INTRODUCTION

Problem

Poverty is a growing phenomenon in most areas of Nepal, especially in the hill and mountain regions. Negative impacts on agricultural productivity and loss in the quality and quantity of forests have, therefore, direct implications for the well-being of rural households who depend on these two primary resources for their sustenance. Throughout Nepal, serious environmental problems have already emerged. These environmental problems are particularly noticeable in the country-wide unprecedented degradation and depletion of forest resources. Forests provide large quantities of fuelwood and fodder resources to households. Over time, population growth rates in the country have increased, along with demand for these forest resources, at similar rates. Poor management of forests, primarily public forests, as well as laxity in the use of fuelwood and fodder for livestock have reduced the forest stock. Other reasons for the depletion of forests are related to the pre-1950 policies of the Government which encouraged deforestation. Since forest lands play an important role in maintaining agricultural productivity, loss in the quality and quantity of forest resources is believed to have had negative effects on agricultural productivity as well (Wyatt-Smith 1982).

Over time, the depletion of natural resources has resulted in food shortage among households, and this is perhaps the harshest problem. The food deficit problem faced by households has become an annual phenomenon, especially among small and marginal farmers who constitute the bulk of farm households. Given their inability to produce sufficient food to sustain themselves and their families throughout the year on the very small plots of land that they possess, coupled with the lack of off-farm employment opportunities, these farmers are forced to borrow at high interest rates from informal sources, thereby worsening their economic situtation with every passing year. The vicious cycle begins with the leakage of income on interest payments, leading to larger loan gaps, and eventually to a progressive disaccumulation of assets. As a result, a large number of small and marginal farmers is increasingly becoming marginalised and is forced to adopt unsustainable practices (e.g., cultivation on steep slopes). Marginalisation is most often characterised by a household slipping into tenancy and then attempting to make up for the loss in production by employment in the non-farm sector. Historically, a hill farmer's response to food deficit has tended to be outmigration, but this has its own limits.

Migration occurs largely as a result of marginalisation of households in its area of origin. Usually, the first attempt to escape from the marginalisation process is to search for off-farm employment opportunities, which are seldom available in the rural areas. If and when available, the very low returns from off-farm work worsens the economic status of the households. Money earned throughout the year is mostly used for consumption, meeting natural calamities and distress, and for religious expenses. This situation, therefore, increases the possibility of households' alienation from their productive assets (Banskota and Sharma 1993). Lacking alternatives, these households (without sufficient food to sustain themselves and their families throughout the year) can hardly withstand the economic stress without mortgaging and then selling their productive assets, e.g., land. Therefore, food deficits and poverty are closely related and further interlinked with the quality and quantity of land and forest resources on which households depend. Agriculture and forest development can therefore be seen as crucial factors for improving the rural economy and weaning it away from poverty and environmental degradation. Given the dependency of the rural areas on these sectors, it is obvious that further deterioration in the productive levels of these sectors will exacerbate poverty.

The food and energy needs of the rural population in Nepal are increasing along with the population. The rural economy is based primarily on the extraction of food and energy from renewable natural resources such as land, forests, pastures, and water. Complex interactions take place in the extraction of food and energy from these resources. Food and energy are becoming more difficult to extract due to the degradation and depletion of renewable resources. Thus, a solution to the food and energy problem requires a proper understanding of the interaction and interdependence, and it is a necessary precondition for the attainment of environmentally and ecologically sound development (World Bank 1992 and WCED, 1987).

Issues

The greatest challenge facing developing countries with poor natural resource bases and rapidly increasing populations, e.g., Nepal, is sustainable development. The term sustainable development is used to define an economic growth process that is environmentally sound, so that at any given time the process of economic growth does not result in degradation of natural resources. Natural resources are those resources that, when used, entail an opportunity cost, and they include air, water, forests, land, and genetic diversity of flora and fauna. Sustainable development is a challenge not only to developing countries but also to developed countries; their challenges are greater in the sense that resources to meet these challenges are limited. In the past, the issue of sustainable development failed to focus on the environmental aspect, primarily because economic policies and programmes did not assess the total cost of natural resources. Since costs of such

resources were not adequately taken into account, the true scarcity value of such resources was never reflected in the process of economic development. As a result, overexploitation of resources has gradually led to their degradation and depletion.

Thus, promoting environmentally sustainable development is one of the major issues facing the developing world today. Sound management of the environment and the natural resource base has become a vital prerequisite, not an obstacle, to sustainable development. Development policy-makers have begun to realise that failing to take the costs of environmental damage into account will prove to be inefficient and often ineffectual in raising the income as well as the well-being of the large numbers of people that depend on these resources. Development and environment are interrelated and in many cases reinforce each other (World Bank 1992; WCED 1987; Nijkamp, Bergh, and Soeteman 1990).

While there is a strong agreement at conceptual level regarding the need to integrate developmental and environmental policies, a large gap exists between rhetoric and practice. This gap arises primarily because of the scarcity of resources, the diversity and magnitude of the problems in terms of space (spatial dimension) and time (short-term versus long-term), and conflicting objectives between different sectors and institutions of the economy. In addition, the gap has further widened due to a poor information base, and information is crucial for understanding the dimensions of the problems and monitoring the environmental effects, let alone advocating remedies. The lack of a strong information base results in the belief that economic growth and environmentally sustainable development are not compatible. In the case of Nepal, many examples that tend to reinforce this belief can be cited. For example, some studies have shown that increasing fertiliser use tends to reduce the dependency of livestock on forests for fodder. If this contention can be unambiguously proved in other parts of nepal, then encouraging higher fertiliser use appears to be rational in terms of saving a portion of the forest cover. However, if the other issues regarding the use of chemical fertiliser are examined, then soil acidification over time has been identified by some studies as a problem. In addition, encouraging higher fertiliser use perhaps entails larger subsidies, and the subsidy policy is not acceptable for various reasons. From an environmental and growth point of view, this cannot be readily resolved, primarily because our existing information base is weak, incomplete, and not representative. Excluding the equity aspects of the fertiliser policy, there is no guarantee that higher fertiliser use will reduce the pressure on the forests of Nepal.

The rural population is often attracted to urban areas, perhaps by the relatively higher economic growth in urban areas, i.e., the pull factor. The motivation for migration also stems from the growing hardships in rural areas where the incidence and magnitude of poverty are increasing, i.e., the push factor. Migration from the

hills and mountains of Nepal to urban areas and the *terai* has been going on for quite some time, and the magnitude of migration is considerable. Whether migration has had any positive impact on the migrants' place of origin and what impacts it has had on the place of destination are unknown. Clearly, the issues and conflicts resulting from different policy options need to be identified and better understood. In addition, the tradeoffs that have to be made by not taking any action should be clear, since taking action may now, when problems have just begun to manifest themselves, be economically more cost-effective from a long-term point of view.

Closing this gap requires a substantial shift in policies and priorities through proper identification of sustainable development options, and this entails (a) a proper understanding of the physical, biological, and social impacts of environmental damage; (b) a sound estimate of the economic value of environmental damage and design of policies and projects to arrive at environmentally- sound investment decisions; and (c) development of policy tools to implement viable strategies and manage natural resources on a sustainable basis.

Given the complex interdependencies and the dimension of the problems, improving the environmental and economic situation (poverty) calls for a holistic and integrated multisectoral approach. Since there are both positive and negative links between development and environment, identifying the underlying causes of environmental damage and poverty involves both harnessing the positive links as well as minimising the negative ones. A broad set of policies that can promote positive links between development and environment includes: (a) abolishing policies that foster excessive resource use; (b) clarifying property rights; (c) accelerating educational and population control programmes; and (d) promoting agricultural research and extension programmes. While it must be ensured that policies and programmes to harness the positive links do not affect growth, curbing other forms of environmental damage resulting from greater economic activities (i.e., negative consequences of development) does require certain tradeoffs, at least in the short-term. It is therefore essential that these tradeoffs are identified, the costs and benefits of alternative policies assessed, priorities and standards set, and that cost-effective policies to counter market and policy failures become vital elements in accelerating development in an environmentally responsible manner.

Objectives of the Study

The general objective of the study is to develop a systematic framework to integrate and analyse the economic and natural resources and environmental sectors of the study area in order to address some of the issues that have been discussed above. It is hoped that such a framework will also aid district planners to understand more fully the complexity of an apparently simple district economy in a simplified manner,

thereby ensuring that priorities are set according to the resource constraints faced by them.

The specific objectives of the study are as follow:

- to integrate the major economic and environmental sectors of the districts;
- to develop a systematic framework for assessing the effects of alternative policies on the economy;
- to forecast the demand and supply of major food and non-food resources;
- to develop some environmental indicators;
- to examine the time paths of resource consumption and supply and their implications for the environment under the *status quo* situation;
- to simulate the *status quo* or baseline situation by providing policy shocks;
- to carry out an evaluation of the policy shocks; and
- to provide recommendations based on the results.

Limitations

The adaptive policy simulation (APS) model (or a multi-market simulation model) developed for the purpose of integrating economic and environmental linkages is based primarily on secondary data and parameters available from different sources. Lack of adequate parameters on various economic and environmental activities have made it difficult to incorporate more sectors. Given the poor information base, a study of this kind cannot be considered as an in depth study of a district's economy and environment. Therefore, this study should be viewed as providing general guidelines for policy action. Interdistrict (or regional) movements of goods and services, including the migratory trend, have not been incorporated in the present exercise owing to the lack of information. Furthermore, income generated by the model is based on the major economic activities for which aggregate district level information is available. Income from commercialised agricultural activities, e.g., vegetable production in some districts (e.g., Dhading) has not been incorporated due to the paucity of such information. Similarly, remittances (which are also one of the major sources of income, especially in the hills) are also not included. Thus, the results on income may be slightly downward-biased in this study. In addition, due to the lack of parameters as well as the relationship between important variables, information has been borrowed from many sources which are identified in appropriate places and these parameters may not fully reflect local conditions. Regarding the functional relationships that are crucial to the model, relationships have been improvised based on intuition, experiences gathered from other studies, and experts' opinions.

Area Covered by the Study

This study covered five rural districts of the Bagmati Zone. These five districts include Kabhrepalanchok, Sindhupalchok, Rasuwa, Dhading, and Nuwakot. Small urban centres are located within some of these districts. In the present study the urban areas in the rural districts have not been taken into account separately, since they are too small and information on urban centres is not available.

Time Frame

The starting year for the study is generally 1991. However, the starting year to develop the baseline varies across sectors, depending on the historical data series available. In the case of the land use sector, information is available for only 1978 (Land Resource Mapping Project, LRMP). Thus, for land use, the LRMP data were used and linkages developed. The changes over time were forecasted using a sub-model. The results from 1991 were used in the main model. In other sectors, relationships were drawn from the data series available (some of which start in 1974 and others much later). The Multi-Purpose Household Budget Survey Report proved to be useful in filling information gaps. All the information based on cross-sectional studies was updated to 1991. Details are explained in the respective sections. The base year for the model is 1991 and the time-frame is up to 1998 to coincide with the end of the Eighth Five-Year Plan Period (1993-1998). In the case of Dhading district, the time-frame has been extended to 2005, primarily to highlight the role of certain policies whose impacts have a long gestation period.

Organisation of the Study

The conceptual framework and methodology employed for the study are given in Chapter 2. The usefulness of the multi-market or the APS model and its detailed specification encompassing different sectors are elaborated along with the policy evaluation framework. Chapter 3 to Chapter 7 contain the results and analysis of the APS model applied in the five districts selected for study. Chapter 8 contains the conclusion.