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Nepalese Agricultural Growth (1965-91): Regional/Sectoral Acceleration Retardation Pattern and Dualism

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INTRODUCTION

Issues

This study seeks to answer: whether the rates of growth of the Nepalese agriculture are constant, accelerating or decelerating, how the agricultural growth rates have been distributed across its sub-sectors and commodities; and what have been the patterns of agricultural growth among the agro-ecological zones, development regions and districts ? The results of the present study underline the urgent need to change our development plans and their implementation in favour of a regionally balanced and sub-sector-rise proportionate agricultural growth.

Shifts in the Sectoral Investment Priorities

Agricultural growth results from the government's and the peoples' investment decisions made earlier. From first Five Year Plan 1956 to Eighth Plan, 1997, the development plans have shifted their inter-sectoral investment priorities at three stages. First, during 1965-70, the emphasis was on: transport and communications; and industry. Second, during 1970-80, the plans accorded priority to: communications. Lastly, the plans during 1980-97 have laid more emphasis on the "basic needs" such as: agriculture and poverty alleviation; and social services. These shifts in the investment priorities across the socio-economic sectors and the agro-ecological regions must have affected not only the pattern of agricultural growth but also redistributed the later's benefits among various regions and, ultimately, among the households.

Regional Development

National Planning Commission (NPC) allocates the public investment among the country's five development regions (Eastern, Central, Western, Mid-western and Far-western regions) and the three agro-ecological zones (mountain, hills and terai) based on some criteria of social equity, economic efficiency, corridor development and natural resources management. An overlay of these five development regions and the three agro-ecological zones gives rise to the 15 sub-regional development blocks as the country's production and consumption planning units.

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This study concentrates on the three principal growth axises, namely, Gandaki Axis (Central plus western development regions), Karnali Axis (Mid-western plus Far-western development regions) and Koshi Axis (Eastern development region) for detailed analysis. Such amalgamation of regions is based on their commonalities, such as, the ethnic composition, natural resource systems, cultural way of life, economic status and the network of infrastructures.

Gandaki Basin

The Gandaki basin is principle growth axis of Nepal. In 1976/77, this basin stood first in economic development with an (unweighed) average score of 796 (National Council for Science and Technology, NCST, 1980). The Gandaki basin enjoys lion's share in the public investment, and has the best agricultural production conditions such as: agro-industrial facilities, urban demand for farm products, marketing and infrastructures. Government has established nine out of ten national agricultural commodity development programmes (namely, paddy, maize, wheat, sugarcane, tobacco, pulses, goat, multipurpose livestock farm, temperate fruits and vegetables) in this region.

In the Gandaki basin, most of the peasants come from the Tamang, Gurung, Jirel, Hayu communities in the mountains and hills, and from the Dhangarh, Tharu, Bhojpuri and Majhi communities in the terai. Brahamin, Thakuri or Rajput, Marwadi and Newar communities own most of the good farm land who also have strong political clout in the government's budget allocation decisions.

Koshi Basin

The Rana rulers (1846-1950) had established Nepal's first industrial plant (jute) in Biratnagar in early twentieth century. Koshi basin topped in the socio-cultural development with an (unweighed) average score of 825 in 1976/77 (NCST, 1980). This basin fell behind the Gandaki basin since 1960s in economic development. Most of the peasants in the Koshi basin come from the Rai, Limbu, Yanka, Koche, Mache, Dhimal communities in the mountains and hills, and Satar and lower caste Maithali ethnics in the terai. Most of the landlords come from the Brahmin, Khas and Marwadi communities.

Karnali Basin

Karnali axis is the most backward basin in the country with an average socio-cultural (unweighed) score of 551 and economic development score of 488 in 1976/77 (NCST, 1980). Here, most of the peasants come from the Magar, Raute and Tharu and

the lower cast Khas communities. This region has the highest incidence of absentee landlordism and medieval culture in the country.

Hypotheses and Objectives

This study hypothesizes that the agricultural growth rates in the "powerful regions" and the commercial sectors have accelerated at the cost of the weaker regions and subsistence farming sectors where agriculture has even retarded.

The objectives of this study are: to summarise the trends of production, area and productivity of agricultural sub-sectors and commodities; to analyze the rates of growth of agriculture in terms of the acceleration-retardation phenomenon or breaks-in-the-trends; to examine the sources of agricultural growth, namely, the area effect and the productivity effect by regions and districts; and to evaluate the regional disparities in the agricultural development.

METHODOLOGY AND DATA

Growth Curves

Nature of the rates of growth of population, gross domestic product (GDP), agricultural GDP, non-agricultural GDP, production according to farm sub-sectors as well as the individual agricultural commodities was analyzed by applying different growth functions as described in Rudara 1982 and Croxton et al 1975. First, the geometric exponential function gives discrete, constant, compound growth rates and, therefore, it cannot tackle the question of changes in the rate of growth. Second, the natural exponential function gives an instantaneous rate of farm output, cultivated area and productivity. Third, the straight line implies a diminishing rate of growth. Fourth, the gompertz function allows both the acceleration or deceleration phenomenon in the rates of growth, and also gives the upper or lower asymptotes of the growth paths. Lastly, the logistic function is preferable to explain the trend of growth of total population.

Data

Population and GDP

The Central Bureau of Statistics (CBS) has published the data on GDP in two series: The old series covers the period of 1964/65-73/74 and the new series was started from 1974/75. The new series revised upward the estimates of GDP by 9.16 percent. The population data is obviously based on censuses of 1931, 1941, 1952/54, 1961,1971, 1981 and 1991.

Agricultural GDP

CBS has indexed the agricultural-GDP by sub- sectors since 1974/75. We used the CBS's estimates of producers' national average farm gate prices at 1976/77 level to aggregate various agricultural commodities by districts (CBS, 1984). From 1967/68 onwards, the then Department of Food and Agricultural Marketing Services (DFAMS) published district-wise estimates of the area, yield and production of cereals (paddy, maize, wheat, millet, barley), and cash crops (potato, mustard, jute, sugarcane and tobacco).

In addition, we analyzed the production of the following commodities during 1985/86-90/91: meat (buffalo, goat, sheep, chicken, duck and pork), milk (buffalo, cow and goat) egg (hen and duck) and wool; fish (extrapolated backward on pro-rate basis for the years 1985/86 and 1986/87), pulses (lentil, chick pea, pigeon pea, black gram, grass pea, horse gram and soy bean), tea and cotton.

Cultivated Area, Cropping Intensity and Productivity

The ratio of the DFAMS's cropped area to the NPC's cultivated area (for 1990) gives an estimate of the aggregate cropping intensity. Here, the growth of productivity refers to the ratio of agricultural-GDP unit of the cropped area.

RESULTS

Aggregate Trends

Stages of Growth

Pessimist view the Nepalese economy as declining because of the "semi-feudalism and neo-colonialism". Others look it as a "half-full bottle". Here, an overview of the rates of growth of GDP, non-agricultural GDP, agricultural-GDP and population suggest that Nepal's socio-economic development has begun to accelerate during the past decade. This is evident from the performance of the Nepalese economy during the past decade-long stages where the annual rate of growth of GDP successively doubled as: 1.84 percent during 1966-74, 2.75 percent per year during 1975-84, and 4.74 percent during 1984-91 (Figure 1 and Table 1). The increasing coefficients of determination (R^2) underscore the strength of acceleration in the GDP growth rates.

Despite fluctuations during 1974/75-82/83, the agricultural GDP growth rate not only increased to 5.17 percent during 1983/84-90/91 but also became more stable. Against such momentum, the Eighth Plan's (1992-97) target to increase GDP by 5.1 percent and agricultural GDP (value added) by 3.2 percent is modest.

Table 1

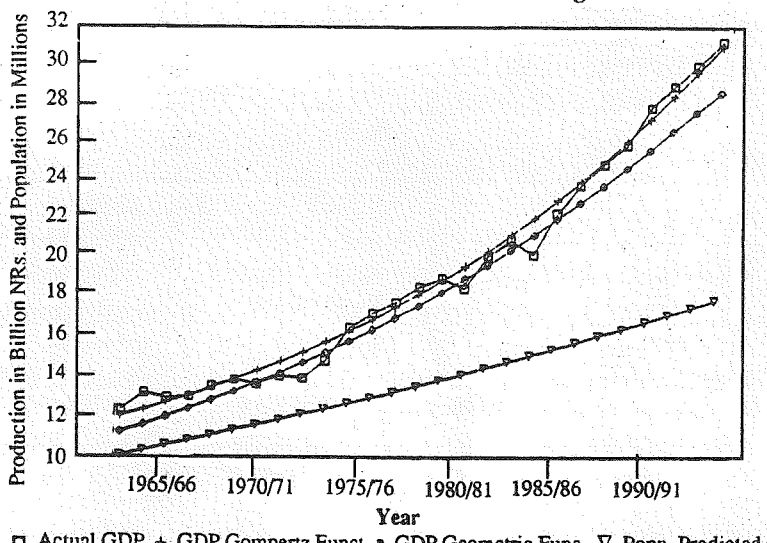
Growth of GDP, Sectoral GDPs and Population by Economic Stages

Sectors & Stages	Compound Growth Rates (% Per year)	R^2
Population	2.38	0.99
GDP	3.66	0.98
of which		
non-agricultural GDP	4.60	0.96
Agricultural GDP	3.12	0.95
GDP Growth:		
1964/65-73/74	1.84	0.90
1974/75-82/83	2.75	0.92
1983/84-90/91	4.74	0.99
Agricultural GDP Growth:		
1964/65-73/74	1.63	0.78
1974/75-82/83	1.17	0.39
1983/84-90/91	5.17	0.97

Source: Author's estimates based on basic data of CBS (1964-1974), Population Census (1964) and DFAMS (1967).

Figure 1

Aggregate Trends of Population, GDP and Agricultural GDP, 1964-91



Accelerating Trends

The gompertz and logistic trends confirm that the economic growth rate has been increasing at an increasing rate (i.e.,accelerating) while the population growth rate has begun to decelerate (Table 2).

During the past 27 years, GDP per capita growth rate was only 1.28 percent per year (equal to GDP growth rate of 3.66 percent minus population growth rate of 2.38 percent). We may elaborate that for the GDP growth, the gompertz equation's "c" parameter (=1.014106 in table 2) is more than unity, so are those for the sectoral GDPs. So, the predicted annual GDP growth rate of 4.39 percent in 1990/91 increased to 5.07 percent in 2001/02. The predicted annual agricultural GDP growth rate increased from 3.99 percent in 1990/91 to 5.06 percent in 2001/02.

Contrary to the general belief, the population growth rate has begun to decelerate. The gompertz function accurately predicted the annual population growth rate for 1990/91 as 2.10 percent, and it forecasted a further slow-down of population growth rate to just 1.89 percent by the year 2001/02.

The rising GDP growth rates and falling population growth rates will accentuate the annual growth of GDP per capita from a stationary level of 0.54 percent per year during 1964/65-73/74 to 2.29 percent for 1990/91 and, at least, 3.18 percent for 2001/02.

Table 2

Gompertz and Logistic Growth Curves for GDP, Non-agricultural GDP, Agricultural GDP, Population and GDP per Capita 1964/65-2001/02

Variables & Growth Curves ("t"=1964/65-90/91)	R^2	Predicted Growth Rates 1990/911	2001/02
GDP (G) = 3.14 21 +0.93287 $(1.014106)^t$	0.99	4.39	5.07
NGDP ,, = -2.1460 + 5.72615 $(1.00328)^t$	0.97	4.80	4.97
AGDP ,, = 3.4986 + 0.40578 $(1.023455)^t$	0.95	3.99	5.06
POP ,, = 5.1471 - 1.14679 $(0.989858)^t$	1.00	2.10	1.89
GDP/Capita = f_g (t) -f_D (t)		2.29	3.18

Notes:

1. Logistic trend, $L= 116.72/(1+10^{1.2978-0.080316*t})$; $R^2 = 0.93$. And time, t = for 1931 (which increases by 1 for every decade) fits less well than the gompertz trend for the population data.
2. In the last equation, "g" denotes the GDP growth rate and "p" denotes the population growth rate.

Source: Author's extimates based on the basic date of CBS (1964-1974), Population censuses (1964-1991) and DFAMS (1967).

Agriculture's Sub-sectoral and Commodity-wise Growth

Disproportionate Growth

The evidences of accelerating rates of growth of food grains, cash crops and livestock products are that: the coefficients of determination (R^2) of the gompertz function are higher than that of the geometric or linear trends and the gompertz function's "c" parameter is greater than unity (Figure 2 and Table 3 and 4).

On the other hand, the production of fish, horticultural crops and pulses, and capital formation in agriculture grew at a constant rate. Low rate of capital formation in agriculture implies an inadequate development of the future productive capabilities.

Worst of all, the forest products had a quadratic growth path which decreased in absolute amounts up to mid-eighties and only there after, it began to recover. In the forestry sector, part of the problem may lie in the government traditions of considering the forestry (like irrigation) not as a part of agriculture but independent of it. Decline of the forestry till mid 1980's might have adversely affected the sustainable crop production and animal husbandry.

Figure 2

Agricultural Sub-sectors' Representative Trends 1974-90

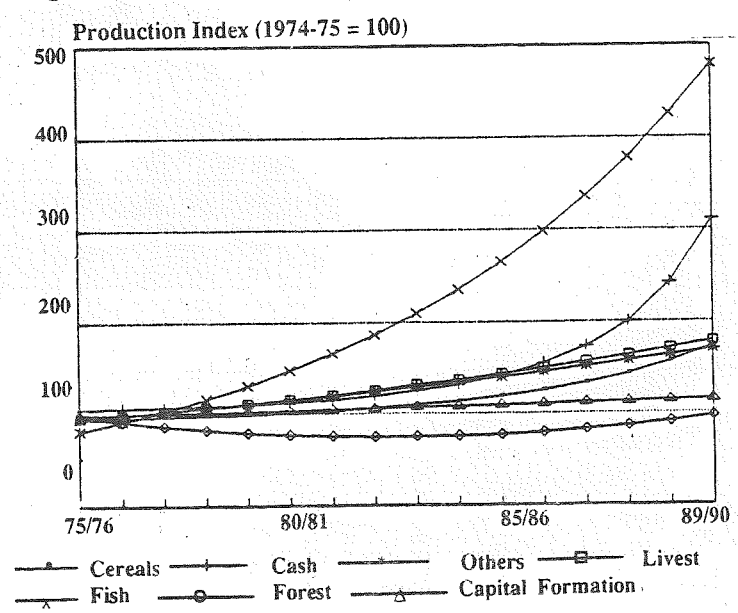


Table 3

Agricultural Sub-sectors' Growth Based on 1975/76-89/90 Indices

Base 1974/75 = 100

Sub-sectors & Growth Curves	Constants	Growth Rates 1985/86	Growth Rates 1995/96	R^2
Cereals:				
Straight line	83.38	2.75	2.17	0.6717
Exponential	87.37	2.82	2.82	0.6796
Geometric	87.10	1.23	1.23	0.6800
Gompertz (F)	*	5.20	33.01	0.8984
Cash Crops:				
Straight tine	60.16	5.41	3.51	0.3906
Exponential	86.49	5.21	5.21	0.5567
Geometric	87.10	2.26	2.26	0.5567
Gompertz (F)	*	2.59	15.51	0.6670
Fruits, Vegetable and Pulses:				
Straight line	87.79	3.48	2.58	0.9247
Exponential	91.84	3.82	3.82	0.9418
Geometric (F)	91.20	3.90	3.90	0.9417
Gompertz	*	4.00	3.67	0.9199
Livestock Products:				
Straight line	83.89	3.49	2.59	0.9181
Exponential	89.12	3.90	3.39	0.9497
Geometric	89.35	1.70	1.70	0.9480
Gompertz (F)	*	4.43	5.09	0.9537
Fish:				
Straight line	64.89	10.27	5.05	0.8207
Exponential	83.93	11.78	11.78	0.9279
Geometric (F)	91.20	12.51	12.51	0.9279
Gompertz	*	20.52	133.30	0.6838
Capital Formation:				
Straight line	95.87	2.16	1.77	0.3119
Exponential	96.54	2.29	2.29	0.4245
Geometric (F)	97.72	0.99	0.99	0.4555
Forest:				
Quadratic (F)		3.21	7.85	0.5476

Notes:
1. (F) : See Figure 2 above for the slope of the curves.
2. (*): See Table 4 below for the estimated equations.
3. Quadratic function alone fitted well for the forest products:

Source: Same as of Table 1.

Equation: $Q = 97.23 - 6.7199 * t + 0.3897 * t^2$
Standard Errors (1.7209) (0.0984)

During 1974/75-89/90, food grain production annually grew by 1.23 percent but the cash crop production grew at twice the rate of 2.26 percent per year. Such a disproportionate rate of growth of the food grains and the cash crops may undermine the household food security due unavailability of food grains and lack of equitably distributed purchasing power.

Table 4

Gompertz Trends by Sub-sectors of Agriculture
1974/75 = 100 for Sub-sectors, and Agricultural GDP (in million. Rs.)

Variables	Growth Curves (t = 1974/75-89/90)	R^2
Cereals	$G = 1.9554 + 0.02090 * 1.18838^t$	0.8994
Cash Crops	$G = 2.0129 + 0.01053 * 1.28991^t$	0.6670
Horticulture & Pulses	$G = 3.8958 - 1.91097 * 0.99015^t$	0.9199
Livestock	$G = 0.8470 + 1.13216 * 1.01439^t$	0.9537
Fish	$G = 1.9238 + 0.10963 * 1.16320^t$	0.8638
Agri. GDP	$G = 3.9517 + 0.08280 * 1.09847^t$	0.9990

Source: Same as of Table 1.

Dualistic Development

The compound growth rates for 32 different farm commodities shed light on the dualistic growth pattern of the Nepalese agriculture (Table 5).

First, it convey a disappointing message for the poor people because the rates of growth of their farm products are very low. For example, production of maize and millet grew at a rate of 1.29 percent per year and 1.52 percent per year respectively. Growth of barley production was zero. Output of "poor peoples' sources of protein", namely, the chick pea, gram pea and horse beans have decreased. Production of labour-intensive crops, such as jute and tobacco declined. As a corollary, the stagnation in the income of the poor and middle class peasants may make food inaccessible to them.

Second, the annual rate of growth of the high value farm outputs are phenomenal: paddy 1.67 percent, wheat 6.61 percent, sugar cane 7.57 percent, tea 11.16 percent, soya bean 13.87 percent, cotton 18.35 percent, black pea 14.01 percent, fish 11.16 percent, chicken meat 10.16 percent and chicken egg 87.94 percent.

Finally, the column under "g-future" in Table 5 shows the Eighth Plan's (1992-97) growth targets for individual commodities, and the figures in the extreme right show the target sub-sectoral aggregate growth rates for agriculture. A comparison of the relative sizes of the above target growth rates among themselves, and their further comparisons with their corresponding past growth rates indicate that the government's selective support for extension, research, marketing, agro-industry have contributed to the dualistic growth of the agricultural sector.

Table 5

Farm Commodities' 1985/86-90/91 Growth and the 1992-97 Targets

Products	Constants (Mt)	g-Past	SEE	(R^2)	g-Future	
Paddy	2021761.9	1.67	0.05221	0.50	5.5	5.4
Maize	696819.0	1.29	0.06068	0.30	4.7	
Millet	114153.7	1.52	0.06663	0.33	2.1	
Buckwheat	-	-	-	-	6.8	
Wheat	194124.3	6.61	0.04466	0.95	8.4	
Barley	23622.7	0.17*	0.03262	0.03	3.4	
Lentil (Pulses)	39414.0	2.77	0.03702	0.36	8.4	
Chickpea ,,	23236.5	-1.44*	0.04811	0.09		
Pigeon Pea ,,	8066.4	1.80*	0.06121	0.08		
Black Pea ,,	540.4	14.08	0.07163	0.78		
Grass Pea ,,	64141.6	-4.46	0.06196	0.38		
Horse Pea ,,	29754.3	-7.94	0.06100	0.66		
Soya bean ,,	620.3	13.87	0.03064	0.95		
Other peas ,,	477.4	13.02	0.04115	0.90		
Oil seeds	51921.8	2.60	0.03937	0.81	10.0	9.01
Tobacco	6022.4	-0.40*	0.07773	0.03	8.6	
Sugar Cane	159602.6	7.57	0.05863	0.94	6.7	
Jute	60711.4	-4.22	0.16590	0.40	8.8	
Citrus	-	-	-	-	8.3	5.4
Other fruits	-	-	-	-	4.0	
Vegetables	-	-	-	-	3.5	
Potato	212339.1	3.97	0.07407	0.73	7.0	
Cow Milk	139688.3	2.55	0.01300	0.80	3.5	3.8
Buffalo Milk	323370.2	2.72	0.00497	0.97		
Mutton meat	1556.9	2.90	0.00688	0.95	3.3	
Buffalo ,,	63235.4	1.76	0.00332	0.97		
Chicken ,,	859.6	10.16	0.04259	0.84		
Goat ,,	16023.6	2.58	0.00658	0.94		
Duck ,,	61.9	6.13	0.00724	0.99		
Pig ,,	2201.8	6.70	0.01212	0.97		
Egg Duck (10^6 Nos)	0.1	-39.02	0.41933	0.60	5.4	
Egg Hen ,,	3711.9	87.94	10.44623	0.68		
Wool	442.6	2.41	0.00962	0.87	1.2	
Fish	4779.1	9.94	0.01949	0.95	12.0	
Cotton	30.3	18.35	0.13621	0.62	-	-
Tea	244.3	11.16	0.01364	0.98	10.7	

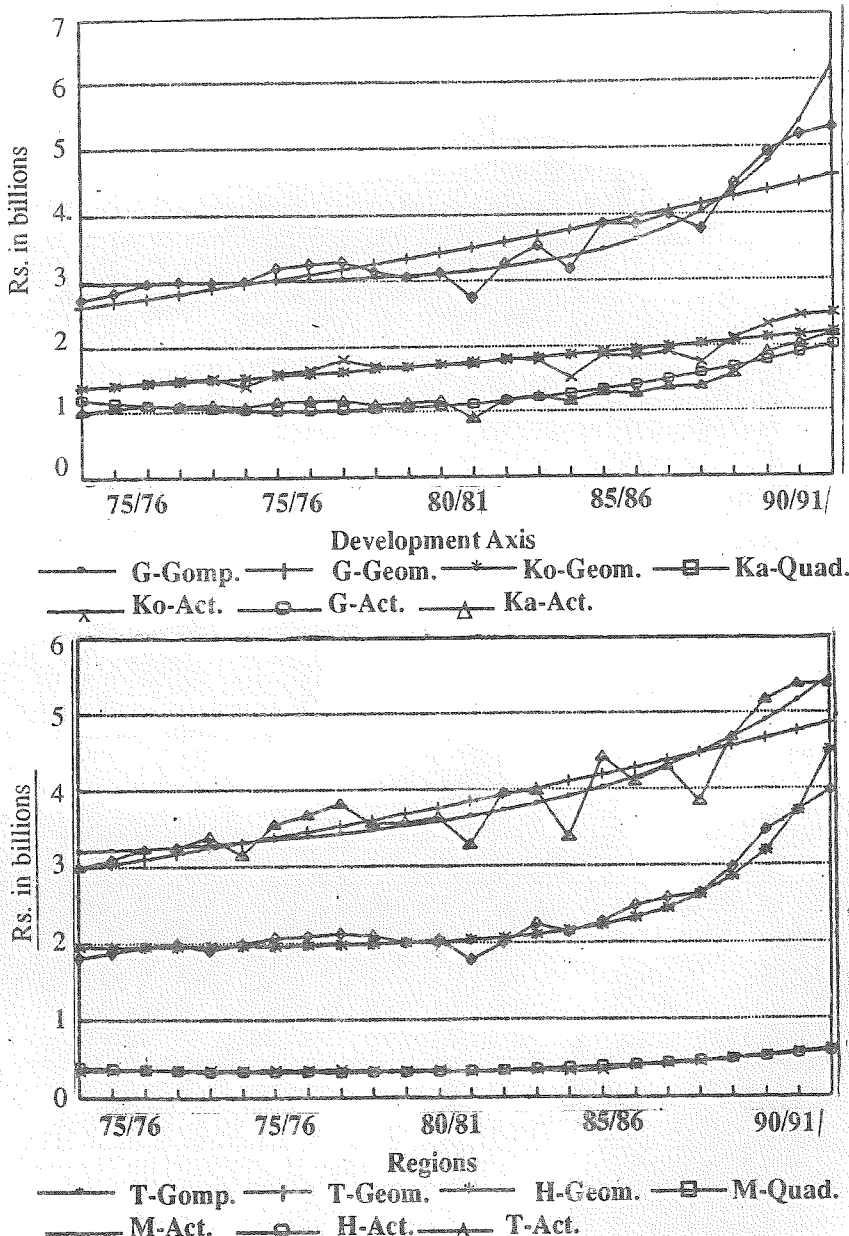
Notes: (1) *: equivalent to zero at 90 percent level of confidence;
(2) g: growth rates in percent-per/year; and R^2: coefficients of determn.
(3) SEE: standard errors of "g" under log form of the equation;

Source: Athor's estimates based on the basic date of DFAMS (1967) and National Planning Commission.

Regional and District wise Disparities

Figure 3

Growth of Agricultural GDP by Development Axis and Agro-ecological Zones



G= Gandaki, Ka= Karnali, Ko= Koshi, M= Mountain, H= Hill, T= Tarai

Agro-ecological Zones:

Agriculture's regional specialization ideally aims at efficient growth of farm income and promotion of inter-regional intergration. But in Nepal, the agricultural development in the terai has accelerated, whereas it is woefully unstable in the mountains and hills (Figure 3 based on Tables 6 and 7).

In terai, the gompertz function's coefficient of determination (R^2 = 0.8622) and that of the geometric curve (= 0.8825) are comparable but still the Gompertz curve fits better in the path of agricultural growth as presented in Figure 3.

Table 6

Growth of Food Grains and Cash Crops by Major Regions

Regions/Functions (1967/68-90/91)		Constants (NRs in mn)	Coefficients (mn NRs or %/year)	Coeff.of Det. (R^2)
All Hills:	Linear	1751.6	77.56	0.6416
	Geometric	1925.5	2.60	0.6867
Mountain:	Linear	280.4	8.39	0.5258
	Geometric	297.2	1.95	0.7274
Hill:	Linear	1471.2	96.17	0.6564
	Geometric	1629.3	2.68	0.8359
Terai:	Linear	4535.2	163.79	0.7203
	Geometric	2910.7	2.16	0.8825
Koshi:	Linear	1788.1	60.63	0.7753
	Geometric	1352.1	2.31	0.7706
Gandaki:	Linear	3446.9	137.65	0.7022
	Geometric	2558.6	2.44	0.8728
Karnali:	Linear	1332.3	51.48	0.5285
	Geometric	924.6	2.47	0.7880

Source: Same as of Table 1.

Table 7

Gompertz Curves for Food Grains and Cash Crops by Regions*

Regions	Growth Curves (t=1967/68-90/91)	Coeff. of Det. (R^2)
Koshi Basin	$G = 5.9539 - 0.1967 * 1.0318^t$	0.8038
Gandaki Basin	$G = 6.4703 + 0.0021 * 1.2448^t$	0.8605
All Hills	$G = 6.3600 + 0.0005 * 1.3414^t$	0.8634
Hill	$G = 6.2879 + 0.0009 * 1.2984^t$	0.9133
Terai	$G = 6.4830 + 0.0220 * 1.1125^t$	0.8622

Note: (*) argicultural-growth curves for Karnali basin and mountain belt are:

Karnali basin: $Q = 1254.79 - 59.2973 * t + 3.7814 * t^2$ $R^2 = 0.8505$

(Standard errors) (16.1266) (0.6262)

Mountain zone: $Q = 402.05 - 19.6853 * t + 1.1232 * t^2$ $R^2 = 0.8847$

(Standard errors) (3.5760 (0.1389).

Source: Author's estimates based on the basic data of DFAMS (1967)

Growth of hill agriculture is apparently accelerating. First, the gompertz function's "c" parameter (equal to 1.2983 in Table 7) is large than unity. Second, gompertz curve's coefficient of determination (R^2 = 0.9133) is more than that of geometric curve (R^2 = 0.8359). The accelerating trend of acceleration in the production of food grains and cash crops in the hills remained valid even after we combined mountain and hill (under "all hills"): the gompertz curve's coefficient of determination (0.8634) is far more than of the geometric curve (0.6867). On the other hand,mountain agriculture is very unstable: a quadratic equation shows that mountain agriculture declined in absolute terms until mid 1970's but thereafter, it began to recover.

Development Regions

Agricultural growth rate in the Gandaki basin has been accelerating. Here, the gompertz curve's "c" parameter (c = 1.2448) is well above unity and its coefficient of determination (R^2 = 0.8605) compares well with that for the geometric curve. On the contrary, the Karnali basin agriculture declined in absolute terms till mid seventies although it began to recover since then. The much awaited development of the Nepalgunj-Jumla-Humla highway would galvanise the Karnali basin agro-industrial economy.

Whether the agricultural growth rate in the Koshi basin is constant or decelerating depends on how the alternative hypothesis is set. For, the coefficients of determination of linear equation (R^2 = 0.7753), geometric equation (R^2 = 0.7706) and gompertz equation (R^2 = 0.8083) are all similar. However, the negative sign of the gompertz function's "b' parameter (b = -0.1967 in Table 7) implies that the Koshi basin agriculture has an upper asymptote of growth path. Neither is the gompertz curve's "c" parameter (c = 1.0318) convincingly greater than unity. Therefore, it may be that, after the initial retardation, the Koshi basin agriculture might have assumed an up-turn in its growth. In future, much will depend on the Arun river cascade for hydropower development.

Sources of Growth

Agricultural GDP per Capita

Substraction of population growth rates from agricultural growth rates show that the farm income per capita is increasing in the mountain and hill but it is decreasing in the terai.

Mountain : 1.95 - 1.20 = 0.75
Hill : 2.68 - 1.64 = 1.04
Terai : 2.16 - 3.48 = -0.60

Crop production growth rates in 5 out of the 15 development blocks and 24 out of 75 districts are less than one percent or equivalent to zero (Table 8), all such districts are located in the mountains and hills. This decline in agriculture partly reflects the de-population in large parts of the mountainous and hilly districts. Given a higher

incidence of absolute poverty in the hills and mountains, the problem of declining agriculture in these regions and districts is deeply rooted in the low level of agricultural GDP per capita itself, and the lack of alternative sources of income and employment, the lack of integration with the economically prospering areas, the environmental deterioration as slow onset disasters, the inequitable distribution of income, and the low socio-cultural development.

Table 8
Growth of Agricultural GDP (Q), Farm Productivity (P) and Population by Agro-ecological/Development Regions in Two Stages.

	Agricultural GDP (Q) and Productivity (P)				Population Growth	
	1967/68-90/91		1985/86-90/91		1971-91	1981-91
Regions	Q	P	Q	P		
Mountain:	1.95	-0.25	5.77	1.70	1.20	1.04
EDR	3.11	-0.32	9.30	1.33	0.83	0.59
CDR	2.59	0.23#	5.53	3.70	1.45	1.33
WDR	0.18	0.95	2.16	2.61	-2.75	-0.13
MWDR	0.00#	-0.85	3.66	-0.02#	1.17	0.75
FWDR	1.20	-1.05	3.19	0.04#	1.67	1.43
Hill:	2.68	-0.94	7.84	2.90	1.64	1.62
EDR	2.73	-1.14	7.95	3.32	1.29	1.29
CDR	2.19	-0.09#	7.31	4.04	2.17	2.41
WDR	3.18	-1.26	7.90	1.57	1.44	1.17
MWDR	3.23#	-1.39	9.74	2.91	1.61	1.57
FWDR	1.32	-1.17	5.51	1.97	1.26	1.04
Terai:	2.16	1.13	7.31	4.16	3.48	2.76
EDR	1.65	0.86	8.19	5.69	3.31	2.33
CDR	2.45	1.16	6.06	4.91	2.72	2.40
WDR	1.86	1.09	6.26	2.51	4.04	3.22
MWDR	1.84#	0.69	9.07	3.44	4.35	3.28
FWDR	3.94	1.74	7.76	3.03	6.36	4.74
Nepal:	2.35	0.32	7.42	3.73	2.37	2.08

Equivalent to zero

Source: Same as of Table 1.

Productivity Effect and Area Effect

During 1967/67-90/91, the output of food grains and cash crops annually grew by 2.35 percent in the country. In the total growth of crop production, the share of productivity growth was merely 13.6 percent while the remainder of overwhelming 85 percent contribution in the output growth was made by the expansion of the cropped area (Which is equal the cultivated area times the cropping intensity). There are

alarming regional disparities in the growth or decline of the agricultural productivity / mountains and hills are nose-diving to dooms day while the terai is successively scoring (Figure 4).

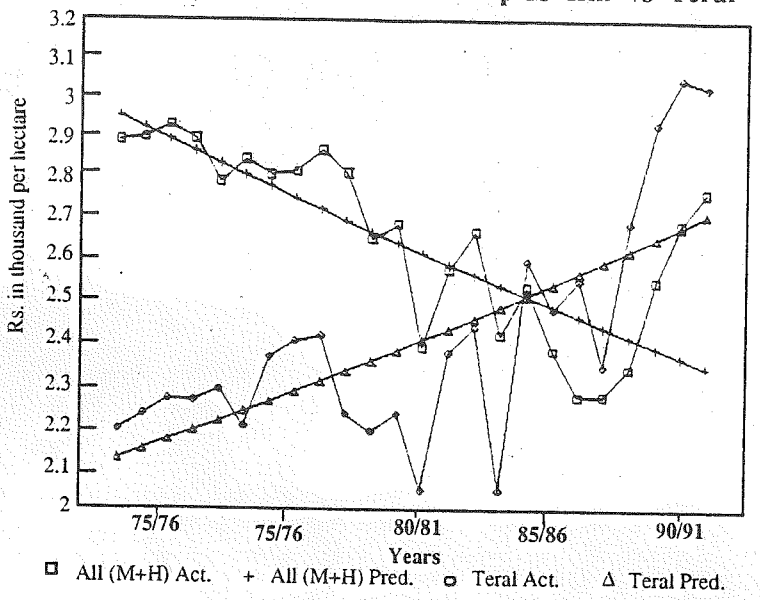
Initially, farm productivity in the Karnali mountain and hill was much higher than that in the central terai. Karnali mountain agriculture steadily plunged below the productivity level in the central terai from 1974/75 onwards. For simplicity, the general paths of the changes in the productivity in these regions are approximated by a set of straight lines (in 1976/77 NRs per hectare for the 1967/68-90/91 period) :

Karnali (mountain + hill) : 2655 - 28* Time; $R^2 = 0.5524$

Central terai : 2022 + 43 * Time: $R^2 = 0.5858$

Figure 4

Productivity Trends in Mountain plus Hill vs Terai



Subsequently in 1984/85, the trend was repeated when the declining productivity in the mountains plus hills as a whole permanently dipped below the ascending productivity curve in whole of the terai as follows:

Mountain plus hill : 2980 - 23 * Time; $R^2 = 0.5213$

Terai : 2077 + 29 * Time: $R^2 = 0.5018$

Contribution of productivity in the growth of farm output in various regions is perturbing. In the terai, the share of productivity in the rate of growth of total farm output is 52.6 percent. In the mountains and hills, the decline in productivity would cut-down the agricultural GDP growth rate by -12.8 percent and -35.1 percent,

respectively. Productivity situation in large parts of the Rapti, Bheri, Karnali and Seti zones decline even to nullify a large growth of cultivated area. The productivity growth rates in 50 out of 75 districts is negative or nil.

For the 1985/86-90/91 period, addition of the livestock products, fish, pulses, tea, cotton, cardamom, coffee to the food grains and cash crops give a very positive picture: the aggregate farm output increased by 7.42 percent per year in the country and the share of the productivity and cropped area growth rate in it was of the order of 40:60 ratio. The share of the productivity growth turned out to be 30 percent in the mountains, 37 percent the hills and as much as 57 percent in the terai.

Breaks in the Trend and Upward Revisions of Estimates

The breaks-in-trend-rate-of-growth of farm output (defined as an increases of production in a year by 10 per cent or more) suggested that the then Department of Food and Agricultural Marketing Services had revised upward the estimates of production of cereals and cash crops 360 times at the district level by taking a few districts at a time during 1967/68-90/91 (Table 9).

Table 9

District Level Discontinuities in Production Trends (Nos.)

Regions	1967-75	1976-80	1981-85	1986-91	Total
Mountain	6	5	24	33	68
Hill	23	13	68	91	195
Terai	15	14	34	34	97
Total	44	32	126	158	360

Source: Author's estimates based on the data of DFAMS (1967).

However, the data-smoothing-effects of aggregations reduced such 360 "revisions" of production estimates to merely four cases at the national level. The revisions in data generally coincided with the publication of results of the Land Resources Mapping Project 1985, Agricultural Census 1981, the National Farm Management Survey 1968/69 and 1983/85 and the Cadastral Surveys. Clearly, data revision is a "pseudo-source" of growth.

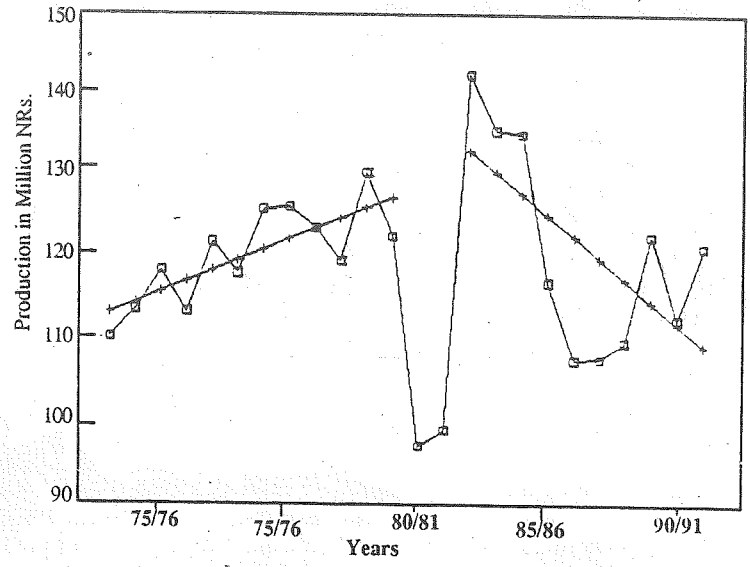
Urban Expansion

Urban expansion in the fertile valley drastically decreased the agricultural GDP (Figure 5). For example in Kathmandu district, the production of cereals and cash crops (in million NRs) showed a self destructive process unfolding as follows:

1. Agricultural GDP = 113.42 + 1.31 * t; R^2 = 0.6002; (t = 1967/86-78/79)
2. Agricultural GDP = 175.80 - 2.73 * t; R^2 = 0.3992; (t = 1980/81-90/91)

Figure 5

Agricultural Production in Kathmandu District, 1967-1991



SUMMARY AND CONCLUSION

This section reviews the findings of the present study in the light of the Eighth Plan (1992-97) and longer term development perspectives. Analysis of the national production accounts during 1964-91 show that the Eighth Plan's targets of increasing the gross domestic product (GDP) by 5.1 percent and agricultural value-added by 3.2 percent per year is a modest target. First, accelerating GDP growth rates minus the decelerating population growth rates would lead to further acceleration in the rates of growth of national average income per capita: the GDP per capita growth rate would speed-up from 2.29 to 3.18 percent per year during 1990/91-2001/02. The population growth rates have decelerated as the gompertz growth curve predicts the population growth rate for 1990/91 as 2.10 percent per year, which also forecasted a decline in the population growth rate down to 1.89 percent per year by 2001/02. On the contrary, the GDP, non-agricultural GDP, agricultural GDP are increasing at the increasing rates. During 1960-91, the annual rate of growth of GDP, for example, doubled in the consecutive decades from 1.84 percent to 2.75 percent and further to 4.74 percent.

Second, the Eighth Plan does not provide a built - in mechanism to redistribute the above mentioned economic growth among the backward regions and disadvantaged peoples, and also to provide a feedback loop from the redistributed income to the economic development and social welfare scenarios. Agricultural growth is "dualistic": dynamic cash crops and fine food grains sub-sectors have co-existed with the stagnant subsistence farming sub-sectors. This will aggravate the inter-regional disparities and further widen the purchasing power gap between haves and haves-not classes. The

regional dynamics of agricultural growth is as follows: accelerated growth in the Gandaki basin and terai, decelerated growth in the Koshi basin and Hill; and decay and recovery in the Karnali basin and mountain region. The Eighth Plan's emphasis on the growth of the poor men's sources of income (such as the pulses, coarse food grains, etc) and the employment intensive agricultural production (such as jute, cotton, livestock etc) are not at par with the targets set for the modern farm sub-sector. Besides, the Plan lacks a corresponding strategy to implement the programmes which could increase the poor and middle class people's income.

Third, contrary to the general belief, the rates of the growth of food grains and cash crops per capita are annually growing at the rate of 0.75 percent in the mountain and by 1.04 percent in the hill but it is decreasing in the terai by at least 0.60 percent per year. Nevertheless in the face of rampant absolute poverty, the problem in the mountain and hill agriculture is not that of relative rates of growth of total farm income (relative to terai) but it is rooted in: the low level of agricultural GDP per capita itself and the lack of alternative sources of income and employment, the lack of access to the centres of economic growth, the environmentally unsustainable resource uses leading to slow on-set disasters and the economic inequity with very low socio-cultural levels.

Fourth, during 1967/68-90/91, the share of productivity in the rate of growth of food grains plus cash crops was 52 percent in the terai, -12.8 percent in the mountains and -35.1 percent in the hills. Besides, the urban expansion in the farm land has been counter-productive. The growth of agricultural GDP in the country during 1985/86-90/91 was 7.42 percent in which, the share of productivity growth increased from 30 percent in the mountain, 37 percent in the hill and 56 percent in the terai. Agricultural growth in the second half of 1980s is unsustainable and questionable because of data. To conclude, the regionwise political economic values, powers and decisions as well as the planning framework require a change before the performance of the economy and the farm sector can be efficient, sustainable and just.

To conclude, the dualistic agricultural growth and the regional underdevelopment are correlated in Nepal. On question of changing this situation, the Eighth Plan's goals, objectives, policies and programmes need to build a vertical logic so that the Plan's national aims are derivable from the agricultural development activities at the regional and district levels. In the absence so such a conceptual consistency, the Eight Plan's aims such as "sustainable economic growth" and "reduction of regional imbalances' would not be realised. Ironically, the Eighth Plan underestimates the problem of agricultural dualism and regional underdevelopment when the Plan says that: the disparities between the well-off and the disadvantageous classes, between the rural and urban areas and between the terai and the hill are gradually emerging and it will gradually redress the regional disparities.

The Eighth Plan, indeed, proposes measures such as - mobilisation of resources of different areas, functional interlinkages among different areas, development of potentialities of different regions, and decentralisation as the *modus operandi* for the formulation and implementation of the regional development programmes. However, at the operational levels, the Plan requires a commitment to redesign the sectoral programmes, implement the action plans, and enforce programme accountability at the

local and regional levels. The Eight Plan's task of preparing "The Agricultural Development Perspective Plan" will hopefully build on the close, interdependent and complimentary relationships among agriculture, irrigation, forestry and the natural environment, and expedite the poverty alleviation and economic growth. Evidently, it is the actions that are more important to transform the agriculture and to increase the peoples welfare.

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