7

DHADING DISTRICT

Performance of the District Economy

Introduction

The economic performances for the crops, livestock, and forest sectors of Dhading district are discussed in this section. These performances were examined by applying the historical data available from different sources. The historical data presented in this section provide a basis for projecting the baseline trend to be described in the subsequent sections. The overall performance of Dhading's economy has, until very recently, depended heavily on its agricultural production. The growth in productivity of the agricultural sector, however, has remained fairly stagnant and largely subsistence-oriented for various reasons. Given the limited irrigation facilities, the performance of the crop sector depends to a large extent on the vagaries of the monsoon. The low use of modern inputs very weak extension services, and other infrastructures have also severely constrained the growth in this sector. The historical data on the cropped area and the yields of food and cash crops, together with the fertiliser supply and use rate in the district, are described in the following section.

Crop Area

Paddy, maize, millet, and wheat are the principal food crops grown in the district, accounting altogether for over 95 per cent of the total cropped area in 1989. The share of cash crops in the total cropped area is less than five per cent, with potatoes covering about four per cent of the cropped area in 1989. Table 7.1 presents the historical data on the area under these crops over the 1975-1990 period. The overall picture in general shows an increasing trend in the area under different crops, despite the varying degree of annual fluctuations that can be observed in most cropped areas. While estimating the average annual growth rate of the cropped area for the 1975-1989 period, the highest annual growth rate is observed to be 13 per cent in the case of wheat followed by potatoes (12%), paddy (10%), and maize (2.4%). The total cropped area shows an increase at the rate of about six per cent per annum during this period. A considerable degree of variation in the cropped area is discernible, with the highest degree of variability being observed in the case of wheat, followed by potatoes and paddy as indicated by their respective coefficient of variation. The drastic reduction in the area under

some crops in some years cannot be explained readily, but, in the case of monsoon crops, such as paddy and maize, adverse monsoonal weather could be a plausible reason. Another pattern that can be noticed is the declining trend in the area under paddy and maize, especially after 1985.

The crop composition also changed considerably along with the expansion in the cropped area over the period. For example, the share of maize decreased considerably from 60 per cent in 1975 to 40 per cent in 1989, while the share of paddy and potatoes increased. The share of wheat and millet, on the other hand, remained more or less constant over the same period.

It is important to emphasise that there is considerable uncertainty regarding these statistics reported by DFAMS. These time-series' data should therefore be treated cautiously. The overall trend in the cropped area, based on the historical data, suggests the relatively higher annual growth rate for most crops which cannot be directly applied to plan future trends. Experience and review of available information reveal that cropping intensity and expansion in the area under cultivation in most hill districts have already exceeded the limit of sustainability under the current state of technology. Further expansion in the cropped area in the district, therefore, seems to be limited, unless at the cost of environmental degradation. The cropped area has to be projected, nevertheless, for the policy exercise discussed below. Hence, a semi-log regression model was fitted to the historical data in order to forecast the cropped area.

Crop Yield

Despite expansion in the cropped area, the productivity of most crops in general has remained fairly stagnant over the past decade. The historical data on crop yields and their average growth rates over the 1975-1989 period are given in Table 7.2. The yields of both paddy and maize, which account for 83 per cent of the total cropped area, declined at the rate of one per cent over 1975-1989. The yields of potatoes and wheat however, increased by an annual rate of 2.3 per cent and 1.3 per cent respectively. The paddy yield declined, consistently, especially after 1982, and it started to pick up marginally from 1988 onwards. The maize yield shows considerable fluctuation and declined drastically in 1983. A considerable degree of variation in yield can be observed as indicated by the coefficient of variation given in Table 7.2. No satisfactory explanation exists for such extreme variability in crop yields, although adverse monsoonal weather may be the reason.

Fertiliser Use

Although the actual use rate of fertiliser by crop in the district is not known, the historical fertiliser sale data reported by the Agricultural Inputs' Corporation (AIC) can give some indication about the extent of fertiliser availability per hectare of

cropped area in Dhading. In Table 7.3, time-series' data on fertiliser sales over the 1983-1990 period and the estimated sales per hectare of cropped area are given. Fertiliser sales in the district increased from 153 metric tonnes in 1983 to 528 MT in 1990. This level of fertiliser sales seems to be quite low compared to Sindhu, Kabhre, and Nuwakot, and it also indicates a low level of sales per cropped area. For instance, the sales' rate in the district ranged from six kg per hectare in 1983 to 17 kg/ha in 1988. The modest increase in the fertiliser sales' rate over time implies that the growth rate of fertiliser supply in the district is higher than the growth in the total cropped area, excluding millet,for which fertiliser is not assumed to be used.

Our estimate, based on the crop specific fertiliser use rate as reported in the Irrigation Master Plan, indicates a shortage of fertiliser only in 1990, and thereafter the district shows no shortage, given the low level of use rate which is driven solely by the growth in cropped area under the constant dose assumption.

In order to forecast the fertiliser supply in the district, a double log linear trend equation was fitted to the historical data on fertiliser sales. The estimated result is presented below.

Log (Fertiliser Sale) =5.07 + 0.53 Log (Time) R2=0.92
SE (0.06)

Livestock

The historical data in the livestock population and livestock products (meat, milk, etc) reported by DFAMS over the 1984-1988 period are presented in Table 7.4. The overall picture shows an increasing trend in all types of livestock population with the exception of milch cows and cattle (their population declined at the rate of 2.7 % and 1.03 % annually). The annual rate of increases in livestock population is amongst the highest for sheep (29%) and the lowest for buffaloes (1.1%). The share of milch buffaloes (22%) and cows (14%) in the total buffalo and cattle population remained constant over the period. This constant share over time raises doubts about the reliability of DFAMS data on the number of milch animals. Table 7.4 provides time-series' data in livestock products over the same period.

Land Use Changes

The detailed breakdown of land use statistics reported by the LRMP pertaining to the year 1978 was updated and projected by using simplified assumptions regarding the magnitude and direction of inter-class land transfers. As indicated in the methodological framework of the study, land use changes in most hill districts result from deforestation assumed to take place at the annual rate of one per cent

over the past few decades (Master Plan). Table 7.5 presents the projected land use changes in Dhading district by ecological region over the 1978-1990 period.

The overall land use distribution in the district shows that over two-thirds of natural forests and 92 per cent of the cultivated land lie in the mid-mountain region where over 91 per cent of the district's population is concentrated. All the natural forests in the mid-mountains are accessible and are of immature type (72%), predominantly hardwood (66%). Only 84 per cent of the natural forest in the high mountains is accessible with a relatively large proportion falling under crown density class 2 and maturity class type-matured. All the accessible forests in the district are projected to decline at the rate of one per cent as stated earlier. Since a major portion of the deforested areas is assumed to be converted into shrubland, the area under shrubland will expand more than other categories of land use such as grass, non-cultivated inclusions, and net cultivated land.

As is evident from Table 7.5, the share of accessible forests in the mid-mountains(high mountains) declined from 32 per cent (47%) to 28 per cent (41%). The share of accessible forests in the district as a whole declined from 35 per cent in 1978 to 31 per cent in 1990, whereas the per cent of cultivated and increased from one per cent to 20 per cent during the same period. It should also be noted that over 52 per cent of the net cultivated land in the mid-mountains, which covers over 90 per cent of the district's cultivated land, is under level terraces, 37 per cent under sloping terraces, and the rest under lower foot slopes.

Economic and Natural Resource Conditions: Baseline Scenario

This section deals with the baseline results generated by the multi-market model in order to examine the economic and environmental status of Dhading district over time under the current state of technology and infrastructure in the district. The baseline results are important, because it is against these results that verification of the extension economic and environmental situation of Dhading can be made. Moreover, the baseline results are important for valuating the changes over time when shocks are given to the model. The first section provides an idea of the past economic performance of the district. The capacities of land in terms of food, fuelwood, and fodder.

Crop Area and Yield

The historical trends in the area under different crops and crops yields in Dhading over the 1975-1990 period have already been described in the preceding section. The forecasted baseline results regarding the crop area and crop yields over the 1989-1991 period are examined in this section. Data on the forecasted area for different crops, based on the semi-log time trend fitted to historical data, are

presented in Table 7.6. Similarly, Table 7.7 provides the respective crop yield projections, based on the assumption of non-constant crop prices and variable inputs.

The forecasted crop area indicates almost negligible growth rates in Dhading. The highest positive growth rate is for oilseeds (3.5%), followed by wheat (1.9%), and the lowest for maize (0.50%). The total cropped area in the district also does not appear to change much over time (1.2%). Expansion of the total cultivated land in the district seems to be limited, unless more forests are brought under cultivation, which is possible only at a high cost, i.e, environmental degradation. Increasing the cropping intensity is possible, but more investment will be required.

The available data indicate that about 26 per cent of the district's cultivated land is under year round (10%) and monsoon irrigation (16%), and the potential area that can be brought under irrigation is estimated to be 10,839 hectares. The year-round irrigated area is assumed to grow over time at two per cent per annum (Table 7.6), and in 1991 it covered 7,593 ha or about 73 per cent of the potential irrigable area. Given that a large part of the potential irrigable area in Dhading is already under irrigation, agricultural development will have to focus more on productivity and increasing the cropping intensity, as well as efficient use of irrigation water.

The availability of chemical fertilisers is another principal constraint to increasing both the cropping intensity and crop yields in the district. Fertiliser sales are expected to flow at a rate of 4.4 per cent, based on the time trend equation fitted to the historical fertiliser sale, data reported by the AIC. The projected fertiliser sales in the district, according to estimates, met 90 per cent of the fertiliser demand in 1991. However, the fertiliser deficit in the district is expected to decline over time, especially after 1994, because the projected sale, of fertiliser increases at a faster rate than the fertiliser demand (1.25%), based on the results(Table 7.6).

Data on the forecasted crop yields in Dhading are given in Table 7.7. This is based on the assumption that crop technologies will remain the same over time. The forecasted crop yields are not encouraging. All crops considered show fairly stagnant or negative yield trends over time, with the annual rate of decline ranging from 0.03 per cent for millet to 0.18 per cent for paddy. Given the fairly low crop yield growth rates, any increase in the food grain total in the district in future is expected to exert additional pressure on forest lands, if the productivity and cropping intensity are not increased.

Crop Production

Crop output or production is determined by the area and yield outcomes discussed in the methodology section. Table 7.8 indicates that the resulting growth in production of all crops is positive with the highest growth observed for oilseeds

(3.45%), followed by wheat (1.7%), and the lowest for maize (0.43%). The positive growth observed in production is due to an increase, although small, in the cultivation area rather than an increase in yield.

Gross Margin

Table 7.9 presents the projected gross margins and cost of cultivation per hectare of cultivated crops. It should be noted that the gross margins were derived by subtracting the projected variable cost of cultivation from the projected value of crops, including the value of crop residue.

The results indicate positive gross margins for all crops, except for millet, as crop prices are assumed to grow at about seven per cent per annum. As in the other districts of Bagmati zone, potatoes appear to be the most profitable crop in terms of returns (currently estimated to be over Rs 27,000 per hectare). Oilseeds rank second, followed by paddy and wheat in terms of per hectare gross margins. Since the per hectare gross margin of paddy reflects a possible increase at a faster rate (18.5%) than that of potatoes (7.3%) over time, the relative contribution of potatoes to the total crop income, however, declines (from 44% in 1991 to 28% in 1998), while that of paddy increases (32% in 1991 to 43 % in 1998). The maize gross margin also increases at a relatively higher rate despite lower returns. According to the results, the millet gross margin, estimated to be negative in 1991, has shown an improved trend, especially after 1993.

Livestock

The gross margin from the livestock sector was estimated, based on projection of the livestock population and products. Table 7.10 indicates that the estimated livestock population in terms of LSU is expected to remain more or less stagnant from 1990- 1998. Any changes in the livestock population, particularly grazing animals, are assumed to be driven by the land use and cattle population changes as described in the methodology section. The average LSU holding per household declines over time because the number of households increases at a faster rate than the LSU population.

Milk, ghee, meat, and wool are the main livestock products. The average yield per head of animal, derived from the historical data on different types of livestock population and their respective produce, was assumed to remain constant over time. These average yield figures were applied to the forecasted livestock population to project the livestock products in the district. Table 7.11 presents the projected trends for different livestock products in the district. The average annual growth rate of all livestock products, except buffalo milk, goat meat, and mutton show a positive trend with the highest positive growth rate being observed for pork and wool (over 6%) followed by chicken (5.9%), and the lowest for ghee and milk

(less than 1%). Given the fairly stagnant trend in meat supply from buffaloes, which constitute a large proportion of the livestock population in the district, the aggregate meat supply in the district is expected to grow at less than one per cent per annum.

The forecasted gross margin from livestock, which was estimated by subtracting the livestock-raising cost from livestock revenue, is given in Table 7.12. The results indicate that of the total gross margin from livestock,that from buffaloes is among the highest followed by sheep and goats. The total gross margin from livestock in the district was estimated to be Rs 101.3 million in 1991 out of which over 62 per cent is accounted for by meat (36%) and milk production (26%) from buffaloes alone, and the rest by sheep and goats (18%), cows (9%), and pigs and poultry (11%). It can be estimated from the results given in Table 7.12 that the gross margin per head of milch buffalo is presently 2.3 times greater than the gross margin per milch cow (Rs 580), because of the higher milk yield of the former compared to the latter, despite the higher cost of raising buffaloes. On the whole, the total gross margin from livestock in the district is expected to grow at an annual rate of 13.2 per cent per annum.

Food Availability and Demand

The total cereal availability (edible form) in the district is derived by subtracting different waste, loss, and seed allowances from the total production of four cereal grains (rice,wheat,maize,and millet). Further, the per capita availability was derived. Similar exercises were carried our to obtain the per capita domestic supply of vegetables (assumed to be potatoes only), meat (mutton,buffalo, pork, and chicken), oils and fats (derived from oilseed and ghee production), and milk. Per capita availability of the forecasted food items is presented in Table 7.13. Similarly, the forecasted per capita demand for these food categories and the total food balance situation in the district over time are given in Tables 7.14 and 7.15.

The results given in Table 7.13 indicate a declining trend in the per capita availability of types of food, except for oils and fats. The average annual rate of decline in the per capita availability is the highest for milk (1.5%) and the lowest for vegetables (0.19%). This indicates that the population growth in the district exceeds the growth in net food production over the projected period.

The per capita demand for all forecasted food items, by using the demand response function (determined by relative food prices and per capita income), also shows a declining trend over the 1991-1998 period. The highest negative growth is observed in the case of meat (2%) and the lowest for cereals (0.2%/). The projected food balance (Table 7.15) indicates that the district has a net surplus in all food items, except for milk and oils and fat. The results, however, show a declining trend in the per capita food items, with the exception of vegetables, which shows a positive growth of 6.6 per cent over time. The vegetable demand declines at a faster rate

than supply, whereas it is vice-versa in the case of cereals. Since the magnitude of balance in cereals, vegetables, and meat is large enough to compensate for the resulting deficit in other food items, the district has a net surplus in food balance from an aggregate point of view. But this does not necessarily mean that the district is self sufficient in terms of calories, because a district could be producing enough food in terms of the calorie requirements but people may be denied access to food items due to price and income constraints. This issue will be discussed later.

Land Use Changes

Land use in the district is comprised of agriculture, forests, shrubs, grassland, non-cultivated inclusions (NCI), and others. The manner in which land use changes in the district are projected over time has already been described in the methodology section. It is, however, important to note that the land use statistics reported by the LRMP for the year 1978 were updated to reflect the situation prevailing in 1991. While projecting the land-use changes over the 1978-1990 period, the accessible forests in different regions of the district were assumed to be deforested at an annual rate of one per cent (Forestry Master Plan), and the deforested area was assumed to be converted to shrubs and agricultural lands depending upon the assumption of the magnitude and the direction of inter-class land transfer (described in the methodology section). For 1991 onwards, the deforested areas in different regions of the district were determined endogenously by the model on the basis of projected fuelwood deficit (which has to be met largely through deforestation).

The simulation results indicate that deforestation takes place only in the mid-mountain region of the district where over 90 per cent of the district's population is concentrated. The high mountain region contains less than eight per cent of the district's population, but it contains about 33 per cent of the district's total forest area and hence no deforestation is assumed to take place in this region. As a result, the area under all land categories in the high mountain region will remain constant over the projected period (1991-1998). Table 7.16 presents the changes in land use over time in Dhading.

The results show a declining trend in the area under natural forests (annual decline of 0.2%) because of a net decline in the accessible forest area in the district (especially in the mid-mountain region). While natural forests in the mid-mountains are all accessible, only 84 per cent in the high mountains fall in that catagory. The accessible forest area in the mid-mountains is expected to decline at the rate of 0.3 per cent per annum, hence, land-use changes occur in this region also. As can be observed from the Table, shrubland is expected to grow at the rate of 0.5 per cent, while the average annual growth rate of other lands is even lower.

As in the case of Kabhre, Nuwakot, and Sindhu districts, significant discrepancy exists between the cultivated area reported by the LRMP and the area estimated on the basis of DFAMS data. In the absence of time series' data on the cultivated area, DFAMS data on the cropped area were used and the near cultivated area in the district was derived as the sum of non-competing major crops(paddy and maize).

Forest Products

Fuelwood, fodder, and timber are the main forest products for which the demand and supply projections were made under the constant yield assumptions as stated in the methodology section.

Fuelwood .

Fuelwood is assumed to come from different sources, mainly accessible forests, shrubland, grassland, non-cultivated inclusions (NCI), and farmland. The fuelwood yields from these land resources vary, as indicated earlier and, under the constant yield assumptions. The forecasted growth in the supply of fuelwood from these sources depends primarily on the projected changes in area under these categories over time. Similarly, the projected demand for fuelwoood (constant per capita consumption of fuelwood) increases over time with the growth in population.

The supply of fuelwood from different sources (Table 7.17) indicates that currently about 68 per cent of the total fuelwood supply in the district is estimated to come from accessible forests,12 per cent from shrubs and grasslands, and the rest from non-cultivated inclusions (13%) and farmlands (6%). This clearly indicates that forests are the major source of fuelwood. Farmlands contribute a negligible proportion (less than 7 %) of the supply. Over time the share of forests in the supply of fuelwood declines at the an annual rate of 0.2 per cent due to the decline in the accessible forest area, whereas the share of shrublands increase slightly. On the whole, the projected fuelwood supply in the district decreases at an annual rate of less than one per cent.

The total supply of fuelwood in Dhading already falls short of the demand (Table 7.18). Currently, the total supply of fuelwood in the district is estimated to meet 99 per cent of the total requirement, but this balance erodes over time at the rate of 1.5 per cent per annum.

Timber.

Table 7.19 shows a surplus in timber in Dhading district. Forests are the only source of timber and currently its supply is estimated to be 1.16 times greater than the timber demand. Under the constant yield assumption, the timber supply in the

district decreases marginally over time due to the decline in forest area, while the timber demand increases along with the growth in population.

Fodder.

Under the constant yield assumption, the supply of fodder in the district changes in land use as in the case of fuelwood. Table 7.20 shows that during 1991 only 26 per cent of the fodder supply in the district was estimated to come from forests, 41 per cent from farmlands and the rest from NCI (7%), shrubs-grasslands (26%). Over time the share's of forests and shrub-grasslands also decline and that of farmlands increase marginally due to some gains in land made by the latter category. On the whole, the projected supply of fodder in the district meets only 96 per cent of the total fodder requirement and the gap between supply and requirement narrows marginally over time. The quantities available from different sources are given in Table 7.21.

Labour Supply and Use

Labour supply in the district is determined by the size of the active population and the normal duration of work. The normal duration of work in the mountain region as reported by the NRB is 240 mandays available per active member of the household. This constant duration of work was directly applied to the projected active population (Table 7.22) to forecast the total supply of labour (mandays) in the district. While the number of labour days used in the crop and livestock sectors were generated by the model, the labour engaged in other non-agricultural activities was projected by using the information reported by Nepal Rastra Bank.

Table 7.23 provides data on the forecasted labour supply and use situation in the district. During 1991 over 85 per cent of the labour force in the district were gainfully employed, with about two-thirds of them employed in the agricultural sector and the rest in the non-agricultural sectors. Since the projected labour force supply in the district increases at a faster rate than labour use rate, the labour use rate declines marginally over time.

Trade Sector

Food.

The extent of food items exported (imported) in the district is determined by the magnitude of food surplus (deficit) generated by the model based on the estimated food demand and supply forecast. As indicated earlier, Dhading district has a considerable surplus in cereals, meat, and vegetables, but faces a deficit in other food groups such as milk and oils and fats. But since the surplus position in cereals, meat, and vegetables is large enough to compensate for the magnitude of

deficit in other food items, the district is a net exporter of food in an aggregate sense. Table 7.24 shows that the total value (nominal) of the food exported from Dhading will increase from Rs 52.8 million in 1991 to Rs 134 million in 1998, at an annual growth rate of about 9.8 per cent. The per capita value of food exported from the district is forecasted to increase by 12.5 per cent.

Non-food.

All non-food items are imported by the district. The import demand for non-food items is assumed to be influenced by the population growth, income growth, and income elasticity of the non-food demand specified in the methodology section. The average monthly expenditure on non-foods reported by the NRB for the mountain region were first adjusted to reflect the base year situation (1991). The projected growth rate of the import demand was then applied to the base value of non-food imports in order to project the total value of non-food imports in the district. Table 7.24 indicates that non-food imports in Dhading are expected to increase from Rs 261.49 million in 1991 to Rs 296.03 million in 1998, at the rate of 1.7 per cent per annum. The per capita value of non-food imports, however, remains almost stagnant because of the population growth, indicating that the import demand increases to match the population increase.

Income

Income is determined endogenously by the model. Gross margins originating from the crop and livestock sectors and income accruing from different employment activities were added to derive the aggregate income for Dhading. Tables 7.25 and 7.26 present the forecasted nominal and real income originating from different sectors and Table 7.27 provides data on the share of income originating from different sources.

The per capita nominal income for Dhading in 1991 was Rs 930 which is fairly low compared to other rural districts of Bagmati Zone. The sources of income identified in the study do not cover all the sources, and this partially explains the low per capita income generated. There is no authentic source to verify the levels of income in Nepal and the NRB Multi-Purpose Household Budget Survey was used as a guideline.

The per capita nominal income in Dhading is expected to grow at an annual rate of over 11.2 per cent, which is relatively high compared to other districts of Bagmati Zone. The per capita real income estimated by using the weighted cereal grain price index (deflator) at 1990 constant price is expected to grow at an annual rate of 1.6 per cent over the period.

As is evident from Table 7.27, currently the contribution of the livestock sector to the total income in Dhading is higher (39%) than that of the crop sector (33.5%). The share of income originating from both crop and livestock sectors increases while that accruing from off-farm employment activities decreases over time. It can also be noticed from the Table that the relative share of crop income increases at a faster rate (2.4%) than that of livestock income(2.0%).

Environment: Sustainability and Carrying Capacity

This section examines the performance of the sustainability indicators dealing mainly with the pressure on the natural resource base in order to assess the carrying capacity of the district in terms of calories and natural resource products. Other simpler indicators are also examined.

Pressure on the Resource Base.

The performance of the district in terms of some selected sustainability indicators, such as population density, agriculture-forest land ratio, and others can be judged from the results given in Table 7.28. It should be noted that the net cultivated land derived from the LRMP data was used to estimate the density of population on agricultural land. As the cultivated land area derived from the LRMP source is higher than the cultivated area derived from the DFAMS data, the density figure reported in the Table is underestimated in terms of magnitude, while at the same time it is overestimated in terms of growth, given the lower growth rate of cultivated land obtained from the LRMP data (0.06%) than that from the DFAMS data (1.03%). For example, the population density estimated from the DFAMS data in 1991 is about 1.33 times greater (9.81 persons) than that from the LRMP data, whereas the annual growth rate of population density per area of cultivated land according to DFAMS data is 0.48 per cent compared to 1.46 per cent according to LRMP data.

The density of both the human and livestock (LSU) populations per hectare of cultivated land in the district is more pronounced than the density per hectare of accessible forest area. Over time, the population pressure on accessible forests is expected to increase at a faster rate than the pressure on cultivated land, primarily because of the declining (increasing) trend in the accessible forest area (cultivated land) in the district. Similarly, the human population pressure on forests is more alarming than the livestock pressure on forests in terms of both magnitude and growth. Although the livestock density is more pronounced in the case of grazing areas than forests, pressure on grasslands is expected to decline due to its gradual increase as a result of deforestation.

The population density per hectare of cultivated land is currently 7.4 per cent, and this pressure is expected to increase at the rate of 1.5 per cent along with the

population growth, whereas the population pressure on accessible forests is at present estimated to be five persons per hectare and it is projected to grow by about 1.8 per cent a year over this period due to the decline (increase) in forests (population). This indicates that the per capita forest land in the district declines at a faster rate than the per capita cultivated land over time. The livestock pressure on cultivated land, on the other hand, remains more or less stagnant (or negative) over time due to the fairly stagnant growth in the livestock population. However,the density of the livestock population per grazing hectare is fairly high at about 10 LSU per ha compared to three LSU per ha of accessible forest.

One important function of forests in most hill districts is to provide forest litter for compost. On an average, 3.5 hectares of accessible unmanaged forests are needed to sustain the fertility level of one hectare of agricultural field according to an estimate made by Wyatt-Smith. This ratio in Dhading is below(only 1.48) the recommended level of 3.5. Furthermore, this ratio does not improve but deteriorates marginally over time, indicating a declining trend in agricultural productivity. This ratio, however, does not reflect productivity improvements made possible through the use of modern technology such as irrigation facilities and fertiliser application, in which case the pressure on forest lands can be reduced. This implies that adoption of improved agricultural technologies has a direct negative pressure on forests, besides increasing productivity.

The ratio between shrub and forest lands is another indicator explaining partially the extent of forest degradation, since, as forests degrade, they are first converted to shrublands. The estimated shrub-forest land ratio in Dhading is currently not very large but its positive trend over time suggests gradual degradation of forests, primarily as a result of over-exploitation of accessible forests to meet the fuelwood demands.

Carrying Capacity

The carrying capacity of land in terms of food, fuelwood, and fodder was calculated separately on a per hectare basis.

Calories : Assuming that 2,410 calories are required by an adult, the carrying capacity of one hectare of cropland was calculated. Table 7.29 shows that the per hectare calorie supply in Dhading is presently 3,851,000 which is about 74 per cent of the district's calorie demand. The carrying capacity of cropland decreases marginally over time because of the negative trend in calorie supply as a result of the declining trend in crop productivity. More specifically, at present, one hectare of cropland can support about 5.32 adults, whereas the demand pressure (i.e., load per ha) is 7.2 adults, and it is 1.35 times greater than the carrying capacity. This indicates that a little over one hectare of cropped area is required to support the calorie requirement of one household, assuming an average size of 6.5 persons per

household. The load on agricultural land will continue to increase as the population increases, and this situation will deteriorate rapidly since more land cannot be brought under agriculture. The carrying capacity is influenced by the total area under agriculture as well as productivity. Since the area is unlikely to increase to match the population growth, productivity enhancement can significantly improve the carrying capacity and appears to be a viable method for improving the resource base and environmental situation in the district.

Fuelwood. The carrying capacity of both aggregate and forest lands in terms of fuelwood was estimated, and the results are presented in Tables 7.30 and 7.31. The results indicate that the carrying capacity of aggregate land (from which fuelwood originates in Dhading) presently meets 99 per cent of the total fuelwood requirement, but the district's carrying capacity in terms of fuelwood is expected to decline over time at an annual rate of 0.15 per cent. More specifically, at present, one hectare of land can support 2.87 persons, whereas the demand pressure is about three persons per hectare. The projected carrying capacity of land by the year 1998 is expected to meet about 89 per cent of the fuelwood demand.

The carrying capacity of forest in terms of fuelwood (as reported in Table 7.31) further indicates that one hectare of accessible forest can support seven persons, whereas the demand pressure is about 10 persons per hectare. This indicates that the capacity of forests to support the fuelwood requirement of the population is about 70 per cent, but this ability declines over time at the rate of 1.78 per cent due to the decline in accessible forests. Since about 92 per cent of the population in the district is concentrated in the mid-mountain region, the forests in this region will experience a greater amount of pressure over time as the population grows.

Timber. The carrying capacity of the district in terms of timber is slightly better than that of fuelwood and fodder. The results presented in Table 7.32 show that the carrying capacity of forests from which timber originates is now 1.16 times greater than the estimated demand pressure (i.e., load). The capacity of forests to meet the growing demand for timber in the district, however, it continues to decrease over time along with the growth in demand pressure at an annual rate of 1.77 per cent, given the fairly constant trend in timber production.

Fodder. The carrying capacity of the land resources of Dhading from which fodder originates has already exceeded the limit of sustainability. It should be noted that grasslands in the Himal have also been included in the estimation of carrying capacity. Table 7.33 shows that the carrying capacity of the district in terms of fodder is now 1.28 LSU per hectare, whereas demand pressure is 1.33 LSU. This indicates that the fodder demand in the district is in excess (4% higher) of the carrying capacity and over time the carrying capacity improves marginally due to the marginal increase in shrub and grassland as deforestation continues.

Table 7.34 indicates the estimated carrying capacity of forests only. The results indicate that the estimated carrying capacity of forests is currently 0.74 LSU per hectare whereas the demand pressure (i.e.,load) is three LSU per hectare. The capacity of forests to meet the total fodder requirement in the district is, therefore, only 25 per cent, and this will remain almost constant over time. The estimated carrying capacity of forests in the mid-mountains is even lower, given the heavy concentration of population in this region (Table 7.34).

Conclusion

Under the current state of technology and infrastructure, the performance of the agricultural sector, upon which the economy of the district depends, continues to remain fairly stagnant or show signs of negative growth over the period considered. The yield rates of most crops and livestock productivity are low and in a state of decline, while the population is growing at an annual rate of 1.5 per cent, adding pressure to the resource base of the district. The population growth exerts unsustainable pressure on the natural resource base and leads to deforestation and environmental degradation. The possibility of further expansion of the cultivated land area to meet the growing food demand seems to be limited in future unless at a high cost, i.e., environmental degradation.

Given the negative trend in productivity growth and continuous deforestation in addition to the population growth, the carrying capacity of the district in terms of food and natural resource products, particularly fuelwood, fodder, and timber, shows a declining trend over time. The estimated real per capita income of the district is low compared to the other districts of Bagmati Zone and is expected to grow by less than two per cent annually over time. The declining share of income originating from the non-agricultural sector, on the other hand, implies that future plans and programmes for promoting off-farm employment opportunities in the rural areas would have far- reaching effects on raising the income level and growth in the district. On the whole, the future of the district depends upon how the food and natural resource policies are coordinated with the population policy.

Policy Scenarios and Impact Analysis

Introduction

In this section, the adaptive simulation model is used to analyse the impacts of different policy scenarios against the baseline results discussed earlier. The population of Dhading district continues to grow at about 1.5 per cent per annum on the basis of the recent population census results. The population of the district is already high in relation to the economic base, and it is believed that more and more people are falling below the poverty line. The growth in population is also

eroding the resource base of the district. The agricultural productivity is declining and the increasing demand for fuelwood has resulted in forest degradation. The livestock pressure has further compounded the problem. This section, therefore, attempts to evaluate some of these issues. Since some of the policies examined have impacts that spread over a longer time period than 1998, the timeframe was extended to the year 2005.

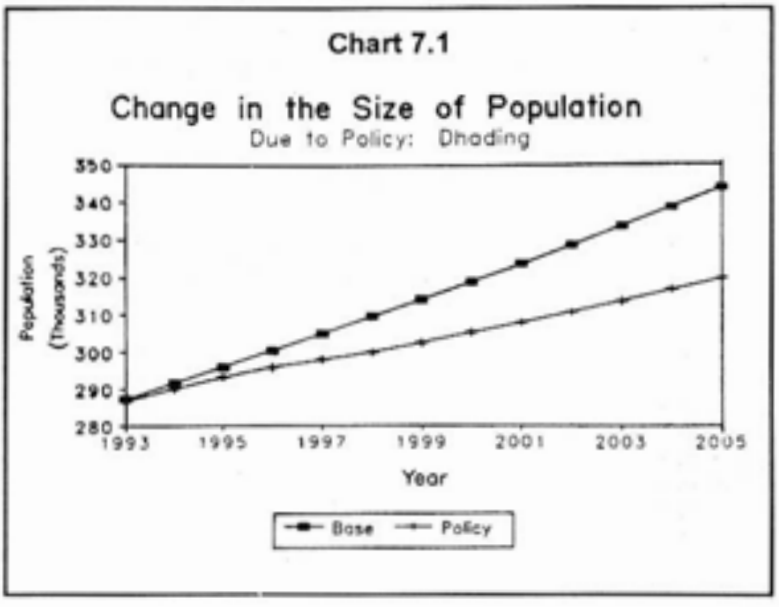
Population Scenario and Impact

Dhading's population growth, according to the 1991 census, is about 1.51 per cent compared to the national average of 2.3 per cent. Despite this relatively lower population growth recorded between the inter-census period from 1981-1991, the economy of Dhading is fairly unsustainable, based on the results discussed under the baseline scenario. Thus, a population reduction policy was examined within the simulation model development for Dhading.

The population reduction policy is assumed to start in 1993 and continue untill 1998. Initially,only a small reduction (growth rate) was envisaged and this was allowed to decrease each year till it reached 0.605 per cent (in 1998). This was made possible by reducing the annual growth by ten per cent each year (beginning in 1993), so that in 1998 the population growth rate would be 60 per cent that of the inter-census growth rate of 1.51 per cent. Beyond 1998, the average growth between 1993-1998 is assumed to drive the population of Dhading. The results are given in Table 7.35.

The population growth under the baseline scenario was derived from the results of population projection provided by the NPC (1992). The 1.514 growth rate was assumed to project population beyond 2001 under the baseline scenario. Under the policy scenario, the annual growth rate corresponding to the baseline scenario was assumed to decrease by ten per cent annually. The resulting growth rates are provided in Table 7.35. The average growth rate of 0.908 per cent was then assumed to be the population growth in Dhading after 1998. The average growth of population beyond 1998 is higher than the growth rate in 1998. This is because, after 1998, the population policy intervention stops and the growth rate is likely to increase but perhaps not to the original level of 1.51 per cent. Hence an average growth rate (1993-1998) was selected to project population beyond 1998.

Table 7.35 also provides the net annual reduction in population due to the policy relative to the baseline scenario. Each year the reduction increases. The last line of Table 7.35 provides the cumulative reduction in population of Dhading as a result of the policy. By the year 2005, there will be 46,014 people less in Dhading as a result of policy alternatives. Charts 7.1 and 7.2 depict the results. The implications of this reduction are reflected in both the food and natural resource sectors simultaneously with the other policy interventions made and are examined below.



Crop Sector: Policy Scenarios and Impacts

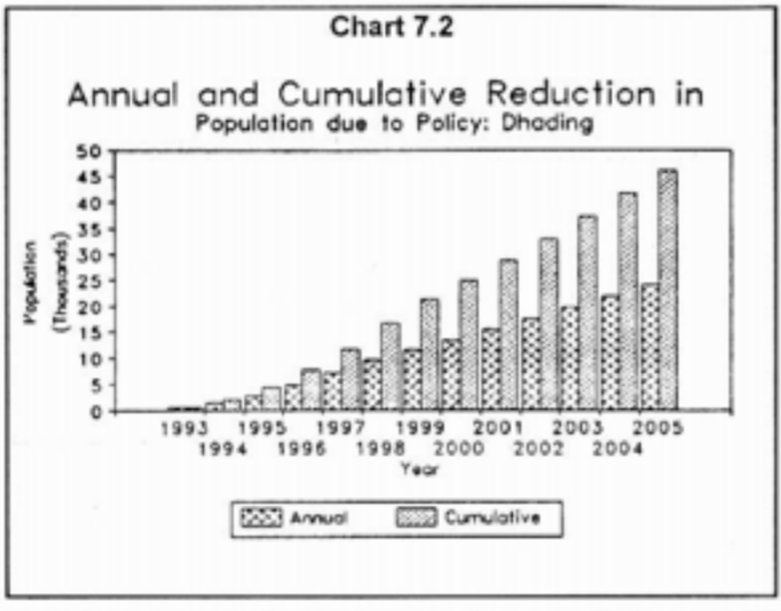
For many years to come, the agricultural sector will continue to play a predominant role in Dhading as almost the entire population of the district depend upon this sector either directly or indirectly for a living. Four different policy alternatives are examined in the food sector. The first policy alternative consists of irrigation development, whereby all potential irrigable area in the district is assumed to be fully developed. The second policy assures a 25 per cent increment in the application of chemical fertilisers. The third policy examines the irrigation development and fertiliser policies jointly including the population reduction policy. Since irrigation also makes it possible to increase the cropping intensity, the additional area irrigated is assumed to be brought under potato cultivation. The last policy in the food sector assumes a reduction in unproductive cattle by the per cent. The milk yield rates of these animals under the baseline scenario have been fixed at 0.4 and 0.9 litres per cow and buffalo respectively. Along with the increased milk yield rate assumption, it is also assumed that fodder consumption per LSU increases by 25 per cent.

Impact on the Food Sector

Crop Yield. Under the current state of agricultural technology and infrastructure, the productivity trends of both food and cash crops in Dhading reveal a bleak picture. Not only is the level of productivity low, but the growth trend is fairly stagnant or declines marginally over the projected 1993-2005 period. The lack of year-round irrigation facilities and the low level of fertiliser use are principal constraints to

improving both the cropping intensity and crops yields in the district. Consequently, both irrigation and fertiliser policies are examined and Table 7.36 shows the forecasted change in crop yields, with and without policy interventions.

Chart 7.2



The estimated irrigated area under the baseline trend in 1993 was 7,900 hectares with a potential area that can be brought under irrigation in the district at 10,839 hectares. Bringing all the potential area under irrigation through the irrigation development policy, therefore, implies an increase in the irrigated area by 37 per cent. Expansion in irrigation facilities will improve the yields of different crops, depending upon the irrigation elasticity parameters of crop response functions used in the model. The results presented in Table 7.36 indicate that both the magnitude and trend of crop yields improve significantly as a result of these policies, but the increase varies. For example, the magnitude of increase in crop yields due to irrigation is the highest for wheat (10% increase over baseline yield) and the lowest for maize (only 2%), whereas the long-run average growth rate of crop yield, although less than one per cent, is among the highest for paddy (0.275%) followed by potatoes (0.18%). The millet yield remains unaffected by this policy and thus its negative yield trend persists even after introducing the irrigation policy.

The impact of the 25 per cent increase in the per hectare application of fertiliser on crop yields is lower than that of the irrigation policy, whereas the long-run growth trend in yields of crops under the fetliliser policy scenario is relatively higher than under the irrigation policy. All considerations remaining the same, a 25 per cent increase in the use rate of fertiliser increases the yields of paddy and wheat by six per cent and that of potatoes and maize by less than three per cent, given the fertiliser elasticities assumed in the model. Since no fertiliser is assumed to be applied on millet, its yield trend is the same as under the baseline scenario.

When both the irrigation and fertiliser policies are introduced jointly together with an increase in the area [1] under potatoes, the wheat yield increases the most (17%), followed by paddy (10%), and the maize yield increases by less than five per cent compared to the per hectare yield in 1993 under the baseline scenario. Despite improvements in crop yield rates, it is interesting to note that the growth rates under this policy are more or less the same or even lower than under the fertiliser policy. This might suggest the relative merit of the fertiliser policy over the irrigation policy in terms of the long-run growth of crop yields. The population reduction policy has no obvious impact on crop yields.

Food Availability. Since the population growth surpasses the growth in net food production, the per capita availability of all food items, except oils and fat, in Dhading shows a declining trend over time under the baseline scenario. It is, therefore, equally important to reduce the existing growth rate of population in order to realise the meaningful and sustained impacts of the supply side policy interventions, such as fertiliser and irrigation, and that of the livestock policy. The forecasted trends in the per capita food availability, with and without policy interceptions, are presented in Table 7.37.

The results indicate that, while the level of per capita availability improves modestly, as a result of the population reduction policy relative to the baseline situation, the long-run growth in the supply of most food items, especially cereals, milk and meat continues to show a declining trend. This indicates that the long run growth rate of the per capita supply of cereals, milk, and meat in the district is even lower than the reduction in population growth rate assumed under the population policy (0.9%). The impact of raising the livestock productivity (yield rate of milch animals and reduced number of unproductive cattle) on the milk supply is more visible for obvious reasons. For example, the per capita milk supply would increase by over two-folds and oils and fat by one and a half-fold if the livestock policy is introduced. Similarly, the introduction of the irrigation and fertiliser policies has a stronger effect on increasing the level of per capita food availability, particularly cereals and vegetables, compared to the population policy. But it is interesting to note that the population policy indicates a relatively better picture than other policies in long-term growth. This might also suggest that mere adoption of a single policy is not adequate for improving both the level and growth rate of food availability in the district. When irrigation and fertiliser policies are introduced jointly along with the population policy, the level of food availability improves considerably. However, the long-run growth rates of food items, particularly vegetables, milk, and meat are still lower than the population growth.

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1. Note that this last set of policy alternatives also includes the population reduction policy, which is not expected to have an impact on the yield rates of crops.

Food Demand. The rural households' demand for food is assumed to be influenced by any changes in the income and price of different food items. The food policy scenario considered in the present exercise, however, increases household income (through increased crop production), and hence the per capita food demand increases depending upon the growth in income and the magnitude of income elasticity of the demand. The changes in the per capita demand of different food groups forecasted under the five different sets of policy interventions are given in Table 7.38. Price effects are also built in the demand framework and food prices increase at different growth rates.

The per capita demand for all food items under the baseline scenario shows a marginally declining trend over time. The impact of the population policy on the per capita demand, which results primarily from the change in the per capita income, is not much compared to the baseline situation, since the per capita income increases marginally when the population growth decreases over time, other considerations remaining the same. The case is similar under the livestock, irrigation, and fertiliser policy scenarios. Since food is a necessity, its income elasticity is generally inelastic, indicating that demand for food does not change proportionately with the change in income.

When both the irrigation and fertiliser policies are introduced jointly with an increase in the cropping intensity (increased area under potatoes) and the population policy, the per capita demand for all food items, however, increases considerably in the initial years and then begins to decline over time.

Food Balance. The per capita food balance situation, with and without food policy interventions, in the district over the 1993-2005 period is presented in Table 7.39. Under the baseline situation, the district experiences a net surplus in cereals, vegetables, and meat, although the net surplus, especially in cereals and meat, declines over time. With the population reduction policy, the rate of decline in the per capita food balance improves considerably,despite the magnitude of surplus under this policy more or less in keeping with the baseline situation. The livestock policy improves the per capita milk balance considerably for obvious reasons. Similarly, the irrigation and fertiliser policies have positive impacts on the per capita food balance. When the population policy, combined with the irrigation and fertiliser policies, are introduced jointly along with the expansion in the area under potato in newly irrigated areas, the net surplus in the food balance is expected to decline drastically. This takes place mainly due to a sudden rise in income which induces increased food demand. From 1994 onwards, the surplus in food balance, however, improves considerably, due to the decline in the per capita demand, as a result of the gradual decline in income growth.

Calorie Balance. Table 7.40 (Chart 7.3) provides the forecasted calorie requirement and supply situation in the district under each policy scenario. Under the calorie

need and supply scenario, only cereals and potatoes are considered (see methodology section for details). Furthermore, calorie requirement and supply are independent of income and prices, and thus calorie requirement and supply are different from demand and supply, as the latter depend on income and prices. The estimated calorie supply meets 74 per cent of the total calorie requirement in the district, and this situation declines marginally over time. With the introduction of the population policy, the rate of decline in the calorie deficit improves because of the modest decline in the per hectare calorie requirement, as the load on a hectare of land declines. Although the livestock policy increases the supply of milk and meat, these food items are not considered in the estimation of calorie supply, and hence the livestock policy is not seen to have any impact on the calorie supply and requirement situation.

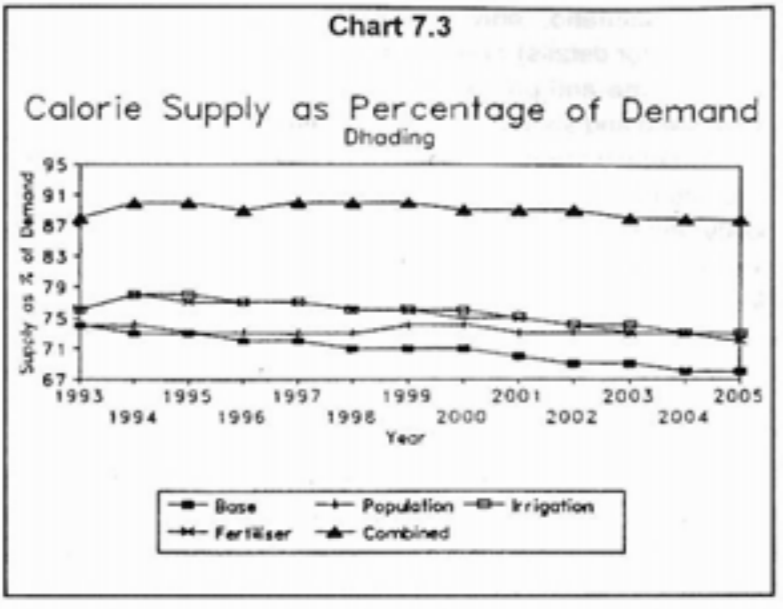
With the introduction of the irrigation and fertiliser policies, the magnitude of the calorie balance in the district improves, but the calorie balance situation under both policies declines over time because the calorie requirement increases at a faster rate than supply. This clearly indicates that implementation of the supply side food policy alone is not sufficient to improve the calorie balance situation in Dhading over the long-run, unless the population growth is also curbed. In other words, a combination of demand and supply policies is required to bring about a sustainable food situation in the district. For example, over 88 per cent of the district's calorie requirement can be expected to be met from the supply, when both the irrigation and fertiliser policies are introduced jointly along with the population reduction policy. Under each policy alternative, the percentage of calories met from the district's supply is much lower. Under the last policy alternative, the calorie balance situation, although not positive, nevertheless does not deteriorate as much as under other policy options.

Impact of Trade

The manner in which both food and non-food trade in the district were forecasted has already been described earlier. The impacts of policy alternatives on food and non-food trade are examined in this section and the results generated by the model under each policy scenario are presented in Table 7.41.

Food. Currently, the district is a net exporter of food in an aggregate sense, with the export increasing at a rate of about seven per cent per annum under the baseline scenario. It may sound puzzling at this stage to say that Dhading exports food,when, in fact, the calorie requirement is not being met. Income and relative prices, which determine the per capita food demand, are subtracted from the per capita food availability discussed above. The balance is assumed to be traded.

Chart 7.3



Among the different food policy alternatives considered independently, the long-run growth rate of the per capita value of food exports is found to be the highest under the livestock policy (16.5%), followed by the population reduction policy (10.7%). The former policy results in a net increase in the milk supply and hence exports, whereas the latter policy results in reduced demand growth over time and also contributes to exports. The per capita value of food export under the irrigation and fertiliser policies also increases at the rate of over 10 per cent annually compared to 6.7 per cent under the baseline scenario. Again, as the results indicate, the impact is much more pronounced when both demand and supply policies are jointly introduced.Under such combined policy alternatives, the per capita value (nominal) of food export in Dhading is expected to reach Rs 2,210 by 2005 at an annual rate of about 23 per cent, which is relatively much higher than under the other policy options considered (Chart 7.4).

Non-Food.

The extent to which the demand for non-food import is influenced by policy interventions depends to a large extent upon the magnitude of growth in income, resulting from the policy interventions together with the strength of income elasticity of non-food demand, other considerations remaining the same. The results provided in Table 7.41 indicate that the value of non-food import under the joint policy is much more pronounced than under a single policy, such as the irrigation and fertilser policies. The per capita value of non-food import under all policy scenarios is, however, forecasted to grow by less than one per cent over the period. The value of non-food import under the single policy intervention does not

change from the baseline scenario. This is perhaps because the annual growth in income, resulting from the policy intervention, which reduces over time, is not strong enough to induce import demand growth over time, given that the income elasticity of demand for non-food in rural areas, is also not highly elastic.

Impact on Labour Use

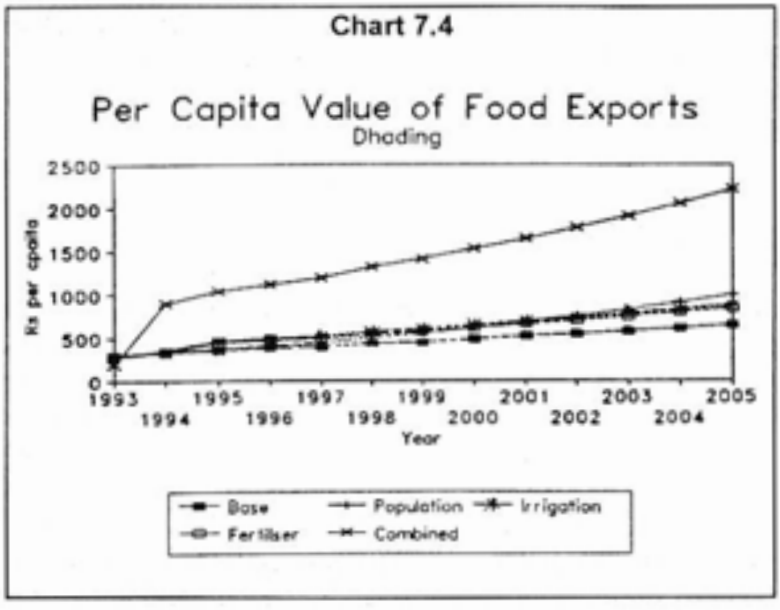
Before examining the impacts of the policy interventions on employment, it is important to emphasis that any increase in the total labour utilisation as a result of a policy action, results primarily from the agricultural sector rather than from the non-agricultural sector. It is, therefore, only under the joint policy that the additional labour force (in terms of mandays) can be utilised in the crop sector due to increased cropping intensity effects. While development of irrigation facilities would also help to generate considerable employment opportunities, at least in the short run, this effect has not been taken into account in the present exercise. As a result, the total labour utilisation rate, under both irrigation and fertiliser policies, remains more or less similar to the baseline situation. When the irrigation and fertiliser policies, combined with the population reduction policy, are introduced jointly, the labour use rate improves marginally to 85 per cent compared to 83 per cent under the baseline scenario in 1993 (Table 7.42)

The labour use rate under all policy scenarios shows a declining trend over time. But the rate of decline in the labour use rate under the combined policy, as well as under the population policy, is, however, relatively lower than under the baseline scenario. The additional labour that is utilised under the combined policy is the result of the cropping intensity effect of the potato season, but this has not been included in the present exercise to simplify matters.

Impact on Income

All the policies examined above affect the per capita income. The estimated nominal incomes originating from all these sources were converted to real income, using the weighted cereal grain price index at 1991 constant price as mentioned in the baseline results described above. The results presented in Table 7.43 indicate that the real per capita income, which is estimated to be Rs 1,030 by the year 2005 under the baseline situation, would reach Rs 1,096 under the population policy, Rs 1,180 under the livestock policy, and Rs 1,422 when both the irrigation and fertiliser policies are introduced jointly along with the population policy. Among the single policy interventions, the livestock policy is seen be most effective in increasing income in the short run, while the population policy shows positive results over a longer period.

Chart 7.4



Data on the relative share of different sources of income in the total income, with and without policy interventions, are provided in Table 7.44 (Chart 7.5). The contribution of the crop sector to the total income, about 36 per cent under the baseline scenario in 1993, is expected to reach 55 per cent when the combined-irrigation,fertiliser, and population-policy is introduced. The projected share of the crop and livestock sectors' income increases while non-agricultural income decreases under each policy scenario. The declining share of non-agricultural income implies that the nominal money wage in the non-agricultural sector grows at a rate lower than the annual growth rate of inflation(price index) and, at the same time, it was not possible to predict whether the non-agricultural sector's employment would grow over time. It is further evident from the policy analysis that the share of the livestock sector in the total income would increase significantly from 39 per cent under the baseline scenario in 1993 to about 50 per cent under the livestock management policy. However, the forecasted share of the livestock sector in the total over time is expected to decline, given the marginally declining trend in productive livestock, especially milch buffaloes, sheep, and goats.

Natural Resource Sector: Policy Scenarios and Impacts

Forests provide fuelwood, timber, and fodder. To meet these growing demands, forests have either been degraded or deforested. As a result, three different policy alternatives are examined in the natural resource sector. The first policy examines a reduction in the per capita consumption of fuelwood by 10 per cent. Introduction of smokeless *chulo* (stoves) has been found to reduce fuelwood consumption by about ten per cent based on studies on this issue. Secondly, a policy whereby all forests in Dhading are assumed to be brought under management is examined.

Proper management results in fuelwood and fodder yield improvement. Thirdly, the two polices are then examined jointly along with the population reduction policy.

Impact on Land Use

As the population increases, greater and greater pressure will be exerted on the land resources to meet the food, fuelwood, and fodder demands. The fertility of existing agricultural lands is declining annually, resulting in a declining fertility trend over time. Forests provide nutrients to farmers' fields and meet fuelwood and fodder demands. Each year, as the population increases, the land use dynamics also change along with reduction in forest covers degradation of forests, increasing areas under shrubland, and possibly agriculture. Thus, changes in population and productivity result in land-use changes.

Table 7.45 provides data on the land use changes under different policy scenarios. Since the livestock population also has implications on land use in terms of fodder demand, the livestock policy results are also presented in Table 7.45. Under the baseline scenario, the area under forests is seen to decline with gains made by all other land uses. The results do not change much under the population, livestock, and demand reduction policies as a negative growth trend in forest areas continue. However, when all forests in Dhading are assumed to have been brought under management, the negative growth trend is reduced by almost one-fourths compared to the baseline scenario. The natural resource and population policies, implemented jointly will result in a stationary situation whereby the forest area will remain almost the same throughout the entire period. The natural resource policy includes both the supply management and demand reduction polices besides the population policy.[2] Clearly, the results indicate that increasing the area under forests is a difficult task.

Impact on Fuelwood

Table 7.46 provides data on the different sources of fuelwood and their shares. Under the baseline scenario, forests provide between 65-68 per cent of the fuelwood supply, followed by adjacent NCI and shrubland. Other land category shares are relatively smaller. The population reduction and livestock policies do not have any appreciable impact on the relative contribution of different land uses to the fuelwood supply. The Natural Resource Policy (NRP) has the most profound impact since the forest area as well as its contribution to the total fuelwood supply increase.

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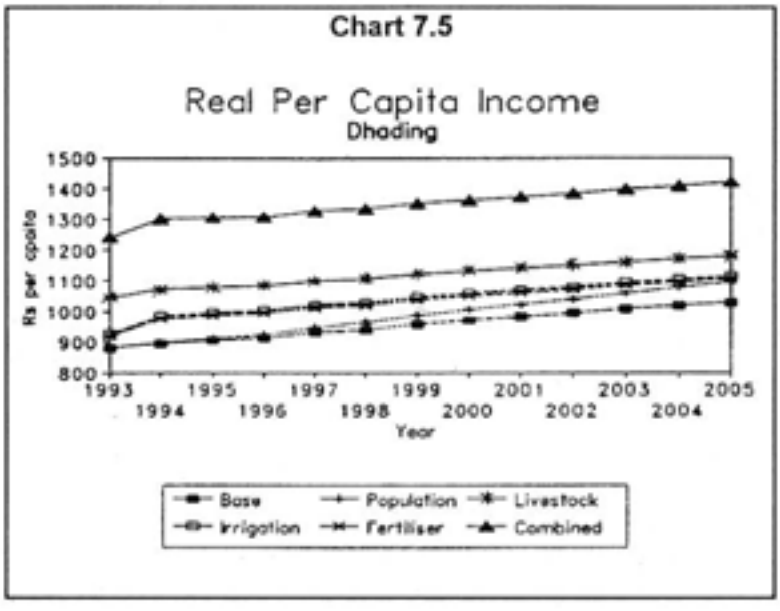
2. This last policy will be referred to as the natural resource policy (NRP) hereafter.

Chart 7.5



Impact on Fodder

Table 7.47 provides similar results regarding the supply of fodder from different sources. The cultivated area's contribution to the total fodder supply is seen to be the largest under all policy alternatives and its share continues to grow over time under all the policy scenarios. Under the management and NRP alternatives, the share of forests is seen to increase, although the negative growth trend continues.

Environment and Carrying Capacity

Pressure on the Resource Base

Some indicators relating to the resource base were also developed. The different policies affect these indicators in different ways, and they are highlighted in Table 7.48. The values of these indicators under the baseline scenario are also provided.

Per Capita Cultivated Land. The per capita cultivated land (ha/person) in Dhading is already low (0.13 ha/person), and, as the population grows, the list will decline to 0.11 ha/person by the year 2005. The different policy alternatives do not have any significant impact on improving this indicator. The different reduction policy will increase the value from 0.11 ha/person to 0.12 ha/person by 2005. The NRP will field the same results. The person/ha indicator (which is opposite this indicator) should be examined also over time. As is clear, the population density on

agricultural land increases under all scenarios. It should be noted that the population density on the cultivated areas is the highest under the fuelwood demand reduction and management polices. This is so because according to the model, deforestation leads to an increment in agricultural land and, since no deforestation occurs as in the case of these two policies, the population density on the cultivated area increases. The NRP policy also reduces the density compared to the baseline scenario.

Per Capita Accessible Forest. The per capita accessible forests in Dhading will decline from 0.19 ha/person in 1993 to 0.15 ha/person by 2005 under the baseline scenario. No changes in the forest area occur in comparison to the baseline scenario under the population policy, but, since the population growth decreases, an improvement in the per hectare availability of accessible forests occurs. The livestock policy has no impact on this ratio as is to be expected. The demand reduction policy has a positive impact. Both the population reduction and demand reduction policies work on the demand side by curtailing the overall demand and do not influence the supply side. The management policy has an impact that is similar to the demand reduction policy. Finally, the NRP policy alternatives influence both the demand and supply, and it can be seen from the results in Table 7.48 that the impact of this policy is the strongest (see growth rate). The population density per accessible forest, which is also presented in the table, indicates the growing pressure exerted by the human population on the forest area.

Forest-Cultivated Area. The forest-cultivated area ratio is also an important indicator. Forests provide leaf litter for eventual use as compost to supplement the field nutrients. Thus, as the forest area declines, the supply of leaf litter will also be reduced, and this has an impact on the soil fertility. A study (Wyatt-Smith) has indicated that about 3.5 hectares of forests are required to sustain one ha of agricultural land. In the case of Dhading, this ratio is only about half and under the baseline scenario it gradually gets smaller. None of the policies examined are strong enough to improve this ratio to 3.5 hectares.

Shrub-Forest Area Ratio. The shrub-forest area ratio is an indicator of forest degradation because, as forests degrade, they are first converted to shrublands. The model allows for this interaction described in detail in the methodology section. Under the baseline scenario, this ratio increases. The NRP policy has the strongest impact relatively in terms of retarding this ratio.

Livestock Density. Livestock also exert pressure on cultivated land, forest, and grazing lands. These three indicators of livestock density are also given in Table7.48. As expected, the livestock policy reduces the density compared to other policies. The livestock density on grazing area increases to about 10 LSU under the

NRP policy, despite this policy's overall positive impact. The reason why density increases is that, as deforestation is controlled (under this policy), the land use changes that occur do not contribute enough additional area to grazing lands to lower the density. Despite the higher density of LSU under this policy alternative, it has already been shown that the fodder supply will exceed the fodder demand in Dhading, hence the high density under this policy scenario should not be a critical issue.

Carrying Capacity. The impact of the different policy options analysed under the natural resource sector has implications for the carrying capacity of land to meet food,fuelwood, timber, and fodder needs. This section examines these impacts.

Food. The food sector analysis has already indicated that Dhading is unable to supply enough calories to meet the population's needs under the prevailing state of technology. Only about 74 per cent of the calorie requirement is being met, and this supply dwindles by nearly 0.7 per cent per annum to reach about 68 per cent by 2005. To explain the calorie situation in a different way, currently about 7.22 persons(adults) depend on a hectare of agricultural land to fulfill their calorie requirements. As the population increases over time, this load on a hectare increases at about 0.6 per cent per annum, reaching 7.76 persons by 2005 under the baseline scenario (Table 7.49). One hectare of cultivated area (paddy,maize, wheat, millet and potatoes) can support only 5.32 adults and, since productivity is declining, the carrying capacity also declines to 5.25 persons by 2005 under the baseline scenario.

The population reduction policy does not have any impact on the carrying capacity of agricultural land but affects the load factor positively , as the total calorie requirement declines in proportion to population reduction. The reduction in population is just sufficient to maintain a constant calorie supply of about 73 per cent throughout the period, as can be noticed in Table 7.49. Since the livestock, fuelwood reduction, and forest management policies do not involve direct interaction with the food sector, the results in respect to agricultural land are similar to those of the baseline. The more obvious impacts of these policies are discussed below.

The changes that can be observed under the NRP are primarily the result of the population policy since the other combined policies (fuelwood reduction and forest management) have no impact on agricultural land use. Under all policy alternatives, the pressure on agricultural land is obvious and exceeds the level that the land can bear. A more detailed discussion of the impacts of other policy alternatives on the agricultural sector has already been given above (food sector).

Fuelwood. The impacts of the alternative polices on fuelwood demand and supply are given in Table 7.50. The carrying capacity indicates how many person's

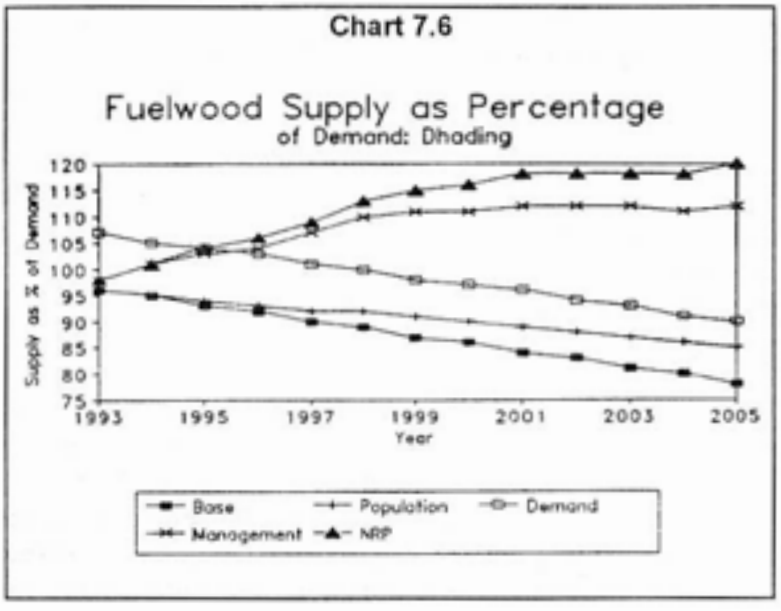
fuelwood requirements one hectare of forest land can meet, given that one adult's fuelwood requirement is 588 kg per year. Under the baseline scenario, the carrying capacity is seen to decline rapidly at about 1.7 per cent per annum. One hectare of forest land can support 2.87 persons' fuelwood requirements per year, and this capacity declines to 2.76 persons by the year 2005 from the figure of 2.99 persons in 1993 at an annual rate of 1.42 per cent. Each year the unfulfilled fuelwood demand is met by deforestation, which reduces the forest area. This is a cumulative effect and each year more and more forest areas vanish, reducing the forest stock as well as the overall supply of fuelwood, timber, and fodder, consequently resulting in lower annual supplies.

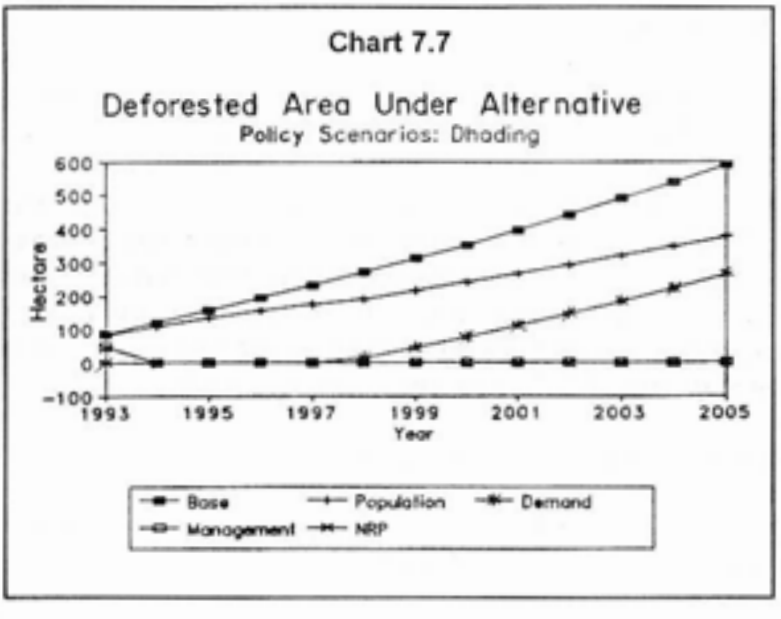
The impact of the population policy reduces the incremental fuelwood demand and improves Dhading's fuelwood situation. As shown, 85 per cent of the fuelwood requirement will be met by 2005, compared to 78 per cent under the baseline scenario. However, despite this reduction, forests in Dhading will be unable to meet the fuelwood demand and thus a continuous state of deforestation at about one per cent per annum is predicted. Under the demand reduction policy, the fuelwood situation improves in 1993 as a surplus of fuelwood occurs in Dhading. But this situation does not last long and as the population continues to grow at 1.51 per cent, a fuelwood deficit is predicted to occur by 1999, resulting in deforestation once again (Chart 7.6).

The forest management policy assumed that all accessible forests in Dhading were under proper management in 1993. The results were remarkable. According to this assumption, fuelwood deficits occured in 1993, but as yield rates began to increase with the management policies introduced, fuelwood surplus began to occur from 1994. This situation continued throughout the forecasted period. Finally,the NRP policy shows the combined effects of the population and fuelwood demand reduction policies, as well as, the management policy. The growth in fuelwood supply is also seen to be a healthy 1.71 per cent and is just the opposite of the negative growth of 1.72 observed under the baseline scenario.

Forests are the main source of fuelwood. However, forests are not the main source of fodder as has already been pointed out earlier. Since forests are an important source of natural resource products,this section examines the carrying capacity and load on forest land in Dhading.

For the district as a whole, the alternative policies are given in Table 7.51. When forests only are considered, only 69 per cent of the fuelwood demand can be met and this situation deteriorates rapidly. By 2005 only 54 per cent of the demand will be met by Dhading's forests.The carrying capacity of forest land to meet the fuelwood demand is about seven persons per hectare, whereas the load is 10 persons and this load will increase over time to reach 13 persons by 2005. The population policy does relieve the burden to some extent as, 59 per cent of demand



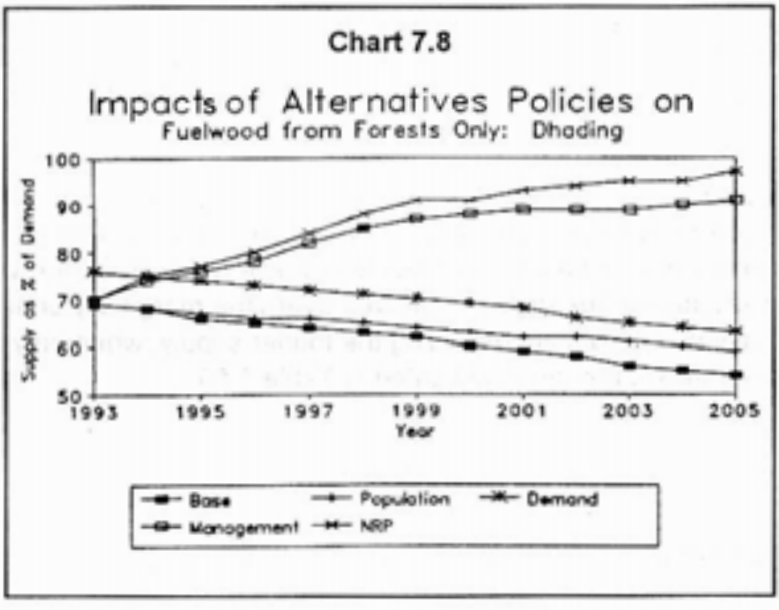


compared to 54 per cent under the baseline scenario will be met by 2005. Under the demand reduction policy, the situation improves further as 63 per cent of the demand will be met by 2005. The load reduces marginally. The impacts of the forest management and NRP policies are noteworthy. In the second year of the policy intervention, about 75 per cent of fuelwood demand is met by forests compared to 68 per cent under the baseline scenario. The situation improves over

time and by 2005 an estimated 91 per cent of the demand is to be met under the management policy option and about 97 per cent under the NRP option (Chart 7.8).

Deforestation. The fuelwood situation in Dhading under the different policy scenarios has serious implications in terms of deforestation. Under the population policy, deforestation occurs at a rate lower than that under the baseline scenario. The demand reduction policy halts deforestation during the first few years, but, eventually, deforestation increases since the stocking rate remains unchanged as under the baseline scenario. The forest management and NRP polices are strong enough to completely stop deforestation. Table 7.52 provides the results regarding the per capita fuelwood supply, deficits/surplus, and the deforested area under the different policy options (Chart 7.7).

Chart 7.8



Under the baseline scenario, the deforested area continues to grow rapidly at 1.72 per cent per annum. According to the results, about 85ha will be deforested by 1993 and, by 2005, this area will have increased to nearly 600ha. The population reduction policy retards this area to 377ha. The fuelwood demand reduction policy retards deforestation until 1997, but in 1998, 13ha would have been deforested to meet the fuelwood deficit, and, by 2005 almost 262ha of forests will be deforested and thereafter the forest areas in Dhading will be sustainable.

Timber. Forests provide timber also. The timber situation in Dhading appears to be fairly good untill 1999 under the baseline scenario, but deteriorates thereafter, resulting in annual deficits. The results are given in Table 7.53. The strongest impacts result from the forest management and NRP policies.

Fodder. Under the baseline scenario, the predicted growth in the livestock population expressed in terms of LSU is almost stagnant. Table 7.54 provides the policy impacts on the fodder situation in Dhading and the baseline scenario. Under the baseline scenario, one hectare of land in Dhading supplies 0.8MT-TDN and a modest improvement in this supply occurs over time. The fodder supply per ha is seen to be the highest under the forest management and NRP policies.

The impact of the livestock policy on the fodder situation is also presented in Table 7.54. This policy assumes a ten per cent reduction in the number of unproductive animals, and, since the milk yield is allowed to increase by almost 100 per cent, fodder requirements of cows and buffaloes increase by 25 per cent. This policy has no impact on the fodder supply as expected by the fodder demand (load) per hectare increases to one MT-TDN. Greater pressure is exerted on land by the fodder demand. As a result, fodder supply as a percentage of demand declines compared to the baseline scenario, although the reduction in the livestock population does not make the growth rate negative. Over time, the fodder situation is seen to remain almost constant under this policy scenario compared to the baseline.

The fuelwood demand reduction policy has no significant impact on the fodder situation. The forest management and NRP policies have strong impacts (as shown in Table 7.54), although the impacts of these two policies are very similar. The fodder situation in the district improves over time marginally under the latter policy alternatives. The results regarding the fodder supply, when only forests are considered as the source, are highlighted in Table 7.55.

Conclusion

The period over which the policy analysis is conducted is important. In the case of Dhading, the timeframe was extended to the year 2005 to judge the impacts of the different policy alternatives. The population reduction policy was seen to retard the negative growth trend of all important variables,but was not strong enough to reverse the trend, given that the pressure on the resource base already exceeds the limit.

In the food and natural resource sectors, the policy impacts were seen to be the strongest when a combination of demand and supply side policies were introduced jointly along with the population reduction policy. The results indicate that the population pressure in Dhading is already very great, and, despite the positive effects of the jointly conducted irrigation, fertiliser, and population reduction policies, Dhading is not likely to meet the calorie requirements of its population by 2005. This is not to indicate that the possibility does not exist, since other agricultural technologies can still be introduced to raise the productivity level. Under the policy

examined, Dhading can produce food to meet about 91 per cent of the calorie requirement compared to the baseline projection of about 80 per cent. Scope, therefore, exists to introduce other agricultural technologies that can boost productivity to make Dhading self-sufficient in food production. For example,the option of introducing improved seeds has not been explored.

The natural resource base in Dhading was also seen to be fairly overloaded. The fuelwood and fodder demands continue to increase as the population rises unabated. Deforestation continues to exert greater pressure on the resource base. The population reduction policy alone was not sufficient to reverse deforestation, although it was effective enough to retard it significantly. The fuelwood demand reduction policy was seen to be effective as a short-run policy, since deforestation is reduced to zero, but, as the population continues to grow, deforestation is likely to occur once after 1998. The forest management policy,which assumed that all accessible forests were brought under management,was seen to halt deforestation completely. The fuelwood demand reduction policy and supply management policy, combined with the population reduction policy,was seen to be the most effective. Under this policy scenario, deforestation comes to a halt and the pressure on forests to meet the fuelwood and fodder demand continues to be sustainable.

Table 7.1: Area Under Different Crops (ha)

Year	Paddy	Maize	Millet	Wheat	Oilseeds	Potatoes
1975	3650	11000	2010	1015	190	310
1976	3650	11000	2010	1015	190	310
1977	5650	10450	1910	1050	170	310
1978	5600	11000	2010	1010	160	300
1979	5600	9900	2020	1050	180	330
1980	6490	7350	2000	1100	150	250
1981	10060	7350	2000	1100	150	250
1982	12660	7760	1480	4840	300	370
1983	11140	8800	3540	4000	270	560
1984	10270	14840	3200	4050	300	1200
1985	13000	15000	3300	4500	300	1350
1986	12990	14960	3200	4550	310	1360
1987	12740	15010	3500	4960	390	1370
1988	12700	15000	3600	4970	320	1370
Mean	9014	11387	2556	2801	241	689
Std.	3568	2927	742	1772	76	485
Coef.Var.%	40	26	29	63	32	70

Table 7.2: Yield Rates of Different Crops (kg/ha)

	Paddy	Maize	Millet	Wheat	Oilseeds	Potatoes
1975	2608	1615	1045	1160	489	5700
1976	2608	1700	1045	1160	511	5984
1977	2303	1360	1042	1162	529	6000
1978	2321	1759	1025	1198	500	5500
1979	2105	1369	1000	1000	389	6000
1980	2079	1650	900	1145	533	6000
1981	2070	1600	1000	1200	533	6000
1982	2000	1242	1000	1500	533	6000
1983	1803	914	1000	1600	593	6000
1984	1832	1300	900	1358	600	6500
1985	1750	1500	1000	1251	633	5496
1986	1782	1472	1000	1319	645	6000
1987	1952	1400	889	1369	487	7701
1988	2184	1539	1200	1368	656	7701
Mean	2100	1459	1003	1271	545	6184
Std.	271	212	75	153	71	663
Coef.Var %	13	15	7	12	13	11

Table 7.3: Fertiliser Sale

	Sale (MT)	Sale per Cropped ha
1983	153	6
1984	277	9
1985	291	13
1986	314	14
1987	318	14
1988	385	17
1989	410	
1990	528	

Source: AIC

Table 7.4: Livestock Population and Products

	1984	1985	1986	1987	1988	Growth
Population						
Cattle	130818	132205	133606	132710	125490	-1.03
Buffaloes	83427	86105	88869	88975	87170	1.10
Milch Cows	18799	18998	19200	18460	16830	-2.73
Milch Buffaloes	18229	18814	19418	20330	19190	1.29
Goats	138263	140572	142919	143460	166590	4.77
Sheep	1686	16782	17321	19531	18436	28.90
Pigs	7671	8079	8509	8620	11990	11.81
Products						
Buff.Meat	1796	1854	1913	1915	1876	1.10
Cow Milk	6341	6408	6476	6705	6192	-0.60
Goat Meat	273	278	382	283	329	4.77
Buff Milk	16260	16782	17321	19531	18436	3.18
Mutton	4	4	4	4	10	25.74
Pork	109	115	121	123	171	12.00

Source: DFAMS 1990

Table 7.5: Land Use Changes

Dhading Land Use	1978	1979	1980	1985	1986	1987	1988	1989	1990
Mid-mountains	138773	138773	138773	138773	138773	138773	138773	138773	138773
Natural Forests	44792	44344	43901	41749	41332	40918	40509	40104	39703
Acc. Forests	44792	44344	43901	41749	41332	40918	40509	40104	39703
Change in Forest Area		-448	-443	-422	-417	-413	-409	-405	-401
Shrublands	18915	19139	19361	20436	20645	20852	21056	21259	21460
Grasslands	5242	5309	5376	5698	5761	5823	5884	5945	6005
Mapped Cultivated	68373	68507	68640	69286	69411	69535	69658	69779	69900
Adj.NCI	27428	27473	27517	27732	27774	27815	27856	27897	27937
Gross Cultivated	40945	41035	41123	41554	41637	41720	41802	41883	41963
NCI Within	7466	7466	7466	7466	7466	7466	7466	7466	7466
Net Cultivated	33479	33569	33657	34088	34171	34254	34336	34417	34497
MM Calculated	137322	137300	137277	137170	137149	137128	137108	137088	137068
High Mountains	38042	38042	38042	38042	38042	38042	38042	38042	38042
Natural Forests	21375	21195	21017	20154	19986	19820	19656	19494	19333
Accessible Forests	17976	17797	17619	16755	16588	16422	16258	16095	15934
Inaccessible Forests	3399	3399	3399	3399	3399	3399	3399	3399	3399
Shrublands	4834	4924	5013	5445	5528	5611	5693	5775	5855
Grasslands	5807	5834	5861	5990	6015	6040	6065	6089	6113
Mapped Cultiavated	4973	5017	5061	5277	5319	5361	5402	5442	5483
Adjacent NCI	1534	1552	1570	1656	1673	1689	1706	1722	1738
Gross Cultivated	3438	3465	3492	3621	3646	3671	3696	3720	3744
NCI Within	602	602	602	602	602	602	602	602	602
Net Cultivated	2836	2863	2890	3019	3044	3069	3094	3118	3142
HM Calculated	36988	36970	36952	36866	36849	36833	36816	36800	36784
High Himal	15672	15672	15672	15672	15672	15672	15672	15672	15672
Natural Forests	1284	1284	1284	1284	1284	1284	1284	1284	1284
Inaccessible Forests	1284	1284	1284	1284	1284	1284	1284	1284	1284
Shrublands	1656	1656	1656	1656	1656	1656	1656	1656	1656
Grasslands	4892	4892	4892	4892	4892	4892	4892	4892	4892
HH Calculated	7832	7832	7832	7832	7832	7832	7832	7832	7832
Total									
Forests	67451	66823	66202	63187	62602	62023	61449	60882	60320
Shrublands	25405	25719	26030	27537	27830	28119	28406	28690	28971
Grasslands	15941	16035	16128	16581	16668	16755	16841	16926	17011
Adjacent NCI	28962	29025	29087	29388	29447	29505	29562	29619	29675
NCIG	8068	8068	8068	8068	8068	8068	8068	8068	8068
Net Cultivated	36315	36432	36547	37107	37215	37323	37429	37535	37639
Dhading Calculated	182142	182102	182062	181868	181830	181793	181756	181719	181683
Residual	10345	10385	10425	10619	10657	10694	10731	10768	10804
Dhading (Given)	192487	192487	192487	192487	192487	192487	192487	192487	192487

Table 7.6: Forecasted Area Under Different Crops (hectares)

Crops	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Paddy	13029	13292	13539	13774	13996	14207	14408	14601	1.521
Maize	15347	15439	15525	15607	15684	15758	15828	15896	0.473
Millet	4043	4083	4122	4158	4192	4224	4255	4285	0.780
Wheat	4922	5036	5143	5245	5341	5433	5520	5604	1.731
Oilseeds	329	342	355	367	380	393	406	419	3.403
Potatoes	1389	1409	1428	1448	1469	1489	1510	1531	1.400
Total Cropped Area	39059	39600	40112	40598	41062	41505	41929	42335	1.085
Total Cultivated Land	28377	28731	29065	29380	29680	29965	30237	30497	0.966
Area Under Irrigation	7593	7745	7900	8058	8219	8383	8551	8722	2.000
Total Fertiliser	560	592	623	652	680	707	734	759	4.031

Table 7.7: Forecasted Yield Rates of Different Crops (kg/ha)

Crops	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Paddy	1998	1995	1998	1993	1983	1975	1982	1973	-0.250
Maize	1493	1493	1495	1494	1489	1486	1489	1486	-0.128
Wheat	1346	1344	1344	1342	1338	1334	1337	1333	-0.170
Millet	1010	1010	1011	1011	1010	1008	1010	1008	-0.060
Oilseeds	661	661	662	661	660	659	660	660	-0.060
Potatoes	7412	7409	7417	7411	7394	7381	7395	7380	-0.099

Table 7.8: Forecasted Changes in Crop Production (MT)

Crops	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Paddy	26034	26520	27052	27454	27760	28060	28555	28810	1.267
Maize	22919	23050	23212	23309	23360	23413	23575	23614	0.344
Wheat	6623	6767	6914	7039	7146	7249	7379	7470	1.558
Millet	4085	4126	4169	4203	4232	4259	4297	4321	0.720
Oilseeds	217	226	235	243	251	259	268	276	3.341
Potatoes	10297	10437	10594	10733	10860	10991	11167	11301	1.299

Table 7.9: Forecasted Revenue, Cost, Gross Margins Per Hectare of Cultivated Land Under Different Crops (Rs/ha)

Crops	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Revenue									
Paddy	12	13	14	16	17	19	21	23	9.569
Maize	8	9	9	10	11	12	13	14	8.329
Wheat	8	9	9	10	10	11	12	13	6.630
Millet	6	6	7	8	9	10	11	12	10.517
Oilseeds	11	13	14	15	17	19	21	23	10.949
Potatoes	43	46	49	53	56	60	65	70	7.219
Cost									
Paddy	10	10	11	12	13	14	15	16	7.086
Maize	7	8	8	9	9	10	11	11	7.022
Wheat	7	7	8	8	9	9	10	11	6.966
Millet	6	7	7	8	8	9	9	10	7.093
Oilseeds	4	5	5	5	6	6	7	7	7.300
Potatoes	15	16	18	19	20	22	23	25	7.115
Per Hectare Gross Margin (Rs/ha)									
Paddy	2157	2664	3267	3883	4523	5239	6184	7066	16.683
Maize	839	1047	1287	1522	1757	2012	2344	2637	15.422
Wheat	1375	1451	1545	1624	1691	1762	1887	1962	4.892
Millet	-321	-103	150	427	732	1077	1493	1930	66.642
Oilseeds	6954	7884	8942	10106	11393	12837	14515	16324	12.793
Potatoes	27408	29375	31568	33841	36222	38806	41839	44853	7.277

Table 7.10: Forecasted Livestock Population

Livestock Type	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Cattle	106154	106157	106166	106180	106201	106227	106259	106298	0.025
Milch Cow	14862	14862	14863	14865	14868	14872	14876	14882	0.025
Bullocks	91292	91295	91303	91315	91333	91355	91383	91416	0.025
Buffalo-Total	87170	87171	87172	87175	87178	87182	87188	87194	0.005
Milch Buffaloes	19190	19190	19189	19188	19187	19185	19183	19180	-0.009
Sheep	4660	4659	4656	4650	4643	4633	4621	4607	-0.211
Goats	166590	166579	166552	166506	166442	166360	166258	166137	-0.050
Pigs	12962	13934	14906	15878	16850	17822	18794	19766	5.806
Chickens	147580	158023	168466	178909	189352	199795	210238	220681	5.548
Total LSU	166369	166369	166370	166372	166375	166379	166383	166388	0.002

Table 7.11: Forecasted Annual Production and Growth in Livestock Products (MT)

Livestock Product	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Cow Milk	1448	1448	1448	1448	1448	1449	1449	1449	0.025
Buff Milk	3658	3658	3657	3657	3657	3657	3656	3656	-0.009
Ghee Supply	72	72	72	72	72	72	72	72	-0.001
Net Milk Supply	3574	3574	3574	3574	3574	3574	3574	3574	0.001
Buffalo Meat	2624	2624	2624	2624	2625	2625	2625	2626	0.009
Goat and Sheep Meat	526	526	526	526	526	525	525	525	-0.054
Chicken Meat	195	209	222	236	250	264	278	291	5.548
Pork Meat	122	131	140	149	158	168	177	186	5.806
Aggregate Meat	3467	3490	3513	3536	3559	3581	3604	3627	0.643
Wool Production (kg)	2051	2051	2049	2047	2044	2039	2034	2028	-0.211

Table 7.12: Forecasted Cost and Returns from Livestock (Rs/animal)

Livestock Cost and Returns	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Raising Cost/Animal									
Buffaloes	32402	34670	37098	39697	42479	45457	48644	52056	7.010
Sheep and Goat	16325	17466	18686	19988	21378	22862	24446	26137	6.942
Pigs	1853	2132	2440	2781	3158	3574	4033	4538	13.212
Chickens	2069	2370	2704	3072	3479	3928	4423	4968	12.936
Milch Cow	6250	6688	7157	7659	8196	8772	9389	10050	7.027
Milch Buffalo	12823	13721	14681	15707	16806	17981	19237	20581	6.990
Cattle (excluding M)	30715	32866	35170	37637	40279	43109	46141	49389	7.027
Total	102438	109914	117935	126542	135776	145683	156313	167718	7.297
Gross Margin/Animal									
Buffaloes	36798	42476	48909	56191	64427	73736	84250	96118	14.468
Sheep and Goats	18431	20671	23208	26079	29324	32989	37123	41782	12.479
Pigs	1954	2356	2823	3366	3994	4719	5556	6518	18.214
Poultry	9629	11381	13390	15690	18320	21323	24746	28645	16.427
Cow (Milk+Ghee)	8610	9513	10508	11603	12807	14132	15589	17192	10.347
Buffalo (Milk+Ghee)	25895	28502	31363	34501	37943	41718	45857	50395	9.950
Total Gross Margin	101318	114899	130201	147429	166816	188617	213121	240649	13.072

Table 7.13: Forecasted Per Capita Food Supply (kg/adult)

Food (Edible Form)	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Cereal Grains	148.43	147.92	147.61	146.78	145.58	144.40	143.99	142.68	-0.676
Meat	12.45	12.34	12.23	12.12	12.02	11.91	11.81	11.71	-0.858
Milk	12.83	12.63	12.44	12.25	12.07	11.89	11.71	11.54	-1.491
Oils and Fats	0.47	0.47	0.47	0.48	0.48	0.48	0.48	0.48	0.110
Vegetables	29.24	29.18	29.17	29.10	28.99	28.89	28.93	28.84	-0.225

Table 7.14: Forecasted Per Capita Food Demand (kg/adult)

Food (Edible Form)	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Cereal Grains	130.39	128.30	128.57	128.40	128.19	128.14	128.61	128.22	-0.055
Vegetables	24.85	22.50	22.68	22.41	22.12	22.00	22.41	21.95	-0.645
Meat	3.77	3.29	3.33	3.28	3.22	3.20	3.28	3.20	-0.822
Milk	21.99	20.52	20.61	20.43	20.23	20.14	20.14	20.09	-0.515
Oils and Fats	2.30	2.15	2.16	2.14	2.12	2.12	2.14	2.11	-0.444

Table 7.15: Forecasted Per Capita Food Balance Situation (kg/adult)

Food (Edible Form)	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Cereal Grains	18.04	19.62	19.04	18.37	17.39	16.27	15.38	14.47	-5.344
Vegetables	4.38	6.68	6.49	6.68	6.87	6.90	6.52	6.89	1.187
Meat	8.68	9.05	8.90	8.84	8.80	8.71	8.53	8.52	-0.872
Milk	-9.16	-7.89	-8.17	-8.18	-8.16	-8.25	-8.67	-8.55	0.902
Oils and Fats	-1.83	-1.68	-1.69	-1.67	-1.65	-1.64	-1.66	-1.63	-0.603

Table 7.16: Forecasted Changes in Land Use (%)

Land Use	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Forests	33.10	33.09	33.07	33.02	32.96	32.88	32.78	32.66	-0.248
Shrublands	15.05	15.06	15.07	15.09	15.12	15.16	15.21	15.27	0.269
Grasslands	8.84	8.84	8.84	8.85	8.86	8.87	8.89	8.90	0.138
Adjacent NCI	15.42	15.42	15.42	15.42	15.43	15.44	15.45	15.46	0.053
Net Cultivated	19.55	19.56	19.56	19.57	19.58	19.60	19.62	19.64	0.083
Others	8.04	8.04	8.04	8.04	8.05	8.05	8.05	8.06	0.051
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.000

Table 7.17: Supply of Fuelwood from Different Sources (%)

Sources	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Forests	67.91	67.84	67.75	67.65	67.53	67.39	67.23	67.05	-0.209
Shrublands	11.61	11.60	11.61	11.63	11.66	11.71	11.76	11.83	0.373
Grasslands	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.76	0.281
Adjacent NCI	12.61	12.60	12.60	12.61	12.62	12.64	12.66	12.69	0.140
Net Cultivated	6.31	6.39	6.47	6.55	6.63	6.71	6.78	6.86	1.152
Total	99.19	99.19	99.19	99.19	99.19	99.19	99.18	99.18	-0.001

Table 7.18: Forecasted Fuelwood Supply from Different Sources (ADT)

Sources	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Forest: Hardwood	74867	74838	74760	74629	74445	74206	73910	73556	-0.324
Conifer	4315	4314	4312	4309	4305	4300	4294	4286	-0.121
Mixed	31071	31062	31037	30994	30934	30857	30761	30646	-0.253
Shrublands	18847	18854	18871	18901	18942	18996	19062	19142	0.285
Grazinglands	1212	1212	1213	1214	1216	1218	1221	1225	0.193
Adjacent NCI	20476	20477	20481	20487	20495	20506	20519	20535	0.053
Cultivated Area	1317	1318	1318	1318	1319	1320	1322	1323	0.083
Crop Residue	10248	10389	10523	10649	10768	10882	10991	11094	1.064
Total Fuelwood Supply	162353	162464	162514	162501	162425	162285	162080	161807	-0.067

Table 7.19: Forecasted Timber Supply and Demand (cubic metre)

	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Timber Supply	16135	16129	16114	16090	16055	16010	15954	15887	-0.284
Timber Demand	13924	14143	14362	14583	14806	15030	15256	15483	1.514

Table 7.20: Forecasted Share of Fodder Supply by Sources (%)

Sources	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Forests	25.81	25.69	25.56	25.43	25.28	25.13	24.97	24.79	-0.614
Shrublands	21.14	21.06	20.99	20.94	20.91	20.90	20.90	20.92	-0.065
Grasslands	4.79	4.77	4.75	4.74	4.72	4.71	4.71	4.70	-0.212
Adjacent NCI	7.16	7.13	7.10	7.08	7.05	7.03	7.01	7.00	-0.297
Net Cultivated	41.11	41.36	41.60	41.82	42.03	42.23	42.42	42.60	0.476

Table 7.21: Forecasted Fodder Supply by Sources (MT-TDN)

Sources	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Forests	25677	25669	25647	25610	25558	25491	25408	25309	-0.265
Shrublands	21032	21040	21059	21092	21138	21198	21273	21362	0.285
Grazinglands	4763	4764	4766	4770	4775	4781	4789	4799	0.138
Adjacent NCI	7122	7122	7124	7126	7129	7132	7137	7143	0.053
Risers and Bunds	2635	2635	2636	2637	2639	2641	2643	2647	0.083
Fallow Grazings	2258	2259	2259	2260	2262	2264	2266	2269	0.083
Tree Fodder	5269	5270	5271	5274	5277	5282	5287	5293	0.083
Crop Residue	30744	31168	31568	31946	32305	32646	32972	33283	1.064
Total Fodder Supply	99500	99926	100330	100714	101082	101435	101775	102104	0.351
Total Fodder Demand	103764	103764	103765	103766	103768	103770	103773	103776	0.002

Table 7.22: Forecasted Population and Changes in the Size of the Active Population

Composition	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Economically Active Males	87191	88841	91715	94324	95551	95543	97271	95932	0.903
Economically Active Females	57388	58363	60068	61607	62318	62290	63310	65143	1.635
Total Active Population	144579	147204	151783	155932	157869	157833	160581	161075	1.195
Total: Male	143685	146102	148533	150976	153431	155895	158370	160857	1.607
Total: Female	134803	136748	138711	140692	142692	144711	146748	148800	1.414
Total Population	278488	282850	287244	291668	296123	300606	305118	309657	1.514
Growth Rate	0.015	0.016	0.016	0.015	0.015	0.015	0.015	0.015	-0.863

Table 7.23: Labour Use by Sector ('000 mandays)

Labour Use & Activity	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Labour Days Available	36145	36801	37946	38983	39467	39458	40145	40269	1.195
Crops	6875	6974	7067	7156	7240	7321	7398	7472	1.121
Livestock	16637	16637	16637	16637	16638	16638	16638	16639	0.002
Professional Workers	555	565	583	599	606	606	617	619	1.195
Office Workers	625	636	656	674	682	682	694	696	1.195
Sales and Service Workers	1319	1343	1384	1422	1440	1439	1464	1469	1.195
Production Workers	1457	1484	1530	1572	1591	1591	1619	1624	1.195
Construction, etc	347	353	364	374	379	379	385	387	1.195
General Labourers	3019	3074	3169	3256	3296	3296	3353	3363	1.195
Total Labour Use	30834	31065	31391	31690	31872	31951	32168	32268	0.553
Labour Use (%)	85	84	83	81	81	81	80	80	-0.635

Table 7.24: Forecasted Values of Food and Non-food Imports (Rs'000)

Imports/Exports	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Growth Rate (%)	0.020	0.018	0.018	0.018	0.018	0.018	0.018	0.017	-1.327
Total Food Export	52807	78059	83963	93823	104270	113663	118384	133959	9.793
Total N-Food Import	261494	266319	271225	276134	281040	285969	291022	296037	1.766
Value of T-Imports	314300	344378	355188	369957	385310	399632	409406	429996	3.897
Per Capita Food Export	190	276	292	322	352	378	388	433	8.156
Per Capita Non-food Import	939	942	944	947	949	951	954	956	0.248

Table 7.25: Forecasted Nominal Income by Source (Rs'000)

Sources of Income	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Crops	86801	102535	121042	140259	160485	183099	212042	239866	14.659
Livestock	101318	114899	130201	147429	166816	188617	213121	240649	13.072
Professional Workers	7105	7740	8539	9387	10169	10878	11842	12710	8.279
Office Workers	7424	8088	8923	9809	10626	11367	12375	13282	8.279
Sales and Service Workers	17368	18921	20875	22947	24858	26592	28949	31070	8.279
Production Workers	12251	13347	14725	16186	17535	18758	20420	21917	8.279
Construction, etc	3493	3805	4198	4615	4999	5348	5822	6249	8.279
General Labourers	23114	25181	27782	30539	33083	35390	38527	41351	8.279
Total Dhading Income	258873	294516	336285	381172	428570	480049	543099	607094	12.541
Per Capita Income (Rs)	930	1041	1171	1307	1447	1597	1780	1961	10.862

Table 7.26: Forecasted Real Income by Source (Rs'000)

Sources	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Crops	78706	84569	90950	96148	100493	104849	111139	115187	4.839
Livestock	91870	94767	97831	101063	104458	108009	111705	115563	3.388
Professional Workers	6442	6384	6416	6435	6368	6229	6207	6104	-0.995
Office Workers	6732	6671	6705	6724	6654	6509	6486	6378	-0.995
Sales and Service Workers	15748	15605	15685	15730	15566	15227	15173	14921	-0.995
Production Workers	11108	11008	11064	11096	10980	10741	10703	10525	-0.995
Construction, etc	3167	3138	3154	3163	3130	3062	3052	3001	-0.995
General Labourers	20958	20769	20875	20935	20716	20266	20194	19857	-0.995
Total Dhading Income	234731	242911	252681	261294	268364	274893	284659	291536	2.902
Per Capita Income (Rs)	843	859	880	896	906	914	933	941	1.367

Table 7.27: Forecasted Income Shares by Source (%)

Sources	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Crops	33.53	34.81	35.99	36.80	37.45	38.14	39.04	39.51	1.882
Livestock	39.14	39.01	38.72	38.68	38.92	39.29	39.24	39.64	0.472
Professional Workers	2.74	2.63	2.54	2.46	2.37	2.27	2.18	2.09	-3.787
Office Workers	2.87	2.75	2.65	2.57	2.48	2.37	2.28	2.19	-3.787
Sales and Service Workers	6.71	6.42	6.21	6.02	5.80	5.54	5.33	5.12	-3.787
Production Workers	4.73	4.53	4.38	4.25	4.09	3.91	3.76	3.61	-3.787
Construction, etc	1.35	1.29	1.25	1.21	1.17	1.11	1.07	1.03	-3.787
General Labourers	8.93	8.55	8.26	8.01	7.72	7.37	7.09	6.81	-3.787
Total	100	100	100	100	100	100	100	100	0.000

Table 7.28: Performance and Sustainability Indicators

Indicators	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Per Capita Cultivated Land	0.14	0.13	0.13	0.13	0.13	0.13	0.12	0.12	-1.409
Per Capita Accessible Forest	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	-1.771
Population Density Per Cultivated Land	7.40	7.51	7.63	7.74	7.86	7.97	8.08	8.19	1.430
Population Density Per Accessible Forest	5.01	5.09	5.17	5.26	5.35	5.45	5.55	5.65	1.803
Forest-Cultivated Land Ratio	1.48	1.48	1.48	1.47	1.47	1.46	1.46	1.45	-0.367
Shrub-Forest Area Ratio	0.52	0.52	0.52	0.52	0.53	0.53	0.53	0.54	0.555
LSU Per Cultivated Area	4.42	4.42	4.42	4.42	4.41	4.41	4.41	4.40	-0.081
LSU Per Forest Area	2.99	2.99	2.99	3.00	3.01	3.01	3.02	3.04	0.287
LSU Per Grazing Area	9.78	9.78	9.77	9.77	9.76	9.74	9.73	9.71	-0.136

Table 7.29: Carrying Capacity of Agricultural Land in Terms of Calorie ('000)

Capacity & Load	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Per ha Calorie Supply	3851	3846	3849	3841	3826	3813	3822	3809	-0.208
Per ha Calorie Demand	5201	5212	5226	5244	5265	5289	5315	5344	0.446
Supply as % of Demand	74	74	74	73	73	72	72	71	-0.651
Carrying Capacity Per ha	5.32	5.32	5.32	5.31	5.29	5.27	5.28	5.27	-0.208
Current Load	7.19	7.20	7.22	7.25	7.28	7.31	7.35	7.39	0.446

Table 7.30: Carrying Capacity of Land in Terms of Fuelwood (persons/ha)

Capacity & Load	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Fuelwood Supply	1.69	1.69	1.69	1.69	1.69	1.68	1.68	1.68	-0.134
Per ha Demand	1.70	1.73	1.76	1.78	1.81	1.84	1.86	1.89	1.467
Supply as % of Demand	99	98	96	95	93	92	90	89	-1.577
Carrying Capacity	2.87	2.87	2.87	2.87	2.87	2.87	2.86	2.85	-0.134
Current Load	2.90	2.94	2.99	3.03	3.08	3.12	3.17	3.21	1.467

Table 7.31: Carrying Capacity of Forest Land in Terms of Fuelwood (person/ha)

Capacity & Load	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Fuelwood Supply	4.13	4.13	4.13	4.13	4.13	4.13	4.12	4.12	-0.020
Per ha Demand	5.82	5.91	6.01	6.11	6.22	6.33	6.44	6.57	1.795
Supply as % of Demand	71	70	69	68	66	65	64	63	-1.783
Carrying Capacity	7.02	7.02	7.02	7.02	7.02	7.02	7.01	7.01	-0.020
Current Load	9.89	10.05	10.22	10.39	10.57	10.76	10.96	11.17	1.795

Table 7.32: Carrying Capacityof Forest in Terms of Timber

Capacity & Load	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Timber Supply Per ha	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.000
Per ha Demand	0.25	0.25	0.26	0.26	0.27	0.27	0.28	0.28	1.803
Supply as % of Demand	116	114	112	110	108	107	105	103	-1.77
Carrying Capacity	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	0.000
Current Load	5.01	5.09	5.17	5.26	5.35	5.45	5.55	5.65	1.803

Table 7.33: Carrying Capacity of Land in Terms of Fodder

Capacity & Load	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Total Fodder SS/ha	0.80	0.80	0.80	0.81	0.81	0.81	0.81	0.82	0.382
Fodder Demand Per	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.033
Supply as % of Demand	96	96	97	97	97	98	98	98	0.349
Carrying Capacity	1.28	1.28	1.29	1.29	1.30	1.30	1.31	1.31	0.382
Current Load	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	0.033

Table 7.34: Carrying Capacity of Forest Land in terms of Fodder

Capacity & Load	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Total Fodder Supply/ha	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.020
Fodder Demand	1.87	1.87	1.87	1.87	1.87	1.88	1.89	1.89	0.287
Supply as % of Demand	25	25	25	25	25	25	24	24	-0.267
Carrying Capacity	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.020
Current Load	2.99	2.99	2.99	3.00	3.01	3.01	3.02	3.04	0.287

Table 7.35: Impact of Population Policy on the Size of the Population and Growth Rate

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Baseline													
Total Population	287244	291668	296123	300606	305118	309657	314222	318813	323640	328539	333513	338562	343687
Growth Rate (%)	1.514	(1981-1991)											
Population													
Total Population	286704	290176	293251	295915	298155	299960	302684	305433	308207	311006	313830	316680	319555
Growth Rate (%)	1.363	1.211	1.060	0.908	0.757	0.605	0.908	0.908	0.908	0.908	0.908	0.908	0.908
Net Annual Reduction	540	1492	2872	4691	6963	9697	11538	13380	15433	17533	19683	21882	24132
Cumulative Reduction	540	2032	4364	7563	11654	16660	21235	24918	28813	32966	37216	41565	46014

Table 7.36: Impacts of Alternative Policies on Crop Yields

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Paddy	1998	1993	1983	1975	1982	1973	1978	1976	1972	1971	1970	1969	1969	-0.123
Maize	1495	1494	1489	1486	1489	1486	1488	1488	1486	1486	1485	1485	1485	-0.057
Wheat	1344	1342	1338	1334	1337	1333	1335	1334	1332	1332	1331	1331	1330	-0.088
Millet	1011	1011	1010	1008	1010	1008	1009	1009	1009	1009	1009	1009	1009	-0.023
Oilseeds	662	661	660	659	660	660	660	660	660	660	660	660	660	-0.021
Potatoes	7417	7411	7394	7381	7395	7380	7390	7389	7383	7382	7381	7381	7380	-0.042
Irrigation														
Paddy	2082	2179	2168	2159	2166	2157	2161	2160	2156	2154	2153	2153	2152	0.275
Maize	1518	1552	1548	1544	1548	1544	1547	1546	1545	1544	1544	1544	1543	0.136
Wheat	1483	1522	1517	1513	1515	1511	1513	1512	1510	1510	1509	1509	1508	0.138
Millet	1011	1011	1010	1008	1010	1008	1009	1009	1009	1009	1009	1009	1009	-0.023
Oilseeds	722	736	735	734	735	734	735	735	735	735	735	735	735	0.149
Potatoes	7778	7982	7964	7950	7965	7949	7960	7958	7952	7951	7950	7944	7949	0.182
Fertiliser														
Paddy	2113	2217	2206	2196	2204	2194	2199	2198	2193	2192	2191	2190	2189	0.298
Maize	1511	1547	1542	1539	1543	1539	1541	1541	1539	1539	1538	1538	1538	0.146
Wheat	1422	1468	1463	1459	1462	1458	1460	1459	1457	1457	1456	1456	1455	0.195
Millet	1011	1011	1010	1008	1010	1008	1009	1009	1009	1009	1009	1009	1009	-0.023
Oilseeds	666	683	682	681	682	681	682	682	681	681	681	681	681	0.190
Potatoes	7624	7628	7611	7597	7612	7597	7607	7605	7599	7598	7597	7597	7596	-0.030
Population+Irrigation+ Fertiliser														
Paddy	2200	2301	2289	2279	2286	2275	2282	2281	2277	2276	2275	2274	2273	0.271
Maize	1534	1569	1564	1560	1564	1559	1563	1562	1561	1561	1560	1560	1560	0.138
Wheat	1568	1609	1604	1599	1602	1597	1600	1599	1597	1596	1596	1595	1595	0.141
Millet	1011	1011	1009	1008	1009	1008	1009	1009	1009	1008	1008	1008	1008	-0.024
Oilseeds	726	740	739	738	739	738	739	739	738	738	738	738	738	0.137
Potatoes	7992	8200	8181	8164	8179	8161	8175	8174	8169	8168	8167	8167	8166	0.179

Table 7.37: Impacts of Alternative Policies on the Per Capita Food Availability

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Cereal Grains (Edible form)	147.61	146.78	145.58	144.40	143.99	142.68	142.05	141.06	139.82	138.70	137.54	136.36	135.16	-0.732
Meat	12.23	12.12	12.02	11.91	11.81	11.71	11.62	11.52	11.42	11.32	11.22	11.12	11.02	-0.865
Milk	12.44	12.25	12.07	11.89	11.71	11.54	11.37	11.21	11.04	10.88	10.72	10.56	10.40	-1.483
Oils and Fats	0.47	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.051
Vegetables	29.17	29.10	28.99	28.89	28.93	28.84	28.86	28.84	28.78	28.74	28.71	28.67	28.64	-0.152
Population														
Cereal Grains (Edible form)	147.83	147.44	146.88	146.52	147.15	147.05	147.30	147.09	146.72	146.41	146.07	145.68	145.26	-0.146
Meat	12.25	12.18	12.13	12.10	12.09	12.09	12.06	12.03	11.99	11.96	11.92	11.89	11.85	-0.277
Milk	12.46	12.32	12.19	12.08	11.99	11.91	11.81	11.70	11.60	11.49	11.39	11.29	11.18	-0.899
Oils and Fats	0.48	0.48	0.48	0.48	0.49	0.49	0.50	0.50	0.50	0.51	0.51	0.51	0.51	0.643
Vegetables	29.21	29.23	29.25	29.33	29.57	29.73	29.94	30.08	30.20	30.35	30.49	30.64	30.78	0.437
Livestock														
Cereal Grains (Edible form)	145.46	146.78	145.58	144.40	143.99	142.68	142.05	141.06	139.82	138.70	137.54	136.36	135.16	-0.610
Meat	12.23	12.12	12.02	11.91	11.81	11.71	11.62	11.52	11.42	11.32	11.22	11.12	11.02	-0.865
Milk	25.95	25.56	25.17	24.80	24.43	24.07	23.72	23.38	23.03	22.69	22.35	22.02	21.69	-1.483
Oils and Fats	0.74	0.74	0.74	0.74	0.73	0.73	0.73	0.73	0.72	0.72	0.71	0.71	0.71	-0.428
Vegetables	28.56	29.10	28.99	28.89	28.93	28.84	28.86	28.84	28.78	28.74	28.71	28.67	28.64	0.024
Irrigation														
Cereal Grains (Edible form)	152.90	156.84	155.60	154.36	153.95	152.57	151.91	150.88	149.58	148.39	147.17	145.92	144.65	-0.461
Meat	12.23	12.12	12.02	11.91	11.81	11.71	11.62	11.52	11.42	11.32	11.22	11.12	11.02	-0.865
Milk	12.44	12.25	12.07	11.89	11.71	11.54	11.37	11.21	11.04	10.88	10.72	10.56	10.40	-1.483
Oils and Fats	0.50	0.50	0.50	0.50	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.218
Vegetables	30.78	31.65	31.53	31.43	31.47	31.37	31.39	31.37	31.30	31.27	31.23	31.19	31.15	0.100
Fertiliser														
Cereal Grains (Edible form)	152.36	156.69	155.44	154.20	153.79	152.42	151.76	150.73	149.43	148.24	147.02	145.78	144.51	-0.440
Meat	12.23	12.12	12.02	11.91	11.81	11.71	11.62	11.52	11.42	11.32	11.22	11.12	11.02	-0.865
Milk	12.44	12.25	12.07	11.89	11.71	11.54	11.37	11.21	11.04	10.88	10.72	10.56	10.40	-1.483
Oils & Fats	0.48	0.48	0.48	0.48	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.178
Vegetables	30.09	30.07	29.96	29.86	29.89	29.80	29.82	29.80	29.74	29.70	29.67	29.63	29.59	-0.139
Population, Irrigation & Fertilisers														
Cereal-Grain (Edible form)	158.15	162.81	162.24	161.89	162.63	162.56	162.79	162.47	161.98	161.55	161.09	160.58	160.03	0.098
Meat	12.25	12.18	12.13	12.10	12.09	12.09	12.05	12.01	11.97	11.92	11.88	11.84	11.79	-0.318
Milk	12.46	12.32	12.19	12.08	11.99	11.91	11.80	11.68	11.57	11.46	11.35	11.24	11.13	-0.940
Oils & Fats	0.50	0.51	0.51	0.51	0.52	0.52	0.53	0.53	0.53	0.54	0.54	0.54	0.55	0.769
Vegetables	97.22	98.88	97.58	96.48	95.95	95.14	94.40	93.47	92.50	91.59	90.69	89.80	88.92	-0.741

Table 7.38: Impacts of Alternative Policies on the Per Capita Food Demand

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Cereal Grains	128.57	128.40	128.19	128.14	128.61	128.22	128.58	128.49	128.39	128.45	128.46	128.47	128.48	-0.006
Vegetables	22.68	22.41	22.12	22.00	22.41	21.95	22.26	22.12	21.98	22.00	21.98	21.95	21.93	-0.278
Meat	3.33	3.28	3.22	3.20	3.28	3.20	3.26	3.23	3.21	3.21	3.21	3.21	3.20	-0.321
Milk	20.61	20.43	20.23	20.14	20.38	20.09	20.27	20.18	20.08	20.09	20.07	20.05	20.03	-0.238
Oils and Fats	2.16	2.14	2.12	2.12	2.14	2.11	2.13	2.12	2.11	2.11	2.11	2.11	2.11	-0.197
Population														
Cereal Grains	128.61	128.49	128.32	128.31	128.83	128.49	128.80	128.67	128.63	128.68	128.69	128.70	128.71	0.006
Vegetables	22.71	22.50	22.25	22.17	22.63	22.22	22.48	22.31	22.22	22.22	22.20	22.18	22.15	-0.207
Meat	3.34	3.30	3.25	3.23	3.33	3.25	3.30	3.27	3.26	3.26	3.26	3.25	3.25	-0.222
Milk	20.64	20.48	20.31	20.25	20.52	20.26	20.41	20.29	20.23	20.23	20.21	20.19	20.17	-0.189
Oils and Fats	2.16	2.15	2.13	2.13	2.16	2.13	2.15	2.13	2.13	2.13	2.13	2.13	2.12	-0.150
Livestock														
Cereal Grains	135.19	128.80	127.99	127.97	128.38	128.07	128.39	128.33	128.25	128.32	128.33	128.35	128.36	-0.431
Vegetables	30.03	22.80	21.92	21.83	22.18	21.81	22.08	21.96	21.85	21.87	21.85	21.83	21.82	-2.626
Meat	5.30	3.35	3.18	3.17	3.24	3.17	3.22	3.20	3.18	3.19	3.18	3.18	3.18	-4.168
Milk	26.54	20.64	20.11	20.03	20.24	20.00	20.15	20.07	19.99	20.00	19.98	19.97	19.95	-2.350
Oils and Fats	2.43	2.17	2.11	2.11	2.13	2.10	2.12	2.11	2.11	2.11	2.11	2.10	2.10	-1.180
Irrigation														
Cereal Grains	130.68	130.08	128.14	128.09	128.55	128.17	128.52	128.43	128.34	128.40	128.42	128.43	128.43	-0.144
Vegetables	24.97	24.17	22.06	21.94	22.34	21.90	22.20	22.06	21.93	21.95	21.92	21.90	21.88	-1.095
Meat	3.78	3.64	3.21	3.19	3.27	3.18	3.25	3.22	3.20	3.20	3.20	3.20	3.19	-1.386
Milk	21.89	21.50	20.19	20.10	20.33	20.05	20.23	20.14	20.05	20.05	20.03	20.02	20.00	-0.750
Oils and Fats	2.32	2.26	2.12	2.11	2.14	2.11	2.13	2.12	2.11	2.11	2.11	2.11	2.11	-0.810
Fertiliser														
Cereal Grains	130.32	130.01	128.14	128.09	128.55	128.17	128.52	128.43	128.34	128.40	128.41	128.42	128.43	-0.122
Vegetables	24.58	24.12	22.07	21.96	22.35	21.91	22.21	22.07	21.93	21.96	21.93	21.91	21.89	-0.963
Meat	3.73	3.62	3.21	3.19	3.27	3.19	3.25	3.22	3.20	3.20	3.20	3.20	3.20	-1.273
Milk	21.82	21.46	20.20	20.11	20.35	20.06	20.24	20.14	20.05	20.06	20.04	20.02	20.01	-0.719
Oils and Fats	2.28	2.25	2.12	2.11	2.14	2.11	2.13	2.12	2.11	2.11	2.11	2.11	2.11	-0.654
Population+Irrigation+ Fertiliser														
Cereal Grains	142.95	129.59	127.82	127.88	128.37	128.10	128.36	128.27	128.24	128.31	128.34	128.36	128.38	-0.892
Vegetables	41.90	23.66	21.75	21.74	22.15	21.83	22.04	21.90	21.83	21.86	21.85	21.84	21.83	-5.288
Meat	7.81	3.53	3.15	3.15	3.23	3.17	3.22	3.19	3.18	3.18	3.18	3.18	3.18	-7.204
Milk	31.40	21.18	19.99	19.97	20.22	20.01	20.13	20.03	19.99	20.00	19.99	19.98	19.97	-3.700
Oils and Fats	3.26	2.22	2.10	2.10	2.13	2.10	2.12	2.11	2.10	2.11	2.10	2.10	2.10	-3.584

Table 7.39: Impacts of Alternative Policies on the Per Capita Food Balance

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Cereal Grains	19.04	18.37	17.39	16.27	15.38	14.47	13.47	12.57	11.43	10.24	9.08	7.89	6.68	-8.361
Vegetables	6.49	6.68	6.87	6.90	6.52	6.89	6.60	6.72	6.80	6.74	6.73	6.72	6.71	0.274
Meat	8.90	8.84	8.80	8.71	8.53	8.52	8.36	8.29	8.21	8.10	8.01	7.91	7.81	-1.078
Milk	-8.17	-8.18	-8.16	-8.25	-8.67	-8.55	-8.90	-8.97	-9.04	-9.21	-9.35	-9.49	-9.63	1.380
Oils and Fats	-1.69	-1.67	-1.65	-1.64	-1.66	-1.63	-1.65	-1.64	-1.63	-1.64	-1.63	-1.63	-1.63	-0.268
Population														
Cereal Grains	19.23	18.95	18.56	18.21	18.31	18.56	18.51	18.41	18.09	17.74	17.38	16.98	16.55	-1.240
Vegetables	6.50	6.74	7.01	7.16	6.94	7.51	7.46	7.77	7.99	8.12	8.29	8.46	8.63	2.387
Meat	8.91	8.89	8.89	8.87	8.76	8.84	8.75	8.75	8.74	8.70	8.67	8.63	8.60	-0.298
Milk	-8.17	-8.17	-8.12	-8.17	-8.54	-8.34	-8.60	-8.59	-8.64	-8.74	-8.82	-8.90	-8.99	0.798
Oils and Fats	-1.69	-1.67	-1.65	-1.64	-1.67	-1.64	-1.65	-1.63	-1.63	-1.62	-1.62	-1.61	-1.61	-0.387
Livestock														
Cereal Grains	10.26	17.98	17.59	16.43	15.61	14.61	13.66	12.73	11.57	10.38	9.21	8.01	6.79	-3.379
Vegetables	-1.47	6.30	7.06	7.07	6.75	7.03	6.79	6.87	6.93	6.87	6.86	6.84	6.82	0.000
Meat	6.93	8.77	8.83	8.75	8.57	8.55	8.39	8.32	8.24	8.13	8.03	7.94	7.84	1.032
Milk	-0.59	4.91	5.06	4.76	4.19	4.08	3.57	3.31	3.04	2.69	2.37	2.05	1.74	0.000
Oils and Fats	-1.68	-1.42	-1.37	-1.37	-1.39	-1.37	-1.39	-1.39	-1.38	-1.39	-1.39	-1.39	-1.40	-1.534
Irrigation														
Cereal Grains	22.23	26.77	27.46	26.27	25.40	24.40	23.39	22.45	21.23	19.90	18.76	17.50	16.22	-2.592
Vegetables	5.81	7.48	9.48	9.49	9.13	9.47	9.20	9.31	9.38	9.32	9.30	9.29	9.27	3.975
Meat	8.45	8.48	8.81	8.73	8.54	8.53	8.37	8.30	8.22	8.12	8.02	7.92	7.82	-0.642
Milk	-9.45	-9.25	-8.12	-8.21	-8.62	-8.51	-8.86	-8.93	-9.00	-9.18	-9.32	-9.46	-9.60	0.131
Oils and Fats	-1.83	-1.75	-1.62	-1.61	-1.63	-1.60	-1.62	-1.61	-1.60	-1.60	-1.60	-1.60	-1.60	-1.111
Fertiliser														
Cereal Grains	22.04	26.68	27.30	26.11	25.24	24.25	23.24	22.30	21.08	19.84	18.61	17.35	16.08	-2.597
Vegetables	5.51	5.95	7.89	7.90	7.54	7.89	7.61	7.73	7.81	7.75	7.73	7.72	7.71	2.839
Meat	8.50	8.50	8.81	8.72	8.54	8.53	8.37	8.30	8.22	8.11	8.02	7.92	7.82	-0.692
Milk	-9.37	-9.21	-8.13	-8.22	-8.63	-8.52	-8.87	-8.94	-9.01	-9.18	-9.32	-9.47	-9.61	0.203
Oils and Fats	-1.80	-1.77	-1.64	-1.63	-1.65	-1.62	-1.64	-1.63	-1.62	-1.62	-1.62	-1.62	-1.62	-0.887
Population+Irrigation+Fertiliser														
Cereal Grains	15.20	33.22	34.42	34.01	34.26	34.46	34.42	34.20	33.73	33.25	32.75	32.22	31.65	6.301
Vegetables	55.32	75.22	75.83	74.75	73.79	73.31	72.36	71.57	70.67	69.73	68.84	67.96	67.09	1.620
Meat	4.44	8.65	8.99	8.96	8.86	8.92	8.84	8.82	8.79	8.74	8.70	8.65	8.61	5.667
Milk	-18.93	-8.87	-7.80	-7.89	-8.23	-8.10	-8.33	-8.35	-8.42	-8.54	-8.64	-8.74	-8.84	-6.148
Oils and Fats	-2.76	-1.72	-1.59	-1.59	-1.61	-1.58	-1.59	-1.58	-1.57	-1.57	-1.56	-1.56	-1.56	-4.662

Table 7.40: Impacts of Alternative Policies on the Per Capita Calorie Supply and Demand

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Per ha Calorie Supply	3849	3841	3826	3813	3822	3809	3815	3812	3806	3804	3802	3801	3799	-0.108
Per ha Calorie Demand	5226	5244	5265	5289	5315	5344	5374	5406	5443	5482	5523	5567	5612	0.595
Supply as % of Demand	74	73	73	72	72	71	71	71	70	69	69	68	68	-0.699
Carrying Capacity Per ha	5.32	5.31	5.29	5.27	5.28	5.27	5.27	5.27	5.26	5.26	5.26	5.25	5.25	-0.108
Current Load	7.22	7.25	7.28	7.31	7.35	7.39	7.43	7.47	7.52	7.58	7.64	7.70	7.76	0.595
Population														
Per ha Calorie Supply	3857	3839	3823	3809	38.17	3803	3810	3808	3803	3801	3799	3798	3796	-0.111
Per ha Calorie Demand	5216	5217	5214	5207	5194	5176	5177	5179	5183	5190	5197	5207	5218	0.002
Supply as % of Demand	74	74	73	73	73	73	74	74	73	73	73	73	73	-0.113
Carrying Capacity Per ha	5.32	5.31	5.28	5.27	5.28	5.26	5.27	5.26	5.26	5.26	5.25	5.25	5.25	-0.111
Current Load	7.21	7.21	7.21	7.20	7.18	7.16	7.16	7.16	7.17	7.17	7.19	7.20	7.21	0.002
Livestock														
Per ha Calorie Supply	3791	3841	3826	3813	3822	3809	3815	3812	3806	3804	3802	3801	3799	0.017
Per ha Calorie Demand	5226	5244	5265	5289	5315	5344	5374	5406	5443	5482	5523	5567	5612	0.595
Supply as % of Demand	73	73	73	72	72	71	71	71	70	69	69	68	68	-0.574
Carrying Capacity Per ha	5.24	5.31	5.29	5.27	5.28	5.27	5.27	5.27	5.26	5.26	5.26	5.25	5.25	0.017
Current Load	7.22	7.25	7.28	7.31	7.35	7.39	7.43	7.47	7.52	7.58	7.64	7.70	7.76	0.595
Irrigation														
Per ha Calorie Supply	3991	4109	4094	4081	4091	4078	4084	4082	4076	4074	4073	4072	4071	0.165
Per ha Calorie Demand	5226	5244	5265	5289	5315	5344	5374	5406	5443	5482	5523	5567	5612	0.595
Supply as % of Demand	76	78	78	77	77	76	76	76	75	74	74	73	73	-0.428
Carrying Capacity Per ha	5.52	5.68	5.66	5.64	5.66	5.64	5.65	5.64	5.64	5.63	5.63	5.63	5.63	0.165
Current Load	7.22	7.25	7.28	7.31	7.35	7.39	7.43	7.47	7.52	7.58	7.64	7.70	7.76	0.595
Fertiliser														
Per ha Calorie Supply	3973	4095	4079	4066	4076	4063	4069	4067	4061	4059	4058	4057	4055	0.171
Per ha Calorie Demand	5226	5244	5265	5289	5315	5344	5374	5406	5443	5482	5523	5567	5612	0.595
Supply as % of Demand	76	78	77	77	77	76	76	75	75	74	73	73	72	-0.422
Carrying Capacity Per ha	5.49	5.66	5.64	5.62	5.64	5.62	5.63	5.62	5.61	5.61	5.61	5.61	5.61	0.171
Current Load	7.22	7.25	7.28	7.31	7.35	7.39	7.43	7.47	7.52	7.58	7.64	7.70	7.76	0.595
Population+Irrigation+ Fertiliser														
Per ha Calorie Supply	4263	4388	4369	4353	4361	4344	4352	4348	4342	4338	4335	4333	4330	0.129
Per ha Calorie Demand	4857	4864	4867	4866	4860	4848	4857	4868	4880	4894	4910	4926	4945	0.149
Supply as % of Demand	88	90	90	89	90	90	90	89	89	89	88	88	88	-0.019
Carrying Capacity Per ha	5.89	6.07	6.04	6.02	6.03	6.01	6.02	6.01	6.00	6.00	5.99	5.99	5.99	0.129
Current Load	6.71	6.72	6.73	6.73	6.72	6.70	6.71	6.73	6.75	6.77	6.79	6.81	6.84	0.149

Table 7.41: Impacts of Alternative Policies on the Per Capita Value of Food and Non-Food Trade (Rs)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Value: Per Capita (Food)	292	322	352	378	388	433	446	483	518	545	575	607	639	6.729
Value: Per Capita (N-food)	944	947	949	951	954	956	958	961	963	965	967	970	972	0.241
Population														
Value: Per Capita (Food)	294	328	367	406	435	506	548	614	680	746	821	903	992	10.659
Value: Per Capita (N-food)	944	947	949	952	954	957	959	962	964	966	969	971	974	0.255
Livestock														
Value: Per Capita (Food)	161	472	537	575	602	658	690	742	795	841	893	946	1002	16.480
Value: Per Capita (N-food)	949	952	954	956	958	960	963	965	967	969	971	974	976	0.233
Irrigation														
Value: Per Capita (Food)	265	351	458	492	513	567	593	642	689	730	776	823	872	10.444
Value: Per Capita (N-food)	946	949	951	954	956	958	961	963	965	967	970	972	974	0.246
Fertiliser														
Value: Per Capita (Food)	264	337	439	473	492	544	568	615	661	699	742	787	833	10.038
Value:Per Capita (N-Food)	945	949	951	953	956	958	960	963	965	967	969	972	974	0.247
Population+Irrigation+ Fertiliser														
Value: Per Capita (Food)	188	894	1034	1112	1192	1309	1406	1524	1643	1768	1905	2052	2210	22.785
Value: Per Capita (N-food)	954	958	960	962	964	966	969	971	973	975	977	980	982	0.237

Table 7.42: Impacts of Alternative Policies on Labour Use (%)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Labour Use as % of	83	81	81	81	80	80	79	79	78	78	78	77	77	-0.616
Labour Balance (SS)	17	19	19	19	20	20	21	21	22	22	22	23	23	2.482
Population														
Labour Use as % of	83	82	81	82	82	82	82	81	81	81	81	81	80	-0.252
Labour Balance (SS)	17	18	19	18	18	18	18	19	19	19	19	19	20	1.129
Livestock														
Labour Use as % of	81	80	79	79	79	79	78	77	77	76	76	76	75	-0.606
Labour Balance (SS)	19	20	21	21	21	21	22	23	23	24	24	24	25	2.218
Irrigation														
Labour Use as % of	83	81	81	81	80	80	79	79	78	78	78	77	77	-0.616
Labour Balance (SS)	17	19	19	19	20	20	21	21	22	22	22	23	23	2.482
Fertiliser														
Labour Use as % of	83	81	81	81	80	80	79	79	78	78	78	77	77	-0.616
Labour Balance (SS)	17	19	19	19	20	20	21	21	22	22	22	23	23	2.482
Population+Irrigation+ Fertiliser														
Labour Use as % of	85	83	83	84	83	84	83	83	83	82	82	82	82	-0.296
Labour Balance (SS)	15	17	17	16	17	16	17	17	17	18	18	18	18	1.467

Table 7.43: Impacts of Alternative Policies on Real Per Capita Income (Rs)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Per Capita Income	880	896	906	914	933	941	958	972	983	995	1007	1018	1030	1.321
Population														
Per Capita Income	880	899	912	924	948	964	986	1005	1022	1041	1059	1078	1096	1.841
Livestock														
Per Capita Income	1044	1073	1080	1085	1101	1107	1121	1133	1141	1151	1161	1171	1180	1.030
Irrigation														
Per Capita Income	927	985	995	1003	1021	1029	1046	1059	1070	1081	1093	1104	1115	1.549
Fertiliser														
Per Capita Income	920	976	986	994	1013	1021	1038	1051	1062	1073	1085	1096	1107	1.553
Population+Irrigation+Fertiliser														
Per Capita Income	1243	1304	1307	1310	1328	1336	1352	1364	1374	1385	1397	1409	1422	1.129

Table 7.44: Impacts of Alternative Policies on Income Shares Originating From Different Sources

Sources	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Crops	35.99	36.80	37.45	38.14	39.04	39.51	40.18	40.61	40.95	41.31	41.63	41.90	42.13	1.319
Livestock	38.72	38.68	38.92	39.29	39.24	39.64	39.72	39.93	40.25	40.54	40.84	41.14	41.46	0.573
Professional Workers	2.54	2.46	2.37	2.27	2.18	2.09	2.02	1.95	1.89	1.82	1.76	1.70	1.65	-3.539
Office Workers	2.65	2.57	2.48	2.37	2.28	2.19	2.11	2.04	1.97	1.90	1.84	1.78	1.72	-3.539
Sales and Service Workers	6.21	6.02	5.80	5.54	5.33	5.12	4.94	4.78	4.61	4.45	4.30	4.16	4.03	-3.539
Production Workers	4.38	4.25	4.09	3.91	3.76	3.61	3.48	3.37	3.25	3.14	3.04	2.94	2.84	-3.539
Construction, etc	1.25	1.21	1.17	1.11	1.07	1.03	0.99	0.96	0.93	0.90	0.87	0.84	0.81	-3.539
General Labourers	8.26	8.01	7.72	7.37	7.09	6.81	6.57	6.36	6.14	5.93	5.73	5.54	5.36	-3.539
Population														
Crops	35.98	36.79	37.46	38.18	39.13	39.64	40.40	40.87	41.25	41.63	41.96	42.24	42.49	1.395
Livestock	38.75	38.76	39.06	39.49	39.15	39.98	40.07	40.31	40.64	40.94	41.25	41.58	41.91	0.655
Professional Workers	2.54	2.46	2.36	2.24	2.15	2.05	1.96	1.89	1.82	1.75	1.69	1.62	1.57	-3.937
Office Workers	2.65	2.57	2.46	2.34	2.24	2.14	2.05	1.97	1.90	1.83	1.76	1.70	1.64	-3.937
Sales and Service Workers	6.20	6.00	5.76	5.48	5.24	5.00	4.80	4.62	4.45	4.28	4.12	3.97	3.83	-3.937
Production Workers	4.37	4.23	4.07	3.87	3.70	3.53	3.38	3.26	3.14	3.02	2.91	2.80	2.70	-3.937
Construction, etc	1.25	1.21	1.16	1.10	1.05	1.01	0.96	0.93	0.89	0.86	0.83	0.80	0.77	-3.937
General Labourers	8.25	7.99	7.67	7.29	6.98	6.66	6.38	6.15	5.92	5.69	5.48	5.29	5.10	-3.937
Livestock														
Crops	28.74	30.72	31.42	32.14	33.08	33.61	34.34	34.85	35.26	35.70	36.09	36.44	36.75	2.068
Livestock	49.95	48.81	48.76	48.85	48.52	48.66	48.48	48.45	48.55	48.62	48.71	48.81	48.94	-0.171
Professional Workers	2.14	2.06	1.99	1.91	1.85	1.78	1.73	1.68	1.63	1.57	1.53	1.48	1.44	-3.259
Office Workers	2.24	2.15	2.08	2.00	1.93	1.86	1.80	1.75	1.70	1.65	1.60	1.55	1.50	-3.259
Sales and Service Workers	5.23	5.03	4.87	4.67	4.52	4.35	4.22	4.10	3.97	3.85	3.73	3.62	3.51	-3.259
Production Workers	3.69	3.54	3.43	3.29	3.19	3.07	2.98	2.89	2.80	2.72	2.63	2.55	2.48	-3.259
Construction, etc	1.05	1.01	0.98	0.94	0.91	0.88	0.85	0.82	0.80	0.77	0.75	0.73	0.71	-3.259
General Labourers	6.96	6.69	6.48	6.21	6.01	5.79	5.61	5.46	5.29	5.12	4.97	4.82	4.68	-3.259
Irrigation														
Crops	39.34	42.60	43.09	43.64	44.36	44.71	45.23	45.53	45.77	46.03	46.24	46.42	46.56	1.414
Livestock	36.70	35.13	35.41	35.80	35.62	36.23	36.37	36.62	36.97	37.28	37.61	37.94	38.29	0.355
Professional Workers	2.41	2.24	2.16	2.06	1.99	1.91	1.85	1.79	1.73	1.68	1.62	1.57	1.52	-3.748
Office Workers	2.51	2.34	2.26	2.16	2.08	2.00	1.93	1.87	1.81	1.75	1.69	1.64	1.59	-3.748
Sales and Service Workers	5.88	5.47	5.28	5.05	4.87	4.68	4.52	4.38	4.24	4.10	3.96	3.84	3.72	-3.748
Production Workers	4.15	3.86	3.72	3.56	3.43	3.30	3.19	3.09	2.99	2.89	2.80	2.71	2.62	-3.748
Construction, etc	1.18	1.10	1.06	1.01	0.98	0.94	0.91	0.88	0.85	0.82	0.80	0.77	0.75	-3.748
General Labourers	7.83	7.28	7.02	6.72	6.48	6.23	6.01	5.83	5.64	5.45	5.28	5.11	4.95	-3.748

Table 7.44 continued....

Sources	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Fertiliser														
Crops	38.90	42.12	42.64	43.22	43.97	44.34	44.88	45.21	45.46	45.73	45.96	46.15	46.30	1.463
Livestock	36.96	35.42	35.69	36.07	36.07	36.48	36.60	36.84	37.18	37.49	37.80	38.13	38.47	0.334
Professional Workers	2.42	2.26	2.18	2.08	2.00	1.93	1.86	1.80	1.74	1.69	1.63	1.58	1.53	-3.768
Office Workers	2.53	2.36	2.27	2.17	2.09	2.01	1.94	1.88	1.82	1.76	1.70	1.65	1.60	-3.768
Sales and Service Workers	5.93	5.51	5.32	5.08	4.90	4.71	4.55	4.41	4.26	4.12	3.99	3.86	3.74	-3.768
Production Workers	4.18	3.89	3.75	3.59	3.46	3.32	3.21	3.11	3.01	2.91	2.81	2.72	2.64	-3.768
Construction, etc	1.19	1.11	1.07	1.02	0.99	0.95	0.91	0.89	0.86	0.83	0.80	0.78	0.75	-3.768
General Labourers	7.89	7.34	7.08	6.77	6.52	6.27	6.05	5.87	5.67	5.48	5.30	5.13	4.97	-3.768
Population+Irrigation+ Fertiliser														
Crops	54.74	56.56	56.46	56.48	56.62	56.55	56.63	56.54	56.42	56.31	56.19	56.05	55.90	0.175
Livestock	27.40	26.64	27.19	27.80	28.16	28.78	29.15	29.62	30.13	30.62	31.11	31.61	32.11	1.330
Professional Workers	1.79	1.69	1.64	1.58	1.53	1.47	1.43	1.39	1.35	1.31	1.27	1.24	1.20	-3.264
Office Workers	1.87	1.76	1.72	1.65	1.60	1.54	1.49	1.45	1.41	1.37	1.33	1.29	1.26	-3.264
Sales and Service Workers	4.38	4.12	4.01	3.86	3.74	3.60	3.49	3.40	3.30	3.21	3.12	3.03	2.94	-3.264
Production Workers	3.09	2.91	2.83	2.72	2.64	2.54	2.46	2.40	2.33	2.26	2.20	2.14	2.08	-3.264
Construction, etc	0.88	0.83	0.81	0.78	0.75	0.72	0.70	0.68	0.66	0.65	0.63	0.61	0.59	-3.264
General Labourers	5.84	5.49	5.34	5.14	4.97	4.79	4.65	4.52	4.40	4.27	4.15	4.03	3.92	-3.264
	100	100	100	100	100	100	100	100	100	100	100	100	100	0.000

Table 7.45: Impacts of Alternative Policies on Land Use Changes (%)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Forests	33.07	33.02	32.96	32.88	32.78	32.66	32.52	32.36	32.17	31.97	31.74	31.48	31.20	-0.482
Shrublands	15.07	15.09	15.12	15.16	15.21	15.27	15.34	15.42	15.52	15.62	15.73	15.86	16.00	0.501
Grasslands	8.84	8.85	8.86	8.87	8.89	8.90	8.93	8.95	8.98	9.01	9.04	9.08	9.12	0.260
Adjacent NCI	15.42	15.42	15.43	15.44	15.45	15.45	15.48	15.49	15.51	15.53	15.55	15.58	15.61	0.100
Net Cultivated	19.56	19.57	19.58	19.60	19.62	19.64	19.67	19.70	19.74	19.78	19.83	19.88	19.93	0.157
Others	8.04	8.04	8.05	8.05	8.05	8.06	8.07	8.08	8.08	8.10	8.11	8.12	8.13	0.096
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.000
Population														
Forests	33.07	33.02	32.97	32.90	32.82	32.73	32.63	32.52	32.39	32.25	32.10	31.93	31.75	-0.337
Shrublands	15.07	15.09	15.12	15.15	15.19	15.24	15.29	15.34	15.41	15.48	15.55	15.63	15.73	0.356
Grasslands	8.84	8.85	8.86	8.87	8.88	8.89	8.91	8.93	8.94	8.96	8.99	9.01	9.04	0.184
Adjacent NCI	15.42	15.42	15.43	15.44	15.45	15.45	15.46	15.48	15.49	15.50	15.52	15.53	15.55	0.071
Net Cultivated	19.56	19.57	19.58	19.59	19.61	19.63	19.65	19.67	19.70	19.72	19.75	19.79	19.82	0.111
Others	8.04	8.04	8.05	8.05	8.05	8.06	8.06	8.07	8.07	8.08	8.09	8.10	8.11	0.068
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.000
Fuelwood Demand														
Forests	33.07	33.07	33.07	33.07	33.07	33.07	33.06	33.04	33.00	32.94	32.86	32.77	32.65	-0.105
Shrublands	15.07	15.03	15.00	14.98	14.97	14.97	14.97	14.98	15.00	15.03	15.07	15.11	15.17	0.057
Grasslands	8.84	8.83	8.82	8.82	8.81	8.81	8.81	8.82	8.82	8.83	8.84	8.86	8.87	0.029
Adjacent NCI	14.42	15.41	15.41	15.40	15.40	15.40	15.40	15.40	15.41	15.41	15.42	15.43	15.44	0.011
Net Cultivated	19.56	19.55	19.54	19.53	19.52	19.52	19.52	19.53	19.53	19.55	19.56	19.58	19.60	0.018
Others	8.04	8.11	8.16	8.20	8.23	8.24	8.24	8.24	8.24	8.24	8.25	8.25	8.26	0.221
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.000
Forest Management														
Forests	33.07	33.04	33.04	33.04	33.04	33.04	33.04	33.04	33.04	33.04	33.04	33.04	33.04	-0.006
Shrubland	15.07	15.08	15.08	15.06	15.03	14.99	14.93	14.85	14.78	14.70	14.62	14.54	14.46	-0.343
Grassland	8.84	8.85	8.84	8.84	8.83	8.82	8.80	8.78	8.76	8.73	8.71	8.68	8.66	-0.174
Adjacent NCI	15.42	15.42	15.42	15.42	15.41	15.40	15.39	15.38	15.36	15.35	15.33	15.31	15.30	-0.066
Net Cultivated	19.56	19.57	19.56	19.56	19.55	19.53	19.51	19.48	19.45	19.41	19.38	19.35	19.32	-0.104
Others	8.04	8.04	8.05	8.08	8.13	8.21	8.33	8.47	8.61	8.77	8.92	9.07	9.22	1.149
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.000
Natural Resource+Population														
Forests	33.07	33.04	33.04	33.04	33.04	33.04	33.04	33.04	33.04	33.04	33.04	33.04	33.04	-0.006
Shrublands	15.07	15.08	15.07	15.05	15.02	14.96	14.87	14.78	14.68	14.57	14.45	14.34	14.22	-0.483
Grasslands	8.84	8.85	8.84	8.84	8.83	8.81	8.78	8.76	8.73	8.69	8.66	8.62	8.59	-0.244
Adjacent NCI	15.42	15.42	15.42	15.42	15.41	15.40	15.38	15.36	15.34	15.32	15.30	15.27	15.25	-0.092
Net Cultivated	19.56	19.57	19.56	19.55	19.54	19.52	19.48	19.45	19.41	19.36	19.32	19.27	19.22	-0.146
Others	8.04	8.04	8.06	8.10	8.17	8.28	8.43	8.61	8.80	9.02	9.23	9.45	9.68	1.558
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.000

Table 7.46: Impacts of Alternative Policies on Fuelwood Sources (%)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Forests	67.75	67.65	67.53	67.39	67.23	67.05	66.84	66.62	66.36	66.06	65.77	65.43	65.06	-0.338
Shrublands	11.61	11.63	11.66	11.71	11.76	11.83	11.91	12.01	12.12	12.25	12.39	12.56	12.74	0.774
Grasslands	0.75	0.75	0.75	0.75	0.75	0.76	0.76	0.77	0.77	0.78	0.79	0.79	0.80	0.605
Adjacent NCI	12.60	12.61	12.62	12.64	12.66	12.69	12.73	12.78	12.83	12.89	12.96	13.04	13.13	0.342
Net Cultivated	6.47	6.55	6.63	6.71	6.78	6.86	6.93	7.01	7.09	7.17	7.25	7.33	7.42	1.142
Total	99.19	99.19	99.19	99.19	99.18	99.18	99.18	99.18	99.17	99.17	99.16	99.16	99.15	-0.003
Population														
Forests	67.75	67.65	67.54	67.41	67.27	67.13	66.97	66.80	66.62	66.42	66.21	65.97	65.73	-0.253
Shrublands	11.61	11.63	11.66	11.69	11.74	11.79	11.84	11.91	11.98	12.06	12.16	12.26	12.37	0.529
Grasslands	0.75	0.75	0.75	0.75	0.75	0.75	0.76	0.76	0.76	0.77	0.17	0.78	0.78	0.409
Adjacent NCI	12.60	12.61	12.62	12.63	12.65	12.67	12.69	12.72	12.76	12.80	12.84	12.89	12.94	0.222
Net Cultivated	6.47	6.55	6.63	6.70	6.78	6.85	6.92	6.99	7.06	7.13	7.20	7.27	7.34	1.051
Total	99.19	99.19	99.19	99.19	99.19	99.18	99.18	99.18	99.18	99.17	99.17	99.17	99.16	-0.002
Fuelwood Demand Reduction														
Forests	67.75	67.73	67.70	67.66	67.63	67.59	67.54	67.47	67.39	67.29	67.17	67.02	66.86	-0.111
Shrublands	11.61	11.58	11.55	11.53	11.51	11.50	11.50	11.50	11.52	11.55	11.59	11.65	11.72	0.075
Grasslands	0.75	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.75	0.75	0.75	0.055
Adjacent NCI	12.60	12.59	12.58	12.57	12.56	12.55	12.55	12.55	12.56	12.57	12.58	12.61	12.64	0.025
Net Cultivated	6.47	6.55	6.62	6.69	6.75	6.81	6.87	6.92	6.98	7.04	7.10	7.16	7.22	0.912
Total	99.19	99.19	99.19	99.19	99.19	99.19	99.19	99.19	99.19	99.19	99.19	99.19	99.19	0.000
Forest Management														
Forests	68.27	69.66	70.52	71.34	72.51	73.60	74.33	74.71	75.31	75.63	75.95	76.29	76.86	0.992
Shrublands	11.42	10.90	10.57	10.25	9.80	9.38	9.08	8.90	8.65	8.49	8.34	8.19	7.95	-2.977
Grasslands	0.73	0.70	0.68	0.66	0.63	0.60	0.59	0.57	0.56	0.55	0.54	0.53	0.52	-2.861
Adjacent NCI	12.40	11.83	11.46	11.12	10.65	10.22	9.93	9.78	9.54	9.42	9.30	9.16	8.94	-2.687
Net Cultivated	6.37	6.15	6.03	5.91	5.72	5.54	5.44	5.41	5.32	5.30	5.28	5.24	5.15	-1.749
Total	99.20	99.25	99.26	99.28	99.31	99.34	99.36	99.37	99.39	99.40	99.40	99.41	99.43	0.019
Natural Resource+Population														
Forests	35.86	35.72	35.62	35.53	35.45	35.39	35.35	35.32	35.30	35.28	35.27	35.26	35.26	-0.140
Shrublands	18.09	18.04	17.98	17.91	17.82	17.72	17.60	17.46	17.32	17.18	17.03	16.88	16.73	-0.646
Grasslands	4.09	4.08	4.07	4.06	4.04	4.03	4.01	3.99	3.98	3.96	3.94	3.93	3.91	-0.377
Adjacent NCI	6.12	6.10	6.08	6.06	6.05	6.03	6.02	6.01	6.00	5.98	5.97	5.96	5.95	-0.226
Net Cultivated	35.84	36.05	36.25	36.45	36.64	36.83	37.02	37.22	37.41	37.60	37.78	37.96	38.14	0.519
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.000

Table 7.47: Impacts of Alternative Policies on Fodder Sources (%)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Forests	25.56	25.43	25.28	25.13	24.97	24.79	24.60	24.39	24.17	23.94	23.69	23.42	23.14	-0.826
Shrublands	20.99	20.94	20.91	20.19	20.90	20.92	20.96	21.01	21.08	21.17	21.27	21.40	21.54	0.216
Grasslands	4.75	4.74	4.72	4.71	4.71	4.70	4.70	4.70	4.70	4.70	4.70	4.71	4.72	-0.054
Adjacent NCI	7.10	7.08	7.05	7.03	7.01	7.00	6.98	6.97	6.95	6.94	6.93	6.93	6.92	-0.213
Net Cultivated	41.60	41.82	42.03	42.23	42.42	42.60	42.77	42.93	43.09	43.25	43.40	43.54	43.68	0.408
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.000
Population														
Forests	25.56	25.43	25.29	25.15	25.00	24.85	24.69	24.53	24.36	24.18	23.99	23.80	23.59	-0.665
Shrublands	20.99	20.94	20.91	20.8	20.87	20.87	20.88	20.90	20.93	20.97	21.03	21.09	21.17	0.070
Grasslands	4.75	4.74	4.72	4.71	4.70	4.70	4.69	4.68	4.68	4.68	4.68	4.68	4.66	-0.123
Adjacent NCI	7.10	7.08	7.05	7.03	7.01	6.99	6.98	6.96	6.95	6.93	6.92	6.91	6.90	-0.236
Net Cultivated	41.60	41.82	42.03	42.23	42.41	42.59	42.76	42.93	43.08	43.24	43.38	43.52	43.66	0.404
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.000
Fuelwood Demand Reduction														
Forests	25.56	25.48	25.41	25.33	25.26	25.18	25.10	25.01	24.91	24.80	24.68	24.54	24.39	-0.391
Shrublands	20.99	20.87	20.77	20.68	20.60	20.53	20.47	20.43	20.40	20.39	20.39	20.41	20.44	-0.220
Grasslands	4.75	4.73	4.71	4.69	4.68	4.66	4.65	4.64	4.63	4.62	4.62	4.61	4.61	-0.251
Adjacent NCI	7.10	7.08	7.05	7.03	7.01	6.99	6.97	6.95	6.93	6.91	6.90	6.89	6.87	-0.269
Net Cultivated	41.60	41.84	42.06	42.27	42.46	42.64	42.81	42.97	43.12	43.27	43.41	43.55	43.69	0.409
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.000
Forest Management														
Forests	35.86	35.72	35.61	35.52	35.44	35.37	35.32	35.27	35.23	35.20	35.17	35.15	35.12	-0.174
Shrublands	18.09	18.04	17.98	17.92	17.84	17.75	17.65	17.53	17.42	17.31	17.19	17.08	16.97	-0.530
Grasslands	4.09	4.08	4.07	4.06	4.04	4.03	4.01	4.00	3.99	3.97	3.96	3.94	3.93	-0.340
Adjacent NCI	6.12	6.10	6.08	6.06	6.05	6.03	6.02	6.01	5.99	5.98	5.97	5.96	5.95	-0.233
Net Cultivated	35.84	36.05	36.25	36.44	36.63	36.82	37.00	37.19	37.36	37.54	37.71	37.87	38.03	0.496
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.000
Natural Resource+Population														
Forests	35.86	35.72	35.62	35.53	35.45	35.39	35.35	35.32	35.30	35.28	35.27	35.26	35.26	-0.140
Shrublands	18.09	18.04	17.98	17.91	17.82	17.72	17.60	17.46	17.32	17.18	17.03	16.88	16.73	-0.646
Grasslands	4.09	4.08	4.07	4.06	4.04	4.03	4.01	3.99	3.98	3.96	3.94	3.93	3.91	-0.377
Adjacent NCI	6.12	6.10	6.08	6.06	6.05	6.03	6.02	6.01	6.00	5.98	5.97	5.96	5.95	-0.226
Net Cultivated	35.84	36.05	36.25	36.45	36.64	36.83	37.02	37.22	37.41	37.60	37.78	37.96	38.14	0.519
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.000

Table 7.48: Impacts of Alternative Policies on the Resource Base

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Per Capita Cultivated Land	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	-1.329
Per Capita Accessible Forest Land	0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	-2.030
Population Density Per Cultivated Land	7.63	7.74	7.86	7.97	8.08	8.19	8.30	8.41	8.52	8.63	8.74	8.85	8.96	1.347
Population Density Per Accessible Land	5.17	5.26	5.35	5.45	5.55	5.65	5.76	5.88	6.01	6.15	6.29	6.45	6.61	2.072
Forest-Cultivated Area	1.48	1.47	1.47	1.46	1.46	1.45	1.44	1.43	1.42	1.40	1.39	1.37	1.35	-0.710
Shrub-Forest Area	0.52	0.52	0.53	0.53	0.53	0.54	0.54	0.55	0.55	0.56	0.57	0.58	0.59	1.061
LSU Per Cultivated Area	4.42	4.42	4.41	4.41	4.41	4.40	4.39	4.39	4.38	4.37	4.36	4.35	4.34	-0.153
LSU Per Forest Area	2.99	3.00	3.01	3.01	3.02	3.04	3.05	3.07	3.09	3.11	3.14	3.17	3.20	0.561
LSU Per Grazing Area	9.77	9.77	9.76	9.74	9.73	9.71	9.69	9.66	9.63	9.60	9.56	9.52	9.48	-0.255
Population														
Per Capita Cultivated Land	0.13	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.12	-0.790
Per Capita Accessible Forest Land	0.19	0.19	0.19	0.19	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	-1.284
Population Density Per Cultivated Land	7.61	7.70	7.78	7.85	7.90	7.94	8.00	8.07	8.13	8.19	8.25	8.31	8.37	0.796
Population Density Per Accessible Land	5.16	5.23	5.30	5.36	5.41	5.46	5.53	5.60	5.68	5.76	5.84	5.93	6.02	1.300
Forest-Cultivated Area	1.48	1.47	1.47	1.46	1.46	1.45	1.45	1.44	1.43	1.42	1.41	1.40	1.39	-0.498
Shrub-Forest Area	0.52	0.52	0.53	0.53	0.53	0.53	0.54	0.54	0.55	0.55	0.56	0.56	0.57	0.746
LSU Per Cultivated Area	4.42	4.42	4.41	4.41	4.41	4.40	4.40	4.39	4.39	4.38	4.38	4.37	4.36	-0.108
LSU Per Forest Area	2.99	3.00	3.00	3.01	3.02	3.03	3.04	3.05	3.07	3.08	3.10	3.12	3.14	0.392
LSU Per Grazing Area	9.77	9.77	9.76	9.75	9.73	9.72	9.70	9.69	9.67	9.64	9.62	9.59	9.56	-0.181
Livestock														
Per Capita Cultivated Land	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	-1.329
Per Capita Accessible Forest Land	0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	-2.030
Population Density Per Cultivated Land	7.63	7.74	7.86	7.97	8.08	8.19	8.30	8.41	8.52	8.63	8.74	8.85	8.96	1.347
Population Density Per Accessible Land	5.17	5.26	5.35	5.45	5.55	5.65	5.76	5.88	6.01	6.15	6.29	6.45	6.61	2.072
Forest-Cultivated Area	1.48	1.47	1.47	1.46	1.46	1.45	1.44	1.43	1.42	1.40	1.39	1.37	1.35	-0.710
Shrub-Forest Area	0.52	0.52	0.53	0.53	0.53	0.54	0.54	0.55	0.55	0.56	0.57	0.58	0.59	1.061
LSU Per Cultivated Area	4.25	4.25	4.25	4.24	4.24	4.23	4.23	4.22	4.21	4.20	4.19	4.18	4.17	-0.155
LSU Per Forest Area	2.88	2.88	2.89	2.90	2.91	2.92	2.94	2.95	2.97	2.99	3.02	3.05	3.08	0.560
LSU Per Grazing Area	9.40	9.40	9.39	9.37	9.36	9.34	9.32	9.29	9.26	9.23	9.20	9.16	9.12	-0.257

Table 7.48 continued....

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Forest Demand Reduction														
Per Capita Cultivated Land	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	-1.466
Per Capita Accessible Forest Land	0.19	0.19	0.19	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.16	0.16	-1.602
Population Density Per Cultivated Land	7.63	7.75	7.87	8.00	8.12	8.24	8.36	8.48	8.61	8.73	8.86	8.98	9.11	1.488
Population Density Per Accessible Land	5.17	5.25	5.33	5.41	5.49	5.57	5.66	5.74	5.84	5.94	6.04	6.16	6.27	1.628
Forest-Cultivated Area	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.47	1.47	1.47	1.46	1.45	-0.138
Shrub-Forest Area	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.53	0.53	0.53	0.177
LSU Per Cultivated Area	4.42	4.42	4.42	4.43	4.43	4.43	4.43	4.43	4.42	4.42	4.42	4.41	4.41	-0.018
LSU Per Forest Area	2.99	2.99	2.99	2.99	2.99	2.99	2.99	3.00	3.00	3.01	3.01	3.03	3.04	0.120
LSU Per Grazing Area	9.77	9.79	9.80	9.80	9.81	9.81	9.81	9.80	9.80	9.79	9.77	9.76	9.74	-0.029
Forest Management														
Per Capita Cultivated Land	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	-1.587
Per Capita Accessible Forest Land	0.19	0.19	0.19	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.16	0.16	-1.491
Population Density Per Cultivated Land	7.63	7.74	7.86	7.98	8.11	8.24	8.37	8.50	8.65	8.79	8.94	9.09	9.24	1.612
Population Density Per Accessible Land	5.17	5.25	5.33	5.41	5.50	5.58	5.66	5.74	5.83	5.92	6.01	6.10	6.19	1.514
Forest-Cultivated Area	1.48	1.47	1.47	1.47	1.48	1.48	1.48	1.48	1.48	1.49	1.49	1.49	1.49	0.097
Shrub-Forest Area	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.51	0.51	0.51	0.50	0.50	-0.335
LSU Per Cultivated Area	4.42	4.42	4.42	4.42	4.42	4.43	4.43	4.44	4.44	4.45	4.46	4.46	4.47	0.097
LSU Per Forest Area	2.99	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.99	2.99	2.99	0.001
LSU Per Grazing Area	9.77	9.77	9.77	9.78	9.79	9.80	9.82	9.84	9.87	9.89	9.92	9.95	9.97	0.167
Natural Resource+Population														
Per Capita Cultivated Land	0.13	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.12	-1.086
Per Capita Accessible Forest Land	0.19	0.19	0.19	0.19	0.19	0.19	0.18	0.18	0.18	0.18	0.18	0.17	0.17	-0.948
Population Density Per Cultivated Land	7.61	7.70	7.79	7.86	7.93	7.98	8.08	8.17	8.27	8.37	8.47	8.57	8.68	1.096
Population Density Per Accessible Land	5.16	5.23	5.28	5.33	5.37	5.40	5.46	5.51	5.56	5.62	5.67	5.73	5.78	0.957
Forest-Cultivated Area	1.48	1.47	1.47	1.48	1.48	1.48	1.48	1.48	1.49	1.49	1.49	1.50	1.50	0.139
Shrub-Forest Area	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.51	0.51	0.51	0.50	0.50	0.40	-0.476
LSU Per Cultivated Area	4.42	4.42	4.42	4.42	4.42	4.43	4.43	4.44	4.45	4.46	4.47	4.48	4.49	0.137
LSU Per Forest Area	2.99	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.99	2.99	2.99	2.99	2.99	-0.003
LSU Per Grazing Area	9.77	9.77	9.77	9.78	9.79	9.81	9.84	9.87	9.90	9.94	9.97	10.01	10.05	0.235

Table 7.49: Impacts of Alternative Policies on Agricultural Land

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Supply as % of Demand	74	73	73	72	72	71	71	71	70	69	69	68	68	-0.699
Carrying Capacity Per ha	5.32	5.31	5.29	5.27	5.28	5.27	5.27	5.27	5.26	5.26	5.26	5.25	5.25	-0.108
Current Load	7.22	7.25	7.28	7.31	7.35	7.39	7.43	7.47	7.52	7.58	7.64	7.70	7.76	0.595
Population														
Supply as % of Demand	74	74	73	73	73	73	74	74	73	73	73	73	73	-0.113
Carrying Capacity Per ha	5.32	5.31	5.28	5.27	5.28	5.26	5.27	5.26	5.26	5.26	5.25	5.25	5.25	-0.111
Current Load	7.21	7.21	7.21	7.20	7.18	7.16	7.16	7.16	7.17	7.17	7.19	7.20	7.21	0.002
Forest Demand Reduction														
Supply as % of Demand	74	73	73	72	72	71	71	71	70	69	69	68	68	-0.699
Carrying Capacity Per ha	5.32	5.31	5.29	5.27	5.28	5.27	5.27	5.27	5.26	5.26	5.26	5.25	5.25	-0.108
Current Load	7.22	7.25	7.28	7.31	7.35	7.39	7.43	7.47	7.52	7.58	7.64	7.70	7.76	0.595
Forest Management														
Supply as % of Demand	74	73	73	72	72	71	71	71	70	69	69	68	68	-0.701
Carrying Capacity Per ha	5.32	5.31	5.29	5.27	5.28	5.27	5.27	5.27	5.26	5.26	5.26	5.25	5.25	-0.110
Current Load	7.22	7.25	7.28	7.31	7.35	7.39	7.43	7.47	7.52	7.58	7.64	7.70	7.76	0.595
Natural Resource+Population														
Supply as % of Demand	74	74	73	73	73	73	74	73	73	73	73	73	72	-0.156
Carrying Capacity Per ha	5.32	5.31	5.28	5.27	5.28	5.26	5.27	5.26	5.26	5.25	5.25	5.25	5.25	-0.113
Current Load	7.21	7.21	7.21	7.20	7.18	7.16	7.16	7.17	7.18	7.19	7.21	7.23	7.25	0.044

Table 7.50: Impacts of Alternative Policies on Land in Terms of Fuelwood

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Supply as % of Demand	96	95	93	92	90	89	87	86	84	83	81	80	78	-1.722
Carrying Capacity (persons/ha)	2.87	2.87	2.87	2.87	2.86	2.85	2.85	2.84	2.82	2.81	2.80	2.78	2.76	-0.330
Current Load (persons/ha)	2.99	3.03	3.08	3.12	3.17	3.21	3.26	3.30	3.35	3.40	3.44	3.49	3.54	1.417
Population														
Supply as % of Demand	96	95	94	93	92	92	91	90	89	88	87	86	85	-1.050
Carrying Capacity (persons/ha)	2.87	2.87	2.87	2.87	2.86	2.86	2.85	2.85	2.84	2.83	2.82	2.81	2.80	-0.213
Current Load (persons/ha)	2.98	3.02	3.05	3.08	3.10	3.11	3.14	3.17	3.19	3.22	3.25	3.27	3.30	0.845
Fuelwood Demand Reduction														
Supply as % of Demand	107	105	104	103	101	100	98	97	96	94	93	91	90	-1.447
Carrying Capacity (persons/ha)	3.19	3.20	3.21	3.21	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.21	3.20	0.030
Current Load (persons/ha)	2.99	3.04	3.08	3.13	3.18	3.23	3.27	3.32	3.37	3.42	3.47	3.52	3.57	1.499
Forest Management														
Supply as % of Demand	98	101	103	104	107	110	111	111	112	112	112	111	112	1.170
Carrying Capacity (persons/ha)	2.92	3.06	3.16	3.26	3.40	3.55	3.65	3.72	3.81	3.87	3.93	3.99	4.09	2.854
Current Load (persons/ha)	2.99	3.03	3.08	3.13	3.18	3.23	3.28	3.34	3.40	3.46	3.52	3.58	3.64	1.665
Natural Resource+Population														
Supply as % of Demand	98	101	104	106	109	113	115	116	118	118	118	118	120	1.712
Carrying Capacity (persons/ha)	2.92	3.06	3.16	3.26	3.40	3.55	3.66	3.72	3.82	3.88	3.94	4.01	4.12	2.903
Current Load (persons/ha)	2.98	3.02	3.05	3.08	3.11	3.13	3.17	3.21	3.25	3.30	3.34	3.38	3.43	1.170

Table 7.51: Impacts of Alternative Policies on Forest Land in Terms of Fuelwood

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Supply as % of Demand	69	68	66	65	64	63	62	60	59	58	56	55	54	-2.053
Carrying Capacity (Person/ha)	7.02	7.02	7.02	7.02	7.01	7.01	7.01	7.01	7.00	7.00	7.00	6.99	6.98	-0.041
Current Load (Person/ha)	10.22	10.39	10.57	10.76	10.96	11.17	11.39	11.62	11.87	12.13	12.42	12.72	13.04	2.055
Population														
Supply as % of Demand	69	68	67	66	66	65	64	63	62	62	61	60	59	-1.300
Carrying Capacity (Person/ha)	7.02	7.02	7.02	7.02	7.01	7.01	7.01	7.01	7.01	7.00	7.00	7.00	7.00	-0.028
Current Load (Person/ha)	10.20	10.34	10.47	10.59	10.69	10.79	10.93	11.07	11.22	11.37	11.54	11.71	11.89	1.289
Fuelwood Demand Reduction														
Supply as % of Demand	76	75	74	73	72	71	70	69	68	66	65	64	63	-1.607
Carrying Capacity (Person/ha)	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.79	7.79	-0.009
Current Load (Person/ha)	10.22	10.38	10.53	10.69	10.85	11.01	11.18	11.35	11.54	11.74	11.94	12.16	12.40	1.625
Forest Management														
Supply as % of Demand	70	74	76	78	82	85	87	88	89	89	89	90	91	2.174
Carrying Capacity (Person/ha)	7.19	7.70	8.04	8.38	8.89	9.40	9.76	9.95	10.27	10.44	10.61	10.80	11.14	3.720
Current Load (Person/ha)	10.22	10.38	10.54	10.70	10.86	11.02	11.19	11.35	11.52	11.70	11.87	12.05	12.24	1.514
Natural Resource+Population														
Supply as % of Demand	70	75	77	80	84	88	91	91	93	94	95	95	97	2.738
Carrying Capacity (Person/ha)	7.19	7.70	8.04	8.38	8.89	9.40	9.76	9.95	10.27	10.44	10.61	10.80	11.14	3.720
Current Load (Person/ha)	10.20	10.33	10.44	10.53	10.61	10.68	10.78	10.89	11.00	11.10	11.21	11.32	11.43	0.957

Table 7.52: Impacts of Alternative Policies on the Per Capita Fuelwood Balance and Deforestation

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Per Capita Supply (kg)	566	557	549	540	531	523	514	505	496	487	478	469	459	-1.722
Per Capita Deficit (kg)	-22	-31	-39	-48	-57	-65	-74	-83	-92	-101	-110	-119	-129	15.756
Deforested Area (ha)	85	120	156	193	231	270	311	352	396	442	490	539	590	17.499
Population														
Per Capita Supply (kg)	567	560	554	549	544	540	535	529	523	517	511	505	499	-1.050
Per Capita Deficit (kg)	-21	-28	-34	-39	-44	-48	-53	-59	-65	-71	-77	-83	-89	12.671
Deforested Area (ha)	81	108	133	155	175	191	216	241	266	293	320	348	377	13.695
Fuelwood Demand Reduction														
Per Capita Supply of Fuelwood (kg)	566	557	549	541	534	526	519	511	504	496	488	480	472	-1.498
Per Capita Deficit (kg)	37	28	20	12	4	-3	-10	-18	-26	-33	-41	-49	-57	0.000
Deforested Area (ha)	-140	-110	-79	-49	-18	13	44	76	110	146	183	222	262	0.000
Forest Management														
Per Capita Supply of Fuelwood (kg)	575	594	603	612	630	646	655	655	661	659	657	656	661	1.170
Per Capita Deficit (kg)	-13	6	15	24	42	58	67	67	73	71	69	68	73	0.000
Deforested Area (ha)	50	-23	-61	-98	-170	-241	-281	-285	-313	-309	-305	-305	-335	0.000
Natural Resource+Population														
Per Capita Supply of Fuelwood (kg)	576	597	609	622	644	667	679	682	692	693	695	697	706	1.713
Per Capita Deficit (kg)	-12	9	21	34	56	79	91	94	104	105	107	109	118	0.000
Deforested Area (ha)	45	-35	-83	-134	-224	-317	-369	-385	-427	-437	-447	-462	-507	0.000

Table 7.53: Impacts of Alternative Policies on Forest Land in Terms of Timber

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Supply as % of Demand	112	110	108	107	105	103	101	99	97	94	92	90	88	-2.030
Carrying Capacity (person/ha)	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	0.000
Current Load (person/ha)	5.17	5.26	5.35	5.45	5.55	5.65	5.76	5.88	6.01	6.15	6.29	6.45	6.61	2.072
Population														
Supply as % of Demand	112	111	110	108	107	106	105	104	102	101	99	98	96	-1.284
Carrying Capacity (person/ha)	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	0.000
Current Load (person/ha)	5.16	5.23	5.30	5.36	5.41	5.46	5.53	5.60	5.68	5.76	5.84	5.93	6.02	1.300
Fuelwood Demand Reduction														
Supply as % of Demand	112	110	109	107	106	104	103	101	99	98	96	94	92	-1.602
Carrying Capacity (person/ha)	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	0.000
Current Load (person/ha)	5.17	5.25	5.33	5.41	5.49	5.57	5.66	5.74	5.84	5.94	6.04	6.16	6.27	1.628
Forest Management														
Supply as % of Demand	112	110	109	107	106	104	102	101	295	301	306	321	323	9.213
Carrying Capacity (person/ha)	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	17.20	17.80	18.40	19.60	20.00	10.866
Current Load (person/ha)	5.17	5.25	5.33	5.41	5.50	5.58	5.66	5.74	5.83	5.92	6.01	6.10	6.19	1.514
Natural Resource+Population														
Supply as % of Demand	112	111	110	109	108	107	106	105	309	317	324	342	346	9.816
Carrying Capacity (person/ha)	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	17.20	17.80	18.40	19.60	20.00	10.866
Current Load (person/ha)	5.16	5.23	5.28	5.33	5.37	5.40	5.46	5.51	5.56	5.62	5.67	5.73	5.78	0.957

Table 7.54: Impacts of Alternative Policies on Fodder Supply and Demand

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Total Fodder Supply /ha	0.80	0.81	0.81	0.81	0.81	0.82	0.82	0.82	0.83	0.83	0.83	0.84	0.84	0.373
Fodder Demand	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.84	0.063
SS as % of Demand	97	97	97	98	98	98	99	99	99	100	100	100	100	0.310
Carrying Capacity (LSU/ha)	1.29	1.29	1.30	1.30	1.31	1.31	1.32	1.32	1.32	1.33	1.33	1.34	1.34	0.373
Current Load (LSU/ha)	1.33	1.33	1.33	1.33	1.35	1.33	1.33	1.33	1.33	1.34	1.34	1.34	1.34	0.063
Livestock														
Total Fodder Supply /ha	0.80	0.81	0.81	0.81	0.81	0.82	0.82	0.82	0.83	0.83	0.83	0.84	0.84	0.373
Fodder Demand	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.062
SS as % of Demand	80	81	81	81	82	82	82	82	83	83	83	83	83	0.311
Carrying Capacity	1.03	1.03	1.04	1.04	1.04	1.05	1.05	1.06	1.06	1.06	1.07	1.07	1.08	0.373
Current Load (LSU/ha)	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.34	0.033
Forest Management														
Total Fodder Supply /ha	0.93	0.93	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.96	0.96	0.96	0.96	0.289
Fodder Demand Per	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.84	0.84	0.84	0.84	0.115
SS as % of Demand	112	113	113	113	113	114	114	114	114	114	114	114	115	0.174
Carrying Capacity (LSU/ha)	1.49	1.50	1.50	1.51	1.51	1.52	1.52	1.52	1.53	1.53	1.54	1.54	1.54	0.289
Current Load (LSU/ha)	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.34	1.34	1.34	1.34	1.35	1.35	0.115
Natural Resource+Population	0.93	0.93	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.96	0.96	0.96	0.97	0.303
Total Fodder Supply /ha	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.84	0.84	0.84	0.84	0.84	0.85	0.159
Fodder Demand	112	113	113	113	113	114	114	114	114	114	114	114	114	0.144
SS as % of Demand	1.49	1.50	1.50	1.51	1.51	1.52	1.52	1.52	1.53	1.53	1.54	1.54	1.55	0.303
Carrying Capacity (LSU/ha)	1.33	1.33	1.33	1.33	1.33	1.33	1.34	1.34	1.34	1.35	1.35	1.35	1.36	0.159
Current Load (LSU/ha)														

Table 7.55: Impacts of Alternative Policies on Forest Land in Terms of Fodder

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Growth
Baseline														
Supply as % of Demand	25	25	25	25	24	24	24	24	24	24	24	23	23	-0.519
Carrying Capacity (LSU/ha)	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.039
Current Load (LSU/ha)	2.99	3.00	3.01	3.01	3.02	3.04	3.05	3.07	3.09	3.11	3.14	3.17	3.20	0.561
Population														
Supply as % of Demand	25	25	25	25	25	24	24	24	24	24	24	24	24	-0.363
Carrying Capacity (LSU/ha)	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.027
Current Load (LSU/ha)	2.99	3.00	3.00	3.01	3.02	3.03	3.04	3.05	3.07	3.08	3.10	3.12	3.14	0.392
Livestock														
Supply as % of Demand met	15	15	15	15	15	15	15	14	14	14	14	14	14	-0.789
Carrying Capacity (LSU/ha)	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.000
Current Load (LSU/ha)	3.70	3.71	3.72	3.74	3.76	3.78	3.81	3.84	3.87	3.91	3.96	4.01	4.07	0.796
Fuelwood Demand Reduction														
Supply as % of Demand	25	25	25	25	25	25	25	25	25	25	25	24	24	-0.112
Carrying Capacity (LSU/ha)	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.008
Current Load (LSU/ha)	2.99	2.99	2.99	2.99	2.99	2.99	2.99	3.00	3.00	3.01	3.01	3.03	3.04	0.120
Forest Management														
Supply as % of Demand	40	40	40	40	40	40	40	40	40	40	40	40	40	-0.000
Carrying Capacity (LSU/ha)	1.20	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	0.000
Current Load (LSU/ha)	2.99	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.99	2.99	2.99	0.001
Natural Resource+Population														
Supply as % of Demand	40	40	40	40	40	40	40	40	40	40	40	40	40	0.003
Carrying Capacity (LSU/ha)	1.20	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	0.000
Current Load (LSU/ha)	2.99	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.99	2.99	2.99	2.99	2.99	-0.003