same time, the high potential for profit has meant that the large cattle ranchers are motivated to displace peasants with small land holdings in order to bring these under pasture.

The impact of recent conservation programmes, initiated by the state in association with international development and conservation agencies, on local livelihood systems has been mixed, if not totally negative from the point of the peasants. These conservation measures can be divided into two broad categories. The first are the conservation projects designed to improve the environmental standards in the settlement areas like soil conservation and tree planting. Although a few financial and other incentives have been provided to persuade the peasants to participate in these schemes, overall, the peasants have seen little or no improvement in their livelihood through these programmes.

The richer farmers have mostly benefited. The second set of conservation initiatives has involved the state management of natural forests. As we noted above, Forest Acts were promulgated to restrict access to the use of forests; and attempts have been made to expand the network of strictly protected areas. These measures have not only been contradictory to the needs and aspirations of peasants, but have also remained the source of continual conflict with the state.

Pakistan

Pakistan's population strategy has directly evolved around birth control measures. The Family Planning Association was established as early as 1953, and the government gave priority to fertility control in its first Five Year Plan in 1955 (Aslam, 1991). From this period on, birth control measures focused on women and the provision of female contraceptive methods-viz. surgery, intra-uterine devices, and injections. Initial outside support was provided by American foundations (e.g. Population Council, Ford Foundation, USAID) and the Swedish government, but soon the United Nations and other international agencies came on board (Myrdal, 1968: 1529, Vol.II). In recent years, there are few international development authorities and NGOs which are not directly or indirectly involved in population project in the country (UNFPA, 1991c).

Despite a long history of population planning and growing international financial support, fertility rates in the country have remained extremely high. The case study areas have not been exceptions. In the coastal villages, the average family size has remained even higher than the national average. Proximity to Karachi has meant that the majority of the people are aware of family planning, but very few of them actually practice it. In the Northern area villages, except Rahimabad II, Passu and Misgar Paeen, people have little access to contraception. Just over 20 percent of the people interviewed indicated that they would avail of contraception means if they had access to it (see Table 8). It should not be supposed, however, that all those expressing

interest in contraception would automatically use it in practice. Social structures and customs play important roles in this sphere. In the Punjab villages, very few of the people surveyed were found to be using contraception, although the modernization processes and greater exposure to the outside world has meant that the villagers are generally informed about the government's family planning programmes.

Most of the early population programmes were concentrated in urban areas, and targeted mainly educated women. From the 1960s on, although family planning programmes were extended to rural areas, they continued to focus mainly on contraceptive provisions. Many rural dwellers frequently found these measures repressive. In recent years, although government documents have recognized the need to integrate birth control measures with wider issues such as health, gender inequality, education, employment, migration, and environment (cf. Aslam, 1991), overall emphasis has tended to rest on direct birth control measures. Government policies have also been vague in terms of how such an integrated approach could be translated into action. There is a fundamental contradiction: a high level stress has been placed on women in family planning programmes, yet, women's social status remains still very low. Evidence suggests that by the early 1990s, only; 18 percent of women were literate and many tended to get married between the age of 15 to 19 years (ibid). A low labour force participation rate (5.8 percent) by women also generates a preference for male children, thus contributing to high fertility (Pakistan National Report to UNCED, 1992). Furthermore, a high level of child mortality has resulted in the desire for a large family in order to ensure some children's survival to adulthood (ibid). Similarly, whilst many social attitudes and practices favour large families, poverty and general economic insecurity oblige households to have more children (ibid, Myrdal, 1968, Mamdani, 1972, Aslam, 1991).

However, the key issue relating to the failure of population programmes in the country has been the institutional vacuum. Although there has been growing commitment to population programmes at the local communities need. At the same time,

there has been a lack of popular interest and services that local communities need. At the same time, there has been a lack of popular interest and participation in population programmes. In particular, there has been an absence of local institutions to mobilize people. The NGOs, for example, which could potentially act as mechanisms to link the government and local communities have also failed in this area. This is largely due to their undue emphasis on sterilization methods, as well as their inability to provide necessary basic services to local communities.

As for the environment, several of the negative processes occurring in the case study areas can be attributed to external forces. For example, beside the pressure from the villagers themselves, the mangrove forests have directly been affected by large-scale government initiated irrigation projects in the Indus Delta. These schemes have reduced not only the volume of fresh water available, but have also affected soil formation and texture, thereby affecting the growth of the mangroves. Furthermore, there has been a growing commercialization of fuelwood and timber in the area.

Market forces have remained especially active in the fishing industry, which has been given additional impetus by high export earnings and domestic fish demand. Increasing demand has also led to the depletion of fish stocks in certain locations. Moreover, growing market penetration and consumerism has led people to accumulate many non-recyclable products in the village. The local people are also faced with the unreliable supply of drinking water. There are no significant initiatives made on the part of the state or other development organizations to solve either of these problems.

In the Northern area, deforestation has been the direct result of the urban timber demand in many villages. The construction of roads, especially the Karakoram Highway, has further facilitated this process. The attempts by the government to bring forest areas under the state jurisdiction have discouraged efforts by local communities to protect or manage these areas themselves.

This has also led to the degradation of high-altitude pastures, as the customary pasture management systems have broke down. Similarly, there has been few successful government initiatives to prevent soil erosion and declining yields.

In the Punjab, the key environmental problems of salinity and waterlogging are results of the expansion of the state-sponsored irrigation system. Although these issues have steadily been recognized by the government, few concrete steps have so far been undertaken to solve the problems (Pakistan National Report to UNCED, 1992).

The government faces a crucial dilemma in addressing the nation's environmental problems: many projects have laudable objectives but they are not translated into improvements at the local level. The state and many international development agencies. For example, an elaborate Forest Act was introduced as early as 1927. Comprehensive laws regulating harvesting and marketing of fish were introduced in the early 1960s. The government has also been active in water regulation and exploitation. In recent years, it has emphasized the need to conserve soil in cropland, protect watersheds, restore pasture areas, conserve biodiversity, and encourage tree planting. It has enacted various new laws and launched many environmental programmes. One key outcome of this process has been the development of the National Conservation Strategy in 1991, which has proposed to allocate as much as 8 percent of GNP for environmental programmes (Pakistan National Report to UNCED, 1992).

Overall, there has been little sign of environmental improvement at the local level. Increased state or external intervention has generally meant growing 'encroachment' upon the local natural resource base and restrictions on its use by local communities. This process has frequently replaced existing management practices, but has provided no workable alternatives in return. This has also made local communities more suspicious of outside initiatives. The government and other development agencies find

it difficult to motivate or organize people to take active part in conservation projects. However, where external agencies have attempted to work within the traditional system of decision making and collective management, there is a greater degree of success in achieving local participation in environmental programmes. To a large extent, this has been the case with the Aga Khan development NGO in the northern area, although major weakness is that people have tended to expect the organization to deliver nearly everything.

The role of external forces in livelihood improvement has not been uniform. In the coastal villages, as the fishing sector has rapidly changed its orientation from subsistence to commercial production (see also Ismail, 1990), previously independent fishermen have needed larger boats, improved engines, superior fishing nets, and outside labour to remain competitive. This has prompted many to borrow money from the middlemen and become heavily indebted. Another option has been to become labourers for those who owned larger boats. A majority of fishermen seem to have chosen this alternative, as nearly 80 percent of the population engaged in fishing are labourers. Becoming a labourer is in some ways less risky than operating a boat. Since the fishing industry is dynamic, it pays higher wages than agriculture or the urban informal sector. Moreover, a labourer is generally allowed to take some residual or commercially undesirable sized fish home. When this is possible, it supplements the family diet and nutritional standard, although all other basic needs have to be met solely by their wages.

In the northern area, it increased penetration of market forces has led to a high level of monetization of the local economy and a growing need for cash. Some households have been able to generate funds through the sales of agricultural products- especially as villages are increasingly connected to roads. There has been some adaptation of the state- promoted improved seeds and other agrarian technologies, although none of the surveyed villages has been able to produce sufficient grain to feed their own people. This and cross-border trade, especially after the

opening of the border with Kashghar, has provided some employment. However, outside remittances remain the most important source of off-farm earnings. The income from remittances has frequently brought about a limited amount of dynamism in the village economy and social mobility.

In the Punjab, the state, in association with many international development agencies, has played an active role in initiating the Green Revolution. This has been accompanied by large scale investment in irrigation, improved seeds, mechanization, and physical infrastructure. In certain locations, productivity has risen dramatically. It has provided substantially more income to certain social groups. The fundamental problem has been that the benefits accruing from the Green Revolution have not been equally shared amongst different social groups. In fact, the richer farmers, in their pursuit to consolidate large land-holdings and generate increased agricultural surplus, have tended to dispossess small peasants of their land. There has also been a decline in sharecropping and the practice of permanent agricultural labour hiring. The predominant outcome of this process has been the creation of a growing number of landless by the late 1980s (Mahmood, 1989). Notwithstanding the negative side-effect, the process of agricultural modernization has also generated increased wage employment, and most dispossessed peasants have thus been able to avoid out-migration.

Uganda

Population policy has a short history in Uganda. Given a comfortable land-man ratio, previous governments saw the existing population size as being quite acceptable. The present government which came to power in 1986, although it recognizes that the current fertility rates are high (UNFPA, 1991c), has placed more emphasis upon the reconstruction and rehabilitation of the whole economy. This will involve not only fundamental restructuring, but also the expansion of infrastructure to accommodate a larger population. In this process, the government views the population as one of the nation's "most important

resources" and seeks to improve it through the provision of education, health, and other necessary services (Ministry of Energy, Minerals and Environmental Protection, 1991:19).

Unfortunately, there has been a great discrepancy between the desire to improve human conditions and realizing it in practice. Till today, there has been little notable improvement in education, health, and employment provisioning; and general infrastructure such as roads still remain in very poor condition. Many of these services are maintained, frequently at a minimum level, by local communities and authorities on a self-help basis. Furthermore, the government has not simultaneously produced a comprehensive population policy clearly linked to social welfare programmes and general economy reforms which are currently underway.

The lack of a coordinated population policy is that much of the external assistance is being used unsystematically, and frequently on a sectoral basis. By 1991, the UN agencies- namely UNFPA, UNDP and WHO, the bilateral agencies representing USAID, Norway and Germany, and a number of NGOs and foundations including CARE, International Planned Parenthood Federation, Pathfinder International, etc. have provided financial assistance to the population sector (UNFPA, 1991c). Much of this aid has however been used for demographic data collection, training and research; and little, if any, has actually; filtered through to reach rural area. In recent years, most external aid has tended to concentrate on programmes dealing with the AIDS epidemic. Even the programme against AIDS problem. This nonetheless has reduced the funds available for other wider population and social welfare programmes.

The influence of many of the external forces on the local environment has clearly been more negative than positive. Three major aspects should be highlighted. Firstly, the powerful industrial groups in mining, breweries, textile, sugar and leather tanning industries, brick kilns, as well as the commercial ranchers have seriously affected the environment in their locations. One

example is the kilembe mines in western Uganda. Cobatt sulphide which is produced as a by-product of copper processing has been stockpiled for 20 years which tends to filter through the soil. At the same time, other wastes are pumped into River Nyambuwamba- with serious health hazards to people and livestock. There are many other small scale mining operations including gold refining which result in similar environmental problems (Ministry of Energy, Minerals and Environment Protection, 1991:29-30). The country's major breweries, textile, sugar, leather tanning, and fishing industries which are located on the shores of lake Victoria discharge many toxic and non-toxic wastes into the lake (ibid). The commercial brick kilns and ranches affect the lake's off-shore wetland ecosystem by draining the area. In the Mbarara district, the introduction of commercial ranching was followed by clearing of trees and thickets to make way for pasture. This scheme was supported by the World Bank and USAID. A high level leverage over the state machinery of the industrial groups has meant little control over many of their environmentally-unfriendly activities. Even when laws exist, they are not implemented. Moreover, given the important contribution of these industries to the national economy, the government has tended to appease them.

Secondly, the attempt to protect forests and other natural resources by establishing national parks or forest reserves has rarely produced desirable results. Seeing the experiences of the neighbouring countries, viz. Kenya and Tanzania, the successive governments in Uganda has sought to develop the network of protected areas to attract tourists and to earn foreign exchange earnings. The development of a dynamic tourist industry faces certain obstacles however: there is a general lack of suitable infrastructure, and continuing political instability. At the same time, Uganda has little unique in its natural endowment which would give it an advantage over its neighbours.

Meanwhile, little attention has been paid to the customary rights or survival imperatives of the local communities in establishing these protected areas. The result is constant conflict and rapid

resource degradation outside of the park such as pasture depletion and soil erosion. Some of those who have been evicted from the protected areas also 'encroach' forest areas which are less strictly protected, thereby causing further deforestation.

Thirdly, although the recent institutional measures emphasize the importance of environmental education, protection of forests and wetland areas, soil conservation, tree planting and so forth, these initiatives have not had much impact. Most of these projects are funded by external agencies of which the World Bank is a leading one. The World Bank has been funding a forestry rehabilitation project since 1987, together with co-financing from the EEC, DANIDA, UNDP and CARE. Although the project stresses the need to support farm forestry and the improved management of existing forest resources, a large part of the budget has been allocated to the rehabilitation of the Forestry Department, training of forest guards and other personnel, and the management of natural forests by the Forestry Department. Moreover, the establishment of eucalyptus plantations has remained the main component of the farm forestry activities. In Mbarara district, for example, where the project has been in place for a number of years, the main activity consists of establishing eucalyptus plantations- planted and managed exclusively by the Forestry Department. Given that eucalyptus remains an exotic species unknown to the area, land tenure is uncertain, and the market is volatile, local communities have been reluctant to plant eucalyptus on their own land (Personal communications and a visit in the area, 1991). Similarly, the government's environmental education programme has generally proved unpopular because it aims to make local people aware of forestry regulations, especially of the prohibition on bush-burning. This programme has been designed by the Forestry Department without any meaningful consultations with the local communities. In recent years, a few NGOs, such as CARE in the Kabale district, have attempted to seek more popular participation in natural resources management projects. However, most of their work has just begun and include the establishment of a few tree

nurseries. Local level wider subsistence needs do not seem to have been integrated into these activities.

External forces, too, have played little part in strengthening local livelihood opportunities. Agriculture and livestock raising are the two principal livelihood activities in rural areas. State policies and market uncertainties have influenced both sectors. The prospects of agricultural extension have been severely constrained as a result of the establishment of national parks and reserves in areas suitable for cultivation. In fact, as seen earlier, many rural social groups- principally the pastoral communities, have been displaced or their livelihood sources have been seriously disrupted as a result of these measures; small-scale livestock production has failed to make any progress, due also to the process of pasture degradation, water shortage, inadequate supply of improved breeds, and a limited domestic market. As far as the "intensification" of agriculture is concerned, production technologies remain primitive, research and extension are ineffective, and credit provisions - except for a few cash crops, are non-existent (FAO, 1985b). Furthermore, investment patterns and resource allocations favour export crops such as cotton, coffee, tobacco, and tea- and neglect the production of food crops (Furley, 1989:297-8). Peasants therefore are vulnerable to market prices. Limitations of the agriculture sector means little creation of wage employment. Minimum agricultural wages have even fallen in real terms (FAO, 1985b:14). The state, as well as external agencies, have rarely been engaged systematically in expanding the scope for rural employment and other aspects of basic needs provisioning. Part of the problem is that, the process of urbanization or Industrialization has remained very slow in the country, thus providing little employment opportunities. Evidence suggests that the urban sector has not been able to accommodate fully even the urban labour force, let alone provide extra jobs for rural migrants. This is demonstrated in the declining level of real wages and low purchasing power of labourers (FAO, 1985b:6).

Summary

The brief discussion above on external forces may be wrapped up by accentuating a few comparative ideas. The nature and level of external interventions in population dynamic has varied greatly between countries. In Costa Rica, population policies have evolved around the improvement in social welfare systems. In Pakistan, however, population policies have focused directly on birth control measures. In both countries, the state has long played an active role in seeking to implement their respective demographic policies and programmes. Yet, the end-results have been altogether different. In Costa Rica, population growth has rapidly declined, life expectancy has dramatically increased, and living conditions have in general improved. In Pakistan, no such positive demographic transition has taken place. Its population policies are clearly marked by their isolated, sectoral approach, whilst social structure and practices favour large households. The Ugandan experience, on the other hand, represents a total lack of a co-ordinated population policy. Despite having one of the world's highest fertility rates, successive governments have not seen the existing population structure as problematic vis a vis the productive resources available in the country. Furthermore, prolonged political turmoil, a stagnant economy, and retarded social welfare systems have meant the coherent and effective policies are hardly feasible.

Regarding the environment, the role of external agencies has generally been negative, producing many contradictory results in the process. The increased penetration of market forces has led to indiscriminate use or the deterioration of many natural resources. In all countries, the state on its part has generally been involved in the appropriation of local natural resources for the purpose of protection or alternative uses such as the creation of forest reserves or national parks. As a ramification of this process, such environmental problems as soil erosion, pasture degradation, and deforestation have frequently shifted to other locations- at times affecting greater areas than those brought under protection. Similarly, the institutional initiatives relating to the rehabilitation

of natural resource through soil conservation, tree planting, pasture regeneration, watershed protection, etc. have scarcely been effective. Many of these programmes have been too narrowly oriented towards nature conservation, whereas local level priorities have tended to be those of food security, shelter, employment, and attainment of other basic needs. Furthermore, from the point of view of the peasants, these environmental initiative demand extra labour and financial inputs, and they are unable to anticipate whether the results would be favourable or not. This has usually resulted in the lack of popular participation at the implementation phase, and many conservation schemes subsequently have lapsed or failed to bring about the intended results.

Increased state and market interventions in the livelihood improvement area have led to a higher level of development in infrastructure and opened up a few new avenues for income and employment. There are such examples as the promotion of export crops and cattle raising in Costa Rica and the Green Revolution in Pakistan's Punjab region. However, much of the gain has been uncertain, short-lived, and disproportionately distributed amongst rural social groups. In fact, poorer households have often paid a heavy price, as they are required to undergo price uncertainty, landlessness, and economic hardships. Similarly, recent conservation initiatives involving the state and many of the international development and conservation agencies have created increased tension in resource use, making some social groups very vulnerable such as the pastoral communities in Uganda. Priorities of conservation measures and local subsistence provisioning have greatly differed. One prominent case in point has been the increased expansion in the network of strictly protected areas, prohibiting local communities for crop production, livestock raising, and the periodic extraction of resources for other purposes. Institutional conservation measures have offered few or no viable alternatives to disruptions in livelihood systems. Likewise, as mentioned above, the resource rehabilitation measures such as soil preservation or tree planting have remained conservation-oriented and are not integrated with

long-term subsistence requirements. Most importantly, these measures have created little space for poorer and weaker groups to participate and reap benefits.

5
Conclusion

In this study, we have reviewed the experiences of three developing countries in the area of their population, environment and development strategies. Throughout the discussion, an effort has been made to present a 'total picture' of the demographic and environmental changes that have occurred, the relationships between population and environment, the local level adjustment practices, and the role and efforts of national and international bodies and other forces which have influenced demographic, environmental and developmental processes. Since the study has mainly restricted itself to the empirical material gathered in the case studies, the analysis which emerges has remained limited, and perhaps still too short for any definite conclusions. What essentially appears from the preceding observation is a complex picture of population dynamics, environmental changes, and development processes. In this chapter, these dimensions are synthesized to draw a few final deductions.

Population Dynamics: Social Provisioning More Important than Fertility Control Measures

The existing population structures in Costa Rica, Pakistan, and Uganda represented different extremes. In Costa Rica, fertility rates have been more than halved over the last twenty-five years (Table 2). The average life expectancy at birth has increased from 54.3 years in 1950 to 74.9 years in 1990 to the level of industrialized countries (Ramirez Solera and Maldonado Ullon, 1988:33). As a matter of fact, Costa Rica in 1990 had the same life expectancy rate as Luxembourg and higher than the one in

Austria (UNDP, 1992). During the late 1980s, some 63 percent of the rural families had access to healthcare, and the contraceptive usage rate was 70 percent. The spread of social consciousness over the population issue is such that even illiterate mothers utilize family planning methods to control the size of their families. The adult literacy rate has reached 93 percent, and the literacy level is the same for men and women (Table 2). This is also reflected in a significant level of female work participation. One study asserts that the high level force participation by women is one of the major causes of fertility decline in Costa Rica (Uthoff and Gonzales, 1985). By the year 2005, the country is expected to have a population growth of 1 percent per annum (World Bank 1992:271).

Pakistan's major demographic challenge is that whilst since 1950, the mortality rates have significantly gone down, the fertility rates remain more or less stable. In 1990, its fertility rates at 5.8 percent were not only the highest in South Asia, but also one of the highest in Asia (World Bank, ibid:270). This has led to a classic demographic situation of high rates of population growth. Yet, the country was one of the amongst developing countries to introduce family planning programmes. Available information suggests that family planning services, even when they are available, are not well-integrated with wider social provisioning requirements. Improved healthcare facilities, the supply of potable water, and sanitation are still non-existent in many parts of the rural areas. In 1990, the average literacy rate was 35 percent, but amongst women, it was only 21 percent (Table 2). As emphasized earlier in the context of different case study areas, women hold a very low social position and their work participation is one of the lowest in the world. Beside religious and cultural values, general economic impoverishment and vulnerability tends to reinforce higher and cultural values, general economic impoverishment and vulnerability tends to reinforce higher fertility rates.

In case of Uganda, fertility rates have even ascended. The only comfort that the country has is that the size of its population is

still small and available land resources are capable of supporting its present population. Land pressure is critical only in a few selected districts in the Mufumbiro mountain range in the Southwest, the Mount Elgon area in the east, and some areas of the lake Victoria crescent. In these areas, the existing standards of living have often declined. This is not purely due to demographic pressures however. Frequently, people have not been producing food crops. At the same time, low prices for their cash crops means that they have been unable to supplement their diet through purchase. The spread of AIDS, which is believed to affect as many as 11 percent of the population, or 1.9 million people (United Nation, 1992b), is also likely to influence the present as well as future population size and structure. The government has neither the capacity to cope with the AIDS epidemic, nor does it have well-coordinated population is literate, and the literacy rate amongst women is significantly lower than for men. The contraception usage rate is one of the lowest in the world. Despite a relatively high labour force participation (i.e. through access to land for cultivation), women hold a low social status and their economic position has often declined. Some authorities studying population dynamics in the Sub-Saharan Africa argue that this low social and economic position of women has in fact been the leading factor favouring large families (Boserup, 1985).

The central question arising here is, why has Costa Rica managed to reduce its fertility rates so successfully whilst Pakistan and Uganda have failed? It is clear that the key to Costa Rica's 'positive' demographic transition has been the improved economic conditions and social services for the majority of the population. The demographic policies themselves have played a secondary role in this process. As a matter of fact, the country has had no formal national population policy until 1968 (IUCN, 1989b:5), and the government has carried out no direct fertility control measures even after that date. The country has a relatively fair economic system by Central American standards. The national economy, particularly the agricultural sector, has remained dynamic, providing employment and income to a large number of

rural people, although this, too, has been somewhat unstable in recent years. Already by 1950, the rate of literacy was nearly 80 percent, and since then, the government has made significant investments in promoting free and compulsory education (Ramirez Solera and Maldonado Ulloa, 1988:32-4). There have been improvements also in the field of health and sanitation. Furthermore, the country has enjoyed remarkable political stability, allowing many of these aspects to be implemented on a long-term basis.

If one were to look carefully at the experiences of Pakistan and Uganda, the opposite has usually been the case. In the late 1980s, Pakistan spent only 2.6 and 0.2 percent of the GNP on education and health respectively, whilst Uganda spent 3.4 and 0.3 percent respectively (UNDP, 1992). Indeed, there has been a negligible increase in public investment in these sectors since 1965. In certain cases, it has even declined. For example, Pakistan allocated more of its budget to the health sector in 1965 than in 1989 (ibid). The country on the other hand has spent an increased proportion of its budget for military expenditure, amounting to 6.7 percent of the GDP in 1989 (ibid). Uganda represents a similar experience regarding the resource flow imbalances between the military and social sectors, although precise data are lacking.

From the empirical base that we have, it seems fair to suggest that the demographic transition characterized by high life expectancy, improved quality of life, and declining fertility rates depends mainly upon the opportunities for employment and income. This livelihood security requires to be linked with access to education, health, and other social services. These opportunities need to be accessible particularly to women and the poor. An integrated population policy is useful, but it needs to be accompanied with an increased investment in both human and economic sectors. This also depends upon whether these measures generate popular interest and participation. As one specialist rightly articulates, "a population programme without popular-based development is like

trying to mop up the floor with the water turned on" (Barraclough, 1992:212).

The Evolving Nature of Environmental Degradation

Deforestation and soil erosion have been the most prevalent environment problem in all three countries. In Costa Rica, deforestation is the direct result of a substantial land clearing for pasture and export crops. The land area under forests in the country diminished from about 75 to 20 percent between 1940 and the mid-1980s (Silliman, 1981; Chacon et al, 1990). This rapid deforestation has led not only to the loss of wildlife and their habitat, but is also associated with the degradation has led not only to the loss of wildlife and their habitat, but is also associated with the degradation of watershed areas. The land use change from forests or long-fallow swidden cultivation to permanent export crops or cattle ranching has especially intensified soil erosion. Export crops such as tobacco, coffee and banana require no bunds or terraces. Tobacco and bananas are grown in cleared areas, and the new varieties of coffees need no tree cover. The production and processing of export crops are usually associated with an intense application of agro-chemical, which tend to pollute both soil and water. The growth in cattle grazing on the other hand has resulted in an increased level of soil compactation, as well as soil erosion through increased exposure to wind and rain.

Pakistan has one of the lowest forest coverage in the world. The remaining forests, from mangroves to high-altitude forests, are under intense pressure from local populations, urban consumers, and industries alike. The mangrove forests are also affected by the construction of large-scale barrages on the river Indus, leading to the reduction in the supply of fresh water, silt deposition, and changes in soil texture. Beside the degradation of mangroves, the coastal area villages confront such environmental problems as

over-fishing, shortage of potable water, and waste disposal. In the Northern villages, deforestation, pasture degradation, and soil erosion have been the pre-eminent environmental issues. In the Punjab area, whilst most of the environmental issues mentioned above existed, new environmental problems such as salinity and waterlogging have emerged as a result of rapid modernization in agriculture- especially the expansion of irrigation networks.
In Uganda too, deforestation has been a widespread phenomenon. Local needs for agriculture and fuelwood, combined with urban timber and charcoal demands have been the main causes of deforestation. Forests are also degraded due to frequent bushfires and reduced fallow periods. The degradation of rangeland is another related problem. The decline in forests or vegetation has caused a severe soil erosion problem, especially in the semi-arid areas. Soil erosion is a serious issue in the mountain areas, too, resulting from the combination of steep terrain, damages of upstream watershed areas, and the lack of proper terracing and bunding. Draining of wetland areas for cattle breeding, cultivation and brick making has been another environmental issue. Industrial damage to soil and water- especially in and around lake Victoria, has also emerged as an important environmental problem.

As has been noted in chapter two, population expansion is only one of many factors behind environmental degradation. In densely populated areas such as the Northern villages in Pakistan or Uganda's Kabale and Mbale districts a lower demographic density might have lessened pressure on the existing natural resources. However, where production technologies remain primitive and labour is in short supply, "extensification" of production activities are necessary, thereby giving incentives to employ more forest, pasture, or land areas for production. Also, achieving a low population would not necessarily imply that existing resources would be equitably distributed, or managed sustainably.

What appears especially important in most case study areas, are the roles played by market forces and state institutions. The

research findings suggests that where market forces have been powerful, natural resources are rampantly used or over-exploited; logging, clearance of forests for commercial cattle ranching and export crops, over-fishing and mining are all examples of such as contamination of soil and water by agro-chemicals and industrial wastes- at times involving highly toxic substances. What is most notable is that, one could not find a single instance where market forces have played a positive role in managing natural resources sustainably in the case study areas.

As for the state, increasing official intervention in the rural environment has emerged from specific development styles and strategies pursued by these countries, which have usually been strongly influenced by market forces. For example, Costa Rica's "agro-export" development strategies have been intimately tied with the interests of local markets and international trade opportunities. Similarly, the Pakistani state's attempts to introduce the Green Revolution or Uganda's promotion of cash crops and commercial cattle ranching have not been independent of market forces. State policies have directly been responsible for certain environmental problems such as forest clearance for agriculture and pasture in Costa Rica, salination and waterlogging in Pakistan, and the clearing of trees and thickets to establish commercial ranching in the Mbarara district in Uganda. However, the indirect impact of policy measures, too, has been destructive to the environment, e.g. the provisions of credits and subsidies for agriculture, logging, and cattle ranching.

A number of institutional conservation initiatives have run parallel to the negative environmental processes observed above. Numerous environmental laws have been coded. Considerable stretches of natural resources have been brought under direct state jurisdiction with the intention of halting the perceived "free access" situation. Various programmes and projects have been implemented to rehabilitate natural resources, including soil conservation, pasture regeneration, tree planting, and watershed management. However, the long-term success of these initiatives have been rare. The protection and regeneration of natural resources can scarcely be achieved merely through legal or

policing measures. The attempts to bring natural resources under state jurisdiction such as by creating national parks or forest reserves have usually meant growing institutional appropriation of local resources. Most "in-settlement" conservation programmes have remained piecemeal, and have not been followed through until they produce some results. More importantly, the majority of these programmes have been restricted to conservation goals, failing to address the wider livelihood requirements at the local level.

Precarious Livelihoods

One important objective of the present study has been to examine if local livelihood conditions have been improved as a result of the type and scale of development strategies that have been implemented in these countries. We saw above how livelihood systems have been affected by the recent institutional conservation strategies; resources have been taken over; restrictions have been imposed on customary resource use; and "in-settlement" conservation programmes have not been coordinated with basic needs. The impact of general agricultural and rural development strategies on livelihood provisioning may be referred to here, briefly, in order to provide an integral picture.

It is evident that past government rural development strategies have led to an improvement in schooling, healthcare, and the physical infrastructure in all the three countries, with the exception of Uganda during the period of civil war and political disorder. There has also been a certain amelioration in agrarian technologies and production systems such as the introduction of new crops, improved varieties of seeds, chemical fertilizers, and modern irrigation systems. These developments have sometimes opened up new ways for income generation, employment, and social mobility. However, these processes in general have rarely been an instrument of economic security and sustained social progress for the majority of rural dwellers.

In Costa Rica, the process of agricultural modernization has inserted peasants and rural communities into the market economy, but peasants hold little leverage over market forces. Although the production of cash crops such as tobacco, coffee and bananas, or cattle ranching has opened up a few new prospects for additional income and employment within rural areas, the gains have generally been temporary, and have accrued mainly to the richer elements of the society. The economic and social vulnerability of peasants at times has even increased, such as the dispossession of their land by large estate owners and cattle ranchers.

Many similar process have been experienced in Pakistan. In the coastal villages, the increased penetration of market forces and dependence upon middlemen for credit an employment has undermined not only community cohesion and the customary forms of resource management, but has also affected the whole range of subsistence provisioning activities which is based on fishing. In the Northern villages, the outside income of large number of people is derived from remittances. In the Punjab, although there has been some positive impact of the Green Revolution on agricultural productivity and the creation of wage employment, the benefits from it has not been proportionately distributed across the tenure groups. Indeed, there has been a rapid decrease in the sharecropping practice and more peasants have joined the ranks of the landless.

In Uganda, there has been a disintegration of many basic facilities for many years. Over the past decade, the repairs or constructions of schools, dispensaries and roads have fallen on the shoulders of the peasantry, frequently involving mandatory corvee labour and cash contributions (Mandani, 1987). A country with a favourable land-man ratio and fertile soil is increasingly experiencing poverty and malnutrition. The "extensification" of agriculture is curtailed by the government's new conservation strategy, whilst "intensification" remains limited and focuses on cash crops-thereby exposing peasants to market forces and price uncertainties. The main dilemma is that the agricultural sector has failed to generate wage employment. In addition, the industrial or

urban sector has remained altogether stagnant, incapable of producing wage employment even for the urban labour force.

Final Remarks

One important recapitulation from this study is the need for a more careful look at the linkage are interrelated in an extremely complicated manner, frequently differing from one context to understanding.

With regards to the environmental changes, all the three countries have faced many common as well as unique environmental problems. Degradation of forests, pasture areas, soil, and watersheds have been the main prevailing problems. However, there are also country-specific environmental issues that have become increasingly serious such as waterlogging and salinity in Pakistan's Punjab region, contamination of soil and water by agro-chemicals in the Pacific zone of Costa Rica, and draining and contamination of wetland areas in the lake Victoria region in Uganda.

These environmental problems have emanated as a result of a combined impact of many socio-economic, political, demographic, as well as ecological processes. Reducing all the emerging environmental issues to population dynamics is unhelpful. Except in a few study villages in Pakistan and Uganda where rising population growth or density has been an "exacerbating factor", demographic dynamics have not generally been a determinant factor. Indeed, the Costa Rican case studies have indicated that rapid environmental degradation such as deforestation and soil erosion can occur without having a high population density. This is also consistent in the semi-arid Mbarara district with one of the lowest levels of population density, where environmental problems include deforestation, pasture degradation, and soil erosion- involving even gully erosions.

Peasants and local communities have made various attempts to accommodate not only to the environmental changes but also with

population levels and livelihoods. People have generally been well-informed about the scale and the impact of such environmental problems as deforestation and soil erosion in their locations, as well as the need for tree planting, soil conservation, forest protection, etc., Yet, these environmental concerns have rarely been put into practice, especially at the level required to maintain the ecological balance and quality of production systems.

The adjustment process regarding population changes differed between Costa Rica and Pakistan and Uganda. In the former country, the main demographic strategy has been to lower fertility, whilst in the latter ones, it has revolved around having large families as a safety-net against livelihood insecurity. Out-migration has however been a common demographic action in all the three countries.

With respect to the modifications in livelihood strategy, where feasible, peasants have sought to bring additional land under cultivation. They have also intensified household labour to increase production. For this purpose, many peasants have remained receptive to modern agrarian technologies and practices. One dominant way of coping with this situation has been the searching of wage employment in agriculture or outside. People have also out-migrated to new locations more congenial to employment, income, and family welfare. However, despite all these efforts, ensuring a stable livelihood has become progressively more difficult for many rural households.

Whilst local level responses to population levels, resources, and livelihood have generally been more of "reactions" than "actions", changing or ameliorating these parameters through policy measures have had little success either. Many of the rural social, economic, and ecological problems have been seen primarily from the demographic angle, in which the assumption has been that growing population has not only caused increased environmental degradation, but also frustrated economic development. Even in Costa Rica, which has generally

emphasized social provisioning rather than direct birth control measures, the dominant tendency has been to consider the present population structure more of a burden to the investments in health, education, housing, energy and employment, and one of the main causes of environmental deterioration (CEAP/NF, 1991: Ramirez Solera and Maldonado Ulloa, 1988). Pakistan's population policies directly revolve around birth control measures, whilst Uganda has yet to have a coordinated population policy. In all the three countries, population is viewed primarily as a problem. The implication of neglecting the human resource, which comprises, amongst others, labour power, skills, knowledge, and creativity, is that no long-term social and economic progress can be achieved. This also dismisses the peoples' ability to assess their own demographic behaviour or resource use patterns.

Institutional involvement has also failed to tackle the processes of environmental degradation or to manage the remaining natural resources more sustainably. Most conservation initiatives have been unrealistic from the standpoint of local social, economic and cultural relationships and constraints. In fact, when looked at carefully, even the experience of Costa Rica, which is often cited as a "successful" environmental conservation case in developing countries is found full of contradictions. As discussed in the preceding chapter, most conservation programmes in the country has been initiated by "outsiders", with little understanding of peasants' livelihood concerns. These programmes have therefore attained a low level of popular participation. At the same time, the creation of strictly protected areas strongly contradicts the local survival interests and generates social conflicts. There is therefore a total absence of local participation in these initiatives. In general, there is a large gap between what is proposed in these conservation measures, and what is actually realized. The experiences of Pakistan and Uganda on the other hand are definitely more discouraging.

Similarly, the development strategies experienced in these countries have scarcely brought about livelihood security or self-reliance. Indeed, increased social and economic vulnerability has

become a daily experience of the majority of the rural dwellers. It is no secret that a precarious economic existence would lead people to rely greatly on surrounding resources, at times causing severe degradation. It is easy to say to people about how and to what extent natural resources should be protected; but mandates are worthless if they cannot be enforced because no better alternatives are provided to the affected populations.

From the preceding remarks it is evident that the government policies and actions in Costa Rica, Pakistan and Uganda do not reflect and adequate understanding of the interrelationships between population dynamics, environmental changes, and development processes. Extremely complex concepts, questions, and processes are interpreted in an extremely simplified fashion. The results is that the states and international development agencies have frequently tended to limit themselves to easy or immediate issues such as birth control or the establishment of strictly protected areas, and failed to address wider basic needs and social development issues. The gist of research findings is that the environment-population nexus is more complex than a simple deduction that "more people cause more environmental degradation". The foremost aspect is not the "sheer numbers" of people, but rather how these people act within a given socio-economic and ecological context, and their interactions with the wider society. Neither the "contraception/family planning routs", nor the "conservation route" is sufficient to address recurrent demographic dynamics and environmental degradation.

What is also required for any effective policy action is to have the "balance right". The role of the state and aid agencies has so far been rather overwhelming in most case study areas. A successful management of local human and natural resources can scarcely be achieved though the actions of external and distantly located authorities. Outside development agencies can sometimes play a positive role in promoting sustainable social and environmental development, but this role cannot be expected to be anything more than a "catalyzing" one. Indeed, growing institutional intervention has only produced indifference and apathy at the

local level. Individuals and communities now look increasingly to government and aid agencies to resolve problems instead of drawing on their resources, skills, and energies. The need therefore is to revive, not undermine, the traditional forms of collective decision making, and responsibility-sharing practices. Without active local participation and initiative, government development strategies would bear little fruit- even when the inter linkages and complexities between population, environment, and economy are taken into account and integrated in the planning process.

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