3

KABHREPALANCHOK DISTRICT

Performance of the District Economy

Introduction

This section provides a summary of the district's economy. The economic base of Kabhre district is primarily agricultural with strong linkages to the forestry and livestock sectors. As a result, these three sectors play an important role in Kabhre. Available historical data series for almost all the districts of Nepal are limited in most cases to crop area, yield rates, and livestock. District level information on other aspects of the district economy is not available, except for studies confined to smaller areas that are not usually representative of the district.

Crop Area

Six crops generally dominate the agricultural land use pattern in Kabhre. These crops are paddy, maize, millet, wheat, oilseeds, and potatoes. The areas under these crops for different years are given in Table 3.1, which indicates that the areas under paddy, maize, wheat, and potatoes increased by about two-fold during the last 14 years (1975 to 1989). This increase in area was very marked between 1981 and 1982 for paddy, when it increased from 9,600 ha to 11,620ha, i.e., 21 per cent. However, in 1989 the area again decreased to 10, 100 ha, i.e., by 13 per cent. The area under maize shows even greater variations. For example, it can be observed that the net gain has been only five per cent. The area under maize shows even greater variations. For example, between 1980 and 1981 it increased from 9,300 ha to 22,310 ha, i.e., 140 per cent increase. Again in 1984 the area declined to 10,100 ha (over 50% decline relative to 1983). These sudden changes in cultivated area are difficult to explain. The areas under wheat and potatoes also show similar trends. The area under millet declined by almost half between 1975-1989. The area under oilseeds shows the least change (see the coefficient of variation) over time. The area under potatoes increased very rapidly almost seven-fold over the period.

In order to project the areas under different crops, a semilog time trend equation was fitted to historical data (1980/81-89/90) obtained from DFAMS. The semilog function was selected to reflect the fact that land is an inelastic input and that growth in crop area over time has to decline, and the historical data also exhibited a semilog trend. The equations fitted are presented in Table 3.2.

Crop Yield

There does not appear to be a consistent trend in the yield pattern of crops over time. Data on the yield rates for the six crops are given in Charts 3.1, and Table 3.3. The trends in crop yields are difficult to explain. While weather plays a crucial role in productivity in any given year, there is little doubt that improving irrigation facilities could reduce dependency on weather (seasonal rainfall) and increase productivity. However, it is difficult to relate the erratic trend to the weather alone. If the observed trends are the outcome of policies, there is scope for formulating appropriate policies. But such a relationship has so far not been established. One plausible explanation for this could be reporting errors, but this point also remains to be validated.

According to yield data given in Table 3.3, yield rates have remained either constant or declined over the years. The food situation in the district, which is believed to be getting worse, supports this declining yield trend. For the last three years, yields have been increasing. However, this does not provide an adequate basis for assuming that yields in Kabhre will continue to increase in this manner, given the technology practised in this district.

Fertiliser Use

The actual use of fertilisers by households on different crops in Kabhre is not known. Information on fertiliser sales reported by the Agricultural Inputs' Corporation (AIC) for Kabhre is given in Table 3.4. The results indicates a very erratic trend. This erratic trend could be the result of a relatively lower fertiliser quota provided to the district in years when imports were low. The average sale per hectare of cropped area (six crops) is also given in Table 3.4. The sale rates per hectare of cropped area are very high, and this is hard to justify unless large quantities of fertilisers are being used on other secondary crops. The sale rates presented are much higher than the rates reported in the Irrigation Master Plan (1980) for the Eastern Stratum which are 19kg/ha for paddy, 17kg/ha for maize, 24kg/ha for wheat, 14 kg/ha for potatoes, and 10 kg/ha for oilseeds. This rate deviates substantially from the per ha sale rate and cannot be explained easily.

Livestock

Information on the livestock sector is available from 1984 only. Livestock numbers and production of meat and milk from different types of livestock are given in Table 3.5 (DFAMS). In general, the existing livestock population for all major categories of livestock appears to be very large. The reasons for this are not very obvious.

Chart 3.1

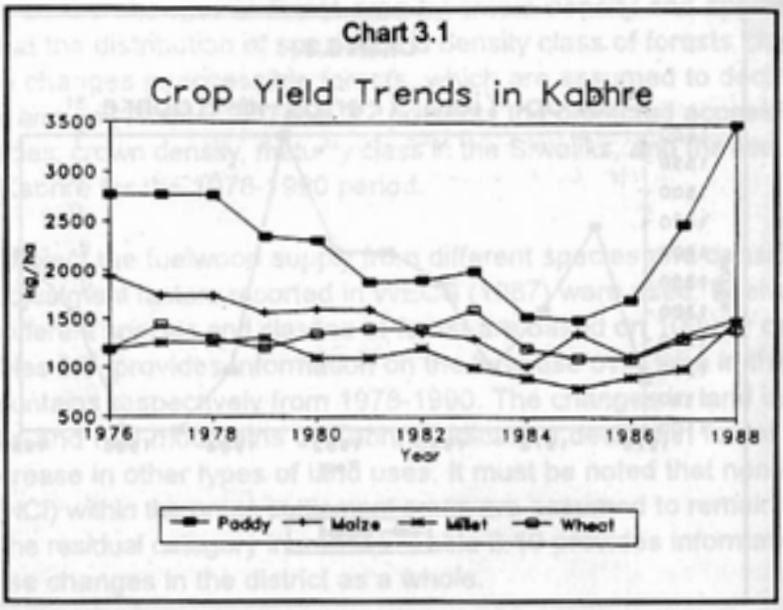
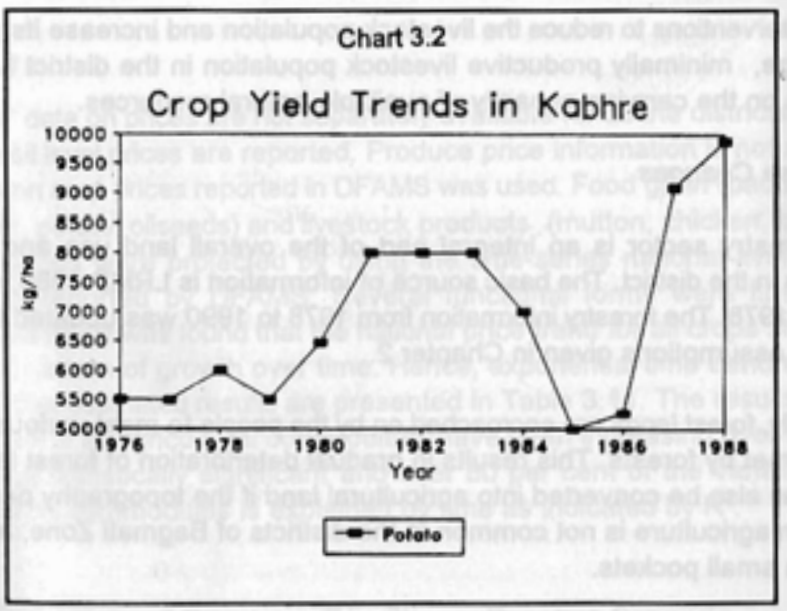
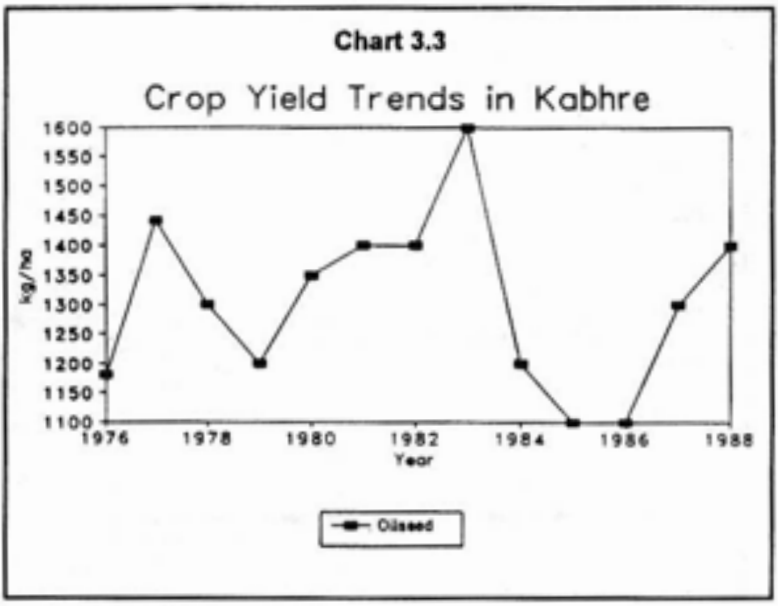


Chart 3.2



Only a small percentage of the total buffalo population provides milk. The amount of buffalo meat production is also small. Buffaloes are not used for ploughing. It is also unlikely that households keep unproductive buffaloes for manure, given the large quantities of fodder required by these animals. Regarding the cattle population, the large number is perhaps due to religious factors. In general, the large number of all types of livestock in the district is hard to justify, given the extremely low levels of meat and milk outputs. This factor emphasises the need for

Chart 3.3



policy interventions to reduce the livestock population and increase its productivity. The large, minimally productive livestock population in the district has negative impacts on the carrying capacity of available natural resources.

Land Use Changes

The forestry sector is an integral part of the overall land use and agricultural systems in the district. The basic source of information is LRMP 1986, which dates back to 1978. The forestry information from 1978 to 1990 was updated by using the various assumptions given in Chapter 2.

Generally, forest lands are encroached on by the people to meet various needs that can be met by forests. This results in gradual deterioration of forest lands. Forest lands can also be converted into agricultural land if the topography permits. Slash and burn agriculture is not common in the districts of Bagmati Zone, although it is found in small pockets.

The Forestry Master Plan (FMP) classifies forests by accessibility. The forest accessibility factor varies by region. In the Siwaliks, all forests in Kabhre are assumed to be accessible whereas, in the mid-mountains, the accessibility factor for Kabhre is 94 per cent. Thus, only accessible forests are assumed to be used by households to meet firewood, fodder, timber, and grazing needs. Deforestation is, therefore, assumed to be concentrated mainly in accessible forests.

LRMP reports the composition of natural forests by types of species, crown cover, and maturity class for the different regions (Table 3.6). In the absence of time-

series' data on the changes in forest area by crown density and species, it was assumed that the distribution of species and density class of forests change as a result of the changes in accessible forests, which are assumed to decline at one per cent per annum (Chapter 2). Table 3.7 presents the projected accessible forest area by species, crown density, maturity class in the Siwaliks, and the mountainous regions of Kabhre for the 1978-1990 period.

In order to project the fuelwood supply from different species and density classes of forests, adjustment factors reported in WECS (1987) were used. Fuelwood yield rates from different species and classes of forest are based on 100 per cent crown density. Tables 3.8 provides information on the land use over time in the Siwaliks and mid-mountains respectively from 1978-1990. The changes in land use time in the Siwaliks and mid-mountains of Kabhre indicate a decline in forest area and marginal increase in other types of land uses. It must be noted that non-cultivated inclusions (NCI) within the gross settlement areas are assumed to remain constant. Over time, the residual category increases. Table 3.10 provides information on the total land use changes in the district as a whole.

Prices

Time-series' data on prices are not separately available for all the districts of Nepal and only retail level prices are reported. Produce price information is not available. Information on crop prices reported in DFAMS was used. Food grain (paddy, maize, wheat, millet, potato, oilseeds) and livestock products (mutton, chicken, buff, pork, and milk) prices were projected by using the time-series national average data (1975-1989) reported by DFAMS. Several functional forms were fitted to the historical data and it was found that the national price trend for all crops showed an exponential pattern of growth over time. Hence, exponential time trend equations were fitted. The estimated results are presented in Table 3.11. The results indicate that the prices of all agricultural commodities have been increasing over time. The times are all statistically significant and over 80 per cent of the variation in the prices of these commodities is explained by time as indicated by R^2.

Economic and Natural Resource Conditions: Baseline Scenario

Various sectors have been linked in the multi-market model framework discussed in Chapter 2 to evaluate the economic and natural resource sectors of the district in order to generate the baseline results. The baseline results are important as it is against these results that policy impacts will be evaluated when shocks are given to the model.

Prices

Ramechhap district prices were used to calibrate the prices of Kabhre. This is presented in Table 3.12. The growth rates of prices calculated by using the end points are given in the last column of Table 3.12. Among the food grains considered, millet and paddy have the highest growth rates. Wheat price is forecasted to have the lowest growth. The aggregate cereal grain price has a growth rate of about 7.4 per cent. Aggregate meat and oil and fat prices are also given in Table 3.12, and it can be observed that the aggregate meat price has the highest growth (11 per cent) among the food commodities.

Crop Area and Yield

Table 3.13 provides results of the area forecasted for different crops and Table 3.14 provides the respective crop yield projections based on the assumption of non-constant crop prices and variable inputs. Area growth follows a time trend based on historic data series.

The growth rates forecasted for crop area over time indicate almost negligible growth. The highest positive growth rate is for paddy (1.4 per cent) and the lowest is for oilseeds. The millet area is seen to decline over time. The changes in the area under irrigation, which was assumed to grow at two per cent per annum, are also presented in Table 3.13. Fertiliser sales are expected to grow at about three per cent per annum based on fertiliser sales in the district over the past years.

Table 3.14 provides future yield trends of the six crops in Kabhre on the basis of past trends. Forecasting was based on the assumption that crop technology would remain the same over time. This is another area where policies could influence yields changes. The forecasted crop yields are not encouraging. All the crops considered show a stagnant or even negative yield trend over time.

The results indicate that, over time, Kabhre faces a declining trend in the foodgrain output under the existing state of technology. The declining trend in the crop yields of major foodgrains, such as paddy and maize, has important implications for the economic future of the district.

Crop Production

According to the model, crop output or production is determined by the area and yield outcome. The resulting growth in the production (Table 3.15) of different crops is positive except in the case of millet. The moderate positive growth observed in the production of other crops is due to the marginal increase in area over time.

Gross Margin

Gross margins were calculated for each crop considered. Table 3.16 presents the total gross margin and cost of cultivation per hectare of cultivated crops. All crops registered positive gross margins. Oilseed gross margin has the highest growth rate despite the fact that its area and yield have remained almost stagnant over time. The increases in gross margins reported in Table 3.16 are primarily the result of an increase in the nominal crop prices over time. Potatoes, however, have the highest per hectare gross margin in Kabhre, followed by oilseeds and paddy. The per hectare gross margin for millet is the lowest, but its growth rate is the highest (16.8%) among the crops. After millet, maize and wheat have the lowest per hectare gross margins.

The results reported in Table 3.16 indicate that, over time, if only gross margins are considered, wheat and millet could gradually be replaced by other more promising crops. However, such substitution cannot take place if people do not grow sufficient food nor have access to food. Thus, despite low per hectare returns, cultivation of staple food crops (paddy, maize, and wheat) is likely to continue. The gross margins calculated for paddy, wheat, maize, and millet also include the value of crop residue.

Livestock

The results indicate that the average annual growth in LSU in the district is less than one per cent (Table 3.17). The average LSU holding per household declines over time, because the number of households increases at a faster rate than LSU over time.

According to the results derived from the model, deficit supply of bullock days exists in the district and this will increase in the course of time from 579 pairdays in 1992 to 726 pairdays in 1998. This deficit could be the result of the number of working days (219) assumed for bullocks. If the number was increased marginally, the deficit situation could change. This indicates that the availability of bullock pairdays in the district is perhaps not a production constraining factor.

Trend equations were fitted to the livestock product data series and the results were linked to the forecasted livestock population to project livestock products for Kabhre. The average annual increases in different types of livestock products are given in Table 3.18. Ghee and milk production show the same rate of growth because the ghee output is based on milk production. The growth rates for pork and chicken meat production are also the same. These two products are not linked to the land use sector. Simple time trends were used to forecast the future chicken and pig populations. Gross margin analysis indicates that the average increase in

LSU cost over time is about seven per cent, whereas the average annual increase in per LSU gross margin is about 11 per cent (Table 3.19).

Food Availability and Demand

By assuming different waste, loss, and seed allowance factors, the total cereal availability in the district was derived from the total production of the four cereal grains (rice, wheat, maize, and millet). The per capita availability/supply was then derived. A similar exercise was carried out to obtain the per capita domestic (district) supplies of meat (mutton, buffalo, pork, and chicken), oils and fat (derived from oilseed production and ghee), vegetables (assumed to be potatoes only), and milk. Tables 3.20, 3.21, and 3.22 provide estimates of the forecasted food supply/availability, demand in per capita terms, and aggregate food balance for the district.

The almost constant or even declining crop yield rates and increasing population have resulted in deteriorating food balance over time in Kabhre (Table 3.22). The per capita supply of cereal grains currently exceed demand resulting in net surplus, but this surplus has declined rapidly at about 1.2 per cent per annum. Milk, oil, and fat supply already suffers from deficit. Vegetables (potato) are also surplus, but this has also declined slightly over time. The milk deficit problem appears to have improved over time but enough for surplus supplies to be generated.

Land Use

Table 3.23 provides details on the changes in land use over time in Kabhre. It indicates that land use changes are small. The share of forest area declines one per cent annually. Some gains are made by adjacent NCI, shrub and grasslands, and cultivated area. Other land use categories tend to remain unchanged over time based on the assumptions of the model.

The cultivated area given in Table 3.13 and 3.10 appears to vary by a small amount. This discrepancy in the two figures is because the net cultivated area of the district could not be obtained from the data collected by DFAMS.

Forest Products

Fuelwood

The demand for fuelwood exerts the maximum pressure on forests. Fuelwood is assumed to come from different sources, i.e., accessible forests, farmland, and non-cultivated inclusions. Yield rates from these sources vary and they are based on density and maturity classes. Table 3.24 provides estimates of fuelwood supply in Kabhre from different sources. Accessible forests are the primary source of

fuelwood in the district and will continue to be so for a long time in the future. However, its share declined marginally over time. Adjacent non-cultivated inclusions, are the second important source of fuelwood for households in Kabhre. These two sources account for over 95 per cent of the fuelwood supply in the district and will continue to remain important sources in the future. The forecasted supply of fuelwood from different sources is given in Table 3.25. The per.capita demand for fuelwood is assumed to remain constant over time. The district faces increasing shortages under the present fuelwood harvesting system.

Timber

Table 3.26 shows the changes in timber supply and timber demand in Kabhre over time. Timber deficit is already a serious problem. In 1991 only about 66 per cent of the demand was met from the present district sources, and this has gradually declined over time.

Fodder

Fodder is supplied from various sources as highlighted in Table 3.27. Forests are not the most important source of fodder, as they contribute only about 13 per cent at present and this share may decline over time. Adjacent NCI, shrublands, and others (risers and bunds, plantation, fallow grazing) are the more important sources of fodder. Grasslands make a very small contribution to fodder supply in the district. Fodder supply from all these sources currently meets only about 73 per cent of the requirements (Table 3.28).

Labour Supply and Use

Labour supply is determined by the size of the active population. Household labour is needed for crop production, livestock raising, and other activities. An active person is assumed to have at his/her disposal 240 working days. The Multipurpose Household Budget Survey of Nepal Rastra Bank (M-NRB) has collected data on the percentage of the population engaged in other activities for the hill region of Nepal. It was assumed that persons were engaged in other activities 240 working days per annum.The number of persons engaged in other activities (Table 3.29) was multiplied by the number of working days in a year to provide an estimate of employment in other sectors. The results are presented in Table 3.30. Labour use as a percentage of availability declines marginally over time as indicated by the "Labour Use" in Table 3.30. Subsistence activities were not taken into account in the present exercise, nor were the labour force participation rates, both of which could reduce the percentage of unutilised labour.

Trade

The amount of imports into the district are not known. However, the Multipurpose Household Budget Survey provides information on the average monthly household expenditure on non-food items originating from domestic sources, India, and Rest of the World (ROW). The results are for 1984, i.e., the year the survey was conducted. The important values were aggregated allowing for inflation, then updated to 1991 (base year). It is important to emphasise that the growth in import demand is driven by the growth in income and the growth in population. The results are presented in Table 3.31. The average rate of growth in non-food demand is about one per cent annually and is solely determined endogenously. The per capita value of non-food imported in 1992 was Rs 895 and it had increased to Rs 906 by 1998 at a growth rate of less than one per cent.

Value of food imports is also presented in Table 3.31. Food imports are derived from the excess food demand determined from the model. The demand for food imports is the difference in domestic supplies (district) and domestic demand. Negative values indicate imports and positive values indicate exports. The value of food imports, including cereals, meat, milk, vegetables, and oils and fat, was multiplied by the aggregate price of cereals and other respective food prices. The value of per capita food imports has increased over time by about 10.9 per cent in nominal terms. In real terms, this growth is between two and three per cent per annum.

Income

Income is also determined endogenously by the model. Each year the gross margins originating from the crop and livestock sectors and income accruing from other employment activities were aggregated to derive the total income for the district. Table 3.32 presents the incomes originating from different sources and Table 3.33 provides the income shares from different sources. The income share of the crop sector has remained more or less constant over time, but that of the livestock sector has improved over time. The income share from other off-farm activities has declined over time. The income shares of the crop and livestock sectors together account for over 90 per cent of the income in Kabhre.

Nominal income (given in Table 3.32) is converted into real income by dividing the nominal income by the agricultural GDP deflator. The per capita nominal income growth rate is 8.8 per cent per annum, while the growth rate in real per capita income is 1.6 per cent per annum (Table 3.34)

Environment: Sustainability and Carrying Capacity

The performance of the district in terms of some selected sustainability indicators can be judged from the results presented in Table 3. 35. In the hill farming systems,

forests are an important source of fodder required by livestock, which in turn, provide nutrients (manure). In addition, forests also provide fuelwood and timber to households. Besides these three resources, forests also provide leaf litter as a nutrient supplement to the fields. As the accessible forest cover declines over time, the supply of fodder and leaf litter also declines, and this has a negative impact on agricultural productivity. The forest-cultivated land ratio in a district, therefore, provides an idea of the amount of forest resources that can be harvested sustainably to meet household needs.

Wyatt-Smith (APROSC 1982) in his study estimates that 3,5 hectares of accessible, unmanaged forest are required to support one hectare of agricultural land in the hill farming system. Wyatt-Smith further broke down the three forest resources (fodder, fuelwood, and timber) needed to support one hectare of agricultural land. One hectare of agricultural land requires 2.8, 0.24 to 0.48, and 0.32 ha of unmanaged accessible forest in order to meet fodder, fuelwood, and other needs respectively.

The accessible forest-cultivated land ratio in Kabhre is currently 0.92 hectares, which is very low compared to the Wyatt-Smith estimate of 3.5 hectares. If it is assumed that 3.5 hectares of forest land are required to support one hectare of agricultural land in order to make the hill farming system sustainable, then the derived ratio for Kabhre is alarming and, furthermore, this ratio shows a declining trend by 3.8 per cent (Table 3.35) over time.

The ratio of shrubland to accessible forest land is another indicator that partially indicates the extent of forest degradation. When degradation takes place, forests are converted into shrubland. The shrubland-forest ratio in Kabhre is estimated to be 1.148 at present, indicating that the area under shrubland far exceeds the area under forests and this ratio increases over time at an annual rate of 3.7 per cent. Other results are presented in Table 3.35.

The population of the district continues to grow over time. Table 3.36 presents the size and growth of the population. Despite the low growth of about 0.7 per cent, the growth of the economically active population is about one per cent. Already, the labour use situation indicates that only about 67 per cent of the available labour days are being used.

Currently, the bulk of the employment generated in the district is in the agriculture and livestock sectors. According to the results derived from the model, the agricultural area has not increased sufficiently to utilise the expanding labour force. Bringing new areas under cultivation would mean that more poor quality forest areas would have to be used. This option may not be sustainable, given the already difficult situation in the forestry sector. It is possible, however, that the adjacent NCIs, which occupy vast tracts of land in the district, could be used for agriculture. But the use of such lands would not result in the generation of sufficient

employment opportunities to absorb all the new entrants into the labour force as there would not be enough land in the first place, even if financial and technical constraints were not the limiting factors.

It could be argued that employment could be generated in the livestock sector. Under the current trend scenario, this also does not appear to be a viable alternative. The livestock carrying capacity is already poor (examined below). What appears to be essential in the livestock sector is the reduction in numbers of animals and an increase in their productivity. In this situation, more labourers are likely to be displaced. If a district's sustainability is viewed in terms of labour use, Kabhre clearly faces major problems.

Implications for Food

Table 3.37 provides the calorie demand and availability for Kabhre over time. Under the current trend scenario, the calorie supply will have decreased marginally from 4,006,000 calories per ha in 1991 to 3,962,000 calories per ha in 1998, primarily due to a decrease in crop yields. On the other hand, the calorie demand per ha will have increased from 4,382,000 in 1991 to 4,257,000 calories per ha in 1998.

Assuming that 2,410 kilo-calories are required by an adult, the existing carrying capacity of one hectare of cropped area can also be calculated (Table 3.37). The present supply of calories per hectare could support 5.54 adult persons in 1991, and this has declined marginally over time. On the other hand, given an adult's calorie requirements (2,410), the load on one hectare of land is 6.06 adult persons. This load, however, is seen to remain almost constant over time. The existing situation indicates that about 91 per cent of Kabhre's food needs can be met by its own production system. Although the situation appears to have improved marginally over time, it will never be sufficient to meet all of Kabhre's requirements.

It is worth noting that access to calories may in fact be less than are available. Access to food is determined by income and relative prices. Table 3.21 provides the food demand results, which indicates that the calorie intake is less than is available. Even though there is a large supply of food, income and relative prices constrain people from meeting the requirements of 2,410 calories per day.

Implications for Fuelwood

The fuelwood situation in the district can be assumed from the results given in Table 3.38. The supply per ha decreases marginally over time as accessible forests decrease. The pressure on forest land increases due to population growth. It can be observed that the present demand for forest biomass is already higher than the present supply. This pattern will continue to deteriorate over time. The supply at

present meets only 88 per cent of the demand, by the year 1998, the supply will meet only 85 per cent of the requirements. The carrying capacity remains fairly constant or even declines over time, while the load factor increases marginally. Clearly, the fuelwood situation in Kabhre is very distressing.

Implications for Fodder

Under the current pattern of land use changes and growth in livestock population, land capacity cannot satisfactorily support the livestock population. Currently, the livestock population (expressed in terms of LSU) that can be supported by one hectare of land is about 1.19 LSU, whereas the current load factor is 1.63 LSU per hectare in 1991 (Table 3.39). This indicates that the livestock carrying capacity in Kabhre is unsustainable.

Conclusion

Under the current state of technology and infrastructure, the ability of the district to sustain the ever-increasing human and livestock populations, given the declining trend in crop yields and the limited scope for expanding agricultural land, on the one hand, and the rapid growth of the population, on the other, the magnitude of food deficit will continue to grow at an even more alarming rate in the foreseeable future. The food shortage will have to be met through imports. However, the lack of purchasing power will be a constraint, largely due to the limited economic activities outside the agricultural sector.

The implication of the poor state of agriculture for the environment (forests) is even more alarming, given the combined effects of the ever-increasing demands for fuelwood fodder, timber, and food. Both the areas under accessible forest as well as their quality (densitv) are declining, while the demand for forest products is increasing. As a result, the gap between forest products is widening over time. This growing deficit in biomass supply will have to be met largely through further deforestation, unless immediate action is taken to replenish the forest stock.

The economy of Kabhre, being heavily dependent on the traditional sectors (agriculture, forest, and livestock), has limited potential to generate employment. Already a large percentage of the active population appears to be underemployed. Limited scope exists to generate additional employment opportunities in these sectors, unless new technologies, that can efficiently utilise the increasing pool of redundant labour in the district are introduced. This is obviously a prerequisite for the economic and environmental development of the district. Can some solutions for greater utilisation of the labour force be found by improving natural resource conditions, particularly by rehabilitating degraded lands? Can expansion in basic infrastructure, e.g., roads and irrigation, provide greater opportunities for gainful employment? Will the provision of better services help in promoting self-

employment? These are important questions for which answers must be found if the economic and environmental conditions of the district are to improve over time.

Policy Scenarios And Impact Analysis

Some of the policies discussed in Chapter Two are examined in this section within the framework of the simulation model.

Crop Sector: Policy Scenarios and Impacts

Impact of Food Sector

The unavailability of and accessibility to food are perhaps the most critical aspects of poverty in the context of Kabhre district. Food production activities are strongly interrelated with the natural resources' sector and the interaction between food production and use of natural resources has both positive and negative impacts on many aspects of the economy as well as the environment. It should be noted that, in the absence of an extensive wage economy, large parts of which are operating as isolated pockets, sufficient food production appears to be a major short-term priority even if the comparative advantage of the district lies in other activities. Therefore, it is important in the context of integrated economic and environmental development that district level food production grows at a healthy rate.

The baseline conditions indicate that food demand in Kabhre is not fully met by internal production. Given the present trends, this situation may not improve over time. In fact it may even degenerate to some extent. Therefore, it is important to identify the possible measures that would have a positive impact on the food supply situation in the district.

It has been pointed out that there is potential for almost doubling the extent of irrigated area in the district. This implies increasing the area under irrigation from the current level of 4,076 ha to 7, 958 ha. If this is undertaken without considering its economic feasibility at the moment and merely seeing it as a policy option, this intervention would have an immediate effect on improving food production, emphasising the importance of irrigation development and the management of water resources for this purpose. Therefore, it is a very desirable policy from the point of the view of food supply, provided it is also economically feasible to develop the irrigation potential.

Supposing that the present level of fertiliser use in the district is increased by 25 per cent, this would have a favourable impact on crop output. The emerging changes would not be as effective as the irrigation policy in terms of raising the food supply immediately, but the long-term growth (1993-1998) appears to be better than in the case of the irrigation policy (Chart 3.4). If the irrigation and fertiliser policies are

introduced simultaneously, the impact on food supply would be even greater (Table 3.40).

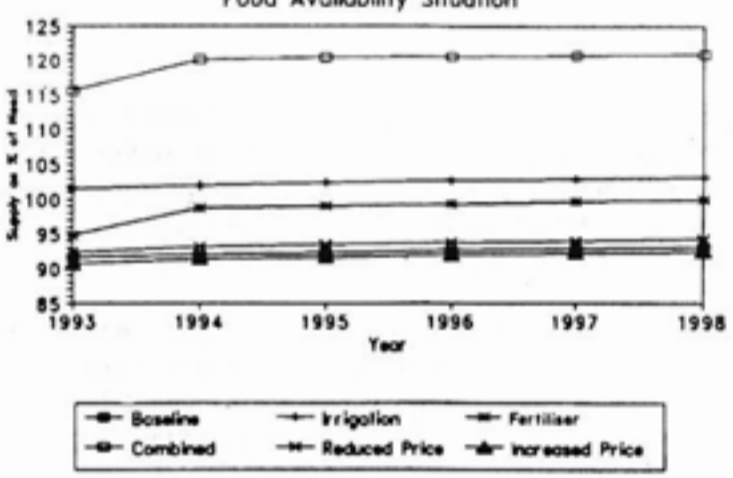
A fourth policy option considered was to introduce potato crops in the additional irrigated area. The introduction of potatoes (a proxy for cash crops) would have greatest impact on the food supply situation of the district (Chart 3.4). Food availability in the district exceeds the requirement by over 30 per cent compared to the baseline scenario.

The cropping intensity impact, resulting from the proceeding policy, would be as follows. If the additional area is brought under irrigation, the cropping intensity of the district would increase by about seven per cent. It should be realised that the cropping intensity impact of irrigation will be seen during the non-potato growing season as well, hence the net result (cropping intensity impact) will be even more pronounced than the seven per cent increase. The cropping intensity impact will also have positive effects on the district labour use situation as examined below.

Maize is one of the most important crops cultivated in Kabhre, both in terms of area as well as its share in the total food production. What would happen if the maize price was allowed to increase and decrease by 10 per cent? The results are given in Table 3.40. Increasing (decreasing) the maize price for 1993 by 10 per cent has a positive (negative) effect on supply response, but the effect is not so pronounced as to require the advocacy of a price intervention strategy. As a price intervention programme cannot be made specifically for Kabhre alone and the effects of such a programme on other maize-producing areas are not known, advocacy of a price-based policy is difficult to recommend without further analysis.

Chart 3.4

Impacts of Different Policies on Food Availability Situation



Impact on Labour Use

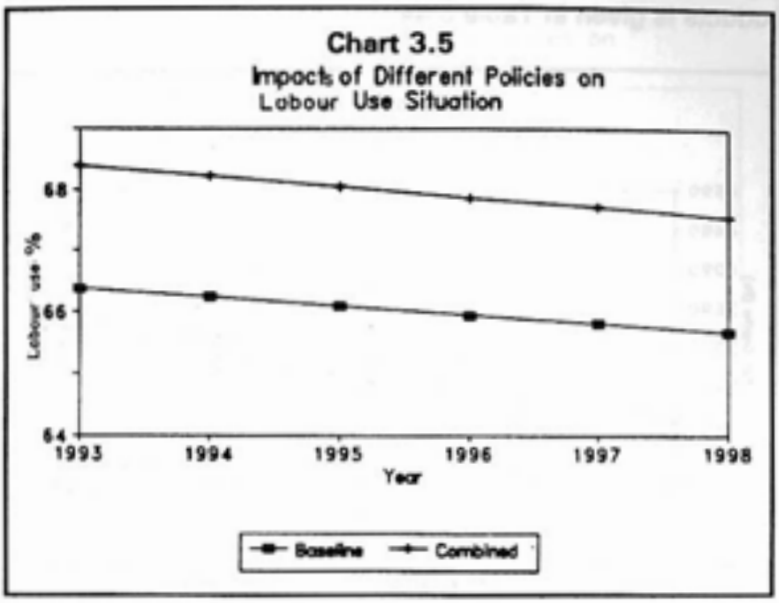
In view of the extremely limited options for enhancing use in non-agricultural sectors and also in view of the poor database, labour use was reviewed only on the basis of changes in the agricultural sector, which is obviously the most important sector in the district. Under the baseline scenario, the labour use situation in Kabhre indicates labour surplus. The effects of different policy actions on the labour use situation are given in Table 3.41 (Chart 3.5). It should be realised that the labour use situation in the district has been determined on the basis of per hectare labour use rates of different crops, labour use per LSU, and labour use in other sectors based upon a fixed proportion of the population. This design indicates that the labour use situation will change only where population changes (negative) and when cropped area and LSU holdings change. As a result, the labour use situation under the different policy options given in Table 3.41 does not reflect much change except in the case of the combined irrigation, fertiliser, and potato policies. Under this policy option, the increased area under potatoes also requires more labour, thereby increasing labour rate.

Given the limited economic activities, it is difficult to increase the overall labour use rate, except by increasing the cropping intensity. Comparing the 3,891 hectares (i.e., additional irrigated area) in relation to the district's overall cultivated area of 35,972 ha in 1993, the cropping intensity increases by seven per cent. Stated differently, increasing the cropping intensity by about 553 ha increases the labour use by one per cent. This implies that there is some scope for increasing the labour use rate by increasing the cropping intensity. If cropping intensity in Kabhre is increased by, say, 25 per cent from the 1993 baseline value, the labour use rate can be increased by about 16 per cent. It is possible to increase cropping intensity in the district, and thus not only have a direct impact on labour use but also on food and income as well.

Impact on Income

Next, the impacts of the different policies on the per capita income and income share of different sources were examined. Both nominal and real incomes were considered. Since only the food sector and price policies have a noticeable impact on the per capita incomes, hence, only these issues are discussed. The results are given in Tables 3.42 and 3.43 (see Charts 3.6 and 3.7 also).

In the baseline scenario, the real and nominal per capita incomes in Kabhre grow at about two and nine per cent respectively. Under different policy regimes, the growth in real income does not change very much as indicated by the long-term growth rates. However, policies have noticeable effects on the per capita incomes relative to the baseline values. For example, under the irrigation policy, the real per



capita income in 1993 increased from the baseline value of Rs 1,914 to Rs 2,042, i.e., an increase of about seven per cent. The greatest impact on the per capita real income was exerted by the combined irrigation, fertiliser, and potato policy action - a 33 per cent increase relative to the baseline value. The effects of the different policy actions on per capita incomes indicate that policies play an important role in increasing the magnitude of per capita incomes. The fertiliser policy, despite its lower impact on the real per capita income in the short-term, has a higher long-term growth of about 2.14 per cent. Charts 3.6 and 3.7 graphically illustrate these results. The contributions of different sources to the total income under the different policy scenarios are given in Table 3.43 and Chart 3.8. The results are self-evident.

Natural Resources: Policy Scenarios and Impacts

Many aspects of natural resources are still not well understood and a greater problem is the lack of adequate information. In this discussion, some of the important aspects that could be quantified and integrated into the model are examined.

Different policies considered in the natural resources' sector include the curtailment of fuelwood demand, improved forest management (supply side), and a combination of these two policies. The other policies, namely, irrigation, fertiliser, and others do not have a perceptible impact on natural resources, hence, they are not examined here. It should also be pointed out that, although on the demand and supply side fuelwood is emphasised, changes in forests also affect the timber and

fodder supply and demand. The impact of these policies on the demand and supply of forest products is given in Table 3.44.

Chart 3.6

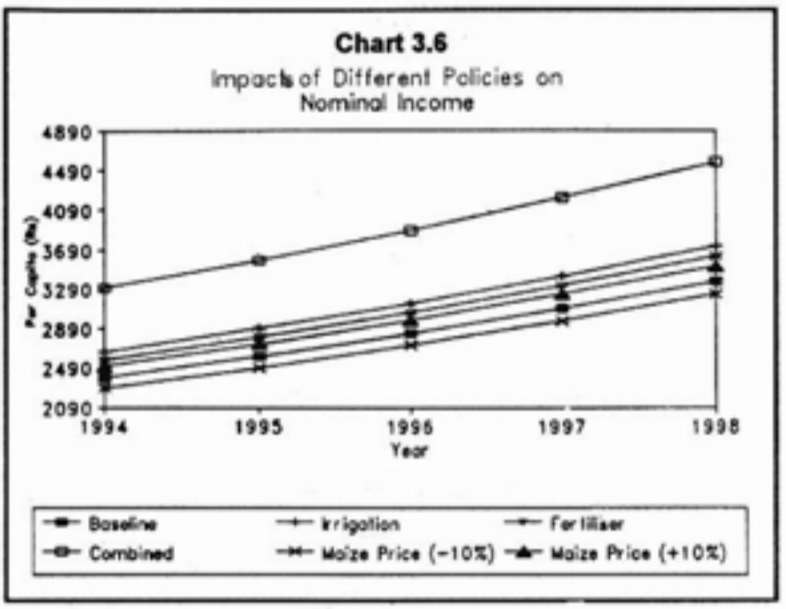
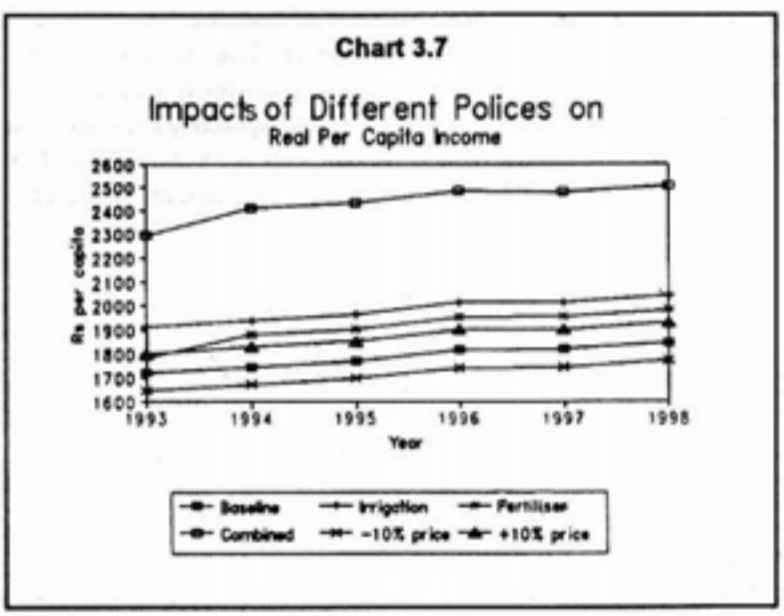
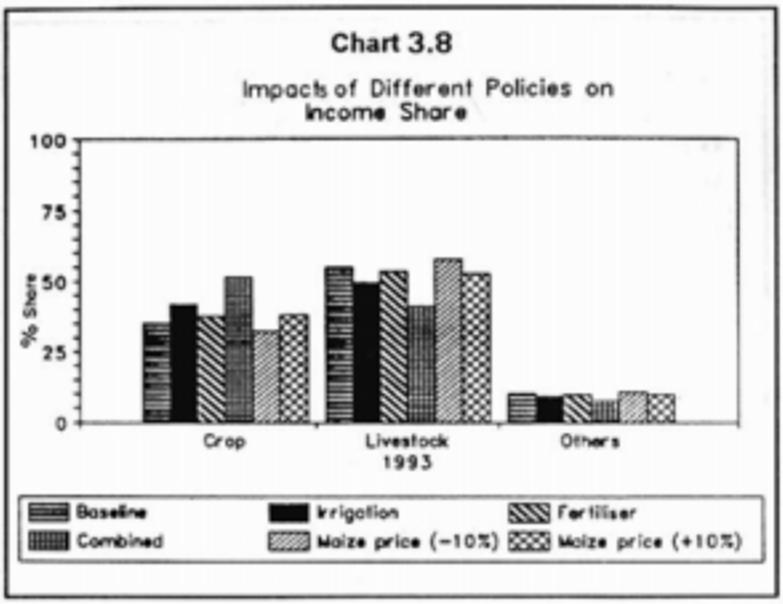


Chart 3.7

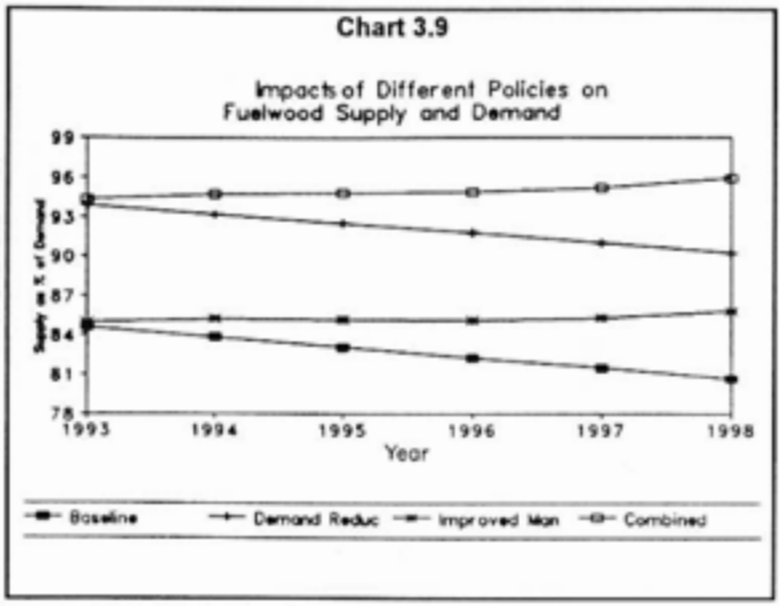




Impact on Fuelwood

Fuelwood deficit is the major source of pressure on the natural resource base resulting in the depletion of growing stock and deforestation as forests are overexploited to meet the excess demand. Currently, about 85 per cent of the total fuelwood demand is met by various sources, namely, farmland, shrub and grazing lands, non-cultivated inclusions, and others. The supply situation, given the harvest and yield rates, will deteriorate over time, meeting only 80.7 per cent of the demand in 1998 (Chart 3.9). If the demand had been curtailed by 10 per cent the supply situation would have improved, and about 94 per cent of the fuelwood demand would have been met in 1993. The long-term performance of this demand policy, however, is not better than the baseline situation, indicated by the growth rate (Table 3.44).

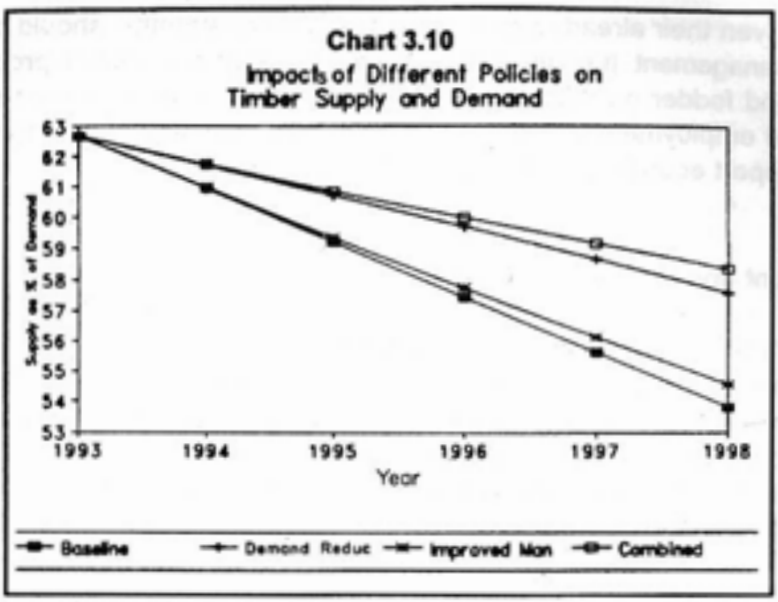
The supply policy will have a much better effect on Kabhre's fuelwood situation over the years. As 50 per cent of the accessible forests come under management, the supply situation remains the same as in the baseline situation in 1993. By 1998, the situation will improve and about 86 per cent of the fuelwood needs will be met, compared to only 81 per cent for the same year in the baseline scenario. Although the net improvement in fuelwood balance under this policy is lower than under the demand policy, the former policy shows a positive trend in percentage balance over time compared to the negative trend under the demand policy. From this perspective, the supply policy will have a more desirable effect in the long run, because incremental fuelwood yield under improved management will increase annually at a faster rate than in the previous year, adding to the stock.



Under the demand policy, the curtailment in demand will bring about change, but as the population continues to grow and the stocking rates of forest do not improve, the supply position of forests will gradually deteriorate over time as indicated by the negative value of the long-term growth rate (-0.8%), and this is similar to the situation under the baseline scenario. On the other hand, under the supply policy, improved management will result in increased stocking rate, and also yield rates. Without compromising demand, Kabhre's population will be able to consume more fuelwood under this management policy than under the baseline scenario within a few years after the policy is introduced, and, at the same time, the long-term sustainability of the forests will increased. The effects of the third policy are more pronounced as can be noticed in Table 3.44. The fuelwood balance situation will improve and the long-term growth in balance will also increase at an annual rate of 0.3 per cent under the third policy.

Impact on Timber

Timber deficit in Kabhre is more pronounced than either fuelwood or fodder (Table 3.44). The annual deficit growth rate is three per cent per annum. The demand curtailment policy appears to be more effective than the supply policy in meeting timber needs. Under the demand policy, as the demand for fuelwood decreases, less forest land will be used to meet fuelwood needs. This land can then be used to meet part of the excess timber demand, resulting in improved timber balance under the demand policy. The supply policy will also affect timber supply, but the effects will be apparent only after 15 years or so, i.e., not within the time-frame of this analysis. The combined effects of the joint demand and supply policy will have a more profound effect on timber balance as may be noticed in Table 3.44 (Chart 3.10).



Impact on Fodder

The curtailment in fuelwood demand has no direct impact on the fodder balance situation, as indicated by the percentage balance under this option and the baseline scenario. As with fuelwood, the effect of the improved forest management policy on fodder balance is much stronger than changes in the demand policy. The effect of improved management of forests on the fodder balance is marginal. The supply of fodder as a percentage of the total fodder demand will increase from 73.2 per cent under the base situation to 74.5 per cent in 1993 under the improved management policy, and this proportion increases at a marginal rate (0.2%) in both scenarios. A similar case can be observed in the case of the joint demand and supply, policy regarding the fodder balance situation (Chart 3.11).

It is important to emphasise that the extent to which improved forest management will result in an improvement in the resource balance situation, particularly fuelwood and fodder, depends very much on the relative share of forests in the supply of these products. Since the share of forests in the total supply of fodder is only 13 per cent, it is quite obvious that the impacts of the forest management policy, as well as the combined policy regarding the fodder balance situation, are not very strong.

What emerges clearly from this discussion is that the time has come to start considering other neglected land resources apart from forests, even for fuelwood and fodder supply. Other land resources include marginal agricultural lands, shrublands, grasslands, and non-cultivated inclusions. Information on these types of land is so poor that it is not possible to consider improvement options for them.

However, given their already significant roles, greater attention should be paid to improved management. It might also be feasible to start commercial production of fuelwood and fodder on these lands. They can provide an important source of income and employment for poorer groups, if they are scientifically managed, in order to support economic and environmental objectives.

Environment and Carrying Capacity

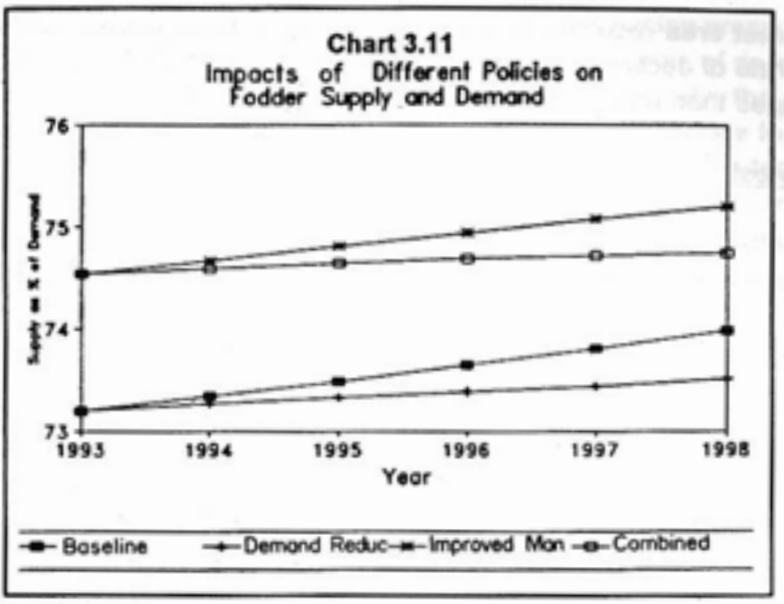
The environmental quality is assumed to depend on the forces that interact in the food, natural resource, and other sectors. It is viewed in terms of the carrying capacity of a hectare of agricultural and other lands to meet food and natural resource demands. In addition, the changing relative pressure on land use will also be examined. Only those policies that had some noticeable impacts will be considered.

Pressure on the Resource Base

The impacts of different policy alternatives on some selected indicators of sustainability, such as changing pressure on the natural resource base, forest-cultivated land ratio, and deforestation, can be judged from the simulation results presented in Table 3.45.

Under the current trend of population growth, the increasing pressure on the natural resource base and the environment, as seen primarily from natural resource deficits (particularly fuelwood), leads to deforestation and land use changes. The results indicate that the population density per cultivated land area remains unaffected by all types of policy intervention carried out in the present exercise. The existing pressure on cultivated land under the baseline scenario, however, declines at a marginal rate over time because cultivated land will increase at a slightly faster rate (1.2%) than the population growth (0.7%). This is also the reason why per capita land increases marginally over the projected period.

Assuming that 0.7 per cent per annum will remain as the population growth rate in the district, the pressure on accessible forest land will continue to grow over the projected period under all policy scenarios. But the population density per hectare of forest land is projected to grow at a relatively lower rate (1.8%) under demand-



induced changes than under supply- induced changes (3.1%). The joint introduction of both the policy scenarios results in an even lower growth in pressure on accessible forests. The positive growth trend of density per forest land area under both scenarios implies that population growth exceeds the growth in accessible area. Similarly, the lower growth of density per forest area under the demand reduction policy is primarily the result of a relatively lower magnitude of fuelwood deficit and, hence, reduction in the area deforested. It is also because of this reason that the livestock population pressure on forest land (LSU/ha) increases over time at a lower rate under demand-induced changes (1.2%) than under supply-induced changes (2.5%). It should be noted that the livestock population density per unit of forest area increases at an annual growth rate of about three per cent under the baseline scenario. When both demand and supply management policies are introduced jointly, the livestock pressure on forests is expected to grow marginally at less than one per cent annually.

The livestock density per unit of grazing land (LSU/ha) is projected to decline over time at the rate of 2.1 per cent per annum, despite the current excessive pressure level on grassland. The impacts of both demand management and improved forest management on minimising the livestock pressure on grassland were not found to be strong as a result of the excessive livestock population.

Forest-Cultivated Land Ratio

Under the baseline scenario, the forest-cultivated land ratio in Kabhre shows a declining trend over time and is below the desired level. Under both the demand and supply side scenarios, the annual growth of cultivated land exceeds the

accessible forest area resulting in a declining trend in the forest-cultivated land ratio. But the rate of decline in this ratio is relatively lower (-2.2%) under demand-induced changes than under supply-induced changes (-3.5%).

Shrubland-Forest

This ratio is often used as an indicator of forest degradation because, as the intensity of use increases and regenerative capacity declines, forest and first changes to shrubland and eventually into other land use categories. Under the demand scenario, the ratio between shrubland and forest increases at a slower rate (1.5%) than under the supply scenario (3.3%), indicating that the conversion process of forest to shrubland (i.e., resource degradation) occurs at a slower rate under the former policy compared to the latter. If both policies are introduced jointly, the ratio will increase from 1.21 in 1993 to 1.28 by 1998 with an annual growth rate of one per cent.

Deforestation

As indicated earlier, natural resource deficit will exert increasing pressure on the natural resource base, leading to overexploitation and even more serious environmental damage. Table 3.46 presents the magnitude and trend of the deforested area estimated on the basis of a simulation exercise under different policy scenarios (Chart 3.12). Under the baseline scenario the extent of deforestation will increase from 552 hectares in 1993 to 679 hectares by the year 1998. With the introduction of the demand side policy intervention, the magnitude of deforestation reduces drastically compared to the baseline situation but the trend of deforestation continues to grow at a much faster rate (about 10% per annum) than the baseline trend (5.3%). When half of the existing forests are brought under improved management from 1993, time is required to improve the situation as incremental yield from improved forest management increases the forest stock over time, yielding a higher flow of resources. During the projected period of five years (1993-1998), the net improvement in fuelwood supply can meet only a small proportion of the fuelwood demand, and, over time, the growth rate of fuelwood supply increases at a faster rate than fuelwood demand. Hence, the deforestation trend gradually declines along with decline in fuelwood deficit.

Carrying Capacity

Food

Agricultural lands provide the required calories. The current levels of calorie supplies are dependent on the technology that characterises the sector. However, given the high dependency on the agricultural sector in the district, the pressure on land to supply more calories will increase over time. This will depend primarily on

the new policies that are adopted. On the demand side, increasing pressure will be exerted on land to supply additional calories to meet the demands of an expanding population. This issue can be viewed from two angles, namely, the supply of calories from one hectare of land and the demand from one hectare to meet the needs of the population. The same pressure also can be examined in terms of the carrying capacity of land and current load in terms of adults. The same kind of evaluation can be conducted in the case of fuelwood, timber, and fodder needs to LSU.

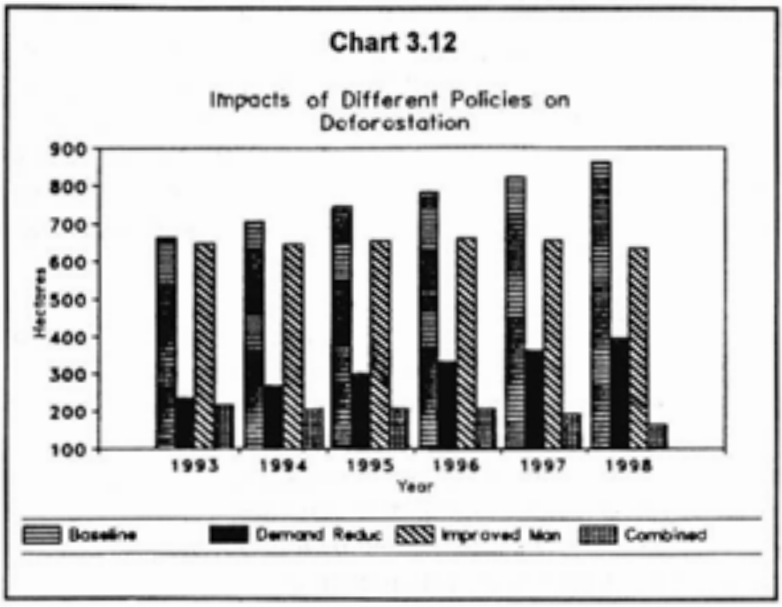
Table 3.47 presents the impacts of different policies on the carrying capacity of crop land and human pressure. Under the baseline scenario, the per hectare calorie supply situation is far below the per hectare need. The long-term growth indicates a scenario in which the supply situation remains stagnant, and in which the demand situation becomes marginally worse as Kabhre's population continues to grow. It should be noted that the calorie demand per hectare under the baseline scenario declines over time, a result that is explained by the fact that the population growth (0.7%) is slightly lower than the growth in cultivated areas (1%).

The food sector policies affect calorie supply only and the calorie demand per hectare remains the same over time as can be observed from Table 3.47. Under the irrigation policy, the per hectare calorie supply increases over time, and this will result in surplus calorie supply in Kabhre. The growth rate observed, however, is the same under the baseline scenario due to the reasons already discussed above. The long-term impact of the fertiliser policy is more pronounced than its short-term effect, since calorie supply under this policy scenario is lower than the per hectare demand. Under the combined policy the situation changes as discussed above, although under this policy scenario the per hectare demand also declines, thus reducing pressure on land to supply calories. This is the result of the increase in cropped area, i.e., the cropping intensity impact.

Each hectare of land can support a certain number of people in terms of their needs and for a given state of technology. On the other side of this picture is the number of people that depend on a hectare of cultivated area for calories. The load factor in all the policy scenarios given in Table 3.47 is the same except in the case of the combined irrigation, fertiliser, and potato policy. Under this policy, additional food supplies increase as a result of the cropping intensity effect, and this tends to reduce the pressure on agricultural land.

Fuelwood

Forest and other lands provide fuelwood. Currently under the baseline scenario, each hectare of land provides an average of 2.01 air dry tonnes (adt), but the per hectare demand is 2.37 adt. for 1993. The supply side picture deteriorates over



time as the demand increases. The results are provided in Table 3.48. As demand decreases as a result of policy interventions, the supply remains the same as under the baseline scenario in 1993. But, over time, the demand policy reduces pressure to a certain extent as indicated by the lower growth rate of -0.3 per cent.

If the management policy is introduced, the supply of fuelwood per hectare will increase at a growth rate of about half a per cent and the demand will remain at the baseline level, thus reducing the pressure on lands to supply fuelwood. Table 3.48 also presents the results of the human pressure on land to meet fuelwood needs. Under the baseline scenario, 3.41 persons' fuelwood demands can be met, whereas the same hectare of land has to bear a load of 4.03 persons currently. This gap widens over time under the baseline scenario.

The introduction of the demand policy reduces human pressure on land to 3.79 persons per hectare. The load factor does not appear to change in the year the policy is enacted, because the land that is saved from deforestation due to demand reduction is converted to forest lands the next year. As a result, the load factor will decrease in 1994 and by 1998 the load factor will drop to 4.14. The carrying capacity of land under the baseline scenario declines at an annual growth rate of 0.7 per cent, whereas the load on forest land increases annually by a little less than one per cent. With the introduction of the demand management policy, both the carrying capacity and load will increase, mainly due to the change in land area. The manner in which the demand policy affects the biomass supply through dynamic interaction has already been described earlier. However, it is worth mentioning that the drastic reduction in fuelwood deficit as a result of this demand policy will lead to increase in the accessible forest area as fewer forest areas are harvested to

meet the demand. In this way, the accessible forest area increases as deforestation declines over time. The decline in deforestation implies that fewer areas will be converted into other land resources and vice versa. Since other land resources dominate the forest area, the overall average growth of these land resources will be lower than the population growth, thereby resulting in a higher load factor. The carrying capacity of land under this policy will increase due to the net increase in accessible forests. When only forests are considered as the source of firewood, the effects of the different policy options are more pronounced. The results are given in Table 3.49. Without considering other land resources under the baseline scenario, forests currently provide 8.38 adt per hectare, whereas the demand pressure is 15.79 adt per hectare (Table 3.49).

Timber

Human pressure on forests and subsequent resource degradation are further compounded by the growing demand for timber (Table 3.50). Timber supply from forests currently meets only 62 per cent of the demand and the percentage balance declines sharply at an annual rate of three per cent. As the load factor increases at a faster rate than the carrying capacity, the scale of timber deficit widens over time. The impact of both supply and demand policy interventions reduces the per hectare timber demand (load factor) at a rate lower than the base line trend. But this reduction in demand pressure is seen to be stronger under the demand policy than under the supply policy. This is primarily the result of drastic reduction in fuelwood deficit under the former policy leading to less depletion of accessible forest areas. The combined impact of both policies will result in a slight improvement.

Fodder

Table 3.51 presents the impacts of different policies on the carrying of land in terms of fodder and livestock pressures. Under the baseline scenario, the estimated carrying capacity of the aggregate land area in Kabhre is only 1.2 livestock unit per hectare for 1993. This implies that the livestock load (or per hectare fodder demand) is about 37 times greater than the carrying capacity (or per hectare supply). Given the marginal increase in carrying capacity compared to load over time, the situation does not improve under the base scenario.

The impact of the supply management policy interventions on the carrying capacity of aggregate land is relatively better than the demand management policy. However, the projected load factor for 1998 under the supply side policy is still 33 per cent higher than the projected carrying capacity.

When only the carrying capacity of forest land is considered, 0.66 livestock units can be supported by one hectare of forest land with the load factor being roughly seven LSU/ha under the base scenario (Table 3.52). Since the share of forests in

the total fodder supply is less than 14 per cent, the drastic reduction in the carrying capacity of forests compared to the carrying capacity of aggregate land is natural. When half of the existing accessible forest areas in the middle mountains of Kabhre are brought under improved management, the carrying capacity of forests is expected to increase by 17 per cent, while the load factor is expected to decrease by two per cent compared to the baseline result in 1998. With the introduction of both demand and supply policies, the load factor (livestock density per hectare of forest land) will grow at a lower rate (0.9%) than the baseline trend (2.7% per annum)

Conclusion

Under the baseline scenario, Kabhre is unable to meet calorie and fuelwood requirements. The situation appears to be deteriorating rapidly despite the low population growth. Several different policies were simulated. In the food sector, the combined effects of irrigation and increased fertiliser usage had the strongest effect. Between irrigation and fertiliser use, the effect on productivity increase was found to be stronger in the case of irrigation. The irrigation policy not only has an impact on yields but also enhances cropping intensity in the district, thereby improving the district's labour use rates and incomes at a relatively better rate than the fertiliser policy. It was also found that the irrigation policy alone was sufficient to make Kabhre marginally surplus in food supplies.

In the natural resource sector, fuelwood and fodder supplies are currently less than the demand, with fodder registering a larger deficit than fuelwood. Currently (1993), less than 85 per cent of the fuelwood demand is being met and this situation is expected to decline to about 80 per cent by 1998. The fuelwood demand reduction policy tends to increase fuelwood supply but not to the extent that all fuelwood needs are met. This is so because, despite reduction in the fuelwood demand, supply will not increase and the population will ultimately catch up to widen the firewood deficit. If the forest management policy is considered, the situation will improve as forest supplies begin to increase. The long-terms prospects for Kabhre in term of fuelwood supply appear to be better, although, in the short-term (within 1998), the situation does not show much improvement relative to the baseline scenario. On the other hand, if the demand and supply policies are jointly implemented, the firewood situation in Kabhre will show a marked improvement.

Table 3.1: Area Under Different Crops (ha)

Year	Paddy	Maize	Millet	Wheat	Mustard	Potatoes
1975	5700	9800	2110	6400	600	450
1976	5810	9800	2046	6528	570	495
1977	6970	9310	1990	6400	560	750
1978	6980	9310	1990	6560	550	1010
1979	6980	9300	2000	6500	410	1100
1980	6950	9300	1930	6500	420	1000
1981	9600	22310	2100	6500	420	1000
1982	11620	22300	1100	8200	400	1840
1983	11620	22000	1100	7000	420	1500
1984	12120	10100	1470	7000	420	1600
1985	12620	22380	1200	8000	430	1500
1986	12500	22300	1100	14740	440	1520
1987	12650	22120	1120	14540	690	1550
1988	10700	22100	1000	14700	750	1630
1989	10100	22100	1150	14000	750	3000
Mean	9487	15888	1590	8541	506	1210
Std	2668	6332	447	3242	111	426
Coef Var	28	40	28	38	22	35

Source: DFAMS 1990

Table 3.2: Regression Results - Area under Different Crops

Paddy Area = 4125.76 + 2904.506 Ln (time)	$R^2 = 0.77$	(499.34)
Maize Area = 4980.21 + 6087.14 Ln (time)	$R^2 = 0.53$	(1586.7)
Wheat Area = 3399.41 + 2959.82 Ln (time)	$R_2 = .43$	(947.78)
Millet Area = 2477.154- 476.76 Ln (time)	$R^2 = .65$	(96.32)
Oilseed Area = 507.80 + 7.633 Ln (time)	$R^2 = .033$	(45.11)
Potato Area =121.655 + 649.485 Ln (time)	$R^2 = .65$	(131.48)

Note: figures in parentheses are standard errors of estimate

Table 3.3: Yield Rates of Different Crops (kg/ha)

Year	Paddy	Maize	Millet	Wheat	Mustard	Potatoes
1975	2767	1938	1175	1180	498	5500
1976	2768	1938	1188	1180	498	5499
1977	2768	1737	1251	1442	500	5493
1978	2765	1737	1251	1300	600	6000
1979	2350	1563	1305	1200	390	5500
1980	2306	1600	1098	1349	595	6486
1981	1880	1600	1100	1400	595	8000
1982	1900	1360	1200	1400	600	8000
1983	2000	1300	1000	1600	595	8000
1984	1529	1012	898	1200	595	7000
1985	1500	1358	792	1100	581	5000
1986	1712	1121	909	1100	614	5263
1987	2488	1350	1000	1300	536	9097
1988	3500	1516	1500	1400	626	9877
Mean	2302	1509	1119	1297	559	6765
Std	558	268	181	139	64	1517
Coef Var	24	18	16	11	11	22

Source: DFAMS 1990

Table 3.4: Fertiliser Sales in Kabhre (MT)

Year	MT	kg/ha
1985	6040	131
1986	6455	123
1987	8430	160
1988	8143	160
1989	8207	160
1990	10377*	na
1991	10721*	na
Mean Std	8339 1636	

Note: * Refers to sales based on time trend projection

Table 3.5 Livestock Population by Type of Livestock

	1984	1985	1986	1987	1988	Growth Rate(%)
Number of Buffaloes	59733	61650	63629	65140	65218	2.22
Meat Production (MT)	2261	2334	2408	2588	2591	3.46
Number of Milch Buffaloes	16122	16640	17174	17980	18771	3.88
Milk Production (MT)	14636	15106	15591	18339	19146	6.95
Number of Cattle	100665	101732	102810	102120	101099	0.11
Number of Milch Cows	11536	11658	11782	11328	11102	-0.95
Milk Production (MT)	5359	5416	5473	5911	5793	1.97
Number of Goats	153319	155879	158482	159085	162267	1.43
Goat Meat Production (MT)	473	481	489	491	501	1.45
Number of Sheep	2729	2833	2941	3086	3218	4.21
Mutton Production (MT)	7	7	8	8	8	3.39
Number of Chickens	55	58	61	62	64	3.86
Chicken Meat Production	145	152	159	176	186	6.42
Number of Pigs	5863	6175	6503	6585	6789	3.73
Pork Production (MT)	55	58	61	62	64	3.86

Source: DFAMS 1990

Table 3.6: Percentage Distribution of Natural Forests by Crown Cover, Maturity, and Species in Kabhre District, 1978

Category	Siwalik	Mid-mountains
Crown Cover		
Density 2	13.9	56.4
Density 3	86.1	39.9
Density 4	-	3.7
Maturity Class		
Reproductive	-	0.6
Immature	100.0	82.1
Mature	-	17.2
Species		
Coniferous	-	9.3
Hardwood	100.0	79.2
Mixed	-	11.5
Total Forest Area (ha)	2806	35,967

Source: LRMP 1986

Table 3.7: Changes in Accessible Forest Area in Kabhre by Species, Crown Cover, and Maturity Class (ha)

	1978	1979	1980	1982	1984	1986	1988	1990
Species								
Siwaliks:Hardwood (H)	2806	2778	2750	2695	2642	2589	2538	2487
Mid-mts.:Coniferous(C)	3141	3110	3079	3018	2958	2899	2841	2785
Mid-mts.:Hardwood	26770	26502	26237	25715	25203	24702	24210	23728
Mid-mts.:Mixed	3896	3858	3819	3743	3668	3595	3524	3454
Crown Cover								
Siwaliks:Density 2	390	386	382	375	367	360	353	346
Density 3	2416	2392	2368	2321	2275	2229	2185	2141
Mid-mts.:Density2	19082	18891	18702	18330	17965	17608	17257	16914
Mid-mts.:Density3	13480	13345	13211	12948	12691	12438	12191	11948
Mid-mts.:Density4	1248	1235	1223	1198	1175	1151	1128	1106
Maturity								
Siwaliks:Class I	2806	2778	2750	2695	2642	2589	2538	2487
Mid-mts.:Class R	203	201	199	195	191	187	183	180
Mid-mts.:Class I	27777	27500	27225	26683	26152	25632	25121	24622
Mid-mts.:Class M	5825	5767	5709	5596	5484	5375	5268	5163
Total Accessible Forest Area	36615	36249	35886	35172	34472	33786	33114	32455
Forest Area Adjusted to Density								
Siwaliks-Maturity I & H	1426	1412	1398	1370	1343	1316	1290	1264
Mid-mts. Adj to Density:	13245	13112	12981	12723	12470	12221	11978	11740
Coniferous	1231	1218	1206	1182	1159	1136	1113	1091
Hardwood	10487	10382	10278	10074	9873	9677	9484	9296
Mixed	1526	1511	1496	1466	1437	1409	1380	1353
Adjusted Forest Area	14671	14524	14379	14093	13812	13538	13268	13004

Source: Based on LRMP 1986 and WECS 1987

Table 3.8: Land Use Changes in the Siwaliks of Kabhre Over Time (ha)

	1978	1979	1980	1982	1984	1986	1988	1990
Natural Forests	2806	2778	2750	2695	2642	2589	2538	2487
Change in Accessible Forests		-28	-28	-27	-27	-26	-26	-25
Shrublands	45	59	73	100	127	153	179	204
Grasslands	5	9	13	22	30	38	45	53
Mapped Cultivated	1085	1093	1102	1118	1134	1150	1165	1181
Adjacent NCI	403	407	411	420	428	436	443	451
Gross Cultivated	682	686	690	699	707	715	722	730
NCI within Gross	106	106	106	106	106	106	106	106
Net Cultivated	576	580	584	593	601	609	616	624
Total Siwaliks (calculated)	3941	3940	3938	3935	3933	3930	3928	3925
Siwaliks Total Land	4026	4026	4026	4026	4026	4026	4026	4026

Source: Based on LRMP 1966 and WECS 1987

Table 3.9: Land Use changes in the Mid-mountains of Kabhre Over Time (ha)

	1978	1979	1980	1982	1984	1986	1988	1990
Natural Forests	35967	35629	35294	34635	33989	33355	32734	32126
Accessible (94%)	33809	33471	33136	32477	31831	31197	30576	29968
Deforestation		-338	-335	-328	-322	-315	-309	-303
Inaccessible	2158	2158	2158	2158	2158	2158	2158	2158
Tree Plantation	791	825	858	924	989	1052	1114	1175
Total Forested Area	36758	36454	36152	35559	34977	34407	33849	33301
Shrublands	34191	34360	34527	34857	35180	35497	35807	36112
Grasslands	3741	3792	3842	3941	4038	4133	4226	4317
Mapped Cultivated	60514	60599	60682	60847	61009	61167	61322	61474
Adjacent NCI	24754	24805	24855	24954	25051	25146	25239	25330
Gross Cultivated	35760	35794	35827	35893	35958	36021	36083	36144
NCI within Gross	6417	6417	6417	6417	6417	6417	6417	6417
Net Cultivated	29343	29377	29410	29476	29541	29604	29666	29727
Total Middle-mts. (calculated)	135204	135170	135137	135071	135006	134943	134881	134820
Middle-mountains	136459	136459	136459	136459	136459	136459	136459	136459

Source:Based on LRMP 1986 and WECS 1987

Table 3.10: Land Use Changes in Kabhre Over Time (ha)

	1978	1979	1980	1982	1984	1986	1988	1990
Forest Area	38773	38407	38044	37330	36630	35944	35272	34613
Shrubland Area	34236	34419	34600	34957	35307	35650	35987	36316
Grasslands	3746	3801	3855	3962	4067	4170	4271	4370
Adjacent NCI	25157	25212	25266	25373	25478	25581	25682	25781
NCI within gross	6523	6523	6523	6523	6523	6523	6523	6523
Net Cultivated	29919	29957	29995	30069	30141	30213	30283	30351
Plantation	791	825	858	924	989	1052	1114	1175
Kabhre (calculated)	139145	139144	139142	139139	139137	139134	139132	139129
Residual	1340	1341	1343	1346	1348	1351	1353	1356
Kabhre (given)	140485	140485	140485	140485	140485	140485	140485	140485

Source: Based on LRMP 1986 and WECS 1987

Table 3.11: Estimated Regression Equations for Prices of Agricultural Commodities

Ln Paddy = 0.533 + 0.0861 time (2.78) (9.42)	R^2 = 0.85
Ln Wheat = 0.8049 + 0.0641 time = (9.32) (7.22)	R^2 = 0.76
Ln Maize = 0.7653 + 0.0699 time (7.43) (8.18)	R^2 = 0.81
Ln Millet= 0.5218 + 0.0886 time (6.20) (9.71)	R^2 = 0.85
Ln Mustard seed = 1.166 + 0.1045 time (14.30) (11.79)	R^2 = 0.89
Ln Potatoes= 0.4598 + 0.0753 time (5.297) (9.92)	R^2 = 0.86
Ln Mutton= 2.3319 + 0.1068 time (61.75) (32.03)	R^2 = 0.96
Ln Chicken=2.6024 + 0.0933 time (50.53) (31.77)	R^2 = 0.98
Ln Buff = 1.533 + 0.1087 time (33.81) (29.04)	R^2 = 0.98
Ln Pork = 1.9702 + 0.092 time (66.26) (34.63)	R^2 = 0.98
Ln Milk = 0.8324 + 0.0852 time (23.45) (30.19)	R^2 = 0.98

Note: figures in parentheses are t values

Table 3.12: Forecasted Product and Factor Prices

Products and Factors (Rs/kg)	1991	1992	1993	1994	1995	1996	1997	1998	Growth Rate
Products									
Paddy	6.76	7.36	8.03	8.75	9.54	10.39	11.33	12.35	0.090
Wheat	6.89	7.35	7.84	8.35	8.91	9.50	10.13	10.80	0.066
Maize	6.58	7.05	7.56	8.11	8.70	9.33	10.01	10.73	0.072
Millet	6.95	7.59	8.30	9.07	9.91	10.82	11.83	12.92	0.093
M.Seed	17.08	18.97	21.06	23.38	25.95	28.81	31.98	35.51	0.110
Potatoes	5.28	5.70	6.14	6.62	7.14	7.70	8.30	8.95	0.078
Mutton	56.87	63.28	70.41	78.34	87.17	97.00	107.93	120.10	0.113
Chicken	60.05	65.92	72.37	79.45	87.22	95.75	105.11	115.39	0.098
Buff	26.37	29.40	32.77	36.54	40.73	45.41	50.62	56.44	0.115
Pork	31.26	34.27	37.57	41.19	45.16	49.51	54.62	59.51	0.096
Milk (Rs/lit)	8.99	9.78	10.65	11.60	12.63	13.76	14.98	16.31	0.089
Price of Mustard Oil (Rs/lit)	59.91	66.37	73.53	81.45	90.23	99.96	110.74	122.68	0.108
Ghee (Rs/lit)	108.26	118.87	130.52	143.31	157.35	172.78	189.71	208.30	0.098
Wool	80.25	85.87	91.88	98.31	105.19	112.55	120.43	128.86	0.070
Price of Cereal Grains	6.70	7.20	7.73	8.31	8.93	9.59	10.31	11.08	0.074
Price of Oils and Fat	99.07	108.81	119.60	131.46	144.50	158.83	174.58	191.90	0.099
Aggregate Meat Price	43.40	48.18	53.49	59.36	65.88	73.10	81.10	89.96	0.110
Factors									
Wage Rate (Rs/day)	33.52	35.87	38.38	41.06	43.94	47.01	50.31	53.83	0.070
Bullocks (Rs/pair days)	26.82	28.69	30.70	32.85	35.15	37.61	40.24	43.06	0.070
Price of Fertiliser (Rs/kg)	4.28	4.58	4.90	5.24	5.61	6.00	6.42	6.87	0.070

Table 3.13: Forecasted Area Under Different Crops (ha)

Crops	1991	1992	1993	1994	1995	1996	1997	1998	Growth Rate
Paddy	10569	10745	10911	11068	11217	11359	11494	11623	0.014
Maize	24344	24713	25061	25390	25703	26000	26283	26553	0.012
Millet	1095	1071	1047	1025	1003	983	964	945	-0.021
Wheat	14548	14727	14896	15056	15208	15353	15490	15622	0.010
Oilseeds	759	760	760	761	761	762	762	762	0.001
Potatoes	3084	3094	3121	3148	3173	3197	3220	3242	0.008
Total Cropped Area	54380	55109	55797	56448	57065	57653	58212	58747	0.011
Total Cultivated Land	34913	35458	35972	36458	36920	37358	37777	38176	0.013
Area under Irrigation	3909	3987	4067	4148	4231	4316	4402	4490	0.020
Total Fertiliser Sale in District	9674	10121	10525	10894	11235	11553	11852	12133	0.033

Table 3.14: Forecasted Yield Rates of Different Crops (kg/ha)

Crops	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Paddy	1974	1972	1969	1967	1965	1964	1962	1961	-0.001
Maize	1464	1464	1464	1464	1463	1463	1463	1463	0.000
Wheat	1388	1346	1344	1342	1341	1340	1339	1338	-0.005
Millet	1023	1023	1023	1023	1023	1023	1023	1023	0.000
Oilseeds	596	601	601	600	600	600	600	600	0.001
Potatoes	7212	7216	7211	7207	7203	7200	7197	7196	0.000

Table 3.15: Forecasted Changes in Crop Production and Average Annual Growth Rates (MT)

Crops	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Paddy	20867	21194	21488	21771	22042	22303	22549	22790	0.013
Maize	35638	36190	36689	37162	37612	38040	38445	38836	0.012
Wheat	20193	19825	20021	20212	20396	20574	20742	20907	0.005
Millet	1121	1096	1072	1049	1027	1006	986	967	-0.021
Oilseeds	452	456	457	457	457	457	457	458	0.002
Potatoes	22100	22325	22509	22686	22856	23020	23175	23327	0.008

Table 3.16: Forecasted Revenue, Costs and Gross Margins Per Hectare of Cultivated Land Under Different Crops (Rs/ha)

Crops	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Revenue Paddy	14.00	15.18	16.46	17.86	19.39	21.06	22.88	24.86	0.086
Maize	9.84	10.54	11.28	12.08	12.94	13.86	14.84	15.90	0.071
Wheat	9.76	10.08	10.72	11.41	12.14	12.92	13.75	14.64	0.060
Millet	7.43	8.09	8.81	9.59	10.45	11.39	12.42	13.54	0.090
Oilseeds	10.18	11.39	12.65	14.04	15.58	17.30	19.20	21.31	0.111
Potatoes	38.11	41.11	44.29	47.73	51.44	55.44	59.75	64.40	0.078
Cost Paddy	9.79	10.47	11.21	12.00	12.85	13.75	14.72	15.76	0.070
Maize	7.16	7.66	8.20	8.77	9.39	10.04	10.74	11.49	0.070
Wheat	6.88	7.35	7.86	8.40	8.98	9.60	10.27	10.98	0.069
Millet	6.15	6.58	7.04	7.54	8.07	8.64	9.25	9.91	0.071
Oilseeds	4.33	4.65	4.99	5.35	5.74	6.16	6.61	7.09	0.073
Potatoes	14.84	15.92	17.07	18.32	19.65	21.09	22.62	24.27	0.073
Per Hectare Gross Margin Paddy	4214	4710	5253	5863	6546	7308	8153	9099	0.116
Maize	2673	2873	3082	3309	3553	3816	4098	4405	0.074
Wheat	2287	2732	2863	3004	3155	3315	3483	3663	0.035
Millet	1280	1509	1764	2054	2381	2750	3165	3633	0.161
Oilseeds	5841	6744	7659	8687	9841	11137	12588	14217	0.136
Potatoes	23273	25196	27218	29410	31784	34352	37126	40131	0.081

Table 3.17: Forecasted Livestock Population

Livestock Type	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Cattle	109797	109869	109937	110001	110059	110108	110147	110173	0.000
Milch Cows	76024	76074	76122	76166	76206	76240	76267	76285	0.000
Bullocks	33772	33795	33816	33835	33853	33868	33880	33888	0.000
Buffaloes (male)	27057	27074	27091	27107	27121	27133	27143	27150	0.000
Milch Buffaloes	152863	152963	153058	153148	153228	153297	153351	153388	0.000
Sheep	3012	3026	3039	3051	3062	3071	3079	3084	0.003
Goats	147999	148013	148026	148038	148049	148058	148066	148071	0.000
Pigs	4194	4320	4450	4583	4721	4862	5008	5158	0.030
Chicken	360674	371494	382639	394118	405942	418120	430664	443584	0.030
Total LSU	227506	227914	228322	228729	229132	229527	229909	230276	0.002
LSU Per Household	4.20	4.18	4.16	4.13	4.11	4.09	4.07	4.05	-0.005

Table 3.18: Forecasted Annual Production and Growth in Livestock Production (MT)

Products	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Cow Milk	7405	7410	7414	7419	7422	7426	7428	7430	0.000
Buff Milk	29136	29155	29173	29190	29205	29218	29229	29236	0.000
Ghee	526	526	527	527	527	527	528	528	0.000
Net Milk Supply	25578	25595	25611	25626	25639	25651	25660	25666	0.000
Buffalo Meat	1044.47	1045.15	1045.81	1046.42	1046.96	1047.43	1047.81	1048.06	0.000
Mutton	464.46	464.53	464.61	464.68	464.74	464.79	464.83	464.86	0.000
Chicken	721.35	742.99	765.28	788.24	811.88	836.24	861.33	887.17	0.030
Pork	39.42	40.60	41.82	43.08	44.37	45.70	47.07	48.48	0.030
Aggregate Meat Available	2269.70	2293.28	2317.51	2342.41	2367.95	2394.17	2421.04	2448.57	0.011
Aggregate Meat Price (Rs/kg)	43.40	48.18	53.48	59.36	65.87	73.08	81.08	89.94	0.110
Wool Production (kg)	2008.84	2017.92	2026.59	2034.67	2041.95	2048.19	2053.12	2056.46	0.003

Table 3.19: Forecasted Cost and Returns from Livestock (Rs)

Livestock and Products	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Per Animal Cost:									
Buffaloes	280.37	300.00	321.00	343.47	367.51	393.24	420.77	450.22	0.070
Sheep and Goats	95.33	102.00	109.14	116.78	124.95	133.70	143.06	153.07	0.070
Pigs	142.99	153.00	163.71	175.17	187.43	200.55	214.59	229.61	0.070
Chickens	14.02	15.00	16.05	17.17	18.38	19.66	21.04	22.51	0.070
Milch Cows	420.56	450.00	481.50	515.21	551.27	589.86	631.15	675.33	0.070
Milch Buffaloes	668.22	715.00	765.05	818.60	875.91	937.22	1002.82	1073.02	0.070
Cattle excluding M.Cows	336.45	360.00	385.20	412.16	441.02	471.89	504.92	540.26	0.070
Total Cost (Rs '000)	173083	185451	198705	212909	228130	244444	261927	280665	0.071
Cost Per LSU	761	814	871	932	997	1066	1141	1220	0.070
Total Gross Margin Per LSU	322169	357616	396874	440346	488476	541750	600706	665933	0.109
Gross Margin Per LSU	1416	1569	1738	1925	2132	2360	2613	2892	0.107

Table 3.20: Forecasted Per Capita Food Supply (kg/person)

Food-edible form	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Cereal Grains	178.12	177.66	178.51	179.27	179.95	180.54	181.04	181.51	0.003
Meat	6.99	7.01	7.03	7.05	7.08	7.11	7.14	7.17	0.004
Milk	78.75	78.21	77.69	77.18	76.68	76.18	75.69	75.13	-0.006
Oils and Fats	4.09	4.07	4.04	4.02	3.99	3.97	3.94	3.92	-0.006
Vegetables	53.60	53.74	53.79	53.82	53.83	53.84	53.83	53.82	0.000

Table 3.21: Forecasted Per Capita Food Demand (kg/person)

Food-edible form	1991	1992	1993	1994	1995	1996	1997	1998	Growth Rate
Cereal Grains-edible Form	170.45	173.79	173.65	174.52	175.29	175.98	176.58	177.10	0.004
Meat	6.67	6.52	6.64	6.68	6.71	6.75	6.78	6.82	0.005
Milk	90.49	86.35	86.47	85.96	85.46	84.96	84.45	83.97	-0.006
Oils and Fat	4.24	4.12	4.13	4.11	4.09	4.06	4.04	4.02	-0.006
Vegetables	50.48	50.07	50.75	50.85	50.93	50.99	51.02	51.06	0.001

Table 3.22: Forecasted Total Food Balance Situation (MT)

Food-edible form (+surplus, -deficit)	1991	1992	1993	1994	1995	1996	1997	1998	Growth Rate
Cereal Grains	2488	1263	1598	1574	1554	1535	1514	1505	-0.012
Meat	103	158	126	124	122	121	121	120	-0.010
Milk	-3814	-2663	-2892	-2916	-2938	-2956	-2967	-2988	0.007
Oils and Fat	-728	-699	-711	-713	-714	-715	-716	-718	0.002
Vegetables	1011	1203	1001	985	972	961	954	943	-0.012

Table 3.23: Forecasted Change in Land Use (%)

Land Use Categories	1992	1995	2000
Forest Area	24	24	22
Shrub Area	24	24	24
Grassland	3	3	3
Adjacent NCI	18	18	19
NCI within gross	5	5	5
Net Cultivated	23	24	24
Plantation	1	1	1
Residual	2	2	2
Total (%)	100	100	100
Total Land (ha)	140485	140485	140485

Table 3.24: Fuelwood Share of Different Sources and Total Annual Supply (%)

Sources	1992	1995	2000
Accessible Forest	64	64	63
Adjacent NCI	32	32	33
Plantation	3	3	4
Farmland	1	1	1
Total (%)	100	100	100

Table 3.25: Forecasted Fuelwood Supply from Different Sources (Air Dry Tonnes (ADT))

Sources	1991	1992	1993	1994	1995	1996	1997	1998	Growth Rate
Forests	104392	103674	102913	102109	101261	100368	99433	98453	-0.009
Adjacent NCI	53927	54058	54196	54342	54496	54659	54829	55008	0.003
Plantation	5228	5477	5743	6025	6324	6640	6973	7322	0.050
Farmland	1067	1071	1076	1081	1086	1092	1098	1104	0.005
Total Kabhre	164614	164280	163928	163557	163167	162759	162333	161887	-0.003
Per Capita Supply (air dry kg)	507	502	497	493	488	483	479	474	-0.009

Table 3.26: Forecasted Timber Supply from Different Sources and Demand (cum)

Sources	1991	1992	1993	1994	1995	1996	1997	1998	Growth Rate
Total Supply	10708	10523	10326	10118	9899	9669	9427	9174	-0.023
Total Demand	16241	16362	16482	16601	16719	16835	16950	17063	0.007
Timber Balance (ss-dd)	-5533	-5839	-6156	-6483	-6820	-7166	-7523	-7889	0.051

Table 3.27: Forecasted Shares of Fodder Supply by Source (%)

Sources	1992	1995	2000
Forests	13	12	12
Grasslands	1	1	1
Shrublands	26	26	26
Tree Fodder: Farmland	4	4	4
Adjacent NCI	33	33	33
Others	23	23	23
Total	100	100	100
Supply as % of Demand	58	58	57

Table 3.28: Forecasted Fodder Supply and Demand and Balance (MT-total digestible nutrient {TDN})

Sources	1991	1992	1993	1994	1995	1996	1997	1998	Growth Rate
Supply	103505	103849	104232	104621	105017	105419	105826	106243	0.004
Demand	141898	142150	142405	142659	142910	143156	143395	143623	0.002
Fodder Balance	-38390	-38301	-38172	-38037	-37893	-37736	-37568	-37380	-0.004

Table 3.29: Percentage of Population Engaged in Off-farm Activities

Occupation	Percentage
Professionals	1.6
Office Workers	1.8
Sales and Services	3.8
Production Workers	4.2
Construction Workers	1.0
General Labourers	8.7

Source: NRB - Multipurpose Household Budget Survey 1988

Table 3.30: Forecasted Employment Situation by Sector and Labour Use

Labour Use by Activity	1991	1992	1993	1994	1995	1996	1997	1998	Growth Rate
Labour Days Available	41479	41875	42276	42678	43081	43483	43852	44223	0.009
Labour Use on Crops	8991	9115	9232	9343	9448	9547	9643	9734	0.011
Livestock	10238	10256	10275	10293	10311	10329	10346	10362	0.002
Professionals	637	643	649	656	662	668	674	679	0.009
Office Workers	717	724	731	737	744	751	758	764	0.009
Sales and Services	1513	1528	1542	1557	1572	1586	1600	1613	0.009
Production Workers	1672	1688	1705	1721	1737	1753	1768	1783	0.009
Construction, etc	398	402	406	410	414	417	421	425	0.009
General Labourers	3464	3497	3531	3564	3598	3632	3663	3694	0.009
Total Labour Use	27631	27853	28070	28280	28485	28684	28871	29054	0.007
Labour Use as % of Available	66.61	66.51	66.40	66.26	66.12	65.97	65.84	65.70	-0.002

Table 3.31: Forecasted Values of Food and Non-food Imports (Rs'000)

Imports	1992	1993	1994	1995	1996	1997	1998	Growth Rate
Growth Rate of Non-food Import	0.010	0.010	0.009	0.009	0.009	0.009	0.009	-0.009
Total Food Import (Rs '000)	55169	62705	69677	77325	85702	94784	1049576	0.109
Total N-food Import (Rs '000)	292738	295472	298241	301003	303757	306499	309229	0.009
Value of Net T Imports (Rs '000)	237570	232767	228564	223678	218055	211715	204272	-0.023
Value: Per Capita Food	169	190	210	231	255	280	304	0.101
Value: Per Capita Non-food	895	896	898	900	902	904	906	0.002

Table 3.32: Forecasted Income by Source (Rs'000)

Sources of Income	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Crops	213570	231227	254348	287062	315540	346724	380728	418092	0.105
Livestock	322169	357616	396874	440346	488476	541750	600706	665933	0.109
Professionals	7119	7187	7256	7325	7394	7463	7526	7590	0.009
Office Workers	7439	7510	7582	7654	7727	7799	7865	7931	0.009
Sales and Service Workers	17403	17569	17737	17906	18075	18244	18398	18554	0.009
Production Workers	12276	12393	12511	12631	12750	12869	12978	13088	0.009
Construction, etc	3500	3533	3567	3601	3635	3669	3700	3731	0.009
General Labourers	23161	23382	23606	23830	24055	24280	24486	24693	0.009
Growth Rate of Income	0.113	0.081	0.088	0.098	0.089	0.089	0.090	0.090	0.007
Total Kabhre Income	606637	660418	723481	800355	877652	962796	1056388	1159612	0.099
Per Household Income (Rs/hh)	11206	12109	13168	14463	15748	17157	18697	20388	0.091
Per Capita Income	1868	2018	2195	2411	2625	2860	3116	3398	0.091

Table 3.33: Forecasted Income Shares by Sources of Income (%)

Sources of Income	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Crops	35.21	35.01	35.16	35.87	35.95	36.01	36.04	36.05	0.005
Livestock	53.11	54.15	54.86	55.02	55.66	56.27	56.86	57.43	0.009
Professionals	1.17	1.09	1.00	0.92	0.84	0.78	0.71	0.65	-0.082
Office Workers	1.23	1.14	1.05	0.96	0.88	0.81	0.74	0.68	-0.082
Sales and Service Workers	2.87	2.66	2.45	2.24	2.06	1.89	1.74	1.60	-0.082
Production Workers	2.02	1.88	1.73	1.58	1.45	1.34	1.23	1.13	-0.082
Construction, etc	0.58	0.54	0.49	0.45	0.41	0.38	0.35	0.32	-0.082
General Labourers	3.82	3.54	3.26	2.98	2.74	2.52	2.32	2.13	-0.082
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.000

Table 3.34: Forecasted Real Income by Source (Rs'000)

Sources of Income	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Crops	193405	194975	199639	209786	214628	219493	224300	229211	0.028
Livestock	291750	301548	311509	321807	332258	342954	353897	365086	0.032
Professionals	6447	6060	5695	5353	5029	4724	4434	4161	-0.061
Office Workers	6737	6333	5951	5594	5256	4937	4633	4348	-0.061
Sales and Service Workers	15760	14815	13922	13086	12294	11549	10839	10172	-0.061
Production Workers	11117	10450	9820	9231	8672	8147	7646	7175	-0.061
Construction, etc	3169	2979	2800	2632	2473	2323	2180	2046	-0.061
General Labourers	20974	19716	18528	17415	16362	15370	14426	13537	-0.061
Real Per Capita Income	1691	1702	1723	1762	1785	1810	1836	1863	0.016

Table 3.35: Performance and Sustainability Indicators

Indicators	1991	1992	1993	1994	1995	1996	1997	1998	Growth
Per Capita Cultivated Land (ha/person)	0.107	0.106	0.109	0.110	0.110	0.111	0.111	0.112	0.005
Per Capita Accessible Forest Land	0.098	0.096	0.093	0.090	0.087	0.084	0.082	0.078	-0.033
Forest-Cultivated Area Ratio	0.913	0.882	0.851	0.821	0.791	0.761	0.731	0.702	-0.038
Shrubland-Forest Area Ratio	1.148	1.180	1.215	1.254	1.298	1.346	1.400	1.459	0.037
Population Density Per Cultivated Land	9.304	9.229	9.164	9.107	9.057	9.013	8.974	8.939	-0.006
Population Per Accessible Forest	10.189	10.465	10.766	11.093	11.450	11.840	12.269	12.741	0.034
LSU Per Cultivated Area	7.466	7.447	7.427	7.406	7.382	7.357	7.330	7.300	-0.003
LSU Per Forest Area	7.136	7.289	7.457	7.642	7.846	8.072	8.321	8.597	0.029
LSU Per Grazing Area	51	50	49	48	47	46	45	44	-0.021

Table 3.36: Forecasted Population and Changes in the Active Population

Population and Composition	1991	1992	1993	1994	1995	1996	1997	1998
Economically Active: Males	96825	97779	98743	99713	100684	101654	102546	103442
Economically Active: Females	69093	69723	70360	71001	71641	72279	72864	73450
Total Active Population	165918	167502	169103	170713	172326	173933	175410	176892
Total: Males	166046	167351	168639	169911	171167	172405	173629	174839
Total: Females	158773	159894	161008	162113	163209	164295	165367	166424
Total Population	324819	327245	329647	332024	334376	336700	338996	341263

Table 3.37: Implications for Calories

Capacity and Load ('000 Calories)	1991	1992	1993	1994	1995	1996	1997	1998	Growth Rate
Per ha Calorie Supply	4006	3973	3970	3968	3966	3964	3963	3962	-0.002
Per ha Calorie Demand	4382	4355	4332	4313	4296	4281	4268	4257	-0.004
SS as % of DD	91.41	91.22	91.63	92.00	92.32	92.61	92.85	93.07	0.003
Carrying Capacity Per ha	5.54	5.49	5.49	5.49	5.48	5.48	5.48	5.48	-0.002
Current load Per ha	6.06	6.02	5.99	5.96	5.94	5.92	5.90	5.89	-0.004

Table 3.38: Implications for Fuelwood

Products and Factors (air dry tonnes)	1991	1992	1993	1994	1995	1996	1997	1998	Growth Rate
Fuelwood Supply Per ha	2.03	2.02	2.01	1.99	1.98	1.97	1.95	1.94	-0.007
Per ha Demand	2.35	2.36	2.37	2.38	2.39	2.39	2.40	2.40	0.003
SS as % of DD	86.19	85.38	84.57	83.78	82.99	82.21	81.44	80.68	-0.009
Carrying Capacity Per ha (person/ha)	3.45	3.43	3.41	3.39	3.37	3.35	3.32	3.30	-0.007
Current load (person/ha)	4.00	4.02	4.03	4.05	4.06	4.07	4.08	4.09	0.003

Table 3.39: Implications for Fodder

Capacity and Load (MT-total digestible nutrient)	1991	1992	1993	1994	1995	1996	1997	1998	Growth Rate
Per ha Fodder Supply	0.74	0.75	0.75	0.75	0.76	0.76	0.76	0.76	0.004
Per ha Fodder Demand	1.02	1.02	1.02	1.03	1.03	1.03	1.03	1.03	0.001
SS as % of DD	72.94	73.06	73.19	73.34	73.48	73.64	73.80	73.79	0.002
Carrying Capacity (LSU/ha)	1.19	1.20	1.20	1.20	1.21	1.21	1.22	1.22	0.004
Current load (LSU/ha)	1.63	1.64	1.64	1.64	1.65	1.65	1.65	1.65	0.001

Table 3.40: Impacts of Different Policy Alternatives on Calorie Balances (Supply as % of Demand)

	1993	1994	1995	1996	1997	1998	Growth
Baseline	91.64	92.00	92.32	92.61	92.85	93.07	0.30
Irrigation Policy	101.53	101.97	102.33	102.64	102.90	103.14	0.30
Fertiliser Policy	94.79	98.70	99.04	99.35	99.61	99.84	1.00
Irrigation, Fertiliser, and Potatoes	115.59	120.16	120.39	120.58	120.72	120.85	0.90
Increased Maize Price Policy	92.44	93.12	93.45	93.74	93.98	94.21	0.40
Decreased Maize Price Policy	90.77	91.39	91.71	92.00	92.23	92.45	0.40
Decreased Fuelwood Demand Policy	91.63	92.00	92.32	92.61	92.85	93.07	0.30
Forest Management Policy	91.64	92.00	92.32	92.61	92.85	93.07	0.30

Table 3.41: Impacts of Different Policy Alternatives on Labour Use (%)

	1993	1994	1995	1996	1997	1998	Growth
Baseline	66.38	66.24	66.09	65.94	65.81	65.67	-0.20
Irrigation, Fertiliser, & Potatoes	68.39	68.22	68.05	67.86	67.71	67.55	-0.20
Irrigation Policy	66.39	66.26	66.11	65.96	65.83	65.70	-0.20
Maize Price Increased	66.39	66.26	66.11	65.96	65.83	65.70	-0.20
Decreased Fuelwood Demand	66.38	66.24	66.09	65.93	65.80	65.67	-0.20
Forest Management	66.39	66.26	66.11	65.96	65.83	65.69	-0.20

Table 3.42: Impacts of Different Policy Alternatives on Income (Rs/capita)

	1993	1994	1995	1996	1997	1998	Growth
Baseline							
Nominal P-Capita Inc-Policy (Rs)	2195	2388	2601	2834	3088	3368	8.94
Real Per Capita Income (Rs)	1723	1746	1769	1817	1820	1846	1.39
Irrigation							
Nominal P-Capita Inc-Policy (Rs)	2439	2652	2885	3140	3419	3724	8.83
Real Per Capita Income (Rs)	1914	1939	1963	2013	2015	2042	1.30
Fertiliser							
Nominal P-Capita Inc-Policy (Rs)	2274	2571	2798	3047	3320	3619	9.74
Real Per Capita Income (Rs)	1785	1879	1903	1953	1956	1984	2.14
Irrigation, Fertiliser, & Potato Policy							
Nominal P-Capita Inc-Policy (Rs)	2924	3297	3576	3880	4211	4573	9.36
Real Per Capita Income (Rs)	2295	2410	2433	2487	2481	2507	1.78
Decreased Maize Price							
Nominal P-Capita Inc-Policy (Rs)	2097	2288	2493	2718	2963	3234	9.05
Real Per Capita Income (Rs)	1646	1673	1696	1742	1746	1773	1.50
Increased Maize Price							
Nominal P-Capita Inc-Policy (Rs)	2293	2502	2723	2965	3230	3521	8.96
Real Per Capita Income (Rs)	1800	1829	1852	1901	1903	1930	1.41

Table 3.43: Impacts of Different Policy Alternatives on Income Shares by Major Sources (%)

	1993	1994	1995	1996	1997	1998	Growth
Baseline							
Crops	35.16	35.28	35.37	35.44	35.47	35.49	0.20
Livestock	54.85	55.52	56.16	56.77	57.37	57.93	1.10
Others	9.99	9.20	8.47	7.79	7.16	6.58	-8.01
Irrigation							
Crops	41.65	41.72	41.74	41.74	41.71	41.66	0.00
Livestock	49.36	50.00	50.62	51.23	51.82	52.39	1.20
Others	8.99	8.28	7.64	7.03	6.47	5.95	-7.90
Fertiliser							
Crops	37.42	39.87	39.94	39.97	39.97	39.96	1.30
Livestock	52.94	51.58	52.19	52.79	53.37	53.92	0.40
Others	9.64	8.55	7.87	7.24	6.66	6.12	-8.60
Irrigation, Fertiliser, & Potato							
Crops	51.33	53.12	53.00	52.85	52.68	52.49	0.50
Livestock	41.18	40.22	40.84	41.46	42.07	42.66	0.70
Others	7.64	6.66	6.16	5.69	5.25	4.85	-8.60
Reduced Maize Price							
Crops	32.16	32.45	32.58	32.68	32.75	32.81	0.40
Livestock	57.39	57.95	58.59	59.20	59.79	60.34	1.00
Others	10.45	9.60	8.83	8.12	7.47	6.85	-8.10
Increased Maize Price							
Crops	37.95	38.21	38.27	38.30	38.31	38.29	0.20
Livestock	52.49	53.01	53.64	54.25	54.85	55.42	1.20
Others	9.56	8.78	8.09	7.47	6.84	6.29	-8.00

Table 3.44:Impacts of different Policies on Demand and Supply of Forest Products Originating from All Sources (Supply as % of Demand)

	1993	1994	1995	1996	1997	1998	Growth
Baseline							
Fuelwood	84.57	83.78	82.99	82.21	81.44	80.68	-0.90
Fodder	73.19	73.34	73.48	73.64	73.80	73.97	0.20
Timber	62.65	60.95	59.21	57.43	55.62	53.79	-3.00
Decreased Demand							
Fuelwood	93.97	93.20	92.45	91.70	90.97	90.24	-0.80
Fodder	73.19	73.26	73.32	73.38	73.43	73.50	0.10
Timber	62.65	61.70	60.72	59.70	58.64	57.56	-1.70
Improved Management							
Fuelwood	84.97	85.18	85.08	85.02	85.24	85.78	0.20
Fodder	74.54	74.67	74.81	74.94	75.07	75.20	0.20
Timber	62.65	60.98	59.34	57.72	56.12	54.55	-2.70
Combined							
Fuelwood	94.42	94.77	94.78	94.82	95.20	95.92	0.30
Fodder	74.54	74.59	74.64	74.68	74.71	74.74	0.10
Timber	62.65	61.73	60.85	59.99	59.15	58.34	-1.40

Table 3.45: Changing Pressure on Land Under the Baseline and Policy Scenarios

	1993	1994	1995	1996	1997	1998	Growth
Baseline							
Per Capita Cultivated Land (ha/person)	0.109	0.110	0.110	0.111	0.111	0.112	0.50
Per Capita Accessible Forest Land	0.093	0.090	0.087	0.084	0.082	0.078	-3.30
Forest-Cultivated Area Ratio	0.851	0.821	0.791	0.761	0.731	0.702	-3.80
Shrubland-Forest Area Ratio	1.215	1.254	1.298	1.346	1.400	1.459	3.70
Population Density Per Cultivated Land	9.164	9.107	0.057	9.013	8.974	8.939	-0.50
Population Per Accessible Forest	10.766	11.093	11.450	11.840	12.269	12.741	3.40
LSU Per Cultivated Area	7.427	7.406	7.382	7.357	7.330	7.300	-0.30
LSU Per Forest Area	7.457	7.642	7.846	8.072	8.321	8.597	2.90
LSU Per Grazing Area	49.152	48.168	47.169	46.157	45.136	44.110	-2.10
Reduced Demand							
Per Capita Cultivated Land (ha/person)	0.109	0.110	0.110	0.111	0.111	0.112	0.50
Per Capita Accessible Forest Land	0.093	0.091	0.090	0.088	0.087	0.085	-1.80
Forest-Cultivated Area Ratio	0.851	0.833	0.815	0.796	0.778	0.760	-2.20
Shrubland-Forest Area Ratio	1.215	1.229	1.246	1.264	1.285	1.308	1.50
Population Density Per Cultivated Land	9.164	9.107	9.057	9.013	8.974	8.939	-0.50
Population Per Accessible Forest	10.766	10.936	11.119	11.317	11.530	11.761	1.80
LSU Per Cultivated Area	7.427	7.425	7.420	7.415	7.409	7.401	-0.10
LSU Per Forest Area	7.457	7.531	7.616	7.710	7.815	7.931	1.20
LSU Per Grazing Area	9.152	48.619	48.446	48.035	47.587	47.105	-0.80
Improved Management							
Per Capita Cultivated Land (ha/person)	0.109	0.110	0.110	0.111	0.111	0.112	0.50
Per Capita Accessible Forest Land	0.093	0.090	0.088	0.085	0.082	0.080	-3.00
Forest-Cultivated Area Ratio	0.851	0.821	0.793	0.766	0.739	0.714	-3.50
Shrubland-Forest Area Ratio	1.215	1.253	1.293	1.335	1.380	1.426	3.33
Population Density Per Cultivated Land	9.164	9.107	9.057	9.013	8.974	8.939	-0.50
Population Per Accessible Forest	10.766	11.086	11.419	11.770	12.140	12.525	3.10
LSU Per Cultivated Area	7.427	7.407	7.386	7.365	7.343	7.322	-0.30
LSU Per Forest Area	7.457	7.637	7.825	8.023	8.233	8.451	2.50
LSU Per Grazing Area	49.152	48.194	47.281	46.391	45.526	44.701	-1.90
Combined							
Per Capita Cultivated Land (ha/person)	0.109	0.110	0.110	0.111	0.111	0.112	0.50
Per Capita Accessible Forest Land	0.093	0.091	0.090	0.089	0.088	0.086	-1.40
Forest-Cultivated Area Ratio	0.851	0.833	0.817	0.801	0.786	0.772	-1.90
Shrubland-Forest Area Ratio	1.215	1.228	1.241	1.254	1.268	1.280	1.00
Population Density Per Cultivated Land	9.164	9.107	9.057	9.013	8.974	8.939	-0.50
Population Per Accessible Forest	10.766	10.929	11.090	11.253	11.416	11.577	1.50
LSU Per Cultivated Area	7.427	7.425	7.424	7.423	7.421	7.421	0.00
LSU Per Forest Area	7.457	7.527	7.596	7.665	7.737	7.805	0.90
LSU Per Grazing Area	49.152	48.846	48.565	48.288	48.017	47.772	-0.60

Table 3.46: Impacts of Different Policy Alternatives on Deforestation (ha)

	1993	1994	1995	1996	1997	1998	Growth
Baseline (ha)	552	580	606	632	656	679	0.042
Decreased Fuelwood Demand	145	181	216	250	282	312	0.166
Increased Demand	534	519	517	514	498	468	-0.026

Table 3.47: Impacts of Different Policies on the Carrying Capacity of Crop Land to Meet Calorie Needs

	1993	1994	1995	1996	1997	1998	Growth
Baseline							
Supply (calorie/ha)	3970	3968	3966	3965	3963	3962	0
Demand (calorie/ha)	4332	296	4296	4281	4268	4257	0
Capacity (adults/ha)	5.49	5.49	5.48	5.48	5.48	5.48	0.00
Load (adults/ha)	5.99	5.96	5.94	5.92	5.90	5.89	-0.40
Irrigation							
Supply (calorie/ha)	4399	4398	4396	4394	4392	4391	0
Demand (calorie/ha)	4332	4313	4296	4281	4268	4257	0
Capacity (adults/ha)	6.08	6.08	6.08	6.07	6.07	6.07	0.00
Load (adults/ha)	5.99	5.96	5.94	5.92	5.90	5.89	-0.40
Fertiliser							
Supply (calorie/ha)	4107	4257	4255	4253	4251	4250	1
Demand (calorie/ha)	4332	4313	4396	4281	4268	4257	0
Capacity (adults/ha)	5.68	5.88	5.88	5.88	5.88	8.88	0.70
Load (adults/ha)	5.99	5.96	5.94	5.92	5.90	5.89	-0.40
Combined							
Supply (calorie/ha)	4677	4846	4841	4838	4834	4831	1
Demand (calorie/ha)	4046	4033	4022	4012	4004	3997	0
Capacity (adults/ha)	6.47	6.70	6.69	6.69	6.68	6.68	0.60
Load (adults/ha)	5.59	5.58	5.56	5.55	5.54	5.53	-0.20
Price Decrease							
Supply (calorie/ha)	3932	3942	3940	3938	3937	3936	0
Demand (calorie/ha)	4332	4313	4296	4281	4268	4257	0
Capacity (adults/ha)	5.44	5.45	5.45	5.44	5.44	5.44	0.00
Load (adults/ha)	5.99	5.96	5.94	5.92	5.90	5.89	-0.40
Price Increase							
Supply (calorie/ha)	4005	4016	4014	4013	4011	4010	0.00
Demand (calorie/ha)	4332	4313	4296	4281	4268	4257	0.00
Capacity (adults/ha)	5.54	5.55	5.55	5.55	5.55	5.54	0.00
Load (adults/ha)	5.99	5.96	5.94	5.92	5.90	5.89	0.00

Table 3.48: Impacts of Different Policies on the Carrying Capacity of Land to Meet Fuelwood Requirement

	1993	1994	1995	1996	1997	1998	Growth
Baseline							
Supply (adt/ha)	2.01	1.99	1.98	1.97	1.95	1.94	-0.70
Demand (adt/ha)	2.37	2.38	2.39	2.39	2.40	2.40	0.30
Capacity (persons/ha)	3.41	3.39	3.37	3.35	3.32	3.30	-0.70
Load (persons/ha)	4.03	4.05	4.06	4.07	4.08	4.09	0.30
Decreased Demand							
Supply (adt/ha)	2.01	2.00	2.00	1.99	1.98	1.98	-0.30
Demand (adt/ha)	2.13	2.15	2.16	2.17	2.18	2.19	0.50
Capacity (persons/ha)	3.79	3.78	3.77	3.76	3.75	3.74	-0.30
Load (persons/ha)	4.04	4.06	4.08	4.10	4.12	4.14	0.50
Improved Management							
Supply (adt/ha)	2.01	2.03	2.03	2.04	2.05	2.07	0.50
Demand (adt/ha)	2.37	2.38	2.39	2.40	2.40	2.41	0.30
Capacity (persons/ha)	3.43	3.45	3.45	3.46	3.48	3.52	0.50
Load (persons/ha)	4.03	4.05	4.06	4.07	4.09	4.10	0.30
Combined							
Supply (adt/ha)	2.01	2.03	2.05	2.06	2.08	2.11	0.90
Demand (adt/ha)	2.13	2.15	2.16	2.17	2.18	2.20	0.60
Capacity (persons/ha)	3.81	3.84	3.87	3.89	3.93	3.98	0.90
Load (persons/ha)	4.03	4.06	4.08	4.10	4.13	4.15	0.60

Table 3.49: Impacts of Different Policies on the Carrying Capacity of Forest Land only to Meet Fuelwood Demand

	1993	1994	1995	1996	1997	1998	Growth
Baseline							
Supply (adt/ha)	8.38	8.51	8.64	8.79	8.96	9.15	1.80
Demand (adt/ha)	15.79	16.26	16.78	17.35	17.97	18.65	3.40
Capacity (persons/ha)	14.26	14.47	14.70	14.96	15.24	15.56	1.80
Load (persons/ha)	26.85	27.66	28.54	29.50	30.56	31.71	3.40
Decreased Demand							
Supply (adt/ha)	8.38	8.43	8.48	8.54	8.60	8.68	0.70
Demand (adt/ha)	14.21	14.43	14.68	14.94	15.22	15.52	1.80
Capacity (persons/ha)	15.84	15.93	16.02	16.13	16.26	16.40	0.70
Load (persons/ha)	26.85	27.28	27.73	28.23	28.76	29.33	1.80
Improved Management							
Supply (adt/ha)	8.45	8.73	8.98	9.24	9.56	9.96	3.40
Demand (adt/ha)	15.79	16.25	16.74	17.25	17.78	18.34	3.00
Capacity (persons/ha)	14.36	14.85	15.26	15.71	16.26	16.94	3.40
Load (persons/ha)	26.85	27.64	28.47	29.33	30.24	31.19	3.00
Combined							
Supply (adt/ha)	8.45	8.65	8.80	8.96	9.17	9.44	2.20
Demand (adt/ha)	14.21	14.43	14.64	14.85	15.07	15.28	1.50
Capacity (persons/ha)	15.96	16.34	16.64	16.94	17.34	17.83	2.20
Load (persons/ha)	26.85	27.26	27.66	28.07	28.48	28.88	1.50

Table 3.50: Impacts of Different Policies on the Carrying Capacity of Land to Meet Timber Requirement

	1993	1994	1995	1996	1997	1998	Growth
Baseline							
Supply (cu m/ha)	0.32	0.32	0.32	0.32	0.32	0.32	0.10
Demand (cu m/ha)	0.50	0.52	0.53	0.55	0.57	0.59	3.20
Capacity (persons/ha)	6.30	6.31	6.31	6.32	6.33	6.34	0.10
Load (persons/ha)	10.06	10.35	10.66	11.01	11.38	11.79	3.20
Decreased Demand							
Supply (cu m/ha)	0.32	0.31	0.31	0.31	0.31	0.32	0.00
Demand (cu m/ha)	0.50	0.51	0.52	0.53	0.54	0.55	1.70
Capacity (persons/ha)	6.30	6.30	6.30	6.30	6.30	6.30	0.00
Load (persons/ha)	10.06	10.21	10.37	10.55	10.74	10.95	1.70
Improved Management							
Supply (cu m/ha)	0.32	0.32	0.32	0.32	0.32	0.32	0.00
Demand (cu m/ha)	0.50	0.52	0.53	0.55	0.56	0.58	2.90
Capacity (persons/ha)	6.30	6.31	6.31	6.32	6.32	6.33	0.10
Load (persons/ha)	10.06	10.34	10.64	10.94	11.27	11.61	2.90
Combined							
Supply (cu m/ha)	0.32	0.31	0.31	0.31	0.31	0.31	0.00
Demand (cu m/ha)	0.50	0.51	0.52	0.52	0.53	0.54	1.40
Capacity (persons/ha)	6.30	6.30	6.30	6.30	6.29	6.29	0.00
Load (persons/ha)	10.06	10.20	10.35	10.50	10.64	10.79	1.40

Table 3.51: Impacts of Different Policies on the Carrying Capacity of Land to Meet Fodder Requirement

	1993	1994	1995	1996	1997	1998	Growth
Baseline							
Supply (tdn MT/ha)	0.75	0.75	0.75	0.76	0.76	0.76	0.40
Demand (tdn MT/ha)	1.02	1.02	1.03	1.03	1.03	1.03	0.10
Capacity (LSU/ha)	1.20	1.20	1.21	1.21	1.22	1.22	0.40
Load (LSU/ha)	1.64	1.64	1.65	1.65	1.65	1.65	0.10
Decreased Demand							
Supply (tdn MT/ha)	0.75	0.75	0.75	0.75	0.76	0.76	0.20
Demand (tdn MT/ha)	1.02	1.02	1.03	1.03	1.03	1.03	0.10
Capacity (LSU/ha)	1.20	1.20	1.21	1.21	1.21	1.21	0.20
Load (LSU/ha)	1.64	1.64	1.65	1.65	1.65	1.65	0.10
Improved Management							
Supply (tdn MT/ha)	0.76	0.77	0.77	0.77	0.77	0.77	0.30
Demand (tdn MT/ha)	1.02	1.02	1.03	1.03	1.03	1.03	0.10
Capacity (LSU/ha)	1.22	1.23	1.23	1.23	1.24	1.24	0.30
Load (LSU/ha)	1.64	1.64	1.65	1.65	1.65	1.65	0.10
Combined							
Supply (tdn MT/ha)	0.76	0.76	0.77	0.77	0.77	0.77	0.20
Demand (tdn MT/ha)	1.02	1.02	1.03	1.03	1.03	1.03	0.10
Capacity (LSU/ha)	1.22	1.23	1.23	1.25	1.23	1.23	0.20
Load (LSU/ha)	1.64	1.64	1.64	1.65	1.65	1.65	0.10

Table 3.52: Impacts of Different Policies on the Carrying Capacity of Forest Land only to Meet Fodder Requirement

	1993	1994	1995	1996	1997	1998	Growth
Baseline							
Supply (tdn MT/ha)	0.41	0.41	0.41	0.41	0.41	0.41	-0.20
Demand (tdn MT/ha)	4.34	4.45	4.56	4.68	4.81	4.96	2.70
Capacity (LSU/ha)	0.66	0.66	0.66	0.66	0.65	0.65	-0.20
Load (LSU/ha)	6.97	7.13	7.31	7.50	7.72	7.96	2.70
Decreased Demand							
Supply (tdn MT/ha)	0.41	0.41	0.41	0.41	0.41	0.41	-0.10
Demand (tdn MT/ha)	4.34	4.39	4.43	4.48	4.54	4.60	1.20
Capacity (LSU/ha)	0.66	0.66	0.66	0.66	0.66	0.66	-0.10
Load (LSU/ha)	6.97	7.03	7.11	7.19	7.28	7.38	1.20
Improved Management							
Supply (tdn MT/ha)	0.47	0.47	0.47	0.47	0.47	0.47	0.20
Demand (tdn MT/ha)	4.34	0.44	4.55	4.65	4.77	4.89	2.40
Capacity (LSU/ha)	0.75	0.75	0.75	0.76	0.76	0.76	0.20
Load (LSU/ha)	6.97	7.12	7.29	7.46	7.64	7.83	2.40
Combined							
Supply (tdn MT/ha)	0.47	0.47	0.47	0.47	0.47	0.47	0.00
Demand (tdn MT/ha)	4.34	4.38	4.42	4.46	4.50	4.54	0.90
Capacity (LSU/ha)	0.75	0.75	0.75	0.75	0.75	0.75	0.00
Load (LSU/ha)	6.97	7.03	7.09	7.15	7.21	7.27	0.90