Prepared for:

National Planning Commission
His Majesty's Government of Nepal
and
Asian Development Bank
(T. A. No. 1854-NEP)

NEPAL

AGRICULTURE PERSPECTIVE PLAN

1995/96-2014/15 A. D.
(2052/53-2071/72 B. S.)

(Final Report)

SUMMARY DOCUMENT

Agricultural Projects Services Centre
Kathmandu
and
John Mellor Associates, Inc.
Washington, D. C.

June 1995

APROSC

The Prime Minister

KATHMANDU
NEPAL

July 3 , 1995

FOREWORD

Nepal can lose no more time in pursuing the course of rapid economic growth combined with a just and equitable social transformation. The Agriculture Perspective Plan (APP) duly addresses this national imperative.

The APP lays out the strategic focus and the prioritized productivity package essential for a holistic and sustainable development of the agricultural and rural sector. Given the overwhelming importance of this sector in the national economy in terms of both employment and income generation, the APP in fact embodies a development strategy to transform the entire economy.

The absence of a clearly defined strategy and well-focused action has hampered the past development efforts. I am convinced that Nepal now has the prerequisites for a take-off to transform its subsistence-based economy into a dynamic, fast-growing one. The APP provides the necessary recipe as to how this possibility could be tapped in the shortest possible time.

The agrarian reform measures which HMG is committed to initiate in the near future would improve the access of the small and landless farmers to land, reform tenancy and consolidate holdings. Productivity gains to be achieved from these measures together with the APP suggested programs would greatly facilitate meeting the social objectives of equity.

I appreciate the commendable job of the experts from APROSC and JMA in preparing this high quality plan document.

His Majesty's Government is fully committed to implementing APP. While we would mobilize all the resources at our command, we would require additional support from the international donor community. I am confident that the level of resources proposed in the APP would be forthcoming in order to implement this plan that envisages the well being of the Nepalese people.

Manmohan Adhikari

(Man Mohan Adhikari)

PREFACE

The Agriculture Perspective Plan (APP) has been formulated with a view to launching the agricultural sector of Nepal into a sustainable high growth path. Indeed, as agriculture acts as the engine of growth in the initial stages of economic transformation, the APP is a blue print for the overall economic development of the country.

The participatory approach followed during the plan formulation has been an added significance of the APP. This study took nearly two years to complete, preceded by about a year of preparatory work. Throghout this period, much emphasis was placed on involving a wide range of government agencies, high-ranking officials, individual experts, private sector representatives, and key donor agencies. This resulted into a much wider participation in the plan formulation process and ownership of the present document which we believe is critical to the successful implementation of the plan.

The APP report consists of the main document, a summary document under separate cover and a series of technical papers listed under references in the main document.

I would like to express our gratitude to the National Planning Commission (NPC), His Majesty's Government of Nepal, and the Asian Development Bank (AsDB) which funded the study, for assigning this challenging task to APROSC in association with John Mellor Associates of the United States. We are grateful to the Vice-Chairman and the member of the NPC responsible for agriculture, for their continuous support and valuable guidance throughout the course of the study.

APROSC owes a special word of gratitude to the members of the APP study team who have worked very hard with utmost professional dedication in accomplishing the present task. The study team was ably coordinated by Dr. Devendra P. Chapagain, the Team Leader. We are also thankful to Prof. John W. Mellor for his unflinching commitment to the study and substantive contribution in shaping and finalizing the APP document.

Besides the APP team of experts, Mr. Krishna P. Sapkota, Mr. Janak Udaya, Mr. Atma Ram Pandey, Mr. Badri N. Shah and Mr. Indra B. Thapa provided valuable technical, logistic and secretarial support. Additional secretarial assistance was provided by Ms. Pratima Rana, Ms. Disha Shah and Ms. Shashi Singh at various stages.

Prof. Dr. Madan Kumar Dahal
Executive Director
Agricultural Projects Services Centre

CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. BACKGROUND

Past Performance

In the past, the excess of agricultural growth over population growth in Nepal clustered around half a percentage point[1], which was not sufficient to boost overall per capita income or to promote economic transformation. As a consequence, the following trends have been witnessed in the country.

- Decreasing trend in per capita foodgrain production[2].
- Increasing trend in poverty incidence[3].
- Increasing trend in the ratio of agricultural import to agricutural export[4].

The generally poor agricultural record is particularly evident in paddy, maize and wheat production, which occupy more than 70 percent of the total cropped area and contribute around 35 percent to agricultural GDP. The yields of paddy and wheat in Nepal were higher than in all other South Asian Countries in the early 1960's, but were considerably lower than those countries by the early 1990's (table S-1). Similarly, between 1974/75 and 1991/92, the yield of maize declined from 1810 to 1598 kilograms per hectare.

Table S-1. Yields in Nepal as Percent of South Asian Countries by Crop and Year
(percent)

Yield in Nepal as percent of	*1961-63*		*1991-93*	
	Paddy	*Wheat*	*Paddy*	*Wheat*
India	129	146	86	57
Bangladesh	116	198	86	75
Pakistan	140	150	93	69
Sri Lanka	101	-	74	-

Source: APP (Main Document), Chapter-1.

The country's poor agricultural performance was due primarily to the lack of a clear-cut strategy and failure to emphasize accelerated sectoral growth and increased farm income. In the absence of a growth strategy with clear priorities, the donor community, whose role in Nepal's development efforts has progressively

1 The annual growth rate of agriculture and population in the past clustered around 3 and 2.5 percent, respectively.

2 The per capita foodgrain production decreased from 376 kilograms in 1974/75 to 277 kilograms in 1991/92.

3 Poverty incidence increased from 40 percent in 1976/77 to 49 percent in 1991/92.

4 The ratio of agricultural import to agricultural export increased from one-half during the period 1975-79 to two-and-a-half during the period 1990-93.

increased in terms of resource mobilization and program selection, has similarly dispersed its efforts.

The overall macroeconomic policy environment was not conducive to growth, either. The exchange rate discouraged agricultural export but encouraged the importation of semiluxury consumption goods. Pricing policy for major domestic and imported products remained distorted. Budget deficits were large and resource allocation among sectors had no well-defined national goal and strategic priority to follow. The private sector was generally regarded as an adversary and therefore was subjected to tight control and stiff regulation.

Although some rational policies and programs had been introduced, they were weakly implemented owing to inimical administrative and personnel policies. The general atmosphere was one in which officials tacitly condoned and sometimes encouraged noncompliance with transparency and accountability. Accountability for performance was made even more difficult by the lack of adequate data and monitoring systems.

The greatest deficiencies in agricultural development lie in four specific areas.

- Fertilizer policies which in recent years have held fertilizer growth below its potential and failed to satisfy effective demand.
- Irrigation investment overlooking the possibility of achieving high productivity through year-round well-controlled water supplies which are essential to high agricultural growth.
- Poor road infrastructure severely limiting the practice of high-productivity agriculture.
- Agricultural technology system ill-prepared to respond to the demands of high-growth agriculture.

Current Status

Many countries of the developing world, including Nepal's immediate neighbors in South Asia, have already made the transition to faster economic growth. In the process, they have gradually increased the commercialization of agriculture, and reduced its share in the national economy. Nepal, in contrast, continues to be a predominantly agricultural country: 90 percent of its population and 42 percent of its GDP are tied up in agriculture. The land expansion has ceased to be a predominant means of increasing agricultural production.

Agriculture practiced in Nepal remains primarily subsistence-oriented. Only a small proportion of farms use modern production inputs. Fertilizer use in Nepal is unbelievably low: on the average 20 nutrient kilogram per hectare of cropped area in 1991/92. Only 18 percent of the arable area is commanded by well-controlled year-round water supplies.

Most major crops and other enterprises have low yields. The average per capita income is one of the lowest in Asia, and nearly half the population falls below the poverty line.

Urgency

Weak agricultural growth severely limits the possibility for overall economic growth, and is hence the main cause of low growth in the nonagricultural sectors. That has restricted employment growth, further exacerbating poverty. The low productivity of Nepal's resources also lies at the root of its deforestation and land degradation problems.

Public revenues generated from a low income base seldom meets the needs of basic social services such as health care and education. Consequently, poverty, poor health, and low educational levels prevail and have worsened over time, despite numerous foreign assistance projects dedicated to reducing poverty and assisting the social sector.

If rapid action is not taken to reverse the present trends, social unrest and political uncertainty will be kindled and will put further restraints on the economy. Moreover, a continuously poor economic performance would discourage international donors. A reduction in their financial and technical assistance would further limit the country's ability to mobilize resources for growth and development.

APP: The Process

Preparatory actions for the APP were initiated in late 1992 when extensive consultations were held among many departments of the government, the private sector, and the donor community. A one-day workshop was held in September 1992 in which a broad consensus was reached on the need for a perspective plan, and on the general principles, priorities, and approach to be adopted in formulating the plan.

Following a request from the government, the Asian Development Bank agreed to provide technical assistance and a contract between the Bank and the Agricultural Projects Services Centre, in collaboration with the John Mellor Associates, Inc., of the United States, was signed in August 1993 for the preparation of the APP. Preparation of the project began in September 1993 and was completed in April 1994. Preparation of the APP entailed three interrelated components.

- The preparation of twenty-six technical papers to serve as background material for developing the main plan document.
- A large number of national and regional seminars/workshops to identify the main strengths, weaknesses, opportunities and constraints present in the different geographic regions, and to obtain comments and suggestions from a

wide range of public and private sector representatives and individuals on the main priorities and strategies proposed in the plan.

- The drafting of the APP and its finalization through a process of widespread participation and consensus building.

The participatory mechanism involved the following arrangements.

- A steering committee consisting largely of secretaries of key ministries, and a few donor representatives and individual experts, headed by the member of the National Planning Commission responsible for agriculture.
- A support group chaired by the secretary of agriculture and consisting of heads of related divisions at the ministries, departments, public corporations, as well as donor representatives.
- A total of eleven working groups consisting of representatives of various government agencies, donor and cooperating agencies, individual resource persons from different subsectors, and private sector groups and representatives, deliberating on various central themes and building consensus on the approaches, priorities, and strategies adopted in the plan with regard to various issues and sectoral/subsectoral concerns.
- A facilitation group to critically review and comment on the draft plan at various stages and make suggestions for amendment.
- Several national and regional workshops, seminars, and working group sessions as described above.

Besides the excellent support and cooperation received from the national agencies and individuals, the project benefited immensely from liberal support received from a number of international donor and cooperating agencies such as the World Bank, German Technical Cooperation Agency (GTZ), International Irrigation Management Institute (IIMI), Food and Agriculture Organization of the United Nations (FAO), United States Agency for International Development (USAID), and Winrock International.

2. OBJECTIVES AND STRATEGY

There are five interrelated objectives and six essential strategic moves embodied in the APP.

Objectives

The following are the main objectives of the APP.

- To accelerate the growth rate in agriculture through increased factor productivity.
- To alleviate poverty and achieve significant improvement in the standard of living through accelerated growth and expanded employment opportunities.
- To transform the subsistence-based agriculture into a commercial one through diversification and widespread realization of comparative advantage.
- To expand opportunities for an overall economic transformation by fulfilling the precondition of agricultural development.
- To identify immediate, short-term and long-term strategies for implementation, and to provide clear guidelines for preparing periodic plans and programs in future.

Strategy

- A technology-based green revolution in *agriculture* becomes the initial engine of accelerated growth.
- Accelerated agricultural growth creates a demand pull for the production of high-value commodities in agriculture, as well as for nonagricultural commodities, with consequent large *multiplier effects* on other sectors of the economy.
- Broadly based high employment *growth* then becomes the mechanism for achieving societal objectives.
- Public policy and investment focus on a small number of *priorities*, building on past investment in human capital and physical and institutional infrastructure.
- A *package approach* to development is introduced, which in Nepal's case would be differentiated for the terai, hills, and mountains, and would recognize the powerful complementarity between public and private investment and priorities, and would ensure their coordination.
- To achieve broad participation, the strategy is *regionally balanced* and explicitly ensures the *participation of women*.

The APP is expected to have a powerful effect on economic growth in Nepal. The plan is designed to add two percentage points to the country's agricultural growth, and this increase, combined with a 0.5 percent decline in the rate of population

growth, would expand per capita agricultural growth sixfold, from its current 0.5 percent to 3 percent per year. This rise would stimulate nonagricultural growth in employment-intensive goods and services throughout Nepal's dispersed villages and market towns.

The APP strategy is not complex: accelerate the agricultural growth rate sufficiently to obtain strong multiplier effects on growth in employment, both in agriculture itself and in nonagricultural sectors. Growth is to occur through technological change in crop agriculture, the consequent demand pull on high-value commodities, increasing specialization, and trade. The technological change is to be achieved through investment in research and extension, which is expected to generate the improved technology; through policies promoting fertilizer use and improved water control, which will embody the technology, and through specialization and trade made possible by investment in roads and other market infrastructure.

To obtain a large aggregate impact and to ensure equity, the strategy calls for broadly participatory growth across regions and income classes and emphasizes subsectors particularly important to women.

The APP concentrates on only a small number of priorities. A diagrammatic presentation of the APP priorities and their linkages are summarized in figure S-1.

The complementary relationship among the priorities themselves is essential to achieve the accelerated growth. The packaging of priorities must observe three principles.

- First, since all the priorities are by and large complementary, they must be applied together, even initially some areas will move ahead of others.
- Second, it is important that high-potential areas receive the package early.
- Third, the choice of areas for the first action, the precise mix of the priorities, and the manner of implementation must all be tuned to local features.

The strategy of the hills and mountain package will be centered on high-value commodities. However, that priority must be attended to concurrently with several others: the all-weather agricultural roads connecting with existing district level roads, improved water control, the immediate direction of research and extension to improved technology for high-value commodities, and the monitoring of rapidly changing needs for the support of successful private-sector development.

The strategy of the terai package will be centered on foodgrain production. However, that priority must be attended to concurrently with several others: the well-controlled year-round irrigation, efficient fertilizer distribution, all-weather agricultural roads, and rural electrification.

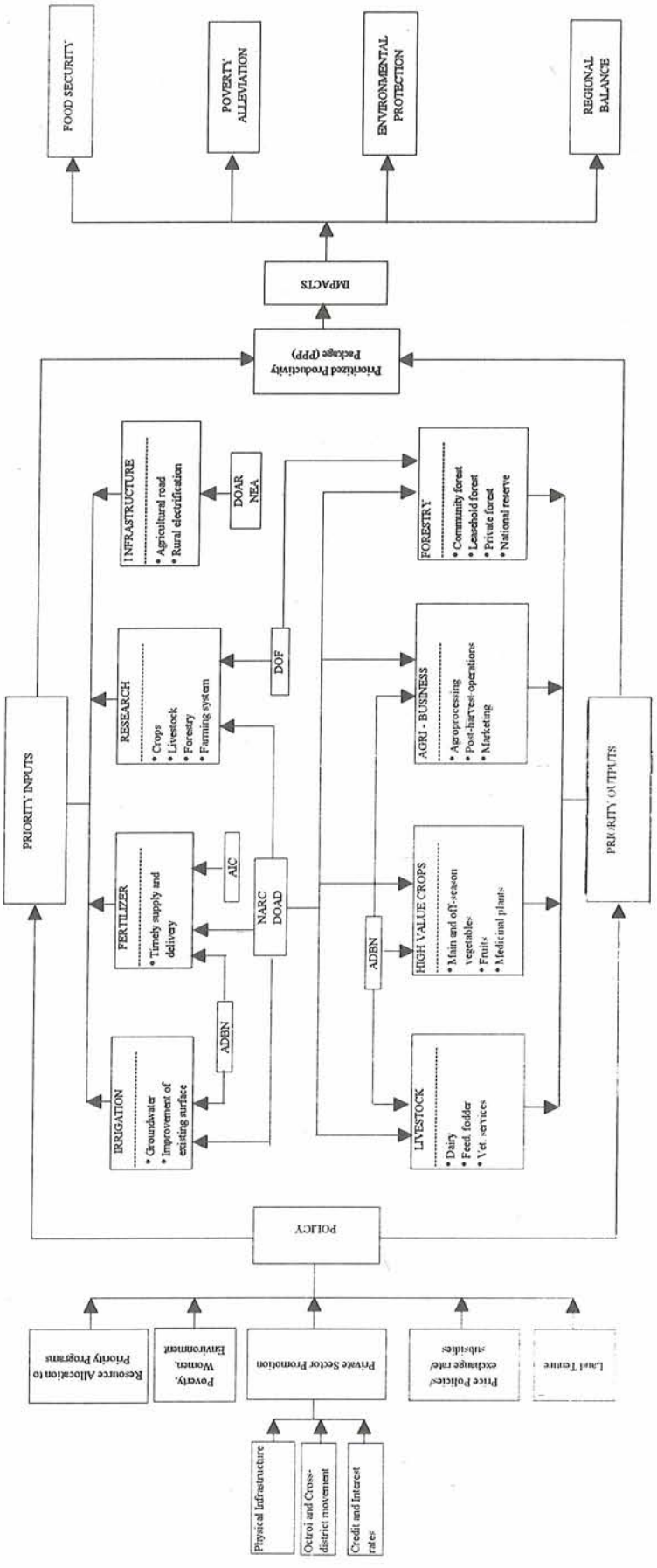


Figure 2-1. A Diagrammatic Presentation of the APP Priorities and Their Linkages

3. ACCOUNTING FOR GROWTH

Growth Accounting Framework

The APP has devised a growth accounting framework (GAF) on microcomputer to estimate the expected impact of its various proposed policy changes upon agricultural growth, as measured by agricultural GDP (AGDP). The procedure consists of estimating the initial contribution (or weight) of each component to AGDP, estimating the growth rate, and updating the weight to the next period. In the process of estimation of the growth statistics of a period, GAF utilizes the information as provided by policy changes during the period and the growth statistics of previous period. The output of GAF, particularly the growth rates, has been utilized to estimate the impact of APP upon poverty alleviation, food sufficiency and employment opportunity.

The GAF is set up to generate growth statistics by ecological zone (mountains, hills and terai), product group (broadly, crop, livestock, forestry and fishery), land type (broadly, year-round irrigated, monsoon irrigated, and unirrigated) and period. The GAF distinguishes a base period, 1991/92 to 1994/95, and four five-year growth periods: 1995/96 to 1999/2000, 2000/01 to 2004/05, 2005/06 to 2009/10, and 2010/11 to 2014/15. The field crop subsector is treated as "supply-driven" in the sense that the main determinant of growth is the capacity to increase production, with the demand side accorded a secondary role. Forestry and fishery are similarly treated as supply-driven subsectors. By contrast, the livestock subsector and horticulture are judged to be "demand driven", which means their growth rates depend on the growth of domestic demand for their products.

Overall Output

Under the APP, the growth rate of AGDP accelerates by almost two percentage points from the nearly 3 percent level of the base period (1991/92 - 1994/95) to nearly 5 percent by 2005/06 to 2009/10, which is the third five-year period of the plan (table S-2). That increases the per capita growth of AGDP for the entire population (which is the correct way to measure agricultural capacity to contribute to economic transformation) from 0.5 to 3.0 percent—which represents a six-fold increase. The plan assumes a decline of 0.5 percentage point in the population growth rate.

The increase in AGDP growth rate from around 3 percent during the base period to around 4.5 percent during the first period of APP appears ambitious but not unreasonable for two reasons. First, the base is low. This can be seen by comparing

the average annual increment of AGDP from one period to another and the corresponding change in growth rates. For instance, an average annual increment of 3.4 thousand million rupees worth of AGDP in the first plan period will change growth rate from around 3 percent to 4.5 percent, while an average annual increment of 4.6 thousand million worth of AGDP in the second period will change the growth rate from 4.5 percent to 4.9 percent. Second, the APP's investment is favorable to growth.

Table S-2. AGDP Growth Rates by Region, 1991/92 to 2014/215
(percent)

Period	*Mountains*	*Hills*	*Terai*	*Nepal*
91/92–94/95	2.58	2.57	3.40	2.96
95/96–99/00	3.68	4.21	4.78	4.45
00/01–04/05	4.44	4.99	4.82	4.87
05/06–09/10	4.79	5.07	4.71	4.88
10/11–14/15	4.94	4.90	4.61	4.76

Source: APP calculations.

Sensitivity Analysis

A critical issue is what might happen to the AGDP growth path if the APP fails to fully achieve its objectives. This issue can be resolved by running GAF under the achieved, or expected to achieve, level of objectives. In this perspective, GAF should remain as a tool in monitoring and evaluation of the APP in future.

To carry out the sensitivity analysis, the GAF has been run under five different cases or scenarios.

- Full APP (APP case)
- Reduced irrigation (RI) case
- Reduced and delayed irrigation (RDI) case
- Reduced and delayed irrigation and reduced fertilizer (RDIRF) case
- No-APP (NAP) case

The APP case and no-APP case are two extreme cases. In the APP case, it is assumed that the full set of APP interventions have been implemented on time and have had the full expected impact within the planned time frame. In the no-APP case, it is assumed that the present policies and priorities will be continued. The GAF shows that the increase in per capita AGDP, a relevant indicator of the impact of the APP on the well-being of the rural populace, in the APP case is about three times the increase in the no-APP case by the end of the APP period. Even the APP case with a reduced impact shows about double or more per capita income increase than the no-APP case does.

Thus although various implementation problems would reduce the impact (or delay the effect) of the APP reforms, even the reduced-impact APP is much better than the alternative no-APP; agricultural income would grow at about double the rate of the no-APP case.

4. PRIORITY INPUT: IRRIGATION

Well-controlled water is essential to reducing risk and to introducing the water regimes of the high-yield crop varieties that drive the green revolution. Year-round irrigation is a prerequisite of the high-cropping intensities that drive rapid output growth once the land frontier has disappeared. Both are necessary to shift to high-value commodities that will soon become the most important source of agricultural growth in Nepal and represent a major portion of the 4 to 6 percent agricultural growth rates that characterize the most successful cases of development.

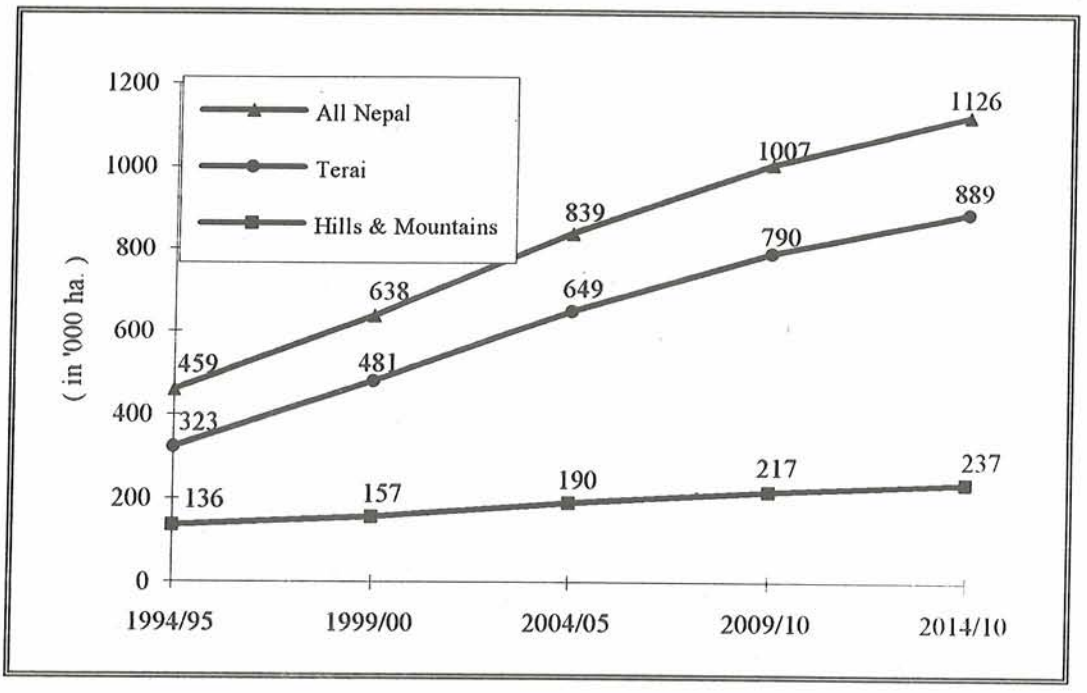
The well-controlled year-round irrigated land, as proposed by the APP, will increase from 459 thousand hectares in 1994/95 to 1,126 thousand hectares in 2014/15 (for details see figure S-2). This calls for an average of 34 thousand hectares per year to be added to the well-controlled year-round irrigated area. During the APP period, the share of the terai in the well-controlled year-round irrigated area will increase from 70 to 79 percent. The groundwater irrigated area will increase from 141 thousand hectares in 1994/95 to 612 thousand hectares in 2014/15, on the average an addition of 24 thousand hectares per year to the groundwater irrigated area (22 thousand of those hectares will be turned over to shallow tubewells and 2 thousand hectares to deep tubewells). At 2.5 hectares per shallow tubewell and 50 hectares per deep tubewell, that translates to 8,800 shallow tubewells and 40 deep tubewells per year, respectively.

During the APP period, the unirrigated area in the terai will decline from 57 to 14 percent of the arable area. In the hills, the unirrigated area will decline from 76 to 67 percent of the arable area. The total arable area in the country will not change, while the total cropped area will increases from 4,103 thousand hectares in 1994/95 to 4,815 thousand hectares in 2014/15, average annual addition of 35 thousand hectares to cropped areas, due to high-cropping intensities.

The APP recognizes that the other priorities are complementary to obtaining high returns to irrigation. Thus irrigation is presented as part of a package of efforts. The key complements in the package are all-weather agricultural roads and electrification, while fertilizer distribution and marketing activities will also be coordinated. The research system will give the highest priority to developing farming systems suitable to the high-intensity farming made possible by well-controlled year-round irrigation, to fertility management, and to a few priority commodities.

Women farmers are to be encouraged and given priority in forming water users groups and in training directed at the organization and management of irrigation systems.

Figure S-2. Growth Path of Year-Round Irrigated Area in Terai, Hills and Mountains and all Nepal



Source: APP calculations.

5. PRIORITY INPUT: FERTILIZER

Under the APP, roughly half of incremental output will be attributable to increased fertilizer use, although well-controlled year-round irrigation certainly becomes a more important contributor to output growth than in the past.

Year-round irrigation will add immensely to fertilizer use by encouraging higher-yielding varieties, increasing the cropping intensity, reducing risk, and thereby encouraging farmers to come closer to the economic optimum usage.

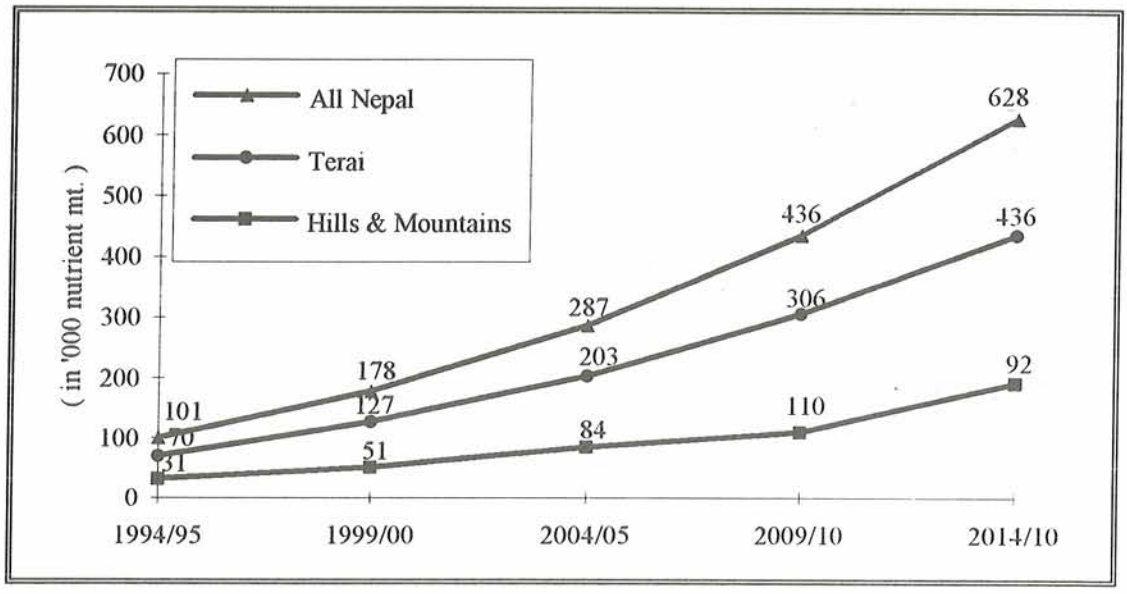
There is a large pent-up demand for fertilizer. The increase in fertilizer use under the APP represents a sharp acceleration of recent trends. From the present 7 percent, this rate increases to 12 percent in the first plan period, declining subsequently to 8 percent in the last plan period. However, these rates of growth are not faster than those achieved prior to the recent slowdown.

The fertilizer use, as proposed by the APP, will increase from 101 thousand nutrient metric tons in 1994/95 to 628 thousand nutrient metric tons in 2014/15 (for details see figure S-3). This calls for an average increment of 26 thousand nutrient metric tons per year. Although the growth in fertilizer use envisaged under the APP is rapid, the final levels that will be achieved at the end of the plan are still modest: 152 nutrient kilograms per hectare in the terai, and only about one-quarter that level in the mountains and about two-thirds that level in the hills. The terai level at the end of the twenty-year plan is expected to be the same as the level reached in Punjab, India, in the last half of the 1980s.

These substantial increments in the tonnage of fertilizer used per year cannot be achieved unless there is a favorable policy environment and a well-developed institutional structure in the private sector. The growth in fertilizer use is so important that the APP gives special attention to public policies to ensure that these systems are in place and will work effectively. It also sets essential research and extension priorities to provide knowledge of proper organic, nutrient balance, and other management practices.

The large subsidies that fertilizer receives from the government will be difficult to expand at the rate at which fertilizer use must increase–and which currently serves perversely to restrict fertilizer supply. If the price were to rise by the full amount of the subsidy, however, the pent-up demand might at least temporarily disappear, and the price would be far higher than the relevant border price, namely, with India.

Figure S-3. Growth Path of Fertilizer Use in Terai, Hills and Mountains and All Nepal



Source: APP calculations.

The environmental impact of the levels of fertilizer use envisaged in the APP will be highly favorable. They will allow increased intensification on the better soils and flatter lands and thereby relieve the pressure on land that is damaged by arable cropping.

Fertilizer use cannot be expected to undergo a rapid expansion without an equally rapid development of private sector distribution. That calls for the immediate removal of the current policies that are unfavorable to private sector fertilizer distribution and for specific public actions to assist the private sector.

Privatization

The following recommendations are made to promote private sector participation in fertilizer trade.

- The ADBN should be opened to large-scale borrowing by fertilizer distributors seeking working capital and to off-lending to small farmers.
- Obstacles should be removed that are preventing the AIC from selling to private dealers.
- Various district-level restrictions on private dealers should be removed.
- The public sector must pursue policies designed to build a public-private partnership in accelerating growth in fertilizer use.
- AIC will promote and monitor fertilizer use; hold stock, and forecast seasonal, annual and five-yearly fertilizer demand.

Subsidy

The appropriate border price of fertilizer in Nepal is the Indian border price, which is substantially subsidized. That is the dominant factor in determining fertilizer pricing and subsidy policy in Nepal.

The current fertilizer subsidy policy of the government has hindered rather than facilitated the supply of fertilizer in the country. The government sets the subsidy rate and financing, and in effect, the quantity imported and supplied conforms. That circumstance must change.

Nitrogen use is highly profitable without subsidy. Thus removing the nitrogen subsidy would relieve the government of a major fiscal cost and in theory would not greatly reduce fertilizer growth. Nevertheless, in practice, the economic shock of suddenly removing the subsidy to fertilizer use at a critical juncture in the APP is a risk not worth taking. The following recommendations are made with regard to fertilizer subsidy.

- Fertilizer subsidies should be gradually removed by clear steps, and in their place policies need to be introduced that will create a strong demand. However, the extent to which this policy can be implemented will be influenced by Indian policy.

- In the case of nonsubsidized fertilizer, prices should be decontrolled immediately. In the case of subsidized fertilizer, sufficient finance needs to be provided to see that domestic sales prices are kept no more than 15 to 20 percent higher than the Indian border prices. The APP recommends continuation of the transport subsidy to inaccessible hill and mountain districts.

- While the subsidy remains, an annual subsidy amount should be set for the year. The AIC would then estimate total consumption for the year and would calculate and widely publicize the subsidy per bag of fertilizer.

6. PRIORITY INPUT: TECHNOLOGY

In giving priority to improved rural transport systems, the APP recognizes that the rapid spread of improved technology brings increased specialization and requires low transactions costs. And in giving priority to fertilizer and well-controlled year-round water, it recognizes that these are the key inputs in which improved technology is embodied. The "green revolution" envisaged by the plan is a short-hand for the dynamic process of constantly developing, improving and disseminating agricultural technology suitable specifically for Nepal.

Priorities

The fertilizer-environment nexus:

- A production-oriented, applied research program on increase in fertilizer efficiency through proper timing and placement, complementary use of organic fertilizer, proper balance of nutrients, and attention to trace element deficiencies, keyed to the differing land utilization categories.

- An intensive extension effort backed by a large number of field trials and close links to the research system.

- A special training effort in soil science and fertilizer management to meet these increasingly complex needs and to rectify the existing imbalance.

Cropping systems for shallow tubewells: In the terai, shallow tubewells are used only for 200 hours per year, far lower than in comparable areas elsewhere. The problem can be resolved in part through research and extension on appropriate farming systems. As APP gets under way, the demand for livestock will grow rapidly and increasing attention will have to be given to high-quality fodders and associated nutrition research.

Commodity-specific programs: In the terai, the major field crops will remain (rice, wheat, maize, potato), to be joined by increasingly important fodder crops. Commodity programs must therefore assign integrated multidisciplinary teams well versed in the geographic diversity of product needs to specific research stations across the terai. The international centers focusing on the four dominant field crops of Nepal should plan an important role in cooperation with the national system.

The APP specifies a clear progression of specialization into a limited number of lead and target commodities for the hills and mountains. Initially, citrus will be the dominant high-value commodity in the hills. Apples, already prominent in the

mountain regions, will become even more important there as the transport system opens up. Vegetables, including vegetable seed, are also important and will grow rapidly. Bee keeping is complimentary to the horticulture industry. Sericulture, although still a small industry, fits into the environment and has special spinoffs for the poor and for women. The commodity research must focus on these activities, particularly in the hills, and perhaps some of it can be transferred to private trade associations.

The livestock subsector is critical to the long-term, high growth rates of the APP The dairy component is by far the most important subsector of livestock and should be a high research priority. Such studies should emphasize animal nutrition and allied management and animal health problems. Only after considerable progress has been made on the animal nutrition front will research priorities shift to breed improvement.

Marketing and Processing: As the growth of high-value commodities and agribusiness accelerates, it will be essential to increase research in marketing and processing. NARC needs to fit that prominently into its priority commodity programs and farming systems research.

Key Issues

Borrowing from India: Nepal's capacity to borrow from India and other countries and international research centers is critically determined by the quality of its own national research system. Thus it is necessary first to establish a solid research and extension system.

Rate of return: The rates of return on agricultural research expenditures are demonstrated to be quite high both in Nepal as well as elsewhere. Since the total expenditure on research in Nepal is low, however, the aggregate impact has been small.

Level of expenditure: The amount Nepal spends per agricultural research worker is only one-quarter as much as that spent in Indonesia, and half that spent in India. Agricultural research expenditure in Nepal in real terms has actually declined by 10 percent in the past five years. On the other hand, research is far cheaper in Nepal than in other countries. That of course assumes that the research resources are allocated sensibly to areas of high priority and that the administrative problems are resolved. According to the target set by the FAO, Nepal needs to double its real research expenditure. That seems conservative, given Nepal's comparative advantage in agricultural research, its excellent and responsive agricultural resources, and the central role of agriculture in its future growth, poverty reduction, and environmental objectives. At present, much of what Nepal calls research expenditure goes to support farm operations such as running nurseries and various other nonresearch activities. These must be divested as soon as possible so that the research system can focus on true research. The APP has proposed a program of doubling the research budget over an eight-year period.

Thereafter, the system needs to grow at least at the rate of AGDP–which is expected to be 5 percent per year in real terms.

Reforms

For the past few years, the focus of the Nepal agricultural research system has been on organizational matters to the exclusion of implementing steps to permit sharply focused research with accountability. The following key steps are necessary.

- A clear, small set of research priorities should be established and top-quality research teams organized around them. The teams must represent a full set of disciplines: for example, economists would be on the farming systems and fertilizer teams, and marketing and processing persons would be on the various horticulture teams.

- A set of monitoring systems is needed to ensure quality control. These should include sample surveys to ascertain the extent to which farms are changing their farming systems, using fertilizer, and introducing new varieties and complementary practices. Farmers must be drawn into the monitoring process.

- The central administration of the NARC would be concerned with quality control and refining the priorities. The actual research would be delegated to the individual research stations and teams.

- The system now has far too many research stations to allow each to be staffed with the quality of personnel that would make such decentralization work. The APP, on substantive grounds, recommends five stations in the hills and mountains, but in the short run three–Lumle, Pakhribas, and Khumaltar–may have to suffice. The APP recommends four stations for the terai, one of which would involve close liaison with the Institute of Agriculture and Animal Science (IAAS). Meeting the challenges of the APP entails reducing the number of species studied per station and a significant increase in the funding allocated per hectare and per worker.

- Many issues relating to women require considerable research. It will be particularly important to better understand women's time allocations and the input of labor-saving devices, particularly for household and livestock activities.

- The extension system must have the same substantive priorities as the research system—those priorities emanate from the agricultural strategy. Mechanisms need to be developed to integrate research and extension, farmers including women, and NARC, IAAS and other national research agencies.

7. PRIORITY INPUT: ROADS AND POWER

Roads

Rural growth cannot proceed without technological change, specialization, and commercialization, and for those to occur transactions costs must be reduced. A road is the first and most important step toward reducing those costs.

Besides, modern rural development requires educated people to staff village-based development institutions in both the public and private sectors. Key social institutions such as schools, health clinics, and family planning centers are just buildings without competent staff. Yet the qualified people are unlikely to want to live in a village without good transportation to urban areas. Empirical evidence has demonstrated a significant relationship between rural roads and rural development.

The APP sees a special need for roads in the terai, to facilitate drilling and maintaining shallow tubewells, and in the hills, to facilitate marketing and agribusiness activities associated with the high-value commodities that are the foundation for income increases under the plan. Thus the road program of the APP is critical to regional balance.

Road density in rural Nepal is one of the lowest in the world (only 5 kilometers per 100 square kilometers). Large sections of these scanty roads are virtually unusable due to poor maintenance. As the surrounding grid of agricultural roads is still meager, the volume of traffic on the existing roads is quite low The lack of maintenance and the absence of all-weather agricultural roads to connect farmers to their markets has greatly reduced their impact. This considerably explains the poor development of the rural areas.

Rural road investments are expensive. They are economic only if payment can come jointly from increased agricultural, residential consumer, and business use. Under the APP, the basic stimulus for increased consumer incomes and rural business is increased agricultural productivity.

The APP draws attention to the essential need to institute policies, reorient institutions and reallocate resources to ensure timely and effective maintenance of all roads. Then, the APP recommends that all of the terai should be serviced with all-weather agricultural roads, and that those hill regions with district-level roads should receive a full grid of agricultural roads. Those networks are to be completed in the first ten years of the plan, with the second ten years devoted to expanding hill and mountain district and trunk roads, and their related agricultural road networks.

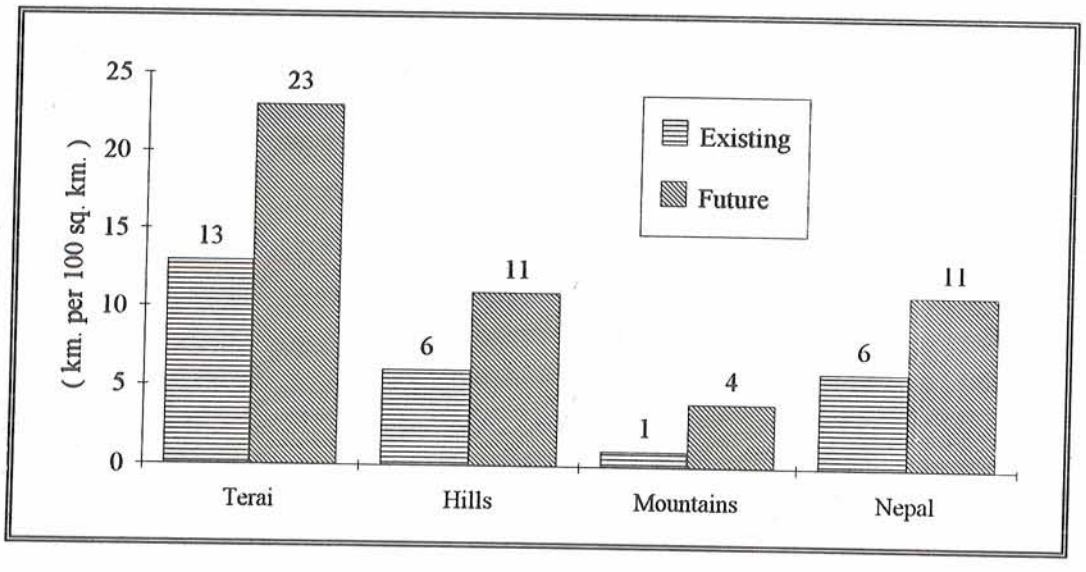
Network: For the terai, the APP recommends a road density of 22 kilometers per 100 square kilometers of mapped agricultural land, which is 50 percent higher than at present. A dirt road is to connect the villages that are not on the all-weather roads. Thus the length of the agricultural roads in terai comes to 3,400 kilometers, of which 1,900 kilometers are paved and 1,500 kilometers are earthen village access roads.

In the case of the hill and mountain districts, it is proposed that Nepal complete the missing links to district headquarters and provide 1,950 kilometers of agricultural roads in the hill districts and 850 kilometers in the mountain districts. These figures give road densities of 11 kilometers per 100 square kilometers of mapped agricultural land for hill districts and 4 kilometers per 100 square kilometers of mapped agricultural land for mountain districts.

All the terai roads are to be built in the first ten years of the APP. About two-thirds of the hill roads and about 40 percent of the mountain roads will be constructed in Phase I of initial ten years, and the rest in Phase II, after additional district roads are completed.

The twenty-two districts that do not now have district roads will need an additional 1,837 kilometers of roads to connect their headquarters. These roads are not included in the cost calculations. The existing and proposed future road density by region in shown in figure S-4.

Figure S-4. Road Density by Region, Present and Future (after 20 years of APP)



Source: Department of Roads. 1991. Nepal Road Statistics; and APP calculations.

The APP gives high priority to completing the Karnali Highway. Since this will be a long-term project, a light-duty ropeway with an annual capacity of 2,400 tons is proposed as an interim connection between Dailekh, Jumla and Manma.

Institutions: The Department of Roads is oriented toward building and maintaining trunk and district roads. Construction of local roads presently falls under the responsibility of the Ministry of Local Development through the District Development Committees which seriously lack technical capability Given the immense magnitude of agricultural roads to be constructed in the districts, and the fact that the existing institutional provisions are grossly inadequate to meet this challenge, it is proposed that a Department of Agricultural Roads be formed within the Ministry of Local Development.

Power

Rural electrification is generally associated with high agricultural growth rates. Rural electrification strengthens consumer incentives to farmers and plays a key role in the growth of employment-intensive small and medium industries. The most critical function of rural electrification is to provide power for the electric motors operating shallow tubewells.

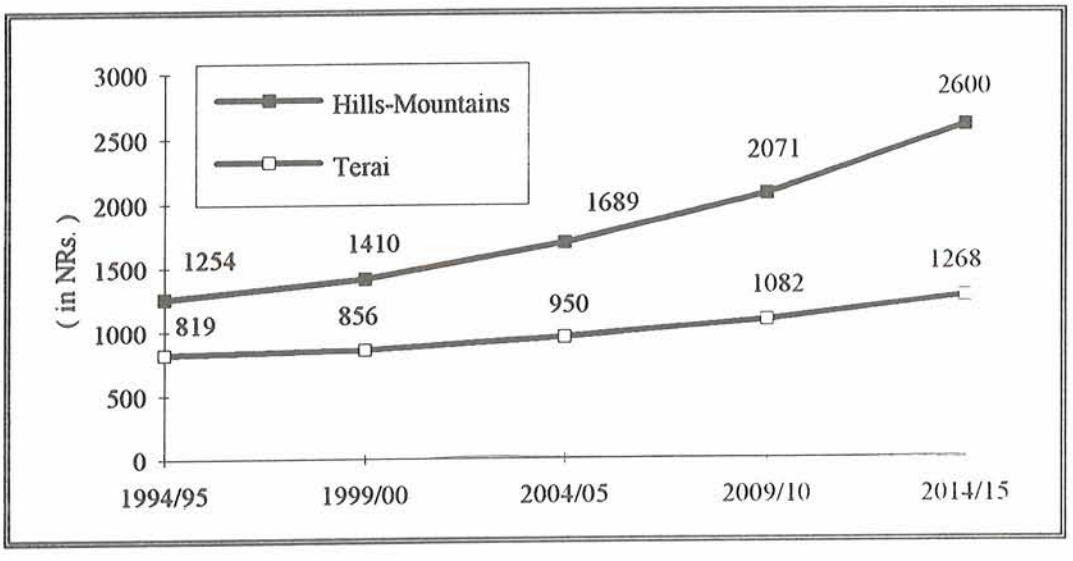
However, in view of the current power shortage, no expansion of rural electrification is envisaged in the first five years of the APP. It is nevertheless essential that every approach promising rapid progress be pursued vigorously. That includes private power generation; private, community, and cooperative distribution; and any other approaches that seem promising.

8. PRIORITY OUTPUT: LIVESTOCK

The livestock sector is a fast-growing sector accounting for a substantial share of overall growth. The growth of this sector is demand-driven. At present, the sector is growing slowly because the growth of per capita income is stagnant, one consequence being the current surplus of milk. The demand for livestock products is highly elastic with respect to per capita income. Thus as income growth accelerates under the APP, there will, after a modest lag, be an explosive growth in the demand for livestock products.

Under the APP, the growth rate of the livestock sector will increase from 2.9 percent at the base period of the plan to 6.1 percent at the end period of APP. The share of the livestock sector to AGDP will increase from 31 to 33 percent during the same period. Livestock are more dominant in the hills and mountains than in the terai and the APP envisages a somewhat higher growth rate in the hills and mountains. As a consequence, the per capita livestock GDP at the end of the plan in the hills and mountains will reach twice as high as in the terai (figure S-5).

Figure S-5. Growth Path of Per Capita Livestock GDP in Terai and Hills and Mountains



Source: APP calculations.

The livestock sector can only achieve high growth rates if the expansion in crop production, the multipliers to the other sectors, and the growth in livestock production itself propel higher per capita incomes.

Livestock growth plays an even more important role in reducing poverty and enabling women to participate in the force. It is the most important context for

mainstreaming rural women in development. It will also help Nepal achieve the regional balance objectives of the APP.

The livestock sector objectives will require an immense effort by the private sector and strong complementary public sector activities. Roads will be the most important public sector investment for the development of the livestock sector.

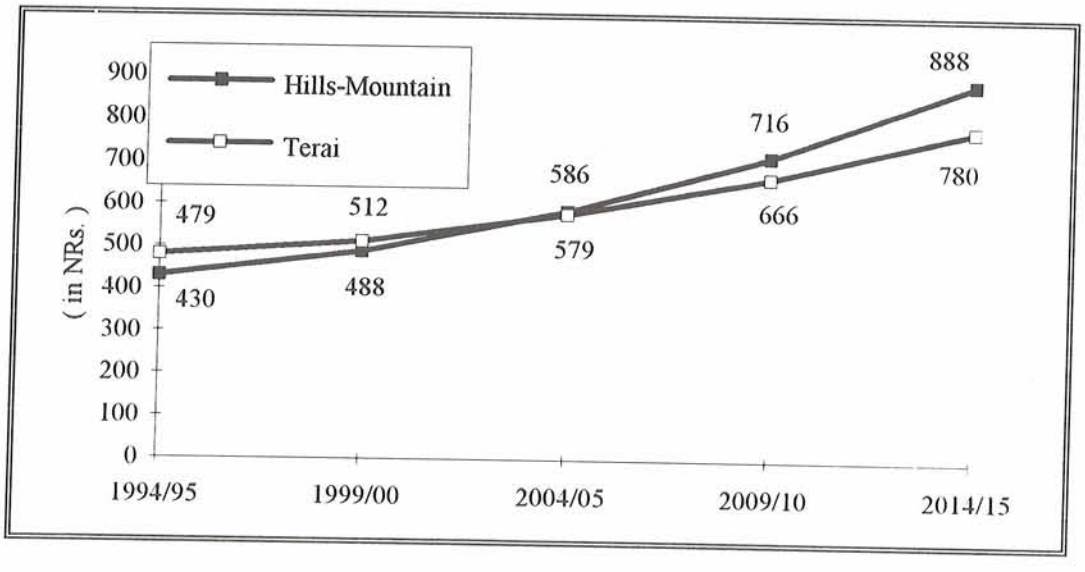
Commodity Priorities: Milk and the associated meat production are by far the most important priority items. Initially, growth efforts will focus almost exclusively on milk animals, with an emphasis on animal nutrition, feed supplies, veterinary services, and marketing. The third priority is to expand poultry production, which has already shown rapid growth, followed by goats, the fourth priority.

9. PRIORITY OUTPUT: HIGH-VALUE CROPS

Over the course of the APP, the income from high-value crops is expected to triple. The annual growth rate of these crops will accelerate from 4.8 percent during the base period to 5.8 percent during the end period, while its share in AGDP will increase from 13 to 15 percent during the same period. The production may expand at possibly even higher rates than predicted because high-value crops have strong export potential. Indeed, their development requires an export-driven strategy. It shows great potential as a provider of off-season vegetables, and thereby illustrates the strategic complementarity between the terai and the hills and mountains.

Horticulture is more dominant in the hills and mountains than in the terai and the APP envisages a somewhat higher growth rate in the hills and mountains. As a consequence, the per capita horticultural GDP in the hills and mountains will be higher than that in the terai after the second period of the APP (figure S-6).

Figure S-6. Growth Path of Per Capita Horticultural GDP in Terai and Hills and Mountains



Source: APP calculations.

The growth rate for horticulture is considered as demand-driven. Horticultural crops are risky enterprises and the policies for the sector will have to deal with risk minimizing measures through research, infrastructure, strong support services, and credit programs.

The APP strategy for the high-value crops sector is a private sector strategy. The role of government agencies, while important, is small. The strategy emphasizes raising incomes, and hence effective demand; investment in roads to increase the

regional participation in high-value crop production; investment in irrigation to reduce the risks in high-value commodities; strong research support, again to reduce risk; and strong support of the Department of Agricultural Development in several activities, primarily to assist private sector development.

Tree crops are a major component of high-value crops and of course have a favorable environmental impact, particularly on hill slopes. Similarly, women play a vital role in the production of all high-value commodities, most notably in sericulture, vegetables, ginger, and vegetable seeds.

Commodity Priorities: The APP priorities limiting the number of commodities emphasized to allow scale economies include:

- citrus, throughout the mid-hills;
- apple, in the inner Himalayan zone,
- off-season vegetables in the hills as well as the terai;
- vegetable and flower seed in the hills and mountains;
- beekeeping products in the hills and mountains; and
- raw silk in the hills.

10. PRIORITY OUTPUT: AGRIBUSINESS

In the latter stages of the APP, as much as two-thirds of the incremental agricultural growth comes from livestock and high-value crops. That growth is essential to the plan's objectives regarding regional balance, poverty, women's participation, and the environment. Where high-value commodities are concerned, it will entail agribusiness development that is far more complex than for food staples and that emanates from a far smaller initial base of enterprise development and experience. Thus a question that poses a major challenge to APP implementation is how to accelerate these private sector efforts.

Nepali entrepreneurs clearly recognize what they urgently need from the public sector:

- better maintained roads and a larger grid of agricultural roads;
- reliable supplies of electricity; and
- appropriate research.

The gross deficiencies in each of these areas explains much of the slow growth of agribusiness in the past.

Significant policy changes are needed to foster agribusiness development, including a specific commitment to the industry, transparent and stable tax structures, transparent rules and regulations, and a commitment to improving quality through enhanced grades and standards.

The agribusiness sector provides opportunities for women farmers to achieve some degree of economic independence. Agribusiness sectors in which women dominate include sericulture, dry ginger (*sutho*) processing, cardamom drying, fruit processing, cut flowers, and saffron. There is considerable need for research and technology policy that deliberately involves women in every aspect of research by relating to their specific socioeconomic and agroecological conditions. Similarly, training policy must identify the specific training needs of different categories of women.

The active participation of farmers' associations and NGOs is very crucial in the development of agribusiness. Besides, policy reform is essential toward establishing an environment conducive to private sector investment in expanded market support services and infrastructure.

11. PRIORITY OUTPUT: FORESTRY

The APP has identified four top forestry priorities:

- community forestry in the hills and mountains;
- commercial management in the terai;
- private and leasehold forestry;
- and training, research and development.

In addition, it supports the development and management of forage and pasture areas with a view to enhancing production from the livestock sector.

Silvicultural activities need to be incorporated in the operational plan of the community forests. The community also needs proper supervision and technical guidance in implementing the operational plan.

The forestry extension service needs to be enhanced considerably. It is suggested that demonstration plots be laid out in different community forests with the help of the communities themselves.

The procedures involved in harvesting, transporting, and selling forest products from private, leasehold, and community forests continue to be cumbersome. A new forest act and by-laws will no doubt alleviate this problem. The process of transporting products from such forests to any part of the country still needs to be simplified. The sale of surplus products should be promoted.

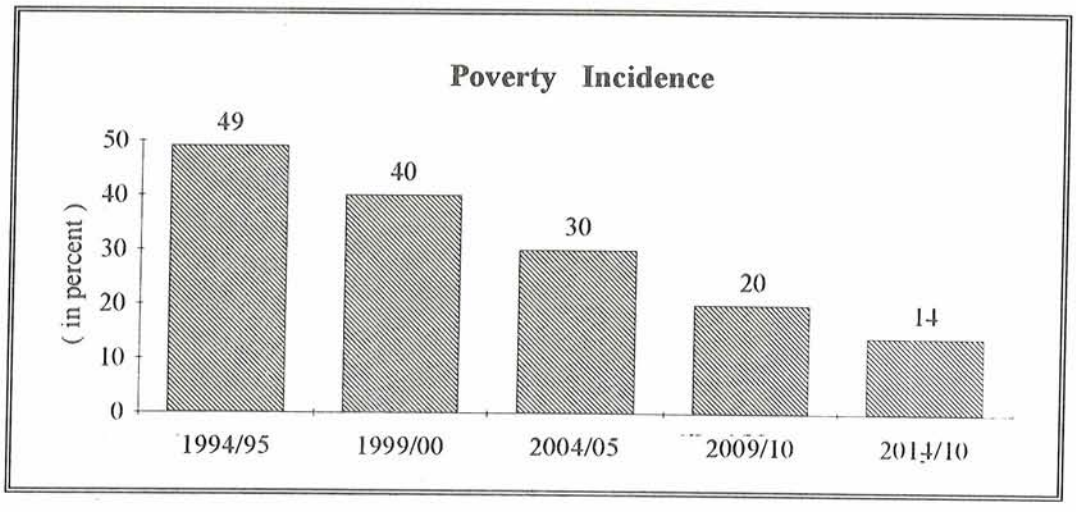
Commercial management of state forests needs strong political and administrative commitment. This type of management is based mainly on clearing the area to encourage natural regeneration. In the past, crop regeneration has been thwarted by problems of encroachment, damage, and destruction.

Encouragement of private nurseries to produce the necessary standard seedlings, review of the existing practice of providing subsidized timber to meet social objectives, legal reforms to resolve the existing conflicts in different laws, measures to improve the efficiency of the forestry staff, availability of credit for viable large-scale forestry projects, research to generate suitable technological packages, and reassessment of the contribution of the forestry sector to the national economy are some of the key recommendations made in the plan.

12. IMPACT: POVERTY AND FOOD SECURITY

The effect of the APP on rural poverty will be dramatic. The poverty incidence will decrease from 49 to 14 percent during the APP period (see figure S-7).

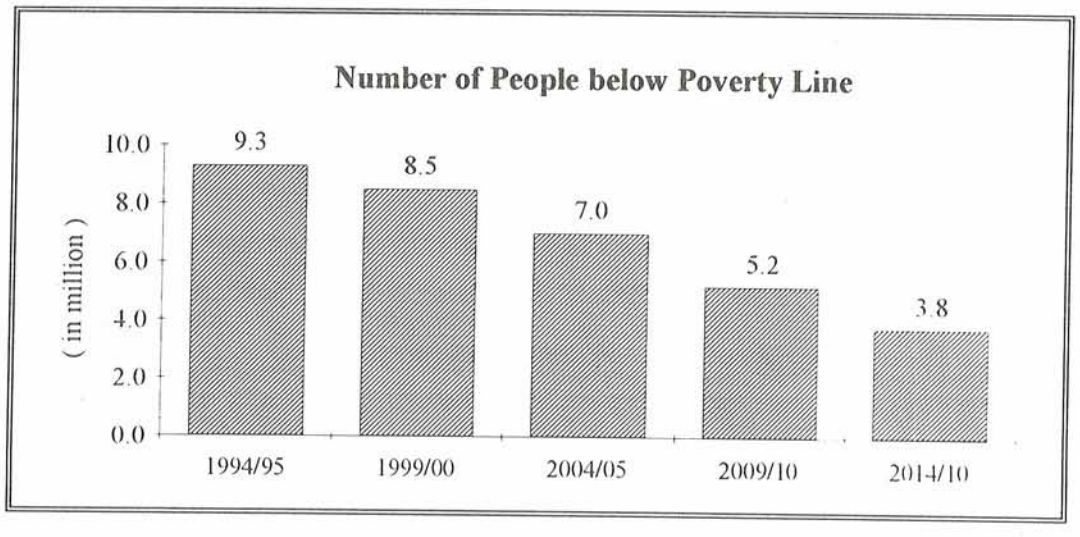
Figure S-7. Poverty Incidence in Rural Nepal, 1994/95 - 2014/15



Source: APP calculations.

In terms of absolute figures, the number of people below the poverty will decrease from 9.3 million to 3.8 million (see figure S-8). The decline in poverty is roughly similar in the hills and mountains (see annex-I).

Figure S-8. Trend in the Number of People Below Poverty Line in Rural Nepal



Source: APP calculations.

In the framework of such a major reduction in poverty through growth, programs targeted to specific pockets of poverty can be highly effective. Conversely, without the broader context of poverty-reducing growth, the allocation of resources to specifically targeted programs will prove to be a mere palliative.

High on the APP's list of urgent actions are measures to remove the greatest barrier to participation of the poor in growth processes—the geographic exclusion that arises from poor physical infrastructure. Provision of all-weather roads to the villages is a central priority of the APP.

The APP recognizes that uncertain land tenure institutions and the fragmentation of farms make it difficult for the poor to participate in the efforts to increase agricultural production. Thus it has strong recommendations in these two areas as part of the package approach to the plan.

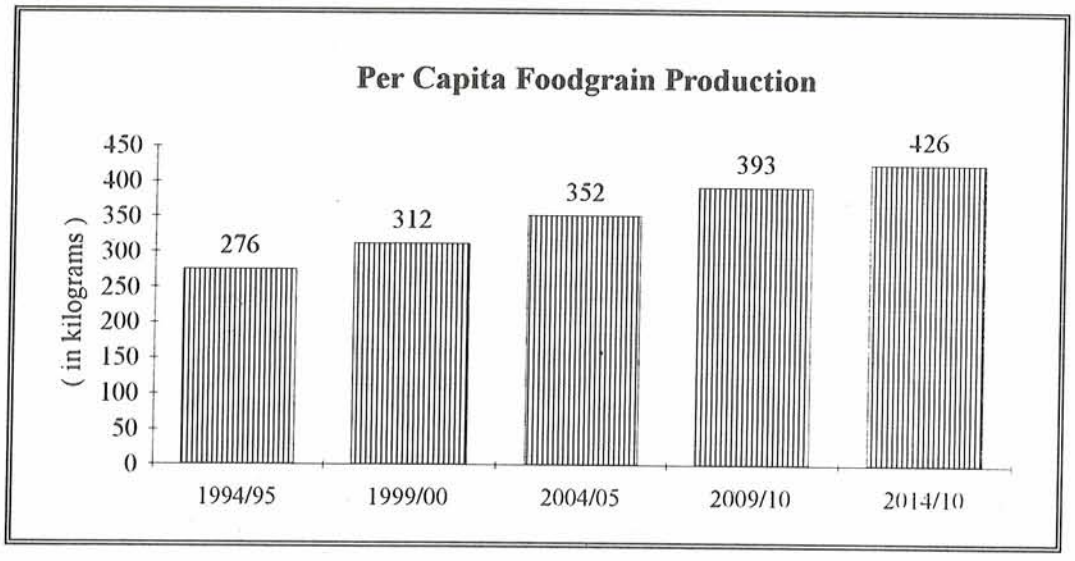
Livestock, particularly dairy production, is a major source of income for women and represents an important focus in the APP. High-value crops and agribusiness have a similar potential. Special attention is also given to women's participation and leadership in all other aspects of the plan, including credit, extension services, and research.

A large number of the poor have small farms (more than two-thirds of rural households own less than half a hectare of land). The crop intensification process of well-controlled year-round irrigation, increased yields per hectare, increased cropping intensity, and high-value crops and livestock all radically decrease the size of farm needed to lift a family above the poverty line. The plan is specifically directed toward the needs of these small farms. In other words, the APP is designed to encourage those activities that skew the income distribution toward the poor, particularly toward poor women.

The APP recognizes that the lack of food security is the most common symptom of poverty. The agricultural production plan will return Nepal to its previous net exporting condition for major cereals (see figure S-9). That will make the supply of cereals more certain. Technological innovations will shift the supply curve to the right and cereals will be lower priced than under present circumstances. The plan also recommends organizing poor rural people to administer food security programs and to otherwise ensure their participation in the broad growth process that characterizes the APP. For the regional growth of per capita food grain production see annex-I.

Landless and other chronically resource-poor households that are least affected directly by agricultural growth need special attention while employment opportunities in large farms and in nonfarm sectors are developing. Interventions to facilitate access to land is one of the options available to address the equity issue in agricultural growth. Indeed, land redistribution and the regulation of tenancy contracts are favored both on equity and efficiency grounds. Land redistribution has the potential to increase output and equity: hence the case for more equal distribution of land. In Nepal, 44 percent of holdings have less than 0.5 hectare and own only 11 percent of the total farm area.

Figure S-9. Per Capita Food Grain Production in Rural Nepal



Source: APP calculations.

Malnutrition is mostly a consequence of poverty. Much of the malnutrition problem stems from poverty-related under-consumption of protein and energy. Higher incomes through accelerated agricultural growth and expanded economic activity allow people to a more balanced diet. Availability of food basket will continually change under the APP proposed growth—cereal-led growth initially with a gradual diversification to livestock and horticulture-led growth. As rural per capita income or AGDP begins to increase, the demand for income elastic livestock and horticultural commodities will increase faster than that for cereals, thus favoring the move toward a balanced diet. Availability of an adequate consumption basket and people's access to it need to be ensured, supplemented with awareness and consumer education addressing nutritional knowledge. Access to food is necessary for reducing protein-energy malnutrition while awareness and education are necessary to reduce the deficiencies of key micro-nutrients, vitamins and minerals.

In order to ensure household food security, the APP recommends supplemental activities such as mobilization of NGOs in reaching the targeted population, enhanced labor-intensive public works programs, and maintenance of food security stock at strategic locations.

13. IMPACT: ENVIRONMENT

The proposed APP land-use changes will have a profoundly favorable effect on the environment. These changes are guided by the principle that sustainable development means helping the present generation meet its needs without compromising the ability of future generations to do so. The challenge for Nepal is to accelerate agricultural growth while avoiding the degradation and pollution of the country's natural resources.

The APP recommends high input intensity on more environmentally robust land. As farmers' incomes rise in response to that effort, it becomes possible–and indeed desirable–for individual farmers to withdraw environmentally fragile land from arable agriculture. The plan also emphasizes high-value tree crops, including tree orchards, and community forestry, both of which will further hasten the withdrawal of environmentally fragile lands from cultivation. This strategy helps increase the habitat of wildlife and areas of undisturbed species development.

To facilitate optimal land use, the APP focuses on improving transport and increasing commercialization. Commercialization shifts the emphasis to fruit trees, grasses for livestock, and land use based on sound ecological principles.

The APP emphasizes integrated pest management (IPM) to reduce pesticide use. In the long run, some land will receive levels of fertilizer that could pollute groundwater. Subsequently, research, extension, and input delivery systems must be tuned to the efficient use of fertilizer. That includes emphasizing the complementary relationship between organic and inorganic fertilizers, testing soil and groundwater to diagnose problems and design solutions, acquiring a better knowledge of soil chemistry and physics, and effectively disseminating improved practices to farmers.

In recognition of the importance of forestry and the increase in forest area that will naturally derive from the plan, the APP places high priority on community forestry, particularly in the hills, and on commercial development of the sal forest in the terai.

Other environmentally positive consequences of the APP include poverty reduction, better land use, and dispersed urbanization. The plan puts a major emphasis on environmental education to impart knowledge on the linkages and interdependence among land use, agriculture, forest and water, and the effects of agrochemicals on the environment and human health.

14. IMPACT: HILLS AND MOUNTAINS

The hill and mountain areas must remain an active participant in Nepal's growth strategy if overall GDP is to continuously grow at a high rate and if people are to have the income base to spontaneously maintain or restore natural resources. At present, the hills and mountains contribute more than half of agricultural GDP, while the per capita income in the rural hills and mountains is only 55 percent of the national average. If these populations do not become an active part of the *solution* to Nepal's development challenge, they will pose a growing *problem* for the terai region and for government planners. They must not be left out of the development process.

The strategy for the development of the hills and mountains calls for a demand-led commercialization of agriculture in these regions with the selection and promotion of a small number of priorities wrapped in a **prioritized productivity package**. The strategy emphasizes partnership between the public and private sectors for generating maximum economic productivity. The strategy adopted in the APP has been demonstrated to be successful under similar conditions elsewhere in the neighboring countries, as well as in numerous pockets of success in Nepal—e. g., within the Rapti Zone, Madan Pokhara (Palpa) and Ilam.

Four key strategic thrusts for the hills and mountains are:

- locating the production of lead commodities;
- developing the requisite agricultural infrastructure;
- technology development and purchased inputs; and
- institutional evolution.

The APP identifies a selected number of potential high-value lead commodities in different hill and mountain ecological planning units (EPUs) allowing for substantial economies of scale in agronomic and marketing research, extension information, processing, and commercialization. The key high-value crop commodities targeted for the hills are citrus, off-season vegetables and vegetable seed, apiculture (as a complement to orchards), and sericulture as a "newcomer" In a parallel fashion, the key high-value crops for the mountain region are apples and vegetables, and potato seeds. Dairy animals constitute the principal lead commodity in the hills, whereas dairy including yaks, sheep and goats are the lead commodities in the mountains. For reasons of food security and risk management, the total percentage of land of a given type devoted to high-value commodities will remain modest, while the cash generation will be large.

Success in the promotion of the potential lead high-value commodities in the hills and mountains is critically dependent on the concurrent expansion of agricultural infrastructure (roads, electricity, and irrigation). Appropriate technological packages must be developed and disseminated as an integral element of the priority package. Main agenda for research would include soil fertility, the four dominant food crops and the priority high-value commodities. For the latter, emphasis is called for on post-harvest handling, processing, packaging, and marketing, all associated with the lead commodities.

Jumla has been identified as a key growth center in the mountains. The APP therefore proposes that a district market road as well as an interim light ropeway be constructed in this area as quickly as possible.

The APP further recommends that roads, irrigation, collection structures, and markets be built and maintained through popular participation, and these be linked to the cash-crop season.

15. IMPACT: TERAI

The APP strategy for the terai is quite different from that for the hills and mountains. The priority package for this region emphasizes foodgrain production and the interdependence of the terai and the hills and mountains.

The terai is the prime candidate in Nepal for a green revolution. This region has abundant irrigable land and good groundwater potential, the scope for developing a cost-effective infrastructure, the capacity to adopt technology from elsewhere and to make indigenous breakthroughs, and access to markets both within and outside the country.

The main obstacles to terai development are the lack of all-weather roads, which makes it difficult to move inputs (mainly fertilizer) and outputs during the rainy season; the lack of well-controlled year-round water; which prevents cropping intensity from increasing; the lack of proven technology; an ineffective extension system; inadequate institutional support; land degradation due to poor soil management; absentee landlordism; and a large number of unproductive animals.

The terai strategy comprises a small number of discrete parts that form a package designed to take advantage of their synergism. Under the plan, districts select a block that is best placed to provide quick returns. After making sure that the full set of priority elements are in place in that block and that those elements will be maintained, districts then move on to the next block. Several conditions apply to the blocks in each package: they must have groundwater potential, land reform must be implemented, land consolidation must be promoted, the agricultural road grid must be upgraded in scope and quality, the Agricultural Development Bank of Nepal and private well-drilling agencies must work together to find rapid solutions to well-drilling problems, the Nepal Agricultural Research Council and Department of Agricultural Development must help farmers develop high-intensity farming systems, and the Agricultural Development Bank of Nepal must work with private fertilizer distributors and the AIC to ensure the timely availability of fertilizer. In addition, the NARC and DOAD must ensure that farmers are aware of appropriate fertilizer practices and high-intensity farming systems for shallow tubewells.

The terai development strategy is essentially an input-driven food grain strategy in that foodgrains will be the predominant commodities produced in this region. The prioritized productivity package for the terai has thus been designed around this basic concern. The region has the potential and comparative advantage in producing food grains in achieving national food grain self-sufficiency.

The terai development strategy has three key elements:

- development of rural infrastructure (irrigation, road construction, and electrification);
- technology development and purchased inputs; and
- institutional support.

Rural infrastructure: Under the APP, the irrigated area in the terai will expand from 40 percent of the arable area at the beginning of the plan to almost 86 percent at the end. More than 80 percent of the additional area to be brought under irrigation will be from groundwater, with the help of about 188,000 shallow tubewells, and 800 deep tubewells.

The plan calls for the construction of 3,400 kilometers of agricultural roads in the terai, of which 1,900 kilometers will be paved and the remaining 1,500 kilometers will constitute earthen village access roads. All the roads will be built in the first ten years of the APP.

The APP clearly gives high priority to rural electrification. The current inadequacies of the power supply, however, make it necessary to postpone the start of electrification until the second five-year period of the plan.

Technology and inputs: In view of the high growth rates set for shallow tubewell development, research and extension efforts need to be expanded immediately to prepare farming systems for shallow tubewells. The focus on technology will also include expanded research and extension efforts pertaining to the present major field crops (rice, wheat, maize, and potato). After the first five years of the plan, emphasis will include dairy animal nutrition, particularly fodder crop production and utilization.

The results envisaged by the APP can only be realized if the productivity of the existing area is increased through the use of well-controlled year-round water, increased cropping intensity, high-yielding varieties of seeds, and the application of chemical fertilizer augmented by organic manure. Fertilizer is an essential part of this package.

Institutions: Only a small number of priority institutions are specified for the terai development strategy. These include the National Support Committee, Agricultural Development Bank, Department of Agricultural Roads, and the Subcommittee for the Implementation of the District Agricultural Program. The main emphasis is on strengthening existing institutions vital to the successful implementation of the package.

16. IMPLEMENTATION: INVESTMENT

While the APP-envisaged growth will be almost entirely in the private sector, the plan outlines how the private farmers and entrepreneurs can invest in growth and how the public sector can raise their rate of return through its investment, institutions, and policy.

The public investment requirements of the plan are large. This expenditure is necessary not just to move the agricultural sector, large and dominating as it is, but also, through the multipliers of agricultural growth, to expand nonagricultural activities in rural areas and employment in these activities even more substantially than agriculture.

Because of the nature of agriculture in Nepal and its diverse natural resource base, the APP achieves regionally balanced growth through regionally balanced investment. And it does so while maintaining a high rate of return to investment in each major region.

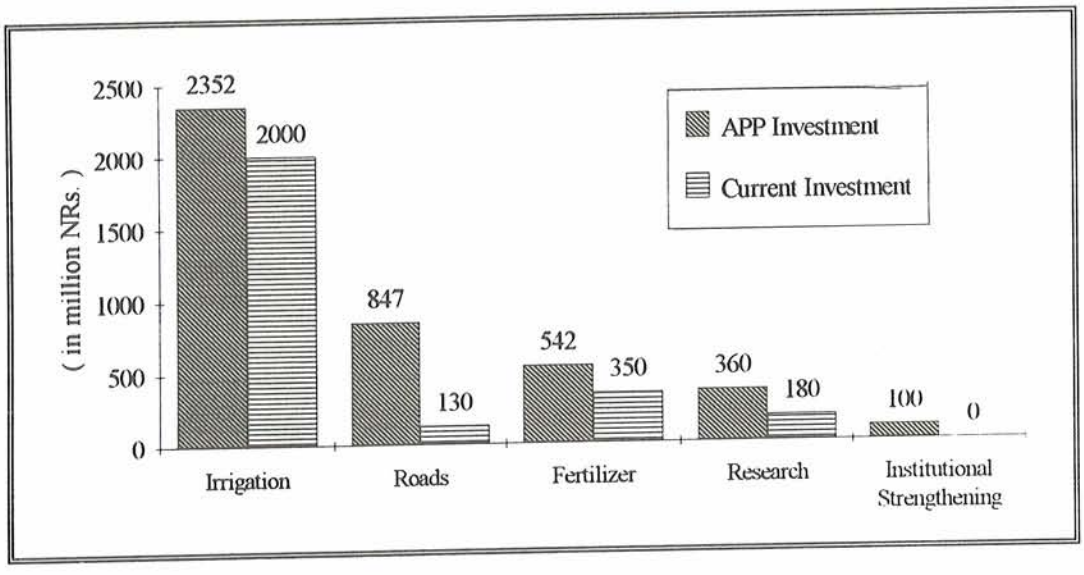
The APP public investment plan is developed for the first five-year plan period and presented in three parts.

- The first claim on public resources is the priority input plan. It consists of investments that will enable the APP to take off and allow the other investments, both public and private, to become profitable at the levels necessary for sustained rapid growth.
- The second claim on public resources is the priority output plan. The priority outputs are demand-driven and initially depend on the priority public input investments, but further along in the APP most of the investment will shift to the private sector. The public sector role will be performed in institutions such as extension, market development, and agricultural credit. The public investments are primarily for training and improving the public institutional capacity to support private investment.
- The third part of the APP public investment plan deals with credit requirements as an aid to preparing the banking system for filling this essential function.

The APP's average annual investment for priority inputs in the first five-year period totals Rs 4,201 million which is significantly higher than the current level of average annual investment of Rs 2,660 (for details, see figure S-10). Regional allocation of the total investment for priority inputs is depicted in figure S-11.

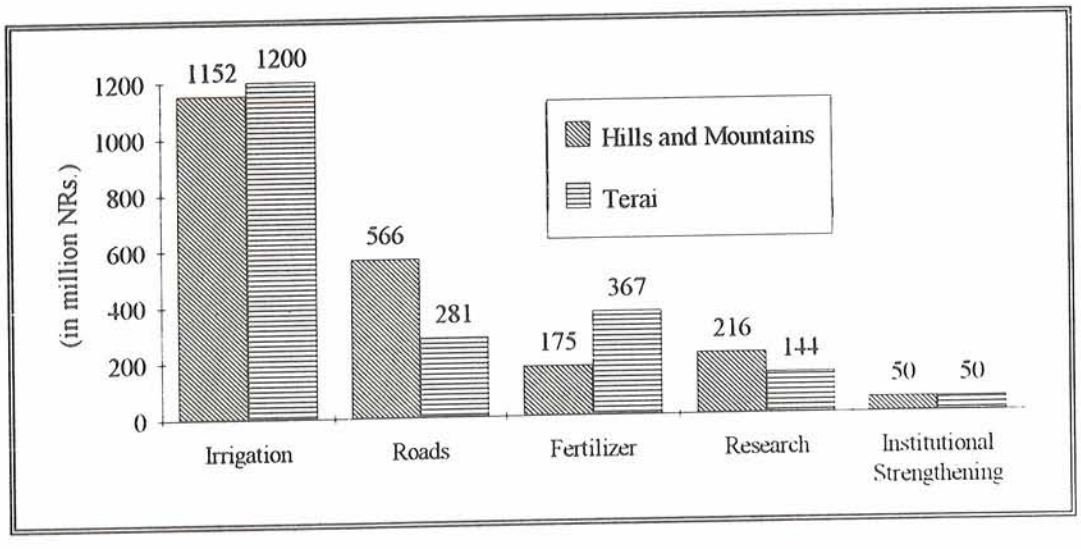
The APP's average annual investment for priority outputs in the first five-year period totals Rs. 1,278 million which is significantly higher than the current level of average annual investment of Rs. 575 million (for more detail see figure S-12).

Figure S-10. Annual Average Public Investment in Priority Inputs, First Plan Period



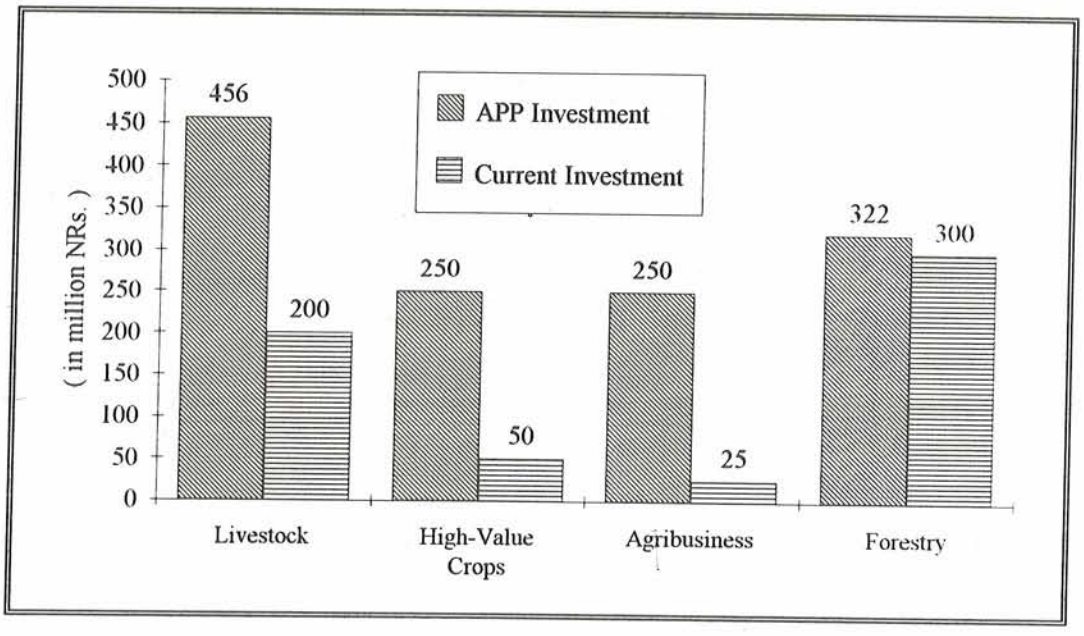
Source: APP calculations.

Figure S-11. Regional Allocation of Annual Average Public Investment in Priority Inputs, First Plan Period



Source: APP calculations.

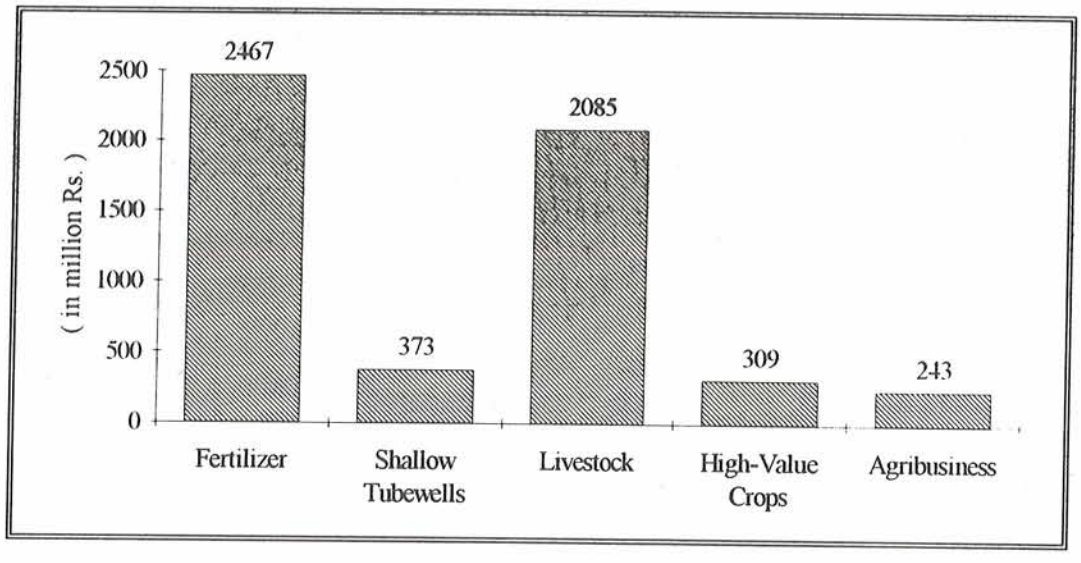
Figure S-12. Annual Average Public Investment in Priority Outputs, First Plan Period



Source: APP calculations.

The average annual credit requirements, based on the projection over the period 1995/96 to 2014/15, for the APP's prioritized productivity package is summarized in figure S-13.

Figure S-13. Projected Annual Average Credit Requirements During the APP Period



Source: APP calculations.

17. IMPLEMENTATION: PUBLIC POLICY

In keeping with its sharp focus, the APP has only four broad areas of policy priority. They are resource allocation, private sector, price policy, and land tenure policy.

The APP urges that public investment and foreign assistance be directed toward APP priorities and that this investment be packaged at the district and farm level so as to realize the full economies of interactions. The plan recommends that restraints on the private sector be loosened so that the sector can be allowed to compete, that octroi and other restrictions on the movement of goods across district lines be abolished, and that the lost local government resources can be replaced.

Resource allocation: Public expenditure on agriculture as a percentage of AGDP has been rising in recent years, but the proportion of foreign assistance in this sector has been declining. The APP calls for increased donor assistance to agriculture by recognizing that donor objectives such as poverty reduction, environmental enhancement, and improved conditions for children and women cannot be achieved by targeted programs unless the overall framework of broadly based increases in rural incomes improves the environment for such programs. Thus a reallocation of foreign assistance resources is at least as important as the reallocation of domestic resources.

Private sector: Under the APP, small private farms, and small and medium-scale manufacturing, processing, and service firms are at the core of the growth in production. These farms and firms are widely dispersed geographically, lack the economies of scale to provide important services, and tend to be greatly penalized by risk and uncertainty. The policy elements of the **prioritized productivity package** critical to private sector performance are:

- a reallocation of public expenditure toward agricultural roads and power,
- the removal of distorted prices and the uncertainty caused by octroi and other municipal and district-level restrictions to the movement of goods,
- greatly expanded access to credit and reduced lending rates by lowering transaction costs, and
- increased positive support from the research and regulatory systems.

Price policy: The PPP approach is designed to reduce the cost of production and increase the supply elasticities of commodities. The plan requires a large increase in exports of traditional cereals, high-value commodities, and agribusiness products. Much of that export will be to India. Hence the exchange rate with the Indian rupee becomes far more important than in the past. A significant overvaluation of

the Nepali rupee would be strongly prejudicial to achieving the trade-related growth targets of the APP, particularly in view of the emphasis on nontraditional, high-value agricultural exports.

A notable feature of price behavior in Nepal is that a large wedge exists between producer and consumer prices, which reflects high transaction costs. These are partly policy-induced, and partly structural. The APP gives high priority to reducing transaction costs from improved infrastructure as well as generally reducing the cost of production.

The plan recommends two kinds of subsidies: for fertilizer and shallow tubewells. Fertilizer subsidies should be gradually removed by clear steps, and policies need to be introduced to create a strong fertilizer demand. However, the extent to which this policy can be implemented will be influenced by Indian policy.

In the case of nonsubsidized fertilizer, prices should be decontrolled immediately. In the case of subsidized fertilizer (urea), sufficient finance needs to be provided to see that domestic sales prices are kept no more than 15 to 20 percent higher than the Indian border prices.

The plan recommends continuation of the transport subsidy to hill and mountain districts . The total amount of the subsidy would be fixed at the beginning of the year by subtracting the transport subsidy, estimated on the total flow to the hills and mountains, estimating the total fertilizer to be used, and then dividing that into the remaining subsidy to obtain the level per kilogram of general subsidy. Similarly, the plan recommends the present level (50%) of subsidy on shallow tubewells.

Land tenure: When land tenure is surrounded by uncertainty, investment faces a great many risks, particularly investment in shallow tubewells, land improvement, livestock and high-value crops, and phosphate fertilizer with its residual effect. It is essential that legislation address the dual ownership issue immediately. The APP defers to the High-Level Land Reform Commission for details of land policy and implementation measures.

Similarly, fragmentation of holdings in the terai will retard investment in shallow tubewells, since the number of farmers who have to be grouped or become purchasers of water will increase as the size of contiguous plots declines. Thus, for the terai, the prioritized productivity package includes land consolidation as a criterion for selecting its blocks, and this consolidation would be administered as a part of the package. Enabling legislation must therefore be drafted, passed, and implemented as part of the PPP.

18. IMPLEMENTATION: INSTITUTIONS

The APP is an interactive and interdependent plan crossing many interrelated sectors, subsectors, public agencies, the farming community, private entrepreneurs, nongovernmental organizations, and international donor and cooperating agencies. A carefully thought out strategy for implementation is thus crucial for its success.

The APP adopts an integrated approach embodied in the prioritized productivity package, consisting of a few key priorities. The approach rests on three vital principles:

- the blocks participating in the efforts must be chosen in a sequence, based on their priority;
- the rate of return to the investments must be the paramount consideration in determining the sequence in which blocks are initiated into the APP; and
- a continual effort must be made to ensure that the full package is implemented.

The APP divides into five-year plans starting with the remaining years of the current Eighth Plan.

Successful implementation requires two powerful new bodies: the National Support Committee (NSC) and the Subcommittee for the Implementation of the District Agricultural Program (SIDAP). The NSC, supported by an Independent Analytical Unit (IAU), will oversee the policy issues, procedural matters, and implementation status of the APP. Key line agencies will be represented on the NSC and will be responsible for implementing their components of the plan in a timely fashion and for coordinating their activities with other agencies. The IAU is essential to the effective functioning of the NSC, being its eyes and ears in the process.

SIDAP will determine the sequence of block introductions to the PPP and will coordinate all the district-level activities. The district heads of the line agencies, and representatives of the farmers' groups, NGOs and the private sector will be represented on the body.

While the NSC will report to and support the National Development Action Committee (NDAC), the SIDAP will assist the District Development Committee in coordinating and monitoring the activities of various public and private agencies, and the NGOs operating at the district level.

In addition to the above, the APP recommends the creation of a new Department of Agricultural Roads as a lead agency to ensure that agricultural roads are constructed and maintained in accordance with the targets set forth in the APP.

Lead agencies responsible for carrying out the key components of the APP are:

- the SIDAP, IAU, and NSC;
- Department of Agricultural Roads;
- the Agricultural Development Bank;
- the Agricultural Inputs Corporation;
- Nepal Agricultural Research Council;
- the Department of Agricultural Development;
- the Department of Irrigation;
- Department of Forestry; and
- Farmers' and business associations.

19. EPILOGUE

The APP is based on the assumption that it is now time for Nepal to commence accelerating growth, and it lays down the basic priorities for doing so. The minimum foundation of physical infrastructure, human capital, and institutions has been laid.

The place to start accelerated growth is where the mass of people are—rural Nepal; in the sector already commanding the largest share of Nepal's resources—agriculture; and, with investments to raise the productivity of those people and their resources—agricultural technology generation and rural infrastructure.

Thus, the APP has four priority inputs—irrigation, roads, technology and fertilizer. They are all technology related and productivity increasing. The APP also gives priority to a few high-value commodities that will bring dramatic increase in farm incomes, especially in the hills.

The APP is regionally balanced. It has a massive effect in reduction of poverty through its direct effects from agricultural growth, and far more so, from the indirect employment-producing multipliers in the non-agricultural sector. The latter will disburse urbanization over most of the country.

What are the essential decisions to make the APP work?

First, appointment of a high level oversight body, reporting to a cabinet sub-committee and an associated independent analytical unit to provide the power of information to that body. Without these, the APP will go the way of the several past strategic plans for agriculture.

Second, the agricultural road investment plan must be seen as both minimal and proven as feasible by any number of examples (e. g., Himachal Pradesh and western Szechuan). A new department of agricultural roads must be created and staffed; local government must be galvanized and monitored for action, including giving priority to roads that tap major commercial potentials; even while currently known construction techniques are applied, improved methods must be developed; and, foreign donors must be led to vigorous supportive actions.

Third, terai district administrations must package ground water development with roads and other key inputs and the ADBN must give a dominant priority to accelerating its lending program for ground water development, even as the government provides land consolidation enabling legislation and settles the land tenure issues.

Fourth, the AIC must redefine its role to achieve accelerated growth in fertilizer use by full privatization of retail distribution, assuring that supplies and stocks are

increased adequately to meet rapid demand growth, that various constraints to that growth are removed, and that the subsidy policy, whatever it may be, facilitates not retards growth in fertilizer use.

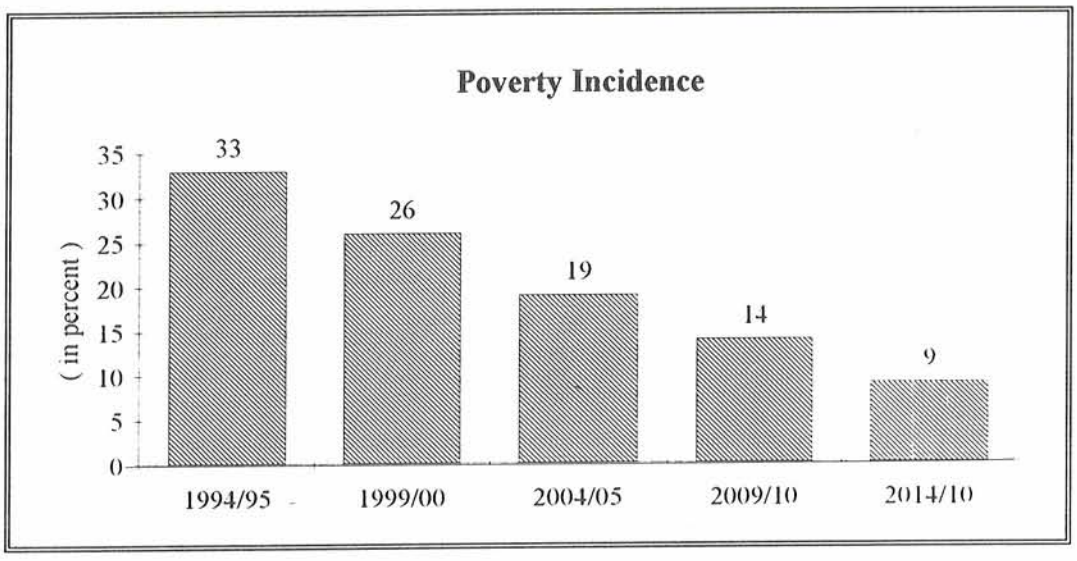
Fifth, NARC and associated extension efforts must set a few priorities for on-farm oriented research that will provide practical improved technologies for sharply increasing agricultural production and farm incomes. In that context, the resources available to NARC must be radically increased.

The effect of these closely monitored efforts will be to accelerate agricultural growth and to have powerful multiplier effects on other sectors, on poverty reduction, on the involvement of women, and on environmental enhancement. These successes will also raise the returns to myriad other public and private actions and mobilize resources in those activities for productive effect. It is the mobilizing of so many now nascent resources that will be the first sign of success of the APP priorities.

The essence of the APP is simplicity and priorities. It is not a grand plan, it is the opportunity and the prospects that are grand.

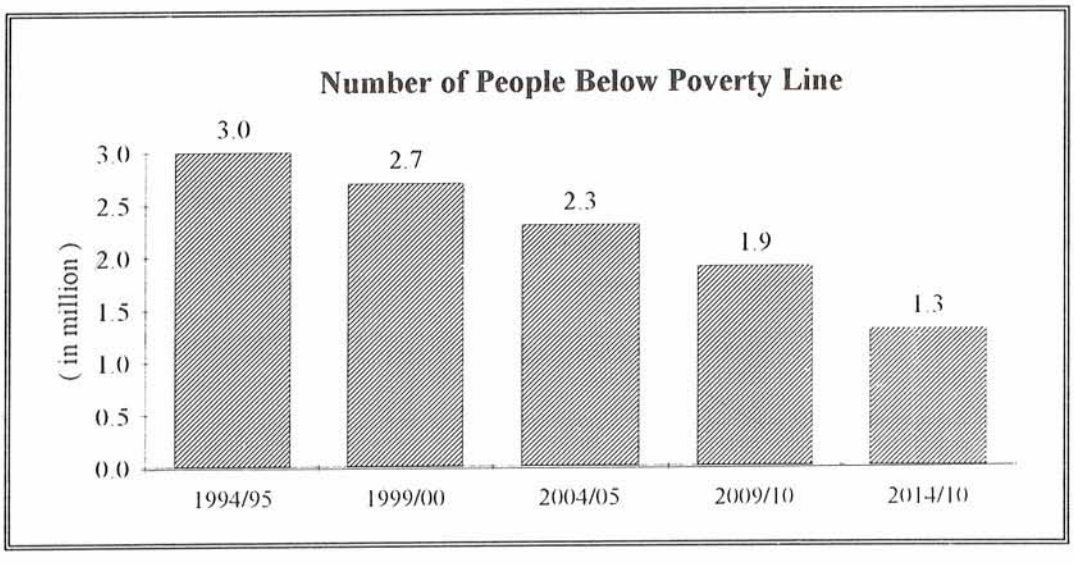
Annex-I

Figure S-14. Poverty Incidence in Rural Tetai



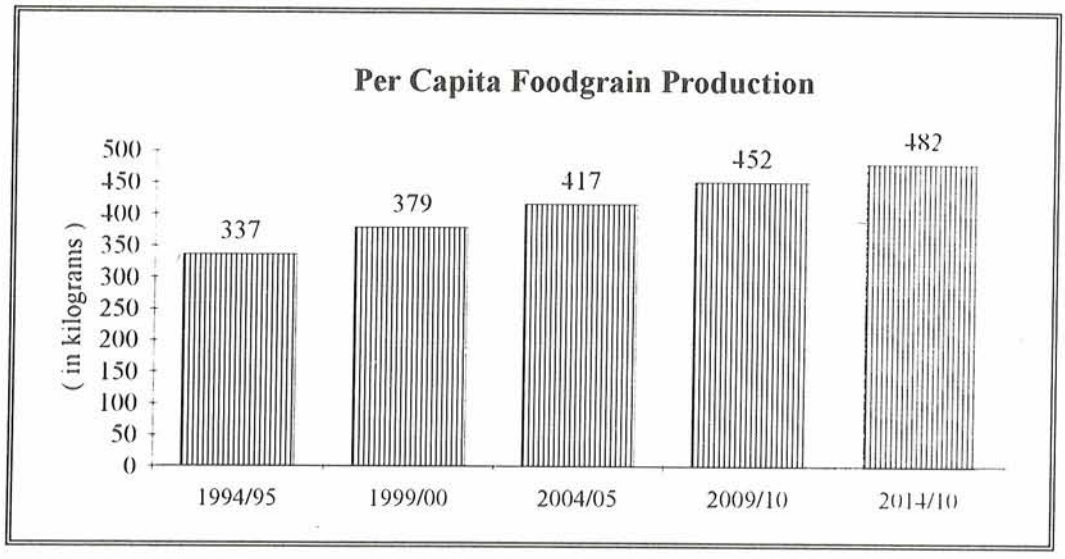
Source: APP calculations.

Figure S-15. Number of People Below the Poverty Line in Rural Terai



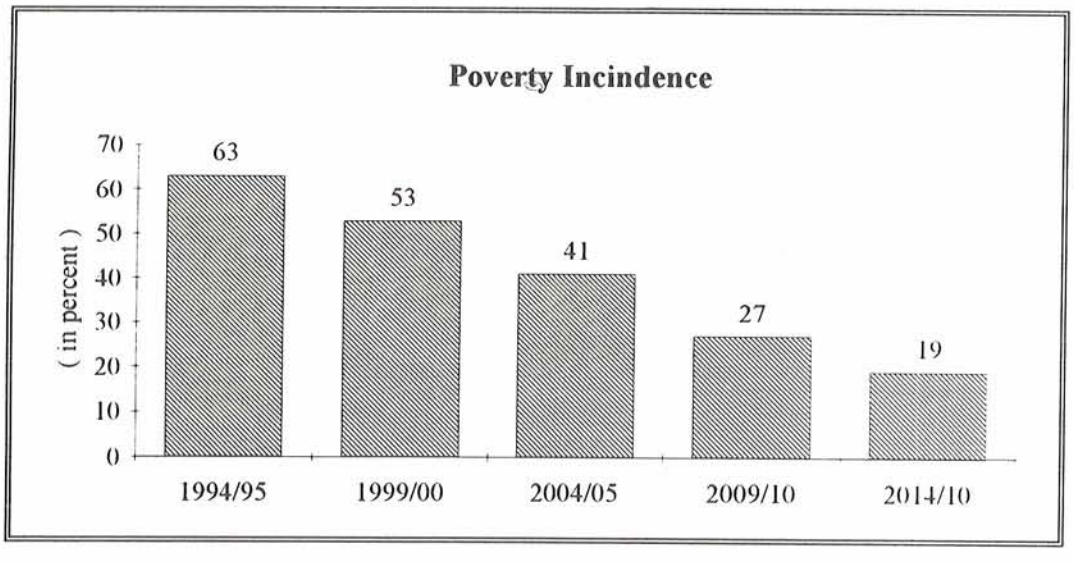
Source: APP calculations.

Figure S-16. Per Capita Food Grain Production in Terai



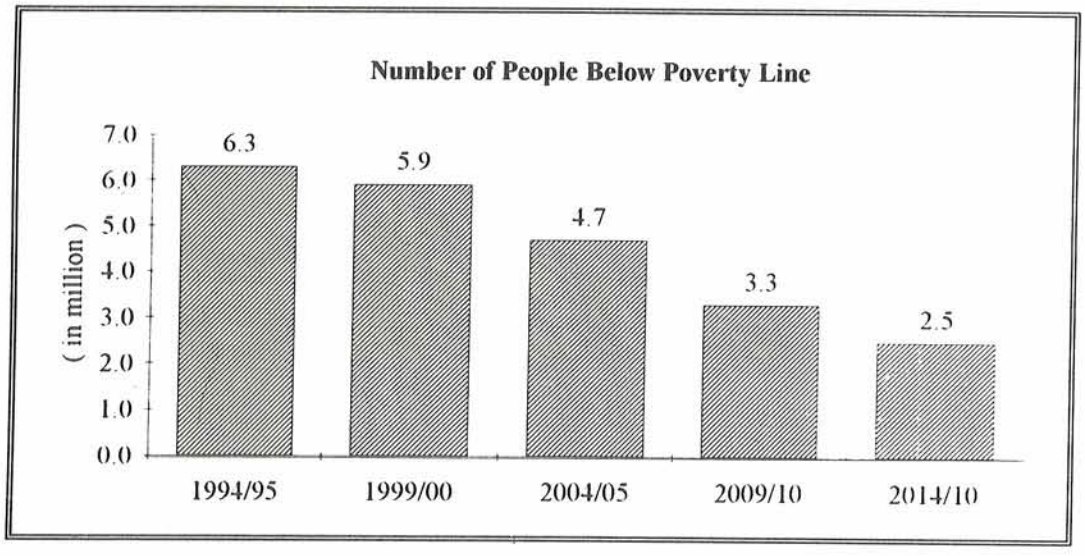
Source: APP calculations.

Figure S-17. Poverty Incidence in Rural Hills and Mountains



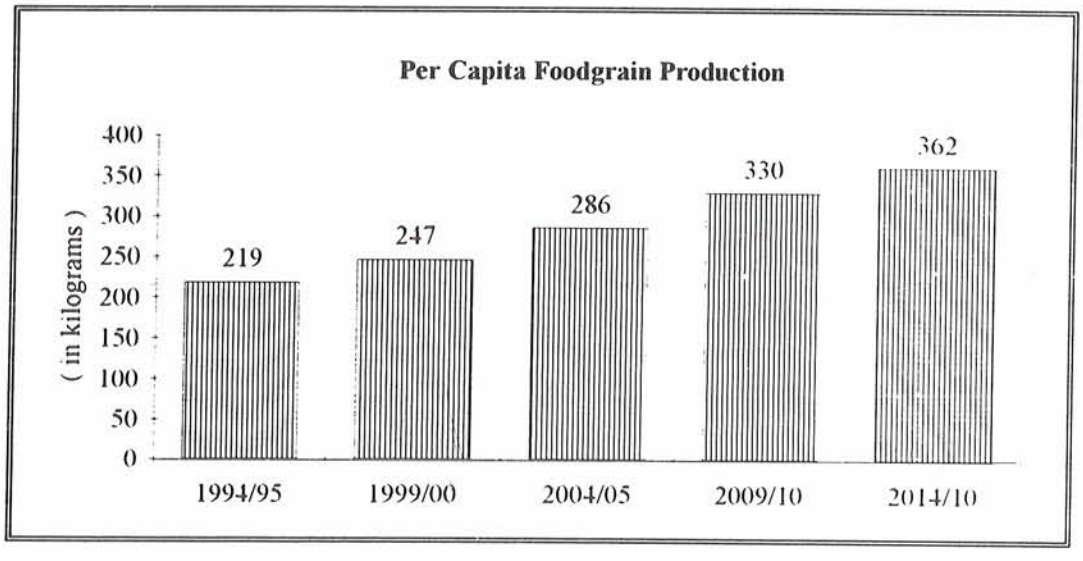
Source: APP calculations.

Figure S-18. Number of People Below the Poverty Line in Rural Hills and Mountains



Source: APP calculations.

Figure S-19. Per Capita Food Grain Production in Hills and Mountains



Source: APP calculations.