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**ECONOMIC AND NATURAL RESOURCE CONDITIONS  
IN KATHMANDU VALLEY**

**Kamal Banskota  
and  
Bikash Sharma**

**ADPI Series No. 1**

**September 1993**

**International Centre for Integrated Mountain Development**

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# ECONOMIC AND NATURAL RESOURCE CONDITIONS IN KATHMANDU VALLEY

**Kamal Banskota**  
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*ADPI Series No. 1*

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International Centre for Integrated Mountain Development (ICIMOD)

Kathmandu, Nepal

## PREFACE

This discussion paper, **Economic and Natural Resource Conditions in Kathmandu Valley**, is the first in the Area Development Planning and Implementation Series of ICIMOD.

This series was introduced following an exercise undertaken by ICIMOD in integrated development planning.

Integrated area development planning and its implementation offers a systematic approach to the promotion of mountain development. Development programmes must find practical methods that reconcile the conflicts between increased productivity and environmental sustainability.

At the request of the National Planning Commission, HMG/Nepal, ICIMOD undertook the task of preparing an integrated economic and environmental development plan for the Bagmati Zone of Nepal. This paper is part of the series evolving from that planning exercise.

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## CHAPTER I

### INTRODUCTION AND METHODOLOGY

#### Introduction

Kathmandu is comprised of three districts, namely, Kathmandu, Lalitpur, and Bhaktapur. Each of these districts contains a small urban conglomerate and a large rural sector. For the purpose of the study the valley was divided into an aggregate urban area and an aggregate rural area. Various important sectors of the rural valley were integrated and analysed according to methods used for other districts of the Bagmati Zone (ICIMOD 1993).

However, the urban sector could not be analysed as exhaustively as the other districts, primarily because of the lack of information and parameters. The urban sector is far more complex than the rural districts. It has large manufacturing, trade, service, and tourism sectors as well as a relatively large private sector. These sectors as well as other sectors of the urban economy interact with one another to determine the level of income and employment. However, an information base for the valley's urban area is simply not available, primarily because, so far, there has been no institution responsible for collecting data related to the urban sector on a systematic basis. As a result the modelling exercise conducted for the urban valley was limited to certain key sectors only.

This paper is divided into two chapters. The first chapter describes the methodology used. A larger part of the methodology dealing with the rural valley is described in Volume I of the Bagmati Study (ICIMOD 1993). Chapter Two presents results of the analysis of the baseline conditions of the valley. Three different sectoral studies, namely, on the manufacturing sector's energy consumption, its performance, and on tourism, have also been published as discussion papers in this series.

#### *Variables and Linkages of Model Prices*

Volume I, Chapter 2 of the Bagmati study (ICIMOD 1993) describes how agricultural commodities, livestock products, and several input prices are forecasted. These forecasted prices have been calibrated to match price trends in the Kathmandu Valley using more recent information.

Several new price series have also been forecasted to develop a model for the urban sector of the valley. These new price series include energy prices, namely, firewood, kerosene, diesel, petrol, electricity, and aviation fuel. The method of forecasting prices is also based on simple time trends, which are based on information from the Economic Survey of the Bagmati Zone (ICIMOD 1993).

Electricity prices are forecasted for the domestic and commercial sectors. The growth rates of electricity tariffs in the domestic and commercial sectors were obtained from a recent report (WECS 1992) and are 12 and 16 per cent respectively. The aviation fuel price is assumed to increase at seven per cent per year.

#### *Population*

The population of the Kathmandu Valley is divided into rural and urban population. The base data obtained are from the National Planning Commission (NPC 1992). The population forecasts were first made for each age group (5-year age intervals) by gender and later aggregated to arrive at total, school going, and active population.

## *Land Use and the Forestry Sector*

The land use and forestry sector data reported by the Land Resources' Mapping Project (LRMP) have also been updated for the valley and the supply and demand for forest products, namely, fuelwood, timber, and fodder are also calculated in the same manner as described in Volume I of the Bagmati study (ICIMOD 1993).

### *Agriculture*

Agriculture as an economic activity is assumed to be confined primarily to rural areas in the present exercise. Due to the paucity of information on crops that have become important in the more recent history of the Kathmandu Valley, we have included six crops in our examination of the agricultural sector of the valley. These crops are paddy, maize, wheat, millet, oilseed, and potatoes. The area cultivated with these crops, their yields, cultivation costs, and gross margins are projected using similar methods to those described in Volume I of the Bagmati study (ICIMOD 1993).

### *Livestock*

Livestock raising is assumed to be an entirely rural activity and the manner in which this activity is treated is akin to that reported in Volume I of the Bagmati Study (ICIMOD 1993). Inside the valley, livestock are not used for ploughing and hence this activity is not included as an input in the crop yield function.

### *Food Availability*

Food availability is estimated using domestic production, i.e., the valley's production. The method of calculating food availability is discussed in Volume I of the Bagmati study (ICIMOD 1993). Milling rates, seed losses, and other allowances are assumed to be the same rates as discussed for the other districts covered in the Bagmati study. Note that we have not been able to include the food production from agricultural land inside the urban enclave. However, the food supply from urban agricultural lands may not have a significant impact on the valley's food supply, especially cereals.

### *Food Demand*

Food demand includes demand for cereals, milk, meats, oils, fats, and vegetables, and this is assumed to be influenced by relative prices and incomes. Urban households are assumed to face a different demand structure than that of rural households. The demand system parameters estimated for high income households by Mudhbery (1988) are used in the case of urban households.

### *Imports*

Food import in the valley is determined endogenously by the model described in Volume I of the Bagmati study (ICIMOD 1993). Estimates of the magnitude of imports into the valley are also made. For food, an aggregate (rural + urban) estimate is made. As in other districts of the Bagmati Zone, food imports into the valley are assumed to be determined by the volume of food deficit ( i.e., difference between projected rural and urban food demand and total food production within the valley).

In addition, the values of non-food imports are also derived. Two types of non-food estimate are made, namely, non-food imports that originate from India and those which originate from the Rest of the World (ROW). The non-food import structure is assumed to differ in the rural and urban areas. This fact is

reflected in the different assumptions of income elasticity of demand for non-food and the population growth in the regions. The demand for non-food product imports in both rural and urban areas is assumed to be elastic. Engel's law states that income elasticity of demand for a luxury is generally elastic, i.e., the demand for a luxury is very sensitive to changes in income. Thus, we assume that non-food imports are luxuries and, further, that imports originating from the ROW are relatively more luxurious than imports originating from India. Further, the sensitivity of imports is assumed to be greater in urban areas than in rural areas following Engel's law.

The values assumed for the import elasticities for Nepal are not available to our knowledge. We have assumed different values for non-food demand elasticities originating from India and the ROW and separate values for rural and urban Kathmandu. These are reported in Table 1.1. The rationale for assuming these values is guided by estimates of such values derived for India and Pakistan.

The base year values for imports from India and the ROW for rural and urban areas are based on the NRB estimates reported in the Multi-Purpose Household Budget Survey (NRB 1988). The survey reports monthly expenditure per household on imports from India and the ROW for food as well as non-food items. For rural areas, the estimates for the rural hills are scaled upwards by a factor of 1.25. Similarly, for the valley's urban areas, expenditure on imports reported for the Urban Hills has been scaled upwards by a factor of 1.40 to reflect the higher levels of expenditure in the Kathmandu Valley; this is also reflected in the Multi-Purpose Household Survey estimates. Since the estimates reported in the Survey are for 1984, the resulting values are further scaled upwards by a factor of 1.1449 to take into account the inflation rate for 1985 and 1986. These adjustments give the base year estimates (1986) on per household annual imports (Table 1.2).

**Table 1.1: Income Elasticity of Demand for Non-food Imports: Kathmandu Valley**

Elasticity	India	ROW
Rural	1.15	1.10
Urban	1.50	2.00

**Table 1. 2: Expenditure per Household on Non-food Imports: Kathmandu Valley**

Rs/Household	India	ROW
Rural	1,436	8,870
Urban	1,931	2,562

### **Energy Demand in the Kathmandu Valley**

In the Kathmandu Valley, energy is assumed to be demanded by urban households and by the manufacturing and transport sectors. The energy demand for rural households is primarily fuelwood and is discussed separately.

The types of energy demanded by urban households are fuelwood, kerosene, and electricity. The manufacturing sector demands fuelwood, coal, diesel, kerosene, and electricity. The transport sector demands petrol, diesel, electricity, and aviation fuel.

## Energy Demand: Household Sector

### Rural

Firewood is the chief energy source used by rural households for domestic purposes. The demand for firewood in rural areas is assumed to be driven by the population. Firewood demand projections in rural areas are based on the method described in Volume 1 of the Bagmati study (ICIMOD 1993). As with firewood demand projection, timber and fodder demands are projected using methods similar to those described in Volume 1 of the Bagmati study (ICIMOD 1993).

### Urban

Urban households primarily consume three different types of energy, namely, firewood, kerosene, and electricity. Demand for these three different types of fuel is assumed to be influenced by the population growth, population elasticity, income growth, and income elasticity of demand for each energy type.

Firewood demand in the base year is assumed to be 220 kg/person in urban areas (APROSC 1983). The demand parameters used in projecting firewood demand are based on a study conducted by APROSC in 1983. In this study, six urban areas are considered. These include Kathmandu, Lalitpur, and Bhaktapur. The estimated demand parameters of the three districts of the valley indicate that the demand parameters for Lalitpur are about at average for the three districts. We have, therefore, used Lalitpur's firewood demand parameters to represent the valley's urban firewood demand. The functional relationship used is:

$$\text{Demand} = \text{Demand in base year} * \{(1 + \text{UPG})^n * (1 + \text{UIG})^e\}$$

where,

Demand	=	per capita demand
UPG	=	urban population growth
UIG	=	urban income growth
n	=	firewood demand elasticity with respect to population growth, and
e	=	income elasticity of firewood demand.

The resulting figure is then multiplied by the population figures to arrive at the total firewood demand. Similar methods were used to project demands for kerosene and electricity. The income elasticity of demand for firewood (0.2) is based on the APROSC (1983) study. Income elasticities for kerosene and electricity are estimated from the information reported in Sharma's study (1988, Table 2.4) and are 0.309 and 0.688 respectively. The population elasticity is assumed to be the same for all three fuel types and is assumed to be 0.0397 (APROSC 1983). Thus, over time, as urban population growth and income growth change the demand for energy by urban households also changes, depending upon the strength of income and population elasticity.

It is reasonable to assume that, over time, as per capita or household incomes increase, households will substitute other types of fuel for firewood. Also, not all households consume all three energy types in the urban area and this fact has to be accounted for in evaluating energy demands. To capture this fact we have used APROSC (1983) and Sharma's (1988) estimates of the percentage of population in the urban area consuming electricity, kerosene, and firewood and changes that have occurred between this period. Annual growth rates are then derived and incorporated into the projections in order to capture changes in energy demand by households over time. It should be noted that, in the Kathmandu Valley, especially in the urban area, cooking gas is also becoming an increasingly important source of household energy, albeit for a small sector of the population. We have not taken this energy type into account.

## Energy Demand: Manufacturing Sector

A detailed study of the manufacturing sector's energy demand was conducted for this present study and is available in Volume I of the Bagmati study (ICIMOD 1993). The data reported in the 1986/87 Census of Manufacturing were used to estimate the energy demand parameters of the manufacturing sector. The model employed to estimate the energy demand parameters was the translog cost function. The model assumes that energy cost is separable from other input costs. This assumption allows for estimation of the energy demand by energy sub-types. The different energy sub-types considered are diesel, kerosene, coal, firewood, and electricity as reported in the Census.

Based on the estimated national level, factor demand elasticities' parameters, as reported in Table 1.3, the energy demand in the valley by the manufacturing sector was forecasted. Price projections for different energy types have already been discussed above.

**Table 1. 3: Energy Demand Elasticities by Energy Types in the Nepalese Manufacturing Sector**

	Wood	Diesel	Coal	Electricity	Kerosene
Wood	0.542	-0.816	0.034	0.644	-0.219
Diesel	-0.705	-0.728	0.349	1.596	0.009
Coal	0.071	0.837	1.981	-2.572	0.703
Electricity	0.241	0.689	-0.464	-0.490	0.001
Kerosene	-2.774	0.136	4.295	0.032	-1.691

The Census results of 1986/87 provide the base line values of energy consumption by the manufacturing establishments for the nation as a whole. To arrive at the base line consumption values of the valley, we first obtained energy consumption values per firm in each establishment for the NSIC group. The values calculated were then multiplied by the number of firms inside the valley (Kathmandu, Lalitpur and Bhaktapur) also based on the same Nepal Standard Industrial Classification (NSIC) group (Table 1.4). This gave us the value of each type of energy consumed by each manufacturing establishment according to the NSIC group. The base consumption values of each of the energy types obtained were as follows: wood 74,168 MT; diesel 6735 kl; kerosene 195 kl; electricity 146,050 mwhr, and coal 12,577 MT. Based on the estimated results on factor demand elasticities, the energy demand in the Kathmandu Valley is projected using the following equation.

$$\text{Energy Demand}_t = \{ \text{Demand} * (1 + [P_{ij}/P_{i,j}]^{n_{ij}}) \}$$

where,

- $P_e$  = to the unit price of energy;
- $i, j$  = wood, diesel, kerosene, coal, and electricity;
- $n_{ij}$  = price elasticity between energy types; and,
- $t$  = time (1987).

**Table 1.4: Number of Manufacturing Establishments in the Kathmandu Valley by NSIC and Percentage of Total**

NISC	Establishment Type	No. inside Valley %	Valley %	Energy bias by Energy-type
31	Food, beverage & tobacco	125	2	Electricity/wood
32	Textile & leather	351	> 90	Electricity/wood
33	Wood products	279	44	Electricity/diesel
34	Paper and printing	131	52	Electricity/diesel
35/36	Chemical, rubber & printing	41	43	Electricity/diesel
38	Fabricated machinery	108	50	Electricity/coal

Note: The percentages reported are approximate, since industries included in the national level figures are not all present inside the valley and, also for reasons discussed in the text, some industries have not been accounted for.

### Energy Demand: Transport Sector

The transport sector demands petrol, diesel, aviation fuel, and electricity (trolley and ropeway). Detailed consumption patterns of these energy types are reported in the Energy Demand Analysis of the Transport and Agriculture Sector, Water and Energy Commission Secretariat (WECS 1989). To project the energy demand of the transport sector the base consumption values have been derived as described below.

**Petrol:** We first estimated the city roads in Central Development Region (CDR) as a percentage of total city roads in Nepal. This factor was multiplied by the petrol consumption by the transport sector in Nepal in 1986 to arrive at petrol consumption in the valley.

**Diesel:** The percentage of total roads in the Central Development Region (CDR) as a percentage of total roads in Nepal was first derived, and the quantity of diesel consumption by the transport sector was multiplied to this factor to obtain the base consumption of diesel in the valley.

**Electricity:** Electricity is consumed by the ropeway linking Kathmandu with Hetauda and by the trolley bus. The WECS (1989) provides the necessary base consumption values of electricity consumed by the ropeway and trolley bus. It should be noted here that we have assumed that all the electricity consumed by the ropeway occurs in the valley. In the case of the trolley bus, this is definitely the case.

The base consumption values of the different types of energy consumed in the transport sector are reported in Table 1.5.

**Table 1.5: Energy Consumption by Energy Type in the Transport Sector (Base Values (1986))**

Petrol (klit)	Diesel (klit)	Aviation (klit)	Electricity (mwhr)	
			Trolley	Ropeway
11,185	20,199	41,745	1334	331
Growth Assumptions (%):				
4.97	4.86	2.62	2.00	0

Source: Growth assumptions were derived from WECS, Part I, Transport Sector, Table 7.8A (1992).

The estimated base consumption values of the different types of energy consumed by the transport sector obtained have been projected then over time using the national consumption growth rates of the energy types reported by WECS (1989, Table 16).

### Energy Demand: Total Valley

The total energy demand for the valley consists of the energy demands of urban households, manufacturing establishments, and the transport sector only in this study. The demand for energy by other sectors could not be included due to lack of information. All energy demanded is converted into metric tonnes using conversion factors reported by WECS (1992).

### Employment

#### Rural Sector

Employment in the traditional sectors, namely agricultural and livestock, depends on the area cultivated and labour used per hectare for the six different crops and for LSU holdings per household. Besides the traditional sources, rural populations also work as professionals, office workers, traders, and in the manufacturing (production) and construction sectors. In addition large numbers of the rural labour force as general labourers. The 1984 estimates of the engagement of rural labour in the above categories are found in the NRB-Multi Purpose Household Budget Survey for the Rural Hills (1988). The recently conducted 1991 census (10 % sample estimates) also provides more recent estimates of the rural employment. Surprisingly, the 1984 and 1991 estimates did not vary in any significant way and hence we used the NRB estimates. While the employment situation in agriculture is determined from the model, rural employment in the non-agricultural sector has been projected using the proportion of the active population in rural areas engaged in activities such as those reported by the Nepal Rastra Bank (NRB, 1988, Table 58, p.210).

#### Urban Sector

Urban employment has been estimated on the basis of industry and occupation. The 1984 NRB and the 1991 census sample estimates have been used to estimate changes in the population engaged in different activities. An average proportion of population engagement during the different periods is then used to obtain the base population engagement by industry. After obtaining the base population, the growth rates in employment for the broad categories of workers are assumed to depend on a combination of historical performances (growth rate) of the sectoral GDP. In the absence of historical data on employment by sector, it is customary to use sectoral GDP growth as a proxy variable (World Bank 1991, p. 182).

First, the nominal sectoral GDPs were projected using time trends based on data from 1974 to 1989. The nominal sectoral, GDPs were then converted to real GDP by dividing the agricultural GDP by the agricultural GDP deflator, and the non-agricultural GDP deflator was used to convert other nominal GDPs to real GDP.

These sectoral, real GDP growth rates were then used to project urban employment by sectors. These employment figures were calibrated to reflect the more recent, i.e., 1991 estimates. The sectoral growth rates derived to project population are presented in Table 1.6.

**Table 1.6: Sectoral Growth Rates Assumed to Project Employment in Urban Areas**

Sector	Growth (% per annum)
Agriculture	-2.90
Manufacturing	1
Electricity	11.80
Construction and Transport	6.20
Trade, Hotel, Real Est etc	4.3
Public sector	6.3
Private sector	1.0

Source: Based on sectoral growth rates of real GDP reported in the Ministry of Finance, Economic Survey, 1991

In addition, estimates of employment by occupation are also made. The method that is used to obtain these estimates is as follows. The 1991 census (10 per cent sample estimate) provides population engagement by industrial and occupational sector for all urban areas of the country. The percentage of population by sector of industry for a given occupation has been derived from the results. This percentage is then used as a multiplier to obtain population engagement by occupation from engagement by industry. The multipliers derived by industry and occupation are reported in Table 1.7.

It is to be noted that agricultural employment by sector and occupation reported for urban areas is not the same. This arises because of the differences in the definition of 'agriculture' in the two cases. For example, in the sectoral definition, agriculture consists of agriculture, forestry and fisheries, whereas, in the other definition, agriculture includes farming and fishing.

### **Income Sector**

Income estimates are made separately for the rural and urban sectors. For the rural sector, incomes are estimated on a sectoral basis, whereas, for urban areas, besides sectoral income we have attempted to estimate incomes by occupation.

#### *Rural Income*

The sectoral incomes accruing in the rural area of the valley are agriculture (crops), livestock, professional, office workers, sales and services, production, construction, and general labourers. Rural sector income assessments have been carried out on a basis similar to those carried out for rural districts of the Bagmati Zone as reported in Volume I of the Bagmati study (ICIMOD 1993). The rural household incomes have been scaled by a factor of 1.25 to reflect the CDR's higher levels of income.

It is to be noted that rural income assessments generated by the model do not take into account household earnings from miscellaneous sources, e.g., property income, pensions and remittances, and others as covered in the NRB estimates. These other sources in the NRB estimate account for about 21 per cent of the total household income in rural Nepal (see NRB 1988, p.82). While it is possible to scale the

income derived in the model by the appropriate factor to account for the miscellaneous income, we have not done so. This is because there is no information to develop this class of income and link it with the rest of the model. Hence the estimated incomes in the present case are underestimated by about 20 per cent in rural areas.

### Urban Income

To derive base year incomes we have relied on the Multi-Purpose Household Budget Survey (NRB 1988) information which reports incomes for 1984. The per household incomes have been scaled first to 1986 values by seven, per cent annually for two years. According to the Survey information, the Central Development Region's urban households had 1.25 times higher household incomes than urban hills' households. The valley's urban income has been assumed to be 15 per cent higher than that of CDR urban income, based on our subjective judgement. From this perspective the per capita base income in the urban area ( Table 1.8) works out to be 40 per cent higher than in the urban hills as reported by NRB (1988). This factor was also taken into account in projecting income and base .

**Table 1.7: Multipliers Used in Converting Employment from Sector of Industry to Occupational Status**

Sector	Total	Proff	Admin	Clerical	Sales	Service	Agri	Manu	Others
Agriculture	0.228	0.001	0.001	0.001	0.001	0.003	0.987	0.002	0.004
Manufacturing	0.082	0.010	0.011	0.020	0.010	0.065	0.000	0.824	0.060
Electricity	0.005	0.174	0.065	0.306	0.004	0.095	0.000	0.193	0.162
Const & Trans	0.057	0.021	0.094	0.042	0.010	0.042	0.000	0.760	0.031
Trade etc	0.214	0.010	0.024	0.048	0.743	0.104	0.000	0.037	0.034
Public & private	0.364	0.141	0.045	0.139	0.014	0.312	0.000	0.164	0.184
General Labour	0.049	0.020	0.018	0.037	0.012	0.063	0.000	0.73	0.777
Total	1.00	0.058	0.029	0.068	0.167	0.148	0.225	0.184	0.121

Source: Derived from the results of the 1991 Sample Census results (CBS, 1986, Vol 1, Table 63).

**Table 1.8: Base Year Per Capita Urban Income by Occupation (1986)**

Occupational Group	Per Capita Income (Rs/year)
Professional	11,214
Administrative	15,930
Clerical	6,930
Sales	7,866
Service	7,848
Agricultural	4,932
Manufacturing	5,346
Others	3,690

## CHAPTER 2: BASELINE CONDITIONS

### Introduction

This chapter deals with the baseline economic and natural conditions of the Kathmandu Valley. Various important sectors of the Valley have been integrated within the framework of a multimarket model as described in Chapter 2. These sectors include food, energy, trade, tourism, employment, and income originating from different sectors. Since each of the three districts belonging to the Kathmandu Valley are comprised of both rural and urban sectors, the baseline conditions of these two sectors have been dealt with separately where possible. While the model has captured all the major activities of the rural areas of the valley, it has not been possible to integrate all the activities of the urban areas due to the lack of information. This lack of information has been a serious drawback in developing a suitable model for the urban areas. Thus some sectors had to be dealt with separately and are presented as separate reports. It is because of this lack of information that the baseline results have been forecasted for a five-year (1991-1995) period only.

### Price Trend

Several agricultural products and input prices have been forecasted using time trend equations fitted to historical data. These prices were calibrated to match the 1991 prices. Similarly, several energy price series have also been forecasted to develop the energy model for the urban sector of the valley. Table 2.1 presents the forecasted price of agricultural output, inputs, and energy.

The average annual growth rate of agricultural and livestock product price, in general, ranged from five per cent (maize) to about 11 per cent (buffalo meat). The aggregate meat price is projected to grow at a faster rate than that of the aggregate cereal grain price. The forecasted prices of six different types of fuel indicate the highest growth rate for electricity and the lowest for kerosene. The average annual growth rate of the commercial electricity price has been found to be higher than that of the electricity tariff for domestic use. The details are presented in (Table 2.1).

### Crop Sector

Agriculture is the primary economic activity in the rural areas of the Kathmandu Valley as in the other districts of the Bagmati Zone. Only six crops account for the crops sector of the valley. Table 2.2 provides the forecasted area under these crops over the period (1991-95). The results indicate that, under the current state of technology in the valley, the area under all types of crops is expected to decline over time, with the exception of potatoes and maize. Based on the trends, millet and oilseed crops are gradually being phased out of production in the valley. This could be a result of urban expansion or of the substitution of high-value crops, such as vegetables, in place of oilseed and millet. On the whole, the total cropped area in the valley is expected to decline by 1.6 per cent per annum over this period. About 37 per cent of the total cultivated land in the valley is estimated to be under irrigation. The irrigated area is assumed to increase at an annual rate of two per cent.

The fertiliser use rate in the valley is believed to be higher than in any other district in the country. The total sales reported by the Agricultural Inputs Corporation (AIC) in the valley divided by the total cropped area provide an estimate of availability per cropped area, and this was found to be over four times higher than the use rate. The high discrepancy between use rate and availability may be due to the fact that the present use rate reported seriously underestimates the use rate in the valley; second, fertiliser application

on the other crops, such as a vegetables (not included in the present exercise), could be considerable; and third, a significant proportion of the fertiliser sales in the valley actually finds its way into other districts as well.

The yield rates of most crops in the valley are relatively higher than the national average and those observed for other districts of the Bagmati Zone, primarily due to a relatively favourable access to other modern inputs and infrastructure. The forecasted yields of crops in the valley are reported in Table 2.3. The highest growth rate recorded is for paddy, followed by wheat and potatoes.

Despite the relatively higher growth rates for paddy and wheat yields, the average growth rates in production of these crops have been found to be lower than those of potatoes because of the declining trend in the area under these crops over time. Table 2.4 shows the projected trend in the production of different crops in the valley.

Table 2.5 shows the forecasted gross margin for different crops. The observed values of gross margin for most crops, apart from millet and oilseed, are generally higher. The average growth rate in gross margin is found to be the highest for paddy and the lowest for maize and wheat. The negative growth in the gross margins of oilseed and millet can be explained by the rapid decline in areas covered by these crops.

### **Livestock Sector**

Livestock forms an integral part of the farming system in the rural Kathmandu Valley, as in most other districts of the Bagmati Zone. The method of livestock population projection has been described already in the previous chapter. Table 2.6 presents the projected trend in livestock population by type of animal. The average annual growth rate of almost all types of animals in the valley is less than one per cent, with the exception of pigs and chickens. As a result, the projected trends in the production of livestock products do not appear to be encouraging (Table 2.7). Table 2.8 shows that the average annual growth rate in gross margin from livestock varies greatly by types of livestock, ranging from 8.8 per cent for cows to 17 per cent for pigs. On the whole the net income from livestock enterprises in the valley has been estimated to increase from Rs 111.9 million in 1991 to Rs 175.6 million in 1995 with an average growth rate of about 12 per cent per annum. Buffaloes contribute a significant proportion of the livestock income.

### **Food Balance**

Per capita demand for different food items has been estimated separately for rural and urban areas. As indicated earlier in the previous chapter, the demand for food is assumed to be influenced by the relative food group prices and income. The total demand for food in the valley (i.e., rural plus urban food demand) has been subtracted from the total food production (edible form) in the valley to arrive at the overall food balance situation.

Table 2.9 shows the projected trend in per capita demand for five different food items in the rural valley. The result indicates a declining trend in the consumption of all types of food items, with the highest decline recorded for meats followed by vegetables (i.e., potatoes). Note that only domestic production is being considered. The situation in per capita food consumption levels for urban households is, however, slightly different. The per capita consumption of urban households is relatively higher than that of the rural households, especially in the case of vegetables and oils and fats, while the opposite is the case for other food items. The forecasted food consumption in the urban area also shows a declining trend, but it is lower than that observed in rural areas (Table 2.10).

The total demand for food in the valley, which is the sum of rural and urban food demands, has been subtracted from the total food production (edible form) in the valley to arrive at the overall food balance situation in the valley. This is presented in Table 2.11. As can be seen from this table, the valley experiences acute shortages of almost all food items, especially cereals. Cereals will be discussed later. Vegetable and milk deficits tend to decrease as the supply position of these food items improves over time.

## **Import**

The extent to which many food items are imported into or exported from the valley is determined endogenously by the model based on estimates of the magnitude of the food demand and supply balance. Table 2.12 shows that the value of food import in the valley will increase from Rs 1,594.5 million in 1991 to about Rs 2,261 million in 1995 with an annual growth rate of about nine per cent. The average annual growth rate in imports varies greatly by type of food. The per capita value of food imports in the valley is forecasted to increase by 5.3 per cent per annum, which is very close to the urban population growth in the valley.

The import demand for non-food items in the valley is assumed to be influenced by population growth, income growth, and income elasticity of non-food demand as specified in the methodology. The value of non-food imports has been derived separately for rural and urban areas, and the results are presented in Table 2.12. The results indicate that the value of non-food imports in the urban area is about 2.5 times higher than in rural areas, but the value of non-food imports in rural areas increases at a faster rate (4.6%) than in urban areas (2.6%). The per capita value of non-food imports in urban areas is expected to decline at an annual rate of 2.3 per cent, while that in rural areas is expected to increase by 2.6 per cent per annum. The declining trend in per capita value of non-food imports in urban areas can be partly explained by a negative growth of real per capita income in urban areas, and this will be described later.

## **Energy Demand Household Sector**

### *Rural Households*

Firewood is the chief energy source used by rural households for domestic purposes. As in the other districts of the Bagmati Zone, the demand for firewood has been projected under the constant per capita consumption level assumption and is allowed to grow over time as the population grows. A similar method has been used to project the demand for fodder and timber in the rural areas of the valley. The supplies of fuelwood, fodder, and timber, on the other hand, have been projected using the constant yield assumption as specified in the methodology.

Table 2.13 presents the projected demands and supplies of fuelwood, fodder, and timber in the rural areas of the valley. The details on projected supplies of fuelwood and fodder originating from different sources are shown in Tables 2.14 and 2.15. The total consumption of firewood in the rural valley has been projected to increase from 298.46 MT in 1991 to about 322.1 MT in 1995, with an annual growth of about two per cent. About 34 per cent of the fuelwood demand in the rural area is currently met by the existing supply of fuelwood in the valley. The results indicate that the growth in demand is higher than the growth in supply. As a result, the magnitude of fuelwood deficit in the rural valley is expected to rise considerably over time, and it has been estimated that, by the year 1995, less than one-third of the fuelwood requirements of rural households will be met by the supply of fuelwood in the valley. Since a large part of this deficit would have to be met through overexploitation of forests, this has grave implications for environmental damage. The deficit is likely to become even larger when the demands

for fuelwood by urban households and demands by the manufacturing sector in the urban area are also taken into account.

### *Urban Households*

In the urban areas of the valley, other forms of fuel besides fuelwood are also consumed by households. These are primarily electricity and kerosene. Electricity is mostly used for lighting and to a lesser extent for cooking. Kerosene is in demand for cooking. The demand for these types of energy in urban areas is assumed to be influenced by the growth in population and income as indicated in the previous chapter. Not all households use all three types of energy, but some may use all three types. Furthermore, as income increases over time, urban households are expected to switch from fuelwood to commercial energy forms such as electricity and kerosene. These factors have been well considered and allowed for in forecasting the urban households' demand for energy. Table 2.16 presents the forecasted demand for energy by urban households. The result shows that the quantity of fuelwood consumed by urban households is expected to decline at the average rate of 5.5 per cent per annum, while electricity consumption will rise by over six per cent per annum over the period from 1991-1995. The demand for kerosene is expected to increase as well but by a lower percentage than the demand for electricity.

The demand for electricity in urban areas is relatively more sensitive to changes in income than demands for fuelwood or kerosene. For example, a 10 per cent increase in income levels in the urban area will lead to an increase in demand for electricity by more than six per cent, whereas the same percentage increase in income will increase the demand for firewood and kerosene by less than three per cent only. However, it has not been possible to model the effects on demand due to the electricity rationing currently being implemented in Nepal. This rationing has most likely led to substitution effects resulting in more consumption of kerosene and fuelwood.

### **Energy Demand: Manufacturing Sector**

A detailed study on the energy demand structure in the manufacturing sector was conducted and is presented as a separate report. A translog cost function was employed to estimate the energy demand parameters for the manufacturing sector, and these national level parameters have been used to forecast the demand for six different types of energy, viz, wood, diesel, petroleum, kerosene, electricity, and coal, in the manufacturing sector inside the Kathmandu Valley. The basic assumption made is that irrespective of the type and location of the manufacturing entities, the energy demand parameters for Nepal are identical across the manufacturing sectors. The share of energy consumed by the manufacturing sector located in the three districts of Kathmandu, Lalitpur, and Bhaktapur and reported in the CBS (1986/87) was used to derive the base consumption level of the different types of energy consumed by the valley's manufacturing sector. The forecasting equation used for this purpose takes into account both the own and cross-price effects of different types of energy used in the industrial sector. Energy price projections required for this purpose have been described above.

Table 2.17 provides the forecasted demand for different types of energy in the manufacturing sector inside the valley. Electricity, wood, and diesel are the three most important forms of energy consumed in the manufacturing sector. The total quantity of wood used in this sector has been projected to almost double to 317 thousand MT in 1995 from 172.3 thousand MT in 1991, with an average annual growth rate of over 16 per cent. The total electricity demand in the manufacturing sector is expected to increase by about seven per cent per annum, diesel consumption is projected to increase by less than two per cent, and the demand for kerosene in industry is expected to decline by one per cent over the projected period. The relatively higher growth of wood demand in the manufacturing sector can be explained by the

presence of a large number of wood-intensive industries such as carpets and rugs. The details of the energy-use pattern by types of industries and energy budget shares are described in a separate report.

### **Energy Demand : Transport Sector**

The transport sector is another large consumer of energy. A large portion of the petroleum products imported is consumed by this sector. Similarly, electricity consumption by trolley and ropeway are also substantial. The projected demand for different types of energy in the transport sector inside the Kathmandu Valley is presented in Table 2.18. The total consumption of electricity by trolley buses was estimated to be 2,024 thousand mwhr in 1991, and this is projected to grow at the rate of about nine per cent over time. The average annual growth rate of petrol and diesel consumption in this sector has been estimated to be three and five per cent respectively between 1991 and 1995. Aviation fuel demands on the other hand are expected to grow at the rate of one per cent per annum. The details are presented in Table 2.18.

### **Total Energy Demand in the Valley**

Total energy demand in the valley consists of the sum of energy consumption in the household sector, manufacturing sector, and transport sector. Table 2.19 presents the forecasted demand for different types of energy in the valley over the period from 1991-1995. On the whole, wood consumption in the valley has been projected to increase from 500.6 thousand metric tonnes in 1991 to 662.2 thousand MT in 1995, whereas electricity consumption is expected to rise from 2,541,916 thousand Kwhrs in 1991 to about 3,380,996 thousand Kwhrs in 1995. Both demands for wood and electricity are expected to grow at an annual average growth rate of over seven per cent during the period from 1991-1995. The demand for diesel and petrol will rise at a relatively higher rate than for kerosene and aviation fuel.

The total cost of energy import by type of energy in the valley is presented in Table 2.20. The total energy import bill for the valley amounted to Rs 709.1 million in 1991 at current prices. Excluding aviation and other minor fuels, diesel (46%) and petrol (45%) account for almost 90 per cent of the value of imports. Kerosene accounted for about eight per cent in 1991. Between 1991 and 1995, the average annual growth rate in value of petrol imports is expected to be the highest (9.5%), followed by diesel (8.3%) and kerosene (3.8%). On the whole, the total import bill for the valley is expected to rise by about 8.5 per cent per annum. Also reported in Table 2.20 is the per capita value of energy imports which is projected to rise from Rs 1,197 in 1991 to Rs 1,365 in 1995 in nominal terms - an increment of little over three per cent growth per annum.

The consumption of energy and rising trend over time also has severe consequences for the quality of the environment inside the valley. Already, pollution, resulting from vehicular emissions in the valley, has become serious. With a growth in energy demand, this situation is likely to become worse unless actions to moderate vehicular emissions are not immediately taken.

### **Sectoral Employment Growth**

Employment projections have been made separately for the rural and urban areas within the Kathmandu Valley. While the rural employment projection in the valley follows a similar method as was adopted for other districts of the Bagmati Zone, the sectoral employment projections in the urban valley are based on a combination of historical performance (growth) of sectoral GDP, given the lack of adequate information. The detailed procedures and simplifying assumptions used to derive the base employment figures and their growth have already been described in the methodology.

## Rural Employment

Rural labour supply in the valley is determined by the size of active population and the normal duration of work. Based on the inter-census growth assumption (Table 2.21), the size of active population in the rural valley is projected to grow at a slightly lower rate (1.8%) than the growth in rural population (about 2% p.a.). The constant normal duration of work as reported by NRB (1988) (i.e., 250 mandays) was employed to forecast the total supply of rural labour force in the valley. The total labour use in rural areas generated by the model were then compared with the estimated rural labour force to arrive at the rural labour utilisation rate. Table 2.22 shows the forecasted labour supply and the labour use situation in the rural areas inside the valley.

The agricultural sector absorbs over 93 per cent of the total labour force in the rural areas of the valley and its ability to employ a growing labour force is expected to gradually decline. The non-agricultural sector on the other hand employs about 20 per cent of the rural labour force in the valley. Total labour use in the rural areas of the valley in 1991 has been estimated to be about 89.62 million mandays, which is significantly higher (about 1.3 times greater) than the estimated rural labour force (66.1 million mandays) in the valley. Less than 15 per cent of the rural employment is in the off-farm sector. In contrast to other districts of the Bagmati Zone, where an excess supply of labour exists, the rural employment situation in the valley exhibits a shortage of labour. It is important to emphasise here that about 52 per cent of the rural population in the valley are economically active compared to about 68 per cent in other districts of Bagmati Zone. The relatively lower size of active rural labour force in the valley, together with the fact that a large number of people commute to urban areas for employment, partly explains the existence of a labour shortage in the rural valley. Furthermore, if participation rates are taken into account, the rural areas already have a labour shortage. Thus, the rural employment situation in the valley is reasonably better than that observed in other rural districts of the Bagmati Zone. The result, however, shows that the rural labour balance situation in the valley is expected to deteriorate marginally, as the growth in active population increases at a faster rate than the growth in the labour utilisation rate.

## Urban Employment

The manner in which the sectoral employment in urban areas is forecasted has been discussed in the methodology. The 1988 Multipurpose Household Budget Survey and the CBS (1992) sample estimate were used to derive the base employment figures by type of industry and occupation in the urban valley, and these base figures were further adjusted to take into account the changing structure of urban employment between these two periods. The growth rate in employment for the broad categories of workers and/or sectors are assumed to depend on a combination of historical performances of sectoral GDPs.

Table 2.23 reports the projected number of urban labour force employed in eight different sectors (e.g., agriculture, manufacturing, electricity, service sectors, etc). The total supply of labour force in the urban valley is estimated to increase from 330,072 in 1991 to 401,358 persons in 1995, with an average rate of about five per cent per annum. About 19 per cent of the total urban labour force in 1991 were being absorbed into the agricultural sector, 17 per cent into manufacturing (including industry, not stated, or other), 28 per cent in the service sector (public plus private), nine per cent in trade and tourism-related sectors, and the rest in the construction (4%) and power (i.e., electricity) sectors. On the whole, about 77 per cent of the labour force in the urban valley is estimated to be employed. The labour balance situation in the valley, however, deteriorates over time at the rate of about 1.61 per cent and, by the year 1995, the urban sector is expected to absorb only 72 per cent of the labour force. This is because the

size of economically active population in the urban valley is expected to grow at a faster rate than sectoral employment generation.

The employment pattern in the valley shows that out of a total labour force of 254,150 estimated to be employed in the urban valley in 1991, about one-fourth of these were in the agricultural sector, 22 per cent in manufacturing (including industry not stated), 36 per cent in the service sector, 12 per cent in the trade and tourism-related sectors, and the rest in construction (5%) and electricity. Table 2.23 also shows the average annual growth in employment generation in different sectors over the projected period.

Urban employment in the agricultural sector, however, is seen to decline over time at an average rate of 2.9 per cent per annum. Despite the positive real agricultural GDP growth, there is a decline in agricultural employment in urban areas. The employment generation in all other sectors shows a positive trend over time, despite some variation in their growth rates.

Employment growth is seen to be highest (11.8%) in the electricity sector, despite its fairly low share in total employment, and it is found to be the lowest in the private service sector. Employment generation in the service sector, particularly in the public sector, is expected to grow by an average rate of over six per cent per annum, a rate similar to that observed in the construction sector. Currently these two sectors alone contribute about 40 per cent of the total urban employment, absorbing about one-third of the labour force. Similarly the growth rate in employment in the tourism-related sector is roughly the same as in the manufacturing sector (4.5%). When the labour force employed in industries not stated or other are also included in the manufacturing sector, this sector alone contributes over 22 per cent of the total urban employment. In this respect, this sector will continue to remain the second largest employer of the urban labour force next to the service sector.

Table 2.24 further shows the projected urban employment for broad categories of workers. The result indicates that over 15 per cent of the labour force employed in urban areas were engaged as labourers in the manufacturing sector, 13 per cent as administrative workers, 11 per cent as service workers, and the rest as sales and service workers, or clericals and professionals. With the exception of agriculture, which shows a declining trend in employment, the growth rate in employment in the other broad of occupational categories is found to be positive, ranging from four to about six per cent per annum. The details are presented in Table 2.24.

## **Income**

### *Rural Income*

Rural households derive their income from crops, livestock, and off-farm employment. It is to be noted that a significant portion of the rural income also comes from miscellaneous sources, such as pensions and remittances, and it has not been possible to estimate income from these sources. Hence the rural income estimated from the model can be believed to be slightly underestimated. The NRB study indicates that income from miscellaneous sources constitutes about 19 per cent of the total income.

Table 2.25 presents the projected nominal income from different sources for the valley's rural areas. Over two-thirds of the total rural income in 1991 is estimated to come from agriculture and the rest from off-farm employment. Rural incomes from the crop and livestock sectors are expected to grow by over 11 per cent compared to about 8.9 per cent growth in the non-agricultural sector. Per capita income in the rural valley has been estimated to rise from Rs 2,207 to Rs 3,260 at an annual rate of about 10 per cent over the period from 1991-1995. In real terms, per capita income is expected to grow at the rate of a little over two per cent.

## Urban Income

Urban households derive income from various sectors, and they are estimated based on the sectoral employment estimates discussed earlier. The base figures for sectoral and occupational income have been derived using the information reported in NRB (1988) which have been adjusted to reflect income for 1991. The growth in sectoral income in the valley is assumed to be determined largely by the historical performance of the different sectors. The detailed procedures used to forecast the sectoral and occupational incomes in urban areas are stated in the methodology.

Table 2.26 presents the projected trend in the income in the valley's urban area. The total urban valley income was estimated to be Rs 4,137.48 million in 1991 and is expected to grow at the annual rate of about 11.5 per cent. About 16 per cent of the total urban income in 1991 is estimated to come from agriculture, 12.5 per cent from manufacturing, 10 per cent each from the service and tourism-related sectors (i.e., trade, hotel, etc), eight per cent from the electricity and water, 14.3 per cent from construction and transport, and the remaining 29 per cent from other industries not stated. The income from agriculture in the urban valley is expected to grow at a relatively lower rate (3.9%) than the income growth in other sectors for which the nominal income growth is likely to be 12 per cent.

Table 2.27 provides further estimates of urban income by major occupational group. Administrative workers receive over one third of the urban income whereas the share of income accruing to other broad categories of workers ranges from five per cent (clerical and sales' workers) to 16 per cent (agriculture). The manufacturing and service workers account for about 13 per cent each of the total income. The growth rates of income for all occupational groups are expected to grow by over 11 per cent, with the exception of agricultural workers for which the growth is less than four per cent per annum.

Per capita nominal income in the urban areas of the valley is estimated to increase from Rs 6,982 in 1991 to Rs 8,889 in 1995 at the rate of 6.22 per cent per annum. Despite such a high growth in per capita nominal income, urban households are likely to suffer from the rising inflation rate. In real terms, the urban per capita income (at 1991 constant prices) is estimated to decline at an annual average rate of 1.34 per cent.

## Conclusions

The above analysis is by no means exhaustive and has been presented here mainly to highlight the overall economic characteristics of the valley and their implications on the natural resources. Economically the valley economy is beginning to show important structural changes - particularly in terms of the decreasing overall share and the commercialisation of agriculture. The changes in manufacturing and non-agricultural activities, important as they are, still appears to be growing relatively slowly. Inflation in the valley has turned out to be a major issue as it has depressed the growth in real incomes.

The changing demand structure of the valley - particularly urban demand - has both positive and negative signals. The opportunities for other areas in the Bagmati Zone to act as major suppliers of food and agricultural products to the Kathmandu Valley are substantial. The continued dependence on fuelwood, both by urban households and manufacturing, suggests that the pressures on the forests, if not in the region then elsewhere in the country, will continue to rise. The relatively limited nature of rural urban income differentials clearly points to a very early stage in the growth of the urban economy. The need for a stronger growth of the non-agricultural economy is quite obvious, but this growth cannot be induced except by the availability of cheap labour from rural areas. It needs capital, infrastructure, entrepreneurs, financial institutions, etc, just those critical areas where our present understanding is extremely poor.

Tables

Table 2.1: Forecasted Product and Factor Prices

	1991	1992	1993	1994	1995	Growth
<b>Agricultural Prices</b>						
Paddy (Rs/Kg)	7.47	8.21	9.02	9.90	10.88	9.86
Wheat	6.03	6.34	6.65	6.99	7.34	5.02
Maize	5.93	6.23	6.54	6.87	7.22	5.05
Millet	6.32	6.79	7.29	7.84	8.42	7.47
M.Seed	27.12	28.66	30.34	32.18	34.18	5.96
Potatoes	5.66	6.08	6.53	7.01	7.52	7.36
Mutton	86.33	93.53	101.54	110.46	120.39	8.67
Chicken	69.33	75.79	82.87	90.64	99.17	9.36
Buffalo	32.58	35.96	39.72	43.92	48.60	10.51
Pork	43.17	47.33	51.89	56.89	62.37	9.64
Milk(Rs/lit)	9.41	10.23	11.11	12.07	13.12	8.65
Mustard oil price	54.53	58.39	62.55	67.05	71.91	7.16
Wage rate (Rs/day)	58.85	62.97	67.38	72.09	77.14	7.00
Bullocks (Rs/pd)	47.08	50.38	53.90	57.68	61.71	7.00
Manure (Rs/mt)	133.75	143.11	153.13	163.85	175.32	7.00
Ghee (Rs/lit)	112.93	121.25	130.33	140.24	151.04	7.54
Fertiliser prices (Rs/kg)	4.28	4.58	4.90	5.24	5.61	7.00
Wool	80.25	85.87	91.88	98.31	105.19	7.00
<b>Energy Prices</b>						
Petrol price (Rs/lit)	25.00	26.52	28.17	29.95	31.88	6.27
Diesel price (Rs/lit)	10.00	10.41	10.82	11.23	11.63	3.84
Kerosene price (Rs/lit)	8.00	8.26	8.52	8.78	9.05	3.13
Aviation fuel (Rs/lit)	13.26	14.19	15.18	16.23	17.38	7.00
Fuelwood (Rs/kg)	0.98	1.04	1.10	1.17	1.22	5.65
Electricity-commercial	2.10	2.44	2.83	3.27	3.80	16.00
Electricity-domestic (Rs million)	1.76	1.97	2.21	2.49	2.77	12.00

Table 2.2: Forecasted Area under Different Crops (ha)

	1991	1992	1993	1994	1995	Growth
Paddy	18694	18359	18025	17690	17355	-1.84
Maize	18853	19006	19159	19312	19466	0.80
Millet	804	623	443	262	81	-43.69
Wheat	15434	14935	14435	13936	13436	-3.41
Oilseed	178	95	13	0	0	-100.00
Potatoes	1982	2027	2073	2118	2163	2.21
Total cropped area	55945	55046	54147	53318	52501	-1.58
Total cultivated land	37547	37365	37184	37002	36821	-0.49
Area under irrigation	14072	14353	14640	14933	15231	2.00
Total fertiliser sale in dist.	22982	24814	26919	29296	31946	8.58

**Table 2.3: Forecasted Yield Rates of Different Crops (Kg/ha)**

	1991	1992	1993	1994	1995	Growth
Paddy	4392	4626	4878	5147	5433	5.46
Maize	1958	1991	2024	2058	2093	1.68
Millet	1075	1081	1086	1092	1098	0.53
Wheat	1890651	1960	2035	2115	2198	3.84
Oilseed	8294	665	679	693	708	2.11
Potatoes		8563	8846	9142	9448	3.31

**Table 2.4: Forecasted Changes in Crop Production (MT)**

	1991	1992	1993	1994	1995	Growth
Paddy	82099	84930	87923	91050	94287	3.52
Maize	36919	37836	38781	39753	40750	2.50
Millet	865	674	481	286	89	-43.39
Wheat	29171	29278	29381	29469	29528	0.30
Oilseed	116	63	9	0	0	-100.00
Potatoes	16437	17360	18360	19361	20440	5.60

**Table 2.5: Forecasted Gross Margin for Different Crops (Rs '000)**

	1991	1992	1993	1994	1995	Growth
Paddy	426719	499217	583215	680135	791542	16.70
Maize	75714	79734	84164	89030	94360	5.66
Millet	80011	85492	91502	97994	104915	7.01
Wheat	-559	-455	-337	-.207	-66	-41.40
Oilseed	2259	1309	189	0	0	-100.00
Potatoes	61003	70407	81208	93583	107729	15.28
Total gross margin	645147	735704	839940	960534	1098480	14.23

**Table 2.6: Forecasted Gross Margin for Different Livestock (Rs '000)**

	1991	1992	1993	1994	1995	Growth
Cattle	76429	76435	76441	76445	76447	0.01
Milch cows	13100	13101	13102	13103	13103	0.01
Bullock + others	63329	63334	63339	63342	63344	0.01
Buffaloes-be	42539	42542	42544	42546	42547	0.00
Milch buffaloes	13322	13319	13316	13314	13313	-0.02
Sheep	24023	24035	24045	24052	24056	0.03
Goat	94347	94349	94350	94351	94351	0.00
Pig	3481	3669	3867	4076	4296	5.40
Poultry	314790	325493	336560	348003	359835	3.40
Total LSU	141950	142281	142622	142975	143339	0.24

**Table 2.7: Forecasted Annual Production and Growth in Livestock Products**

	1991	1992	1993	1994	1995	Growth
Cow's milk (@.487 lit/day)-200 day	1276	1276	1276	1276	1276	0.01
Buff's milk (@.953 lit/day)-200 day	2539	2539	2538	2538	2537	-0.02
Ghee ss (4&5% cow & buff) MT	53	53	53	53	53	-0.01
Net milk ss (mt)	2671	2670	2670	2670	2670	-0.01
Buffalo meat (mt)	1642.14	1642.25	1642.25	1642.40	1642.44	0.00
Goat and sheep meat (mt)	352.82	352.86	352.89	352.91	352.92	0.01
Chicken meat (mt)	415.52	429.65	444.26	459.36	474.98	3.40
Pork meat (mt)	32.72	34.48	36.35	38.31	40.38	5.40
Aggregate meat available (mt)	2443.21	2459.24	2475.83	2492.98	2510.72	0.68
Wool production (kg)	10574.03	10579.40	10583.62	10586.71	10588.70	0.03

**Table 2.8: Forecasted Gross Margin from Livestock (Rs '000)**

	1991	1992	1993	1994	1995	Growth
Buffaloes	39054	44611	50807	57714	65415	13.76
Sheep and goats	20025	21837	23885	26197	28805	9.52
Pigs	915	1071	1253	1465	1713	16.99
Poultry	24396	27679	31413	35661	40493	13.51
Cows (milk + ghee)	12530	13628	14829	16143	17581	8.83
Buffaloes (milk + ghee)	14997	16438	18015	19739	21626	9.58
Total gross margin from Livestock	111917	25264	140201	156920	175633	11.93

**Table 2.9: Forecasted Per Capita Rural Food Demand (kg/person/year)**

	1991	1992	1993	1994	1995	Growth
Cereals	184.02	170.85	170.66	170.92	170.91	-1.83
Vegetables	19.26	12.63	12.57	12.80	12.86	-9.60
Meat	7.03	3.92	3.97	3.86	3.83	-14.09
Milk	34.90	26.32	26.73	25.93	25.77	-7.30
Oils and fat	3.62	2.72	2.65	2.83	2.87	-5.60

**Table 2.10: Forecasted Per Capita Urban Food Demand (kg/person/year)**

	1991	1992	1993	1994	1995	Growth
Cereals	156.20	151.66	152.25	150.53	150.07	-1.00
Vegetables	24.10	20.48	19.98	21.30	21.63	-2.66
Meat	6.40	6.00	6.00	5.99	5.99	-1.65
Milk	33.00	31.98	32.17	31.67	31.54	-1.13
Oils and fat	4.40	3.70	3.56	3.91	4.00	-2.34

**Table 2.11: Forecasted Change in Food Balance in the Valley (ss-dd) in MT**

	1991	1992	1993	1994	1995	Growth
Cereals	-87461	-82065	-86443	-89663	-93709	1.74
Vegetables	-11046	-5487	-5053	-5983	-6184	-13.50
Meat	-4918	-3307	-3543	-3694	-3901	-5.63
Milk	-34602	-30861	-32460	-33008	-34173	-0.31
Oils and fat	-4359	-3637	-3670	-4154	-4405	0.26

**Table 2.12: Forecasted Values of Food and Non-Food Imports (Rs '000)**

	1991	1992	1993	1994	1995	Growth
FOOD: cereals	578978	583961	661941	739679	833723	9.54
Oils and fat	397457	384913	467776	582516	665263	13.74
Milk and products	325678	315610	360691	398522	448283	8.32
Vegetables	62556	33360	32983	41930	46522	-7.14
Meat -	229832	169778	200021	229584	267125	3.83
RURAL-NONFOOD: India	165955	173599	181657	190232	190232	4.67
Non-food: ROW	95832	100134	104664	109477	114484	4.55
URBAN: NON-FOOD: India	272699	280889	289293	297901	306702	2.98
Non-food: ROW	361803	370261	378861	387577	396385	2.31
Total Food Imports: Rur + Urb	1594500	1487623	1723412	1992231	2260916	9.12
Total Non-food Imports: Rural	261786	273733	286320	299709	313644	4.62
Total Non-food Imports: Urban	634501	651150	668154	685477	703088	2.60

**Table 2.13: Forecasted Fuelwood and Fodder Balances in the Rural Valley**

	1991	1992	1993	1994	1995	Growth
Total valley fuelwood supply (kg)	101789	101823	101855	101886	101915	0.03
Rural HHs: firewood dd (kg)	298461	304422	310356	316250	322090	1.92
Firewood bal (ss-dd)	-196672	-202599	-208501	-214501	-220175	-
Timber supply (m <sup>3</sup> )	3134	3102	3071	3071	3010	-1.00
Timber demand	-	-	-	-	-	-
Timber balance	-	-	-	-	-	-
Total valley fodder supply - Total digestible nutrient (TDN) (MT)	53601	53303	53005	52707	52409	-0.56
Fodder demand	153732	154090	154459	154841	155236	-
Fodder balance (ss-dd)	-100131	-100787	-101454	-102134	-102827	0.67

**Table 2.14: Forecasted Fuelwood Supply from Different Sources (MT)**

	1991	1992	1993	1994	1995	Growth
Fuelwood supply (kg): forest	41964	41935	41906	41876	41846	-0.07
Shrub	8159	9232	8304	8375	8445	0.86
Grassland	96	99	102	105	108	3.13
Non cultivated inclusion (NCI)	8351	8366	8381	8395	8409	0.17
Farmland	1254	1256	1257	1259	1260	0.12
Total valley fuelwood supply	101789	101823	101855	101886	101915	0.03
Timber supply (m <sup>3</sup> )	3134	3102	3071	3041	3010	-1.00

**Table 2.15: Forecasted Fodder Supply from Different Sources (MT)**

	1991	1992	1993	1994	1995	Growth
Forest	044	8953	8864	8775	8687	-1.00
Shrubland	9105	9186	9266	9346	9424	0.86
Grassland	268	277	286	295	303	3.13
Non cultivated inclusion (NCI)	2905	2910	2915	2920	2925	0.17
Riser and bunds	2509	2915	2515	2518	2521	0.12
Crop residue	22458	22144	21830	21517	21203	-1.43
Fallow grazing	2151	2153	2156	2158	2161	0.12
Tree fodder	5161	5167	5173	5179	5185	0.12
Total valley fodder supply (TDN)	53601	53303	53005	52707	52409	-0.56

**Table 2.16: Forecasted Demand for Energy: Urban Households**

	1991	1992	1993	1994	1995	Growth
Wood (MT)	29868	28228	26678	25213	23829	-5.49
Kerosene (MT)	6561	6607	6654	6701	6748	0.70
Electricity (mwhr)	33373	35640	38062	40649	43411	6.80

**Table 2.17: Forecasted Energy Demand in Manufacturing Sector**

	1991	1992	1993	1994	1995	Growth
Wood Kl (MT)	172340	200610	233501	271772	316303	16.39
Diesel (Kl) (MT)	7229	7333	7440	7548	7658	1.45
Kerosene (Kl) (MT)	185	183	181	179	178	-1.04
Electricity (mwhr)	204237	218301	233329	249387	266545	6.88
Coal (MT)	25530	28823	32508	36630	41242	12.74

**Table 2.18: Forecasted Energy Demand in Transport Sector**

	1991	1992	1993	1994	1995	Growth
Petrol (KI) (MT)	13004	13402	13812	14235	14671	3.06
Diesel (KI) (MT)	25767	27053	28403	29820	31308	4.99
Electricity: Trolley (mwhr)	2024434	2200559	2392008	2600113	2826323	8.70
Electricity: ropeway (mwhr)	279873	270637	261706	253069	244718	-3.30
Aviation (MT)	76262	77024	77795	78572	79358	1.00

**Table 2.19: Forecasted Energy Demand in the Valley**

	1991	1992	1993	1994	1995	Growth
Wood (MT)	500670	533260	57535	613235	662222	7.24
Diesel (KI)	32996	34386	35843	37368	38966	4.25
Kerosene (K)	6746	6790	6835	6880	6925	0.66
Electricity ('000 kWhr)	2541916	2725138	2925106	3143218	3380996	7.39
Coal (MT)	25530	28823	32508	36630	41242	12.74
Petrol (KI)	13004	13402	13812	14235	14671	3.06
Aviation fuel (KI)	76262	77024	77795	78572	79358	1.00
T-Qnty KTM (MT) Import no aviation	41713	43188	44717	46311	47975	3.55

**Table 2.20: Projected Cost of Energy Imports Consumed in the Valley**

	1991	1992	1993	1994	1995	Growth
Diesel ('000 Rs)	330088	358003	387764	419487	453296	8.25
Petrol ('000 Rs)	325049	355457	389114	426382	467664	9.52
Kerosene ('000 Rs)	53940	36075	58237	60425	62640	3.81
Total ('000 Rs)	70977	769536	835115	906294	983600	8.53
Per capita urban (Rs)	1197	1237	1278	1321	1365	3.35

**Table 2.21: Forecasted Rural and Urban Population and Changes in the Size of Active Population**

	1991	1992	1993	1994	1995	Growth
Econactive: urban	330072	346609	363974	382209	401358	5.01
Econactive pop: rural	264023	268993	273912	278769	283547	1.80
Econactive total valley	594095	615601	637886	660978	484905	3.62
Total rural population	507587	517725	527817	537841	547772	1.92
Urban population	592589	622278	653454	686192	720570	5.01
Total population	1100176	1140002	1181270	1224032	1268342	3.62
Rural households	82400	84046	85685	87312	88924	1.92
Urban households	107743	113141	118810	124762	131013	5.01

**Table 2.22: Projected Changes in Rural Employment ('000 Mandays)**

	1991	1992	1993	1994	1995	Growth
Labour days available	66006	67248	68478	69692	70887	1.80
Labour use on crops	62051	63037	63982	64885	65731	1.45
Livestock	14195	14228	14262	14297	14334	0.24
Professional	1014	1033	1052	1070	1089	1.80
Office workers	1141	1162	1183	1204	1225	1.80
Sales and service	2408	2453	2498	2542	2586	1.80
Production workers	2661	2711	2761	2810	2858	1.80
Construction etc	634	646	657	669	681	1.80
General labourers	5513	5617	5719	5821	5920	1.80
Total labour use	89616	90887	92115	93299	94424	1.32
Labour use as % of available	135.77	135.15	134.52	133.87	133.20	-0.48
Labour balance %	-35.77	-35.15	-34.52	-33.87	-33.20	-1.84

**Table 2.23: Urban Employment Situation by Industry**

	1991	1992	1993	1994	1995	Growth
Agriculture & livestock	62181	60378	58627	56927	55276	-2.90
Manufacturing	30478	31850	33283	34781	36346	4.50
Electricity	388	434	485	543	607	11.80
Construction & transport	12014	12759	13550	14390	15283	6.20
Trade, hotel, real estate, etc	29913	31200	32541	33941	35400	4.30
Public services	86913	92387	98207	104394	110971	6.30
Private service	5842	5900	5959	6019	6079	1.00
Industry not stated & others	26420	27186	27975	28786	29621	2.90
Total urban employment	254150	262095	270629	279781	289583	3.32
Urban labour balance %	75922	84514	93345	102428	111775	10.15
Labour use as % of availability	77.00	75.62	74.35	73.20	72.15	-1.61
Total labour balance in valley	-18518	-10041	-1203	8001	17626	
Valley labour use as % of avail.	103	102	100	99	97	-1.41

**Table 2.24: Urban Employment Situation by Occupation**

	1991	1992	1993	1994	1995	Growth
Professional	14064	14893	15773	16709	17703	5.92
Administrative	44236	46870	49670	52646	55808	5.98
Clerical	15624	16526	17483	18500	19579	5.80
Sales	24013	25066	26165	27314	28515	4.39
Services	34759	36739	38839	41066	43429	5.73
Agriculture	61373	59593	57865	56187	54557	-2.90
Manufacturing	50763	53420	56222	59178	62298	5.25
Occup. not stated & others	6317	8989	8611	8181	7693	-4.68
Total	254150	262095	270629	279781	289583	3.32

**Table 2.25: Forecasted Rural Income by Source (Rs '000)**

	1991	1992	1993	1994	1995	Growth
Crop	645147	735704	839940	960534	1098480	14.23
Livestock	111917	125264	140201	156920	175633	11.93
Professional	36630	39932	43509	47380	51566	8.93
Office workers	42926	46796	50987	55523	60429	8.93
Sales and service workers	78539	85619	93288	101587	110562	8.93
Production workers	64103	69882	76141	82915	90240	8.93
Construction, etc	19078	20798	22661	24677	26857	8.93
General labourers	121720	132692	144577	157440	171349	8.93
Total rural valley income	1120061	1256686	1411304	1586977	1785115	12.36
Per capita rural income (Rs)	2207	2427	2674	2951	3259	10.24
Real per capita income	2207	2258	2312	2368	2425	2.38
Per capita real income growth	-	0.23	0.24	0.24	0.24	-

**Table 2.26: Forecasted Urban Income by Sector (Rs '000)**

	1991	1992	1993	1994	1995	Growth
Agriculture	658737	684869	712081	740422	769945	3.98
Manufacturing	513035	577975	651220	733842	827052	12.68
Electricity, water, etc.	321250	363085	410439	464047	524743	13.05
Construction, transport, etc.	589424	664873	750090	846350	955097	12.82
Trade, hotels, etc.	414121	464301	520621	583838	654804	12.14
Public & private	406563	459568	519576	587522	664465	13.07
Industry (not stated) & others	1234355	1393483	1573655	1777702	2008837	12.95
Total	4137484	4608154	5137682	5733722	6404941	11.54

**Table 2.27: Forecasted Urban Income by Occupation (Rs '000)**

	1991	1992	1993	1994	1995	Growth
Professional	311118	352511	399487	452807	513335	13.34
Administrative	1384307	1569411	1779574	2018215	2289224	13.40
Clerical	212850	240896	272693	308746	349633	13.21
Sales	388680	434120	484890	541616	604999	11.70
Services	562623	636294	719749	814300	921434	13.13
Agricultural	662266	688075	714889	742749	771693	3.90
Manufacturing	547775	616793	694591	782296	881177	12.62
Occup. not stated & others	67865	70054	71809	72995	73447	2.00
Total urban valley income	4137484	4608154	5137682	5733722	6404941	11.54
Per capita real income	6982	6889	6797	6705	6614	-1.35
Per capita urban income (Rs)	6982	7405	7862	8356	8889	6.22
Per capita real income growth	-	-0.01	-0.01	-0.01	-0.01	-

## REFERENCES

- Agricultural Projects Services' Centre (APROSC) 1983.** A Feasibility Study on the Provision of Fuelwood for Urban Areas, Vols. 1 and 2. Kathmandu, Nepal: APROSC.
- Central Bureau of Statistics (CBS) 1986.** Census of Manufacturing Establishments. Nepal: CBS/HMG-Nepal.
- Central Bureau of Statistics (CBS) 1986/87.** Manufacturing Census. Kathmandu. Nepal: CBS/HMG-Nepal.
- Central Bureau of Statistics (CBS) 1990.** Annual Survey of Manufacturing Establishments. Nepal: CBS/HMG-Nepal.
- Central Bureau of Statistics (CBS) 1992.** Census 1991 - Preliminary Results. Kathmandu: CBS, Mimeographed.
- Central Bureau of Statistics (CBS) 1992.** Census 1991 - Advance Tables (Sample Tabulations). Kathmandu: CBS.
- ICIMOD (Bagmati Zone Study Team) 1993.** Economic and Environmental Development Planning for the Bagmati Zone. Draft. Kathmandu: ICIMOD.
- Ministry of Finance. 1991.** Economic Survey (Annual, various issues). Kathmandu, Nepal: MOF/HMG-Nepal.
- Mudhbery, P. (1988).** A Demand System Analysis of Food Consumption in Nepal. Ph.D Thesis. East Lansing: Department of Agricultural Economics, Michigan State University,
- National Planning Commission (1992).** Eight Five Year Plan Document. Nepal: National Planning Secretariat, HMG.
- Nepal Rastra Bank (NRB) 1988.** Multipurpose Household Budget Survey. Kathmandu, Nepal: NRB.
- Sharma, S.P. (1988).** Energy Pricing Policies in Nepal; Regional Energy Development Programme. Kathmandu: UNDP/ESCAP/ILO/ARTEP.
- Water and Energy Commission Secretariat (WECS 1992).** Energy Sector Synopsis Report, Updated and Revised Report 4/2/18/185/1/3, seq.226. Kathmandu: WECS.
- (WECS 1989): Energy Demand Analysis of the Transport and Agricultural Sector. Kathmandu: WECS.
- World Bank. (1991):** Nepal: Poverty and Income. Kathmandu: World Bank.

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