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NEW STRATEGIES FOR HILL AGRICULTURAL DEVELOPMENT IN NEPAL

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ABSTRACT

Nepal, a landlocked kingdom, has only 2.3 million hectares of cultivated land of which less than one-third is located in the hills supporting two-thirds of the nation's over 18 million people. Hills are deficit in food supply. With the population growth rate at 2.3 percent annually, if the agricultural production remains at the present level, Nepal would have to import 2.2 million tons of food in the year 2000. To increase food production including crops and livestock is therefore the prime responsibility of the government and the people in the coming years. Potentials do exist but special efforts are required.

Government policy in the early years gave heavy emphasis on tarai development, then shifted its attention the hills, and finally focused on the balanced regional development. Experience show that effective means to develop hill agriculture have to rely more on the mobilization of local resources particularly the surplus rural manpower. To build a strong foundation for future modernization of hill agriculture, the immediate development strategies by mobilizing local resources are the establishment of garden farming the construction of track network, the development of rural markets, and the extension of non-formal education.

I. THE IMPORTANCE OF HILL AGRICULTURE

Hill agriculture along the Himalaya Range has made Nepal famous not only because of its scenic beauty which promotes tourism but also because of its high productivity which provides food for two-thirds of Nepal's 14.3 million people. Encircled by China in ft north and by India in the east, west, and south, Nepal's hills constitute 83 percent of the total land area of 141,000 km².¹

The most serious concern in Nepal is the problem of population explosion. With an annual population increase rate of 2.3 percent (NPC 1981, p. 135), Nepal will have 25

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million mouths to feed in the year 2000, 10 million more persons than in 1981. The hill area is expected to accommodate and feed more than 16 million people in the year 2000.

As of 1979, Nepal has 2.3 million hectares of cultivated land of which less than one-third (0.7 million hectares) is located in the hills (DFAMS 1979, pp. 8-21). With no land frontier for further expansion, this limited area of cultivated land, no matter how productive it is, is unable to produce sufficient food to meet even the present level of population. Of the 75 administrative districts in Nepal, 45 districts are located in the hills. As many as 39 out of 45 hill districts already have problems of food deficit.

At present, a food surplus exists in the tarai which is enough to meet the hills' deficit and even to provide a small amount for export. The movement of food, from the tarai to the hills, however, is very costly. Moreover, with high rate of population growth, this favourable population-food balance will not last long. Because of the possibility of importing a large amount of food before the year 2000, a world food expert considered this problem to be a matter of serious national security (Wortman 1980, pp. 4-5).

Thus for future survival, Nepal has to develop its hill agriculture for higher output and for improved livelihood for the hill people. Development will require a large amount of capital investment, labour inputs and institutional changes. Even though the present situation of food deficit is serious, Nepalese experts do see hope and potentials. They think it is possible to transform the traditional hill agriculture into being more viable.²

The objectives of this paper are : (1) to study the critical situation of population-food balance and its potential, (2) to review the past and present efforts in hill agricultural development, and (3) to ascertain the construction of new strategies under various constraints and strengths.

II. POPULATION-FOOD BALANCE AND ITS POTENTIALS

Population

Nepal's population stood at 5.64 million in 1911 and 11.56 million in 1971 (ESCAP 1980, p. 13). It took 60 years to double the figure. In 1980, Nepal's population stood at 14.3 million and is expected to increase to 16 million in 1985 (NPC 1981, p. 134). The second 38 percent increase will take only 15 years. In other words, Nepal has a growth rate of 2.3 percent. Approximately two-thirds of the population live in the hills; as of 1980, the hills accommodated about 9 million people.

Between 1957 and 1976, more than 10 agencies including the Tribhuvan University have made population projections for Nepal (ESCAP 1980, p. 92, 103). In 1980, the East-

West Center's Population Institute has also made a set of three projections (Banister and Thapa 1981, p. 98). Both projections made by the Tribhuvan University (Table 1) and the East-West Center's Population Institute (Table 2) are used here for comparisons.

In Tables 1 and 2, it is important to note that in 1976 Nepal had 42 percent of its population in the age group 0-14. In the year 2001, the country will still have between 39.8 and 44 percent of the population under age 15 (Table 1) and from 31 to 41 percent in the 0-14 age groups (Table 2). Thus the dependency burden is very high.

Life expectancy at birth for Nepal estimated in 1952-54 was 25.6 for males and 25.7 for females (CBS 1956). This life expectancy increased to 43.4 for males and 41.1 for females in 1976 (CBS 1976). The average life expectancy for both sexes reached 45.5 in 1980 and is expected to be 48 in 1985 (NPC 1981, p. 135). Obviously, the life expectancy is too low.

TABLE 1. ALTERNATIVE POPULATION PROJECTIONS AND PERCENTAGE DISTRIBUTION BY AGE GROUP OF THE PROJECTED TOTAL POPULATION, 1971-2001

Projection year	Projection variant	Projected population '000	Proportion of total population in various age groups			
			0-4	5-14	15-59	60+
1971	High	11556	15.4	25.5	53.7	5.4
	Medium I	11556	15.4	25.5	53.7	5.4
	Medium II	11556	15.4	25.5	53.7	5.4
1981	High	14797	16.8	25.3	52.7	5.2
	Medium I	14746	16.6	25.4	52.8	5.2
	Medium II	14696	16.3	25.5	53.0	5.2
1991	High	19318	16.9	26.1	51.7	5.3
	Medium I	18959	16.2	25.7	52.7	5.4
	Medium II	18599	15.4	25.4	53.7	5.5
2001	High	26131	17.6	26.4	50.5	5.5
	Medium I	24972	16.4	25.6	52.2	5.8
	Medium II	23818	15.1	24.7	54.1	6.1

Source : Rajbanshi and Gubhaju 1976.

The high dependency burden and low life expectancy will have strong impacts on the food production and consumption in the coming decades. Since the ratio between the actual number of producers and the actual number of consumers becomes smaller, the amount of food available per capita is likely to become smaller, unless productivity increases substantially.

TABLE 2. THREE PROJECTIONS OF THE AGE STRUCTURE OF NEPAL : 1976-2026 (PROPORTIONS IN PERCENTAGES AND TOTAL POPULATION IN THOUSANDS)

Age group	1976	1981	1991	2001	2011	2021	2026
Pessimistic projection							
0-14	42	43	43	41	40	39	38
15-64	55	54	54	56	57	58	58
65 and over	3	3	3	3	3	4	4
Total population	13,793	15,696	20,174	25,680	32,720	41,612	46,705
Optimistic projection							
0-14	42	42	39	31	24	20	18
15-64	55	55	58	65	71	72	73
65 and over	3	3	4	4	5	7	9
Total population	13,793	15,596	19,143	22,039	24,424	26,157	26,565
Turning point projection							
0-14	42	43	42	37	31	27	25
15-64	55	54	54	60	65	67	69
65 and over	3	3	3	4	4	5	6
Total population	13,793	15,702	20,022	24,178	28,395	32,421	33,952

Note : Some percentages do not sum to 100 because of rounding.

With the population continuing to grow in the next four decades, Nepal's food supply (both foodgrains and livestock products) has to be proportionally increased. Self-sufficiency in food supply is the primary target, and then exporting surplus to earn foreign exchange will come next.³

Demand for Foodgrains

Comprehensive regional studies on rural food consumption are not available. Reports of two household food consumption studies which were carried out in the late sixties were released in 1968 but were limited to one panchayat only. Another food consumption survey was conducted in 1973 in 19 districts but results from the study have not yet been released. A report on Trade Flow Survey of Agricultural Commodities, prepared by the Department of Food and Agricultural Marketing Services, provides district-level information on the balance of cereal grains.

An attempt was made by the Ministry of Agriculture in 1981 to update estimates of per capita consumption of different food crops in Nepal by using data on Nepal from FAO Projections on Agriculture Toward 2000. Population projections were taken from the Central Bureau of Statistics until 1986 and separate projections were made to 2000. This study also took into account the difference of income elasticities between the hills and tarai.

By multiplying the projected per capita demand with projected population increase, a projected total demand in both edible and gross forms by ecological regions and by year is shown in Table 3.

The most striking feature of Table 3 is that Nepal will need 90 percent more food grains by the year 2000 to meet the estimated demand. Among the cereal, the increments in total demand for wheat are highest in the hills at 149 percent, followed by rice (122 percent) and maize (47 percent). The total demand for millet and barley is estimated to increase by 33 and 24 percent, respectively.

Supply of Foodgrains

Statistics on the supply side do not show encouraging signs. Production of cereal in the hills, in the tarai, and in the whole Nepal in 1978-79 was 1,357,000, 2,296,000 and 3,653,000 M tons, respectively. For the hills, production of paddy, maize, wheat, millet, and barley in 1978-79 was 536,000, 533,000, 155,000, 116,000, and 17,000 M tons, respectively. For the tarai, the 1978-79 production of paddy was 1,803,000 M tons ; of maize, 210,000 M tons ; of wheat, 260,000 M tons ; of millet, 18,000 M tons ; and of barley, 6,000 M tons. The current supply, if not drastically increased, is not enough to meet the future demand.

The Ministry of Food and Agriculture had prepared two alternative projections on cereal production up to the year 2000. Both projections did cast some light on the hidden food crisis that Nepal is going to face in the very near foreseeable future.

TABLE 3. ESTIMATED REQUIREMENTS IN BOTH EDIBLE (E) AND GROSS (G) FORMS OF TOTAL CEREAL, 1980-2000 ('000 M.TONS)

Year Region	Paddy		Maize		Wheat		Millet		Barely		Total	
	E	G	E	G	E	G	E	G	E	G	E	G
1980												
Hills	414	791	593	713	140	175	120	145	23	33	1,295	1,857
Tarai	683	1,341	201	243	94	132	19	22	8	10	1,005	1,748
Nepal	1,097	2,132	794	956	234	307	139	167	36	43	2,300	3,605
1990												
Hills	631	1,135	734	866	219	269	141	170	31	37	1,756	2,477
Tarai	982	1,806	262	311	138	187	21	25	9	11	1,412	2,340
Nepal	1,613	2,941	996	1,177	357	456	162	195	40	48	3,168	4,817
2000												
Hills	1,067	1,762	912	1,046	370	435	162	193	34	41	2,545	3,477
Tarai	1,579	2,646	356	409	225	258	22	26	9	11	2,191	3,350
Nepal	2,646	4,408	1,268	1,455	595	693	184	219	43	52	4,736	6,827

a. Gross grain requirements include consumption requirements and intermediate demands like seeds, feed, storage losses, and milling losses. Gradual reductions on storage and milling losses have been assumed due to potential improvement on post-harvest technology. Paddy (E) refers to polished rice.

The first projection was based on the assumption that a level of production can be achieved if the past trend, present efforts, and current resource use are to continue. Results of the first projection by using linear trend are shown in Table 4.

TABLE 4. PRESENT AND PROJECTED CEREAL PRODUCTION BASED ON CURRENT METHODS OF PRODUCTION IN BOTH EDIBLE (E) AND GROSS (G) FORMS USING LINEAR TREND, 1980-2000.

Region	1980		1990		2000	
	E	G	E	G	E	G
('000 M. Tons)						
Hills						
Paddy	295	567	343	656	390	746
Maize	427	519	379	461	331	404
Wheat	111	142	147	183	181	224
Millet	98	119	105	127	114	135
Barley	15	18	14	17	13	16
Total	946	1,365	988	1,444	1,029	1,525
Tarai						
Paddy	981	1,900	1,068	2,066	1,157	2,231
Maize	158	192	131	159	107	131
Wheat	236	296	399	485	562	673
Millet	15	18	16	19	16	20
Barley	4	5	4	5	4	5
Total	1,394	2,411	1,618	2,734	1,846	3,060
Nepal						
Paddy	1,276	2,467	1,411	2,722	1,547	2,977
Maize	585	711	510	620	438	535
Wheat	348	438	546	668	742	897
Millet	112	137	120	146	131	155
Barley	19	23	18	22	17	21
Total	2,340	3,776	2,604	4,178	2,875	4,585

a. Gross grain requirements include consumption requirements and intermediate demands such as seeds, feed, storage losses, and milling losses. Gradual reductions on storage and milling losses have been assumed due to potential improvement on post-harvest technology. Paddy (E) refers to polished rice.

The first projection expects a low rate of cereal production increase in the next two decades. The increase of cereal production for the hills, tarai, and Nepal will be 12, 27, and 21 percent, respectively, by the year 2000. The output of maize is projected to decline by 22 percent in the hills and by 32 percent in the tarai; barley also has a marginal rate of decline. Production of paddy, wheat, and millet is projected to increase. The increase of wheat production is most spectacular with 58 percent for the hills and 127 percent for the tarai. The projected annual growth rate for cereal which forms the main bulk of Nepalese diet is, however, only about one-half of the conservatively assumed annual growth rate of population, say 2.3 percent.

The second projection is a normative scenario based on the production potentials in the hills and the tarai with an attempt not only to close the gap between requirements and production for the next two decades but also to sustain a reasonable level of surplus for export. Results of this projection are shown in Table 5.

This 20-year bold production plan envisages an annual growth rate of 3.06 percent in cereal production in the hills as compared with 4.93 percent for the country between 1980 and 2000. Such a high rate of increase in cereal production can only be achieved by improving crop productivity, expanding irrigated areas, and using more improved inputs such as seeds, inorganic fertilizers, insecticides, and implements.

The projected and planned cereal production in the hills as shown in Table 5 is calculated by using the following assumptions:

- a. By the year 2000, cereal yield will increase 43 percent. An additional 150,000 hectares of cultivated land will be put under irrigation.
- b. The proportion of areas planted with improved seeds for paddy, maize, wheat, millet, and barley will rise to 70, 65, 100, 51, and 26 percent of the cultivated area, respectively.
- c. The use of fertilizer will go up by approximately 40,000 metric tons of nutrients. Most of the fertilizer will be applied to irrigated land.
- d. The land use intensity will be increased by extending maize to 57,000 hectares and barley to 6,700 hectares.

Under these assumptions, the planned production of paddy, maize, wheat, millet, and barley is projected to increase by 59, 60, 84, 45, and 80 percent, respectively.

TABLE 5. PRESENT AND POTENTIAL LEVEL OF GROSS CEREAL PRODUCTION UNDER NORMATIVE APPROACH, 1980-2000

Region	1980	1990	2000
(000 M. TONS)			
Hills			
Paddy	567	705	868
Maize	519	725	880
Wheat	142	240	282
Millet	119	134	147
Barely	18	25	31
Total	1,365	1,829	2,200
Tarai			
Paddy	1,900	2,728	3,912
Maize	192	415	562
Wheat	296	527	707
Millet	18	22	25
Barely	5	10	12
Total	2,411	3,702	5,218
Nepal			
Paddy	2,467	3,433	4,781
Maize	711	1,140	1,442
Wheat	438	767	989
Millet	137	156	173
Barely	23	35	43
Total	3,776	5,531	7,428

Balance of Foodgrains Demand and Supply

Comparing the first and second projected cereal production (Tables 4 and 5) with the projected demand (Table 3), the balance in deficit or surplus for the hills, tarai, and Nepal is calculated and shown in Table 6. The balance clearly shows that the hills will

remain as a heavy deficit area in the next two decades under both projections. The tarai could help meet the food shortage in the hills only if the second projection would become a reality.

The deficit of cereal in the hills as of 1980 was 492,000 metric tons (in gross form). Fortunately, a surplus of 663,000 tons were available in the tarai. After meeting the hills deficit, the tarai were still able to export approximately 100,000 tons of cereal to other countries. According to the first projection, the country's surplus position will disappear as early as 1985. This shortage in the hills is estimated to be 719,000 tons in 1985, 1 million tons in 1990, and almost 2 million tons in 2000. By the same projection, the tarai

TABLE 6. BALANCE BETWEEN PROJECTED DEMAND AND PROJECTED PRODUCTION LEVELS OF TOTAL CEREAL IN NEPAL (GROSS FORM), 1980-2000

Region	First Projection			Second Projection		
	1980	1990	2000	1980	1990	2000
(Gross : '000 M. Tons)						
Hills						
Demand	1,857	2,477	3,477	1,857	2,477	3,477
Production	1,366	1,444	1,525	1,365	1,829	2,208
Surplus (+) or Deficit (-)	-492	1,033	-1,952	-492	-648	-1,269
Tarai						
Demand	1,748	2,340	3,350	1,748	2,340	3,350
Production	2,411	2,734	3,060	2,411	3,702	5,218
Surplus (+) or Deficit (-)	663	394	-290	663	1,362	1,868
Nepal						
Demand	3,605	4,817	6,827	3,605	4,817	6,827
Production	3,776	4,178	4,585	3,776	5,531	7,428
Surplus (+) or Deficit (-)	101	-639	-2,242	171	714	601

will retain its surplus position up to 1990. In 2000, even in the tarai, a deficit of 290,000 tons will occur. The shortage for the country as a whole will reach 2.2 million tons in the year 2000.

All hopes will pin on the translation of the second projection into a reality. Unfortunately, there are not many alternatives available from which to choose. According to the second projection, Nepal after meeting the hills' cereal shortage with the tarai's surplus, will remain a cereal exporting country in Asia.

Livestock Products

Nepal has the highest livestock population per unit of land area in Asia. As of 1979-80, there were 5.98 million cattle, 2.60 million buffalo, 3.65 million goats, 0.56 million sheep, 0.36 million pigs, and 8.21 million poultry (Rajbhandary and Shah 1981, p. 44). Since the hills' climate is more suited to raising livestock, the hills have shared 68, 79, 78, and 86 percent of the country's cattle, buffalo, goat, and sheep population, respectively.

Livestock raising is the second most important enterprise, next to crops, in the hill farming system. It provides draught power to plough the land and to transport agricultural produce besides providing manure for the field crops. It accounts for 27 percent of household income.

A projection on the minimum requirement for meat, milk, and eggs in the hills up to the year 2000 has been made. According to the U.S. standard, a person requires 45 grams of animal protein per day. Since the average body weight of Nepalese is 45 kg, FAO suggested that a diet with only one-fourth of the U.S. required animal protein can be considered as satisfactory, i.e., 11.25 grams per person per day. It is assumed that the animal protein content of meat, milk, and eggs is 22, 35 and 35 percent, respectively. The per capita annual requirements for meat and milk are calculated at 8.0 and 46.9 kg, respectively, and for eggs, 84 in number. Based on these requirements and population trends, the projected demand for meat, milk, and eggs between 1980 and 2000 is shown in Table 7.

The requirements for meat, milk, and eggs in the year 2000 are expected to be 48 percent higher than those of 1980. The present and projected livestock population up to the year 2000 is shown in Table 8. This projection indicates three main trends :

- a. cattle population increases at a very low rate of 0.17 percent per annum.
- b. buffalo population declines by 1.2 percent per annum,
- c. sheep and goat population increases by 0.26 percent per annum.

TABLE 7. PRESENT AND PROJECTED REQUIREMENTS AND PRODUCTION FOR MEAT, MILK, AND EGGS IN THE HILLS, 1980-2000

Item	1980	1990	2000
Meat ('000 tons)			
Requirement	68.2	83.0	101.2
Production	35.8	38.0	44.1
Surplus (+) or Deficit (-)	-32.4	-45.0	-57.1
Availability (%)	52.5	46.0	43.6
Milk ('000 tons)			
Requirement	400.8	488.1	594.8
Production	346.0	368.0	388.0
Surplus (+) or Deficit (-)	-54.8	-120.1	-206.8
Availability (%)	86.0	75.4	65.2
Eggs (Million No.)			
Requirement	720.9	878.0	1,069.8
Production	106.5	124.2	144.2
Surplus (+) or Deficit (-)	-614.4	-753.8	-925.6
Availability (%)	14.8	14.2	13.5

TABLE 8. PRESENT AND PROJECTED LIVESTOCK POPULATION FOR THE HILLS, 1980-2000 ('000 HEAD)

Livestock	1980	1990	2000
Cattle	4,050	4,255	4,472
Buffalo	2,053	2,194	2,306
Sheep	481	505	521
Goats	2,841	3,073	3,328
Pigs	224	236	248
Poultry	6,338	7,393	8,580

The major constraint on the expansion of livestock population in the hills is the serious shortage of feed. The feed from crop residue, fodder trees, forest, and rangeland is quantitatively inadequate and qualitatively poor. It can hardly meet the nutritional requirements of the livestock production. Supply of green fodder is sufficiently available from June to September. Animals are virtually in a semi-starved condition for a period of more than seven months. Thus, malnutrition over two-thirds of a year has miserably affected the growth and health of livestock population.

Bases used for estimating production are not the same. For estimating meat production, the off-take rates of the buffalo, sheep/goat, pig, and poultry population are assumed to be 10, 30, 50, and 75 percent, respectively. The average carcass weight of 100, 10, 25, and 0.5 kg are used in the projection.

On milk production, it is first assumed that 32.7 percent of the cattle population and 53.3 percent of the buffalo population are adult females. Among them, 40 percent of adult cows and 55 percent of adult buffalo cows are in lactation. Animal milk production is assumed at 165 liters per cow and 450 liters per buffalo cow.

Laying hens are estimated to be 40 percent of the poultry population and on an average each laying hen produces around 42 eggs annually.

Using these production bases, the present and projected production for meat, milk, and eggs is calculated and shown in Table 7. Although production of all these three

items is expected to increase, yet when measured on per capita basis it is less as the years pass.

If the present and projected production for meat, milk, and eggs in the hills from 1980 to 2000 is compared with the present and projected requirements for the same period, the alarming finding is that the balance of all three items of livestock products is on the deficit side.

Meat production can hardly satisfy half of the demand. The percentage of availability of milk declines year after year varying from 86 percent in 1980 to 65 percent in 2000. The supply of eggs is far behind the demand. In the next two decades, egg production will not meet more than 15 percent of the projected demand.

The best area for developing livestock enterprise in Nepal lies in the hills. Hill people need earnings from the sales of livestock products to buy cereal grains. As Table 7 shows, the possibility for the hills to export a surplus of livestock products is practically non-existent.

Potentials for Population-Food Balance

The population-food balance as discussed in the previous sections does show the magnitude and seriousness of the deficit problem. A simple conclusion can be drawn that unless the hill agriculture can be developed for a rapid increase in both crop and livestock production, the ever increasing hill population will face starvation in the very near future.

The possibility for expanding cultivated land areas in the hills is very limited since most areas suitable for cultivation have already been used. Some marginal areas may even have to be reverted to forest and rangeland in order to control soil erosion (Pant and Thapa 1981, p. 22). Therefore, higher agricultural production must be achieved through improved yield and through higher intensity in crop and livestock combination. Recent trial results have demonstrated high potentials in such an endeavour.

Since 1977, the Department of Agriculture has conducted a crop systems trial which is a part of the activities of the Integrated Cereal Project (ICP) with the aim of increasing total food production and improving farmers' income. The programme is devoting its efforts to developing an understanding of hill farming systems as practised by farmers in four hill sites, one in each development region. The trial results show a very high potential for increasing production. Crop yield can be increased by adopting improved varieties and/or practices (Rana and Mathema 1981, pp. 59-62). Table 9 shows the trial results under the farmers' own practices and by the use of improved technology in these four hill sites.

TABLE 9. CROP YIELD (KG/HA) OF PREDOMINANT CROPPING PATTERNS UNDER FARMERS' AND IMPROVED TECHNOLOGY, 1980

Land type and combinations of cropping patterns	Pumdi Bhundi		Lele		Chauri Janari		Khandbari	
	F	I	F	I	F ^a	I	F	I
Upland								
Maize	1,191	3,700	1,141	4,000	0	0	786	4,200
Millet ^b (R)	1,358	1,358	0	0	0	0	700	700
Wheat	765	2,500	0	0	0	0	0	0
Soybean (M)	0	0	12	470	0	0	0	0
Mustard	0	0	185	410	0	0	0	0
Lowland								
Rice	1,782	2,900	1,801	3,300	1,568	4,000	1,967	3,300
Wheat	532	2,000	1,114	2,800	1,245	4,800	1,290	3,000
Maize	839	2,000	0	0	0	0	0	0

Notes, a Data based on tentative crop yield from cropping systems survey.

b Millet in this paper refers to finger millet.

R Relay crop.

M Mixed with main crop.

F Farmers' own technology. Data based on cropping systems survey, 1977-78.

I Improved technology. Data based on cropping systems trial results.

The trial results show that farmers who adopted improved technology have doubled and in two sites even tripled their yields compared to using traditional practices. If such improved technology can be extended throughout the hills, a planned and projected annual increase of 3.06 percent in cereal production in the hills will be a very modest expectation.

Possibilities also exist regarding the increase of livestock production. Four factors which affect the livestock productivity are : (1) poor quality and insufficient quantity of feed, (2) low genetic potential of indigenous breeds for milk and meat production, (3) high incidence of diseases, and (4) lack of suitable marketing channels for livestock products in most areas (ADB 1979).

The first important step as recommended by the experts from ADB and IBRD is to reduce the present 5.2 million units of livestock population by one half to 2.6 million units. This will relieve the excessive burden on the land and increase the productivity of each unit. The second step is to improve the genetic stock. Improved feeding and management at the Pokhara Livestock Farm in the hills have increased its milk production of buffalo cows to 671 litres per lactation of 300 days. Improved feeding and management at the Khumaltar Farm have increased the milk production of local cows to 510 litres per lactation of 277 days (Rajbhandary and Shah 1981, p. 56).

In both cases, the milk production is more than double as compared with the local average. The progeny of the hill goat when crossed with the Jamunapari goat is capable of producing 58 kg of milk per lactation (World Bank 1980).

Ecological conditions in the hills have important comparative advantages for the production of fruits and vegetables. The opportunities should be explored for producing low-weight and high-value fruits, spices, herbs, and vegetable seeds to raise employment and income. Examples are : oranges in the Eastern and Far Western hill regions ; apples in Mustang, Helambu, Jumla, and Rasuwa ; ginger in the Western hill region ; and tea in the Ilam district of the Eastern hill area. Sericulture and beekeeping are other areas for expansion in the hills.

III. PAST AND PRESENT EFFORTS IN HILL AGRICULTURAL DEVELOPMENT

Hill Agricultural Development was greatly neglected during the first four Five-Year Plans, 1956-1975 as more financial and personnel resources were allocated to develop the tarai (Upadhyay and Shrestha 1981, p. 137). Since Nepal opened its door for international contact in 1951, several schools of thought have been developed on how to launch economic development for the Kingdom.

Tarai-First Emphasis

The tarai-first school has dominated the policy of Nepal's economic development for the first three Five-Year Plans and part of the fourth Five-Year Plan. Reasons are : (Hagan 1976, p. 13) :

1. The potential for increasing total crop and fibre production is much greater in the tarai than in the hill because of : (a) the present low crop and fibre yields even lower than the hills, and (b) the possibility of converting an estimated 400,000 hectares of forest-and brush-covered land into agricultural production.
2. Irrigation facilities in the tarai can easily be expanded to promote multiple cropping systems.
3. Being locationally close to India, the tarai enjoy the accessibility of inputs (seeds, fertilizer, pesticides, etc.) at lower costs.
4. The efficiency in using investment capital is substantially higher in the tarai.
5. Higher food and fibre production in the tarai can assure adequate supply not only to meet the domestic demand but also to promote export needs.

Under heavy population pressure, out-migration from the hills to the tarai will be a continuing necessity. If an additional 400,000 hectares of forest-and brush-covered land can be converted into crop production, this new land will be able to support 2 million more people and to provide employment for an additional 800,000 workers.

Under the influence of the tarai-first school, the distribution of development projects was 34 percent in the Kathmandu Valley, 28 percent in the tarai, 22 percent in the nationwide programmes, and only 14 percent in the hills between 1956 and 1975 (Gurung 1971, p. 6). Since most of the projects in the Kathmandu Valley and the tarai areas entail a larger financial commitment, the actual financial allocation could have been greater than what the percentages of project distribution show.

Hill-First Emphasis

The major reason advocated by the hill-first school is the principle of equity. It would be grossly unfair to either neglect or postpone the development programmes in the hills because there lives two-thirds of the nation's population. The hill people share very limited land resources and have the lowest level of income and the lowest standard of living.

As the hill-first school sees it, the tarai-first emphasis is politically undesirable in a democratic country. When more people in the hills live below the poverty line, any delay in hill agricultural development will affect the respect and loyalty of the hill people toward the Monarchy. More development funds should, therefore, go to the places where more people live.

The importance of hill agricultural development received a further boost from a study made by a Rockefeller Foundation Team in early 1976 (RFT 1976). Recommendations by this study has generated several action projects including the Integrated Cereal Project, the Rapti Agricultural Development Project, the Resource Conservation and Utilization Project, and the Seed Multiplication and Storage Improvement in the Mid-Hill Project. The implementation of the first phase of these projects started from the Fifth Plan period.

Balanced Regional Development

The balanced regional development envisaged during the Fourth Plan (1971-75) began to get underway during the Fifth Plan. This approach was actually a compromise between the tarai-first and the hill-first schools. The balanced regional development changed the planning design from the ecology-oriented approach to a geography-oriented one. By dividing the country into four development regions, each development region stretched from the north to the south and covered areas of the mountains, the hills, and the tarai.

The major objective of the balanced regional development was to reduce inter-regional disparities in development efforts by applying "packages" of investment on a more equitable basis to each of the four development regions. This approach also envisaged a series of north-south growth axes or development corridors linking the diverse geographical regions.

Each growth axis performed the functions of integrating and coordinating different development programs within each development area (Gurung 1969, pp. 7-16). Each growth axis should have a road, or a road under construction, or one to be constructed to link various growth centres. These growth centres will provide marketing services for the area population.

The main reason for having the growth axis was to link the economy of the developing tarai with that of the hill areas. Unless the products from the north can find markets in the south and those from the south can move to the north, it will be very difficult to maintain and improve the economic viability of the hills and the tarai. This corridor development approach intends not only to encourage the trade between the north and the south but also to transmit the growth from one area to another.

IV. PAST ACHIEVEMENTS AND PRESENT EFFORTS

Since hill agricultural development is still a new programme in Nepal, the Fifth Plan did get some development projects moving and the Sixth Plan will implement more projects. Some important past achievements and present efforts are mentioned below.

1. Infrastructure Improvements

By the end of the Fifth Plan, a total of 4,940 km of roads, 61 suspension bridges, and 4 motorable bridges were constructed. The Sixth Plan intends to build 1,950 km of roads, 300 suspension bridges, and 121 km of foot-or-mule tracks. As road transport is important to the development corridors, it can bring the hills closer to the tarai.

The total irrigated area by the end of the Fifth Plan was 198,481 hectares. Most of the irrigated areas are located in the tarai. The Sixth Plan will provide additional irrigation facilities to 233,482 hectares of land of which 23,261 hectares will be for the hills.

2. Input Supplies

As all chemical fertilizers are imported and distributed by the Agricultural Input Corporation (AIC) under the Ministry of Agriculture, the AIC has built a dealer network of 1,400 outlets of which about 300 are in the hills (Singh and Shrestha 1981, p. 93).

To accelerate the increase of agricultural production in the hills, His Majesty's Government during the Fifth Plan period has : (1) exempted all duties on fertilizer imports, (2) formed a uniform price on fertilizer sales throughout the country by subsidizing the transportation costs from the tarai to the hills, (3) requested foreign aid agencies to import 129,628 metric tons of fertilizers as grants which constituted 55 percent of the total imports, (4) established 39 AIC offices in the hills and expanded the storage capacity of the 17 AIC warehouses to 7,050 tons, and (5) improved the distribution system of agricultural inputs from the AIC offices to village cooperatives or *sajha* societies and private dealers with the assistance from the Agricultural Development Bank.

Due to transportation difficulties, only 34,000 M tons out of total fertilizer sales of 210,000 M tons during the Fifth Plan were consumed in the hills as compared to 75,000 M tons in the Kathmandu and 101,000 M tons in the tarai.

The sales of improved seeds in the hills and the tarai were 2,300 and 8,736 tons, respectively. For pesticide and farm tools, the sales were US \$ 176,000 and \$ 270,000, respectively, in the hills as against \$ 47,000 and \$ 910,000, respectively, in the tarai.

The fertilizer consumption level of the Fifth Plan was 7 kg per hectare in the hills as compared with 9 kg in the tarai and 100 kg in the Kathmandu Valley. The Sixth Plan envisages increasing the fertilizer consumption level to 15 kg in the hills, 22 kg in the tarai, and 135 kg in the Kathmandu Valley at the end of the Plan. The use of other inputs such as seed, pesticide, and farm tools is estimated to increase by 250 percent.

Although agricultural credit is not a direct production input, but it helps augment the farmers' purchasing power to obtain inputs. Under the present inputs distribution system, the Agricultural Development Bank, Nepal (ADB) provides credit to the village cooperatives to buy agricultural inputs in cash from the AIC. After selling these inputs to the private dealers or farmers, the village cooperatives will pay back the loans to the ADB. In the whole production process, the ADB plays a very important role as the sole agency providing institutional credit to the farmers, via village cooperatives, to accelerate the increase of production.

As of 1981, the ADB has 72 field offices in the hills (Upadhyay and Koirala 1981, p. 106). In 1980 alone, the ADB provided US\$ 5.7 million in loans to the hill farmers (Yadav and Rawal 1981, p. 131). The Sixth Plan will provide the ADB with US \$ 145 million to meet the country's agricultural credit needs (NPC 1981, p. 56).

3. Hill-Tarai Migration

In the past, migration was a common phenomenon in Nepal when the crowded hill people sought seasonal employment or permanent settlement in the tarai or abroad, mainly in India, all in a small scale. With the success in malaria eradication and with the infrastructure improvements in the tarai in recent years, the rapid increase of the hill-tarai migration has become one of the most challenging problems of the government.

The internal migration increased from 13,380 in the 1952-54 population census to 178,000 in 1961 and to 506,921 in 1971 of which 86 percent of migrants came from the hills (Sainju and Ram 1981, p. 113). As many as 50,000 farm families were settled in the tarai in an organized manner by the Resettlement Company and the Department of Resettlement during the Fourth and Fifth Plans. It is estimated that another 25,000 families will be settled by the Government in the Sixth Plan. In addition to the organized settlement, many migrants also settled in the tarai through various illegal means.

From a demographic viewpoint, the hill-tarai migration has at least one positive effect: relief to the densely populated hills. But its accompanying array of problems, such as the drain on the hill labour force, ecological imbalance, and the declining hill economy, on the one hand, and encroachment of forest land resettlement problems, and the negative impact on the tarai economy, on the other, have become of great concern to both planners and policymakers.

4. Integrated Rural Development

The concepts of integrated rural development embodying action programmes on production increase, health improvement, illiteracy elimination, and people's participation have become very popular in the 1970's. Assisted by the foreign assistance agencies, the government has approved and started the implementation of seven Integrated Rural Development Projects (IRDPs) during the Fifth Plan (Table 10). Those seven key IRDPs

TABLE 10. NEPAL'S RURAL DEVELOPMENT PROJECT : COVERAGE AND INVESTMENT

Project	Districts covered	Total project cost (US\$ million)	Donor agencies	Comencing year
Rasuwa-Nuwakot IRDP	Rasuwa and Nuwakot	10.90	World Bank	1976
Sagarmatha IRDP	Udaipur, Siraha and Saptari	30.20	1) ADB 2) IFAD 3) EEC	1974
Kosi Hill Area IRDP	Dhankuta, Terathum, Sankhuwasabha Bhojpur	9.40	UK	1979
Mahakali IRDP	Baitadi, Dhandheldhura and Darchula	13.50	World Bank	1980
Rapti IRDP	Dang, Salyan, Rukun, Rolpaha and Pyutha	33.70	USAID	1980
Karnali-Bheri IRDP	Surkhet, Dailekh and Jumla	12.50	Canada	1980
Lamosangu-Jiri-IRDP	Dolkha and some parts of Sindhu-palchok and Ramechhap	6.25	Switzerland	1980

Note ADB Asian Development Bank
 IFAD International Fund for Agricultural Development
 EEC European Economic Community

cover 22 districts of which 20 districts are located in the hills. When completed, the benefits of these projects will extend to 600,000 farm families (Upadhyay and Shrestha 1981, p. 139).

In addition to these seven big IRDPs, other medium and small size projects of a similar nature include the Gandaki Agricultural Development Project (GADP) supported by the Federal Republic of Germany, the Small Farmers' Development Project (SFDP) assisted by FAO, and the Janapur Agricultural Development Project (JADP) sponsored by Japan. Although the implementation of these big and small projects may take another five to 10 years, when completed, the impact on the rural economy will definitely be great.

5. Population Control

Population policies were formulated in both the Fifth and Sixth Plans. If the population growth rate is not properly arrested, it will not only lead the country to a further deterioration in the quality of life but also turn the country into a net food importer. In the early stage of programme implementation, the Sixth Plan proposes that the growth rate can be brought down from 2.34 to 2.30 percent.

With regard to population education, the Ministry of Education, Panchayat Training Centre, Cooperative Department, Administrative Management Department, Women's Services Coordination Committee, Mother's Clubs, and Women's Organizations are mandated to launch different programmes aimed at the rural areas, particularly the hills where the fertility rate is high. A National Population Commission was recently established in 1980 to conduct more realistic and practical development policies on population growth and migration. The Sixth Plan provides a budget of US \$ 2.4 million to fund all programmes related to the population control activities.

V. NEW STRATEGY : ITS CONSTRAINTS AND STRENGTH

Development of hill agriculture in Nepal is a project which is easier said than done. If a short-cut is available that can effectively develop the hill agriculture, the problem will not become an international significance. In the process of developing hill agriculture, Nepal has many constraints. At the same time, Nepal has her own strength to rebuild a healthy hill agriculture.

Constraints

Physical constraint is a key factor making hill agricultural development difficult. As a landlocked country, Nepal's imports have to be shipped from the Calcutta Port in

India to the long Indo-Nepal border and then to be trans-shipped from the border to the hill destinations. It takes a long time and bears a high cost for a shipment to reach the hills. In the hills, feeder roads connecting villages with towns are very much lacking. Poor communications prevent mobility of the hill people.

The steep slopes and severe erosion of the hill terrain limit expansion and intensification of land use. Cooler temperature slows the maturity of crop growth affecting the selection of varieties for better rotation systems. Frequent occurrences of violent hailstorms in some hill valleys also preclude successful fruit production (Nepali and Regmi 1981, p. 126).

With population density of the hills exceeding 1,500 persons per km² of arable land (World Bank 1972, p. 2), the average size of farms in the hills is less than 0.5 hectare (World Bank 1981, p. 4). The unfavourable man-land ratio hinders the efficiency of farm management. Making hill farming economically viable is difficult because of the high costs of purchased inputs and low prices of the small marketable surplus resulting in low income. The lack of non-farm jobs prevents the optimum use of surplus farm labor.

The depressed economic conditions in the hills encourage surplus labourers to migrate to the tarai or India temporarily or permanently. Temporary migrants spend all their savings earned outside to purchase daily necessities for home consumption. Permanent migrants transfer their wealth to their new settled places. Both contribute very little to the capital accumulation in the hills. So the hill people remain poor.

Due to the lack of markets, supply and demand of farm products can not be regulated. Of the 640 periodic markets in Nepal, the hills and the tarai share 169 and 471 markets, respectively. Among the hills, 161 periodic markets are located in the Eastern and Central Development Regions while only 8 periodic markets serve the marketing needs of the whole western part of the country (Misra and Satyal 1981, p. 87).

Culturally, Nepal is a multi-racial, multi-linguistic, and multi-religious country. The Kingdom consists of two distinct races (the Indo-Aryan and the Tibeto-Mongoloid), five major religious groups (Hindus, Buddhists, Muslims, Christians and Jains), and six important languages (Nepali, Maithili and dialects, Bhojpuri, Tamang, Tharu, and Newari). Diversity if not well coordinated may become a cause of national disunity.

One major concern for Nepal is the low rate of literacy. As of 1980, the literacy for the whole country was 20 percent, 35 percent for the males and 5 percent for the females. The literacy rate in the hills could be much lower. With such low literacy rate, the pace of hill agricultural development can hardly be expected to move forward very fast.

Strengths

It would be erroneous to think that Nepal's hills are only barren lands. In travelling around Nepal's hills, one can hardly find any place where farmers practice shifting cultivation or slash-and-burn agriculture. All arable land areas are used by those who were either born there or moved in from nearby villages. They practised permanent agriculture for centuries.

The most striking feature about Nepal's hills is the highly developed terracing techniques which make the sloping land productive in growing crops and raising livestock on a sustained basis. By applying their own ingenuity, hill farmers construct terrace from the foot to the top of the hills. It is a stupendous engineering feat. It can be called a man made wonder. It is difficult to find a similar type of permanently settled hill agriculture in such a grand scale elsewhere.

Utilizing their limited resources through trial and error over the years, hill farmers have developed various types of farming systems by combining crops and livestock suitable for the operation of small farms under given constraints. For instance, in areas where water is accessible land use intensity is usually high, and in areas where rainfed culture is practiced it is usually low. For diversification, fruits and vegetables are popularly grown together with major cereal crops. Livestock raising has become the important additional source of income and food nutrients. It is this intensive farming system which utilize less than one-third of the country's cultivated land to support almost two-thirds of the country's population but with periodic shortage when the weather was poor.

Due to continuous and intensive use of hill land for production with less effort in replenishing soil fertility, the yields per hectare of major cereal crops (paddy, maize, millet and barley) show a declining trend from 1970-71 to 1979-80 (Table 11). Only wheat yield has been slightly improved mainly due to the adoption of high-yielding varieties. Even with a declining trend, the average yields of these five crops are still higher than that of the same crops in the tarai.

Another important strength is the high quality of the hill people. They engage in farming from their childhood, going through the process of learning by doing. They are very skillful in organizing their limited resources relevant to the local physical conditions. Hill people are religiously disciplined. Even without law enforcement in the remote areas, one can move around the hills safely. The hero image of the hill males is to become Gorkha servicemen because they are brave fighters serving under Nepalese, British, and Indian armies. They also join the United Nations Peace Force stationed in Lebanon. Because of their loyalty to His Majesty, they unconditionally obey the royal decrees. Regardless of all hardships, hill people survive with the spirit of endurance.

TABLE 11. COMPARISON OF AVERAGE CROP YIELDS (Q. TONS/HECTARE) BETWEEN HILLS AND TARAI, 1967/68 - 1939/80.

Year	Paddy		Maize		Wheat		Millet		Barley		Potato	
	H	T	H	T	H	T	H	T	H	T	H	T
1967/68	2.41	1.73	1.92	1.57	1.26	0.89	1.16	0.87	1.00	0.69	5.64	6.06
1968/69	2.43	1.76	1.93	1.58	1.30	0.93	1.16	0.88	1.00	0.69	5.64	6.19
1969/70	2.46	1.83	1.94	1.61	1.33	1.02	1.16	0.89	1.02	0.70	5.62	6.28
1970/71	2.55	1.83	1.97	1.64	1.00	0.70	1.21	0.90	1.03	0.70	5.46	5.97
1971/72	2.39	1.83	1.79	1.62	1.10	0.78	1.18	0.90	1.02	0.70	5.42	6.77
1972/73	2.43	1.62	1.87	1.70	1.10	1.28	1.14	0.88	1.02	0.66	5.29	6.79
1973/74	2.45	1.86	1.86	1.63	0.95	1.19	1.21	0.87	1.02	0.71	5.38	6.68
1974/75	2.43	1.88	1.90	1.64	1.02	1.21	1.18	0.91	1.02	0.70	5.19	6.64
1975/76	2.51	1.97	1.81	1.33	1.18	1.17	1.23	0.90	0.99	0.72	5.63	6.78
1976/77	2.49	1.75	1.85	1.66	1.09	1.01	1.18	0.88	0.85	0.72	4.84	6.62
1977/79	2.30	1.69	1.66	1.68	1.18	1.09	1.10	0.93	0.93	0.71	5.22	6.20
1978/79	2.24	1.74	1.62	1.60	1.20	1.14	1.11	0.91	0.88	0.86	5.61	—
1979/80	2.02	—	1.33	—	1.12	—	0.99	—	0.89	—	5.45	—

Sources : Department of Food and Agricultural Marketing Services, Ministry of Food, Agriculture and Irrigation, Nepal, Handbook of Agricultural Statistics of Nepal, Kathmandu, 1979.
 Part and Thapa 1981, p. 21.

Some Elements of New Strategy

Since no place in the world has similar problems as Nepal's hills, foreign experience can not be used as a model for development. At present, Nepal has no land frontier for a large-scale settlement. To support continuing increase of population, not only should the current declining trend of land productivity be quickly arrested but also the upward trend of land productivity be quickly established and increased. To produce more food is the prime target of development.

No immediate prospect appears to exist of discovering highvalue mineral deposits such as gold or petroleum ; borrowing multi-billion dollars from international or regional banks to develop the abundant hydraulic resources ; and getting commitments from friendly countries for expanded long-term external assistance. If the agricultural sector is not fast developed, Nepal's industrialization has a long way to go. The practical approach is that Nepal should not rely too much on foreign aid but should rely more on the mobilization of local resources, particularly the hill's manpower.

The present government policy to develop hill agriculture by emphasizing the balanced regional development to establish corridor growth axes, on the one hand, and the best use of available external assistance to meet foreign exchange requirements of various development projects, on the other, are to be considered as a practical, fair, and workable approach. The present question is that how to proceed with the balanced regional development.

If the new strategy is to rely on the mobilization of local resources, four key measures should be implemented by the cooperation between the public and private sectors.

Establishment of Garden Farming

Hill farmers have already managed their small farms in a very intensive way. Garden farming is a measure to encourage them to operate their farms in an even more intensive way. In other words, garden farming should characterize resource renewal management with heavy labour inputs. With proper guidance, it is easy to promote garden farming because of the superior quality of the skills of the hill farmers.

Establishment of garden farming include five essential activities. All of them can be done by the farmers. Firstly, the terrace bunds have to be renovated. This includes the repairing of the existing bunds which are in poor conditions, the levelling of individual fields and the consolidation of irregular fields. Secondly, the farm layout should be properly planned including the design of land use patterns, the adoption of improved crop and livestock systems, and the alignment of irrigation and drainage facilities. Thirdly, the making of compost should be encouraged by converting all wastes into

fertilizer for maintaining and improving soil productivity and for saving high costs of transporting imported fertilizers up to the hills. Fourthly, the feed supply should be increased by reducing the number of livestock population on the one hand and by introducing forage cultivation on the other. Fifthly, the popularization of high-yielding varieties of main crops by means of organized trials on farmers' fields similar to the mini-kit programme sponsored by the Integrated Cereals Project should be promoted.

Construction of Track Network

A great majority of hill people today travel by foot on small tracks made by Nature. The surface of those small tracks is rough, the height between steps is uneven, the side of the tracks is unstable, and the alignment of those tracks is based on the existing topography extending the walking distance. Even the local porters who know the areas well are walking at their own risks, particularly when they carry heavy thing either over their backs and on their heads. Many of those Nature-made tracks are also used by mules for transporting purpose.

It is necessary to widen the foot-or-mule tracks by making it safe to walk and easy to climb up the hills and to reduce the distance through the construction of small bridges or suspension bridges. When the construction of track network is completed, the portage services should be organized including porters and mules in order to create more employment opportunities and to facilitate the commodity flows among villages.

Development of Rural Markets

This should be carried out simultaneously with the construction of track network to facilitate the mobility of both people and goods. Population distribution in the hills should be used as the guideline to determine the number of rural markets. For instance, should a rural market is designed to serve 3,000 people, the total number of rural markets in the hills should be over 3,000.

In the remote areas, the setup of weekly periodic markets first will be more desirable. When the volume of businesses increases, the weekly markets can be expanded into daily markets. When necessary, the daily markets can finally be converted into rural development centres.

Extension of Non-Formal Education

The elimination of illiteracy through formal education will take a longer time and require heavy capital investment. Non-formal education (the methods of imparting

knowledge outside of the classrooms) is, therefore, the most effective short-cut. It has to be pointed out that non-formal education is timely useful but is by no means a substitute for formal education.

In the hills, the most effective way to carry out non-formal education is by means of radio broadcasting, movie shows, artist performance, pictorial illustrations, training demonstrations and group discussions. As seeing is believing, all these means of communications can get the needed messages across to the people directly. The following four types of non-formal education are urgently needed.

Firstly, population education on family planning to reduce the fertility rates and to have small number of healthy children is of paramount importance. Secondly, the demonstration of appropriate technology to increase agricultural production in both government farms and private plots is critically needed. Thirdly, the training of rural women in better home management, improved farm practices, and community activity participation with the objectives of reducing work fatigues, performing better work quality and involving them as partners in decision making on family and community affairs should be immediately conducted. Last but not least, hill farmers should have more opportunities to participate in group actions such as the joining of the multi-purpose cooperatives, the participation of community activities, and the voluntary work on public projects to improve their living environment.

Characteristics in carrying out the above four measures are ; (1) implementation requires little foreign exchange, (2) implementation depends entirely on local resources particularly cheap labour inputs, (3) without new organizational setup, the present government ministries are able to provide guidance and assistance on the implementation of such measures, and (4) implementation of these four measures will provide a solid foundation for the modernization of Nepal's hill agriculture.

Notes

1. Nepal is ecologically and physiologically divided into three levels of land : the tarai, the hills, and the mountains. Stretching along the southern border with India, the height of the tarai is between 75 and 300 meters above sea level. The height of the hills is between 300 and 3,000 meters. The mountains range from 3,000 to 8,000 meters above sea level. The tarai terrain shares only 17 percent of the total land area. For the hills and the mountains, the share of the total land area is 68 percent and 15 percent, respectively. Since the mountains have limited importance in agriculture, the hills, as discussed in this paper, will include the land area of the mountains, making a total of 83 percent of the country.

The Kingdom was politically divided into four development regions : Eastern, Central, Western, and Far Western. To speed up balanced economic development, in late 1981, the Far Western Development Region was split into two regions : Far Western and Mahakali.

2. Realizing both the urgency of understanding the seriousness of the problems of hill agricultural development and the need to find effective ways of solving these problems, the Ministry of Food and Agriculture of His Majesty's Government organized a seminar on Nepal's Experience in Hill Agricultural Development in Kathmandu from 30 March to 3 April 1981. In addition to mobilizing its own experts to prepare papers based on their experiences in implementing hill agricultural development programmes, the Ministry in cooperation with the Agricultural Development Council invited specialists from neighbouring countries and international and bilateral organizations to share in their experiences. A total of 22 papers were discussed in this seminar.

The proceedings of this seminar were published by the Ministry in October 1981. This paper will cover most of the problems discussed in this seminar.

3. This section on food will rely heavily on two papers included in the Proceedings on Nepal's Experience in Hill Agricultural Development. One is by Khadka and Gautam on Demand and Production of Foodgrains in the Hills and the other by Rajbhandary and Shah on Trends and Projections of Livestock Production in the Hills.

REFERENCES

- ADB 1979 Asian Development Bank : *Appraisal of the Livestock Development Project in Nepal*. Manila : 1979.
- Banister & J. Banister and S. Thapa : *The Population Dynamics of Nepal*. Honolulu : East-West Thapa 1981 Population Institute, East-West Center, 1981.
- CBS 1956 Central Bureau of Statistics : *1952-54 Population Census*. Kathmandu : 1976.
- CBS 1976 ——— : *Demographic Sample Survey*. Kathmandu : 1976.
- DFAMS 1979 Department of Food and Agricultural Marketing Services : *Handbook of Agricultural Statistics of Nepal*. Kathmandu : Ministry of Food and Agriculture, 1979.
- ESCAP 1980 Economic and Social Commission for Asia and the Pacific : *Population of Nepal*. Country Monograph Series No. 6. Bangkok : United Nations, 1980.
- Gorkhaly & Shrestha 1981 P.P. Gorkhaly and M.M. Shrestha : "Irrigation Water Management and Use at the Farm Level in the Hills, in (MFA 1981).
- Gurung 1969 Harka Gurung : *Regional Development Planning for Nepal*. Kathmandu : National Planning Commission, His Majesty's Government of Nepal, 1969.
- Gurung 1971 Harka Gurung : *Rationale for Hill Area Development*. Kathmandu : Nepal Industrial Digest, 1971.
- Hagan 1976 A.R. Hagan : *The Agricultural Development of Nepal, Analysis of the Agricultural Sector*. Special Report 189. University of Missouri, 1976.
- Khadka & Gautam 1981 B.B. Khadka and J.C. Gautam : "Demand and Production of Foodgrains in the Hills", in (MFA 1981).

- MFA** Ministry of Food and Agriculture : *Proceedings on Nepal's Experience in Hill Agricultural Development*. Kathmandu : 1981.
- Misra and Satyal 1981** I.R. Misra and M.R. Satyal : "Development of Agricultural Marketing and the Improvement of Rural Markets in the Hill Areas", in (MFA 1981).
- Nepali & Regmi 1981** S.B. Nepali and I.R. Regmi : "Technological Innovations for Agricultural Development", in (MFA 1981).
- NPC 1974** National Planning Commission : *Nepal Policy Guidelines for the Fifth Plan (1975-1980)*. Kathmandu : His Majesty's Government, 1974.
- NPC 1981** ——— : *The Sixth Plan (1980-1985)*. Kathmandu : His Majesty's Government, 1981.
- Pant and Thapa 1981** T.N. Pant and G.B. Thapa : "Development Potentials of Nepals Hill Agriculture" in (MFA 191).
- Rajbhandary & Shah 1981** H.B. Rajbhandary and S.G. Shah : "Trends and Projections of Livestock Production in the Hills", in (MFA 1981).
- Rana and Mathema 1981** P.N. Rana and S.B. Mathema : "Potential Income of Desirable Changes in Relation to Productivity and Income in Hill Farming Systems", in (MFA 1981).
- RFT 1976** The Rockefeller Foundation Team : *A Study of Hill Agriculture in Nepal*. New York : The Rockefeller Foundation 1976.
- Sainju and Ram 1981** M.M. Sainju and B.K.C. Ram : "Hill Labor Migration : Issues and Problems", in (MFA 1981).
- Singh and Shrestha 1981** R.B. Singh and G.R. Shrestha : "Delivery of Agricultural Inputs to Hill Farmers : Issues and Problems", in (MFA 1981).
- Upadhyay & Koirala 1981** S.K. Upadhyay and G.P. Koirala : "Production Incentives for Hill Agricultural Development", in (MFA 1981).
- Upadhyay & Shrestha 1981** J. Upadhyay and B.R. Shrestha : "External Assistance for Nepal's Hill Agriculture", in (MFA 1981).
- World Bank 1979** World Bank : *Nepal Development Performance and Prospects*. Washington, D.C. : 1979.
- World Bank 1980** ——— : *Report of the Nepal Hill Food Production Project Preparation Mission*. Washington, D.C. : 1980.
- World Bank 1981** ——— : *Staff Appraisal Report of the Hill Food Production Project*. Washington, D.C. : 1981.
- Wortman 1980** S. Wortman : *Accelerating Nepal's Agricultural Progress* (A Report for the secretary of Ministry of Food and Agriculture). New York : The Rockefeller Foundation, 1980.
- Yadav and Rawal 1981** R.P. Yadav and T. Rawal : "Institutional Innovations for Hill Agricultural Development", in (MFA 1981).