Chapter 3

Agriculture in South Asia—Historical Perspective

The history of South Asian agriculture makes for interesting reading. Most countries in the region attained independence from colonial rule in the late 1940s. Agriculture was the dominant source of income and employment in the newly independent states. These states were, however, facing a desperate situation due to growing food demand and food insecurity. Malthusian predictions of rising population and declining food production haunted the region. Amid this dismal scenario, the advent of Green Revolution, pioneered by Norman E. Borlaug[1], raised the hope for a brighter future in food security and agricultural development. Agricultural productivity grew remarkably in most countries of South Asia during the 1960s and 1970s. The productivity started declining, however, in post Green Revolution period. Through the 1980s and 1990s it became increasingly difficult to sustain the success achieved earlier due to increasing population, declining agricultural resource base, land degradation, deforestation, natural catastrophes, constraints in input management and lack of institutional reforms. The saga of agricultural development in South Asia is thus filled with stunning performances but at times dismal failures.

During the past two decades a number of other disturbing developments took place[2], for instance:

- The population of South Asia grew steadily, albeit at a decreasing rate. A Large population base meant provision of more and more food for the increasing number of people. It also meant increasing pressure on agricultural resource base.
- Commercialisation and diversification played an important role in motivating farmers to move away from major staple food crops and cereal production to high-value oil crops, vegetables, fruits and horticulture.
- The growth of cereal yield per hectare fluctuated erratically and at times demonstrated a declining trend.
- The per capita food production started declining in many South Asian countries.
- The per capita food availability increased but at a decreasing rate.

Historically, there has been a race between population growth and food supply in South Asia

Reassessing the Malthusian Cross in South Asia: Are we winning the race between population growth and food supply?

In the 1950s it was apprehended that a severe food shortage might occur in South Asia resulting in a Malthusian Cross whereby population growth would exceed the rate of increase in food production; and food supply in particular[3]. Historically, there has been a race between population growth and food supply in South Asia. At times food production outpaced the rate of population growth; at others population growth exceeded the rate of food production and food supply.

Between 1971 and 1998, the total population in South Asia increased by 79 per cent, the crop production grew by 69 per cent, whereas livestock production index showed a growth of 114.7 per cent. The growth in overall food production therefore, outpaced the population increase. By looking at these figures, one may argue that South Asia has been able to avoid the Malthusian[3] prediction. The overall figures, however, mask the fluctuating trends in per capita food

Table 3.1 Reinventing Malthusian Cross in South Asia

(Average annual growth rates, 1971-75 to 1996-00)

Bangladesh

Period	Population	Food Production	Per capita Food Production	Cereal yield (Kg/ha)	K-calories per capita Per day
1971-75	2.8	0.5	-2.3	1.1	-1.9
1976-80	2.5	2.6	-0.3	1.9	0.8
1981-85	2.4	1.5	-1.0	2.4	0.3
1986-90	2.5	2.4	0.4	2.2	0.4
1991-95	1.7	1.4	-0.3	1.5	-0.4
1996-00	1.7	4.1	2.4	1.8	1.8

Bhutan

Period	Population	Food Production	Per capita Food Production	Cereal yield (Kg/ha)	K-calories per capita Per day
1971-75	1.4	2.2	0.1	0.1	–
1976-80	2.0	2.6	0.4	-0.1	–
1981-85	2.0	3.8	1.4	-0.2	–
1986-90	2.1	0.6	-2.0	-5.8	–
1991-95	2.8	2.2	0.4	0.8	–
1996-00	2.9	1.1	-1.5	0.5	–

India

Period	Population	Food Production	Per capita Food Production	Cereal yield (Kg/ha)	K-calories per capita Per day
1971-75	2.3	2.1	-0.1	1.7	-0.5
1976-80	2.3	2.9	0.8	2.9	1.1
1981-85	2.2	4.4	2.2	4.0	1.1
1986-90	2.1	3.5	1.3	3.5	1.2
1991-95	1.9	3.0	1.0	2.5	0.6
1996-00	1.8	2.4	0.7	1.6	0.2

Nepal

Period	Population	Food Production	Per capita Food Production	Cereal yield (Kg/ha)	K-calories per capita Per day
1971-75	2.4	2.7	0.2	0.4	0.0
1976-80	2.5	1.0	-1.5	-2.0	0.4
1981-85	2.6	5.0	2.3	2.4	2.1
1986-90	2.6	4.3	1.6	2.2	3.2
1991-95	2.5	2.2	-0.3	0.0	-0.9
1996-00	2.1	2.5	0.1	1.9	-0.4

production and food supply vis-à-vis population growth. The fact is that food production has been erratic during the past forty years. In the Green Revolution era, food production increased at a faster pace due to the introduction of high yield varieties. In post-Green Revolution period, however, growth in food production slowed down in many countries. It must be noted that in South Asia, the absolute number of under-nourished people increased in the past two decades (table 6.3 in chapter 6).

The following conclusions could be drawn from table 3.1:

- In Bangladesh, population growth outpaced the growth in food production during the last three decades. The cereal yield (kg/h) growth rate that increased from 1.1 per cent in 1971-75 to 2.4 per cent in 1981-85 has decreased to 1.7 per cent in 1996-00. The per capita food production growth rate has been negative over the period 1971-96. Similarly, per capita food availability (food supply) did not improve much until 1996-2000. The devastating floods of 1998 exposed Bangladesh's vulnerability to natural catastrophes. It is only recently that the country has managed to increase its food production by 4.1 per cent (1996-2000) and per capita food availability (food supply) by 1.8 per cent in 1996-2000.
- The situation in Bhutan, Nepal, and Sri Lanka is not much different from Bangladesh. In Bhutan, population increased from 1.4 per cent in 1971-75 to 2.0 per cent in 1976-85, and further to 2.9 per cent in 1996-2000. For the last fifteen years, growth in food production has been lower than the population growth. Food production has decreased from 3.8 per cent in 1981-85 to 0.6 per cent (1986-90); rising briefly to 2.2 per cent (1991-95) and falling again to 1.1 per cent (1996-2000). Bhutan has consistently witnessed a declining trend in cereal yield per hectare and per capita food production.
- In Nepal, population is growing at an average rate of 2.5 per cent while food production is fluctuating from a high growth rate of 5.0 per cent in 1981-85 to 2.2 per cent in 1991-95 and 2.5 per cent in 1996-2000. The per capita food availability, which had been growing

strongly at 2.1 per cent in 1981-85 and 3.2 per cent in 1986-90, has shown a negative growth rate in recent decade.

- In Sri Lanka, although population growth is not as high as in other countries of the region, yet food production is fluctuating erratically. The population is increasing at a decreasing pace; growing at 1.6 per cent in 1971-75 it has slowed down to 1.3 per cent in 1996-2000. The food production growth rate at times matched the population growth. However, it decreased from a high of 4.7 per cent in 1976-80 to 3.1 per cent in 1981-85, and to 1.1 per cent in 1986-90, rising briefly to 2.5 per cent in 1991-95 and falling again to 0.7 per cent in 1996-2000. This led to a declining trend in per capita food production and food supply.
- In South Asia, only Pakistan and India seem to have done better than the other countries in terms of their performance in per capita food production and food supply. So far, Pakistan and India have effectively managed a food crisis even under unprecedented drought conditions in 2000-2001. In the past few years, although Pakistan has seen fluctuations in growth of agricultural value added yet food production has outpaced population growth rate. The population growth has consistently decreased from 3.1 per cent in 1971-75 to 2.6 per cent in 1986-90 and 2.4 per cent in 1996-2000. The food production is growing at a stable rate from around an average of 3.4 per cent in 1976-85 to well above 4 per cent in the last 15 years. Domestic food availability is, however, increasing at a decreasing rate due to increasing processed food exports. This holds true for India as well.
- In India, except for the damaging floods of 1998 that brought the growth rate in food production down to 2.4 per cent, it has been growing steadily above 3.0 per cent from 1976 to 1995. The per capita food production and food supply which was growing in periods spanning from 1976-80 to 1986-90 have shown a declining trend in the last ten years from 1991 to 2000.
- The situation in Maldives is satisfactory. The population growth has slowed down over the years while food production has increased. Per capita food production and cereal production growth rates have shown considerable improvement in the past few decades.

Pakistan

Period	Population	Food Production	Per capita Food Production	Cereal yield (Kg/ha)	K-calories per capita Per day
1971-75	3.1	2.8	0.1	2.6	0.7
1976-80	3.1	3.2	0.6	2.6	0.4
1981-85	2.8	3.6	0.2	1.1	-0.4
1986-90	2.6	4.6	1.2	2.1	1.0
1991-95	2.5	4.7	1.8	2.2	0.9
1996-00	2.4	4.0	1.2	2.2	0.4

Sri Lanka

Period	Population	Food Production	Per capita Food Production	Cereal yield (Kg/ha)	K-calories per capita Per day
1971-75	1.6	1.5	-0.3	-4.2	-0.9
1976-80	1.7	4.7	3.0	5.1	1.1
1981-85	1.5	3.1	1.4	4.7	0.2
1986-90	1.5	-1.1	-2.3	0.5	-1.2
1991-95	1.2	2.5	1.5	0.3	0.1
1996-00	1.3	0.7	-0.3	1.5	1.3

Maldives

Period	Population	Food Production	Per capita Food Production	Cereal yield (Kg/ha)	K-calories per capita Per day
1971-75	2.4	2.4	0.0	3.1	1.6
1976-80	2.8	1.9	-0.9	-2.5	3.8
1981-85	3.0	4.2	1.2	2.6	1.6
1986-90	3.0	1.0	-2.2	6.8	0.9
1991-95	2.7	2.7	-0.2	2.7	1.2
1996-00	2.6	3.0	0.1	–	-1.5

Note: Growth rates are based on 3-year central moving average.
Source: Extrapolated using data from FAO 2002d and World Bank 2001a.

The race between population growth and food production in South Asia has been far from won. If population grows at a rate of about 2.0 per cent, the food grain production and supply must also

continue to increase above 2.5 per cent annually to maintain the delicate balance between population growth and food production in this region[4]. In the 1990s, growth in food production has slowed down slightly. One may argue that the the the Malthusian predictions may start coming true if food production continues to decline in the next few years and the much-needed policy and institutional reforms are not undertaken.

Agriculture and rural poverty in South Asia: A historical nexus

Investment in human development is not possible without a sustained increase in per capita income. There is widespread poverty in rural South Asia where livelihood is dependent on agriculture. Countries that achieved rapid reduction in poverty had the most rapid agricultural growth[5]. In order to understand the vicious link between low agricultural incomes and rural poverty in South Asia, we need to understand the process of economic growth and transformation in this region. A few questions need to be answered here to provide a historical perspective: Is agriculture playing an important role in sustaining overall economic growth? Has agriculture effectively transformed the South Asian economies? Is there a widening gap between agricultural and non-agricultural sectors as a consequence of transformation? Is the quality of economic growth fair enough to alleviate poverty? Is the dominant agricultural economy in South Asia the primary cause of poverty?

Agriculture and Overall Economic Growth

Agriculture has always been the mainstay of South Asian economies. The key to attack poverty lies in rapid agricultural growth that fuels broader economic growth. A robust growth in agriculture can contribute to overall economic development in many ways. A stable and growing agriculture sector has strong forward and backward linkages (box 3.1). In East Asia and the Pacific for instance, a consistently high rate of agricultural growth of above 3.0 per cent (1971-80 to 1990-2000) has proved to be a precursor for overall economic development. In 1971-80, agricultural GDP in that region grew by 3.1 per cent while overall economic growth was above 7.0 per cent (table 3.2). In 1981-90, the agricultural sector grew by 4.3 per cent and overall GDP by 7.5 per cent.

South Asia stands way behind East Asia and the Pacific in this respect. In comparison to East Asia and the Pacific, the growth in agricultural sector has fueled a rather slower growth in overall

Table 3.2 Net real growth rates of selected countries and regions (1971-80 to 1990-2000)[a]

Countries	GDP growth			Growth in value added								
				Agriculture			Manufacturing			Services		
	1971-1980	1981-1990	1990-2000[a]	1971-1980	1981-1990	1990-2000[a]	1971-1980	1981-1990	1990-2000[a]	1971-1980	1981-1990	1990-2000[a]
Bangladesh	1.9	4.6	4.8	0.5	2.7	2.9	5.6	2.9	7.2	3.1	6.0	4.5
Bhutan*	–	7.8	6.1	–	4.9	3.2	–	21.1	12.6	–	7.1	7.0
India	3.4	5.5	6.0	2.1	3.7	3	4.7	6.7	7	4.7	6.3	8
Nepal	2.5	4.3	4.9	0.8	3.8	2.5	–	8.0	9.2	–	3.5	6.2
Pakistan	4.9	6.6	3.7	2.6	4.9	4.4	5.7	7.8	3.5	6.2	6.9	4.4
Sri Lanka	4.3	4.3	5.3	2.6	2.7	1.9	2.5	5.6	8.1	4.9	5.3	6
East Asia & Pacific	7.1	7.5	7.2	3.1	4.3	3.1	12.6	9.6	9.9	7.1	8.4	6.4
South Asia	3.4	5.5	5.6	1.9	3.7	3.1	4.4	6.4	6.6	4.6	6.3	7.1
Sub-Saharan Africa	3.9	2.1	2.5	2.2	2.2	2.8	5.3	2.8	1.6	4.5	2.6	2.6

Note: Growth rates are based on 3-year moving average.
a: Data for period (1990-2000) is taken from World Bank 2002a.
*: For Bhutan 1990-2000 data pertains to period 1991-98 calculated from World Bank 2001a.
Source: Extrapolated using data from World Bank 2001a & 2002a.

Box 3.1 Strong backward linkages from agriculture to other sectors

It has been estimated that in Asian countries where agriculture's share in the economy is significant, a 1 per cent increase in per capita agricultural growth leads to a 1.5 per cent increase in per capita nonagricultural growth. This is because agriculture has strong backward linkages (by purchasing farm inputs such as chemicals, fertilisers, and machinery) and forward linkages (by supplying raw materials to food and fiber processing to the non-agricultural sector). On the other hand, increase in agricultural incomes are usually spent on locally produced goods and services which have high-income elasticity of demand and employment content. Countries having higher growth in agricultural value added have relatively higher growth in overall GDP (See figure below).

Agriculture and economic growth of selected Asian countries (1960-92)

(annual percentage growth)

	Gross Domestic Product			Agriculture		
	1960-70	1970-80	1980-92	1960-70	1970-80	1980-92
China	5.2	5.8	9.1	1.6	3.2	5.4
India	3.4	3.4	5.2	1.9	1.8	3.2
Indonesia	3.9	7.2	5.7	2.7	4.1	3.1
Republic of Korea	8.6	9.6	9.4	4.4	2.7	1.9
Malaysia	6.5	7.9	5.9	–	5.0	3.6
Pakistan	6.7	4.9	6.1	4.9	2.3	4.5
Thailand	8.4	7.1	8.2	5.6	4.4	4.1

Source: Faruquee 1995.

Agriculture and Economic Growth Selected Countries, 1980-92
(annual percentage growth)

Source: Extrapolated by the author.

economy in this region. For instance, in 1971-80 agricultural value added increased by 1.9 per cent, therefore, overall economy grew by only 3.4 per cent. As agricultural sector growth rates increased above 3.0 per cent in the next two decades (1981-90 to 1990-2000), the overall economy grew by more than 5.0 per cent. The growth in overall economy is, however, slower than East Asia and the Pacific which experienced a growth in the overall economy of above 7.0 per cent for the same growth in agricultural sector. Nevertheless, the evidence of a positive relationship between agricultural growth and overall economic growth does exist in both the regions (figure 3.1).

Within South Asian countries, there are striking differences in growth performance. Some countries have grown faster than the others (table 3.2). In case of Pakistan, a strong growth in agriculture value added averaging well above 4.0 per cent and a corresponding overall growth averaging well above 5.0 per cent in the last two decades has ranked it among high growth rate countries. Consequently, there has been some decline in rural poverty from 49.1 per cent (1969-70) to 31.95 per cent (1998) over the last thirty years (table 3.4). In recent years (1990-2000) there has been a slight decline in agricultural growth rate (4.4 per cent) due to unprecedented drought conditions in 1998 and 2000. The overall GDP growth rate has, therefore, declined to 3.7 per cent.

Similarly in the case of India, agricultural growth fueled overall economic growth[6]. In 1971-80, the

agricultural sector grew by 2.1 per cent and subsequently, overall GDP increased by 3.4 per cent. In later periods (1981-90 and 1990-2000), agricultural production increased above 3.0 per cent and consequently, overall GDP increased by 5.5 per cent in (1981-90) and 6.0 per cent in 1990-2000.

Bangladesh, on the other hand, has seen strong but volatile growth in agriculture value added and other sectors of the economy. Floods and cyclones in 1970s and in the recent years as well caused significant crop losses in affected areas of Bangladesh. In 1971-80, the country was struggling with post independence problems. As there was no industrial base in the country prior to independence, therefore manufacturing and industry received priority in government policies. However, the agricultural policies were also strengthened which helped to improve agricultural performance in later years. In later periods, agricultural value added grew by 2.7 per cent in 1981-90 and 2.9 per cent in 1990-2000; overall economy grew by 4.6 per cent in 1981-90 and 4.8 per cent in 1990-2000.

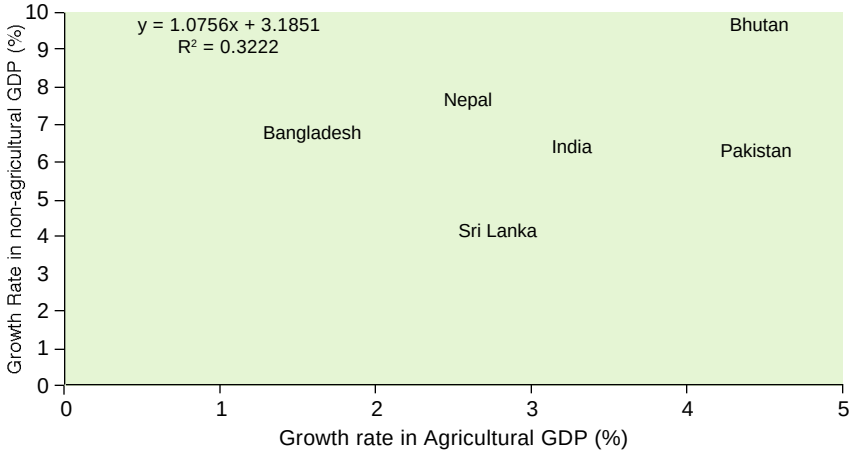
In Nepal, the agricultural value added growth fluctuated erratically. In 1971-80, agricultural value added grew by only 0.8 per cent; subsequently overall GDP grew at a stagnant rate of 2.5 per cent. In 1981-90, as agricultural value added increased rapidly at a rate of 3.8 per cent, overall GDP grew by 4.3 per cent. In the last decade (1990-2000), agricultural sector growth rate averaged around 2.5 per cent while the overall GDP growth was 4.9 per cent (table 3.2).

The above evidence from South Asian countries indicates that there is positive relationship between agricultural growth and overall economic growth. Periods of high agricultural growth are more or less associated with high levels of overall economic growth. The evidence also underlines the important point that rapid agricultural and economic growth has a significant impact on poverty reduction. In East and South East Asia for instance, rapid agricultural and overall economic growth reduced the incidence of poverty by two-thirds between 1975 and 1995[7]. South Asia, on the other hand, witnessed a reduction in poverty by only one third[8] during the same period. This is mainly because growth in the agricultural sector was slower and population growth was much higher. Also, widespread human deprivation prevailed in the region. Economic growth alone is not sufficient to reduce poverty. It must be accompanied by policies that raise the status of human development.

Agricultural transformation: The unfinished agenda

Rural nonfarm transformation is one of the most important steps in the process by which agricultural growth contributes to overall economic growth. It helps to transfer surplus resources to other sectors of the economy and creates demand for non-agricultural products. An estimated relationship between agricultural and non-agricultural value added growth rates for South Asian countries over the last 30 years suggests that a one per cent change in per capita agricultural incomes could lead to 1.08 per cent change in per capita growth in non-agricultural sector (figure 3.2 and box 3.2 for the income multiplier effect from agricultural to other sectors)[9].

Figure 3.2 Agricultural and nonagricultural GDP growth rates 1971-98



Source: Extrapolated using data from World Bank 2001a.

After the advent of the Green Revolution much of Asia transformed rapidly. In South Asia, however, agricultural transformation is still part of an unfinished agenda[10]. For instance, in East Asia and the Pacific, countries with relatively larger share of agriculture in GDP experienced high agricultural growth, which helped to boost non-agricultural sectors of the economy. In South Asia, although the overall performance of the agricultural sector has not been unimpressive (the region experienced agricultural growth rates of above 3.0 per cent for the last two decades), yet the growth in per capita agricultural GDP has been asymmetrical, mainly due to high population growth rate (table 3.3). For instance, growth in per capita agricultural GDP in South Asia was minus 0.47 per cent in 1971-80, 1.44 per cent in 1981-90, and 1.52 per cent in 1991-98. This low growth in per capita agricultural GDP resulted in low growth in per capita non-agricultural GDP.

Compared, to other South Asian economies, Pakistan and India have done very well in the 1980s. Both countries have seen above 2.0 per cent and 1.5 per cent increase in per capita agricultural GDP, respectively. This, in turn, transformed into growth in non-agricultural sector during the same period. The per capita non-agricultural GDP has increased by above 4.0 per cent in both countries in 1981-90. In the 1990s, however, uneven growth in agriculture did not help much to extend the agenda of transformation.

During the 1960s, Pakistan did very well and benefited from the Green Revolution. The per capita agricultural incomes increased by 2.55 per cent and nonagricultural incomes increased by 5.81 per cent. The gains in agricultural sector were lost in the period of nationalisation (the 1970s) that followed immediately. The agriculture sector witnessed a negative growth of -0.54 per cent in per capita incomes whereas the per capita non-agricultural incomes grew at a non-impressive rate of 2.89 per cent.

Table 3.3 Per capita income growth in South Asian economies and selected regions

	Per capita value added growth					
	Agricultural			Non-agricultural		
	1971-80	1981-90	1991-98	1971-80	1981-90	1991-98
Bangladesh	-2.14	0.17	1.03	0.22	5.83	4.98
Bhutan	–	2.75	0.27	–	9.54	3.42
India	-0.22	1.54	1.58	3.54	4.11	3.16
Nepal	-1.63	1.19	0.13	0.89	6.94	5.24
Pakistan	-0.54	2.07	2.22	2.89	4.17	2.45
Sri Lanka	0.88	1.13	0.65	1.86	2.39	3.69
East Asia & Pacific	1.01	2.68	2.16	5.50	5.85	7.08
South Asia	-0.47	1.44	1.52	2.90	4.12	3.13
Sub-Saharan Africa	-0.53	-0.74	-0.46	1.52	-0.78	0.62

Note: Growth rates are calculated on 3 year moving average basis.
Source: Extrapolated using data from World Bank 2001a.

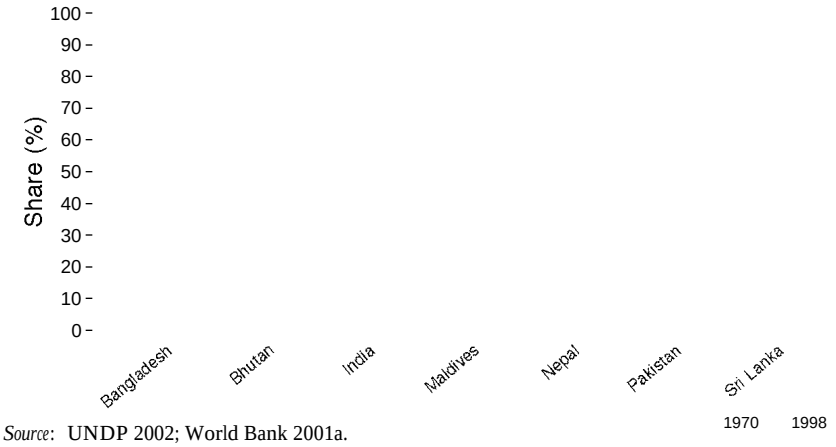
In the relatively stable period of the 1980s, characterised as a period of structural change, the per capita agricultural incomes increased at a rate of 2.07 per cent and non-agricultural incomes at a rate of 4.17 per cent. Later in the 1990s the country faced many problems ranging from political instability and corruption to slow macroeconomic reforms and rising economic sanctions. However, the overall economy progressed at an enviable rate of above 6.0 per cent during 1965-98 with per capita agricultural and non-agricultural incomes

Box 3.2 The income multiplier effect from agriculture to other sectors

Agricultural growth has strong linkages to non-farm economy. The linkages work in several directions. On one hand, a growing agricultural sector generates demand for various agricultural inputs provided by the non-farm sector. On the other hand, increased agricultural production provides raw materials that require processing and distribution by the non-farm sector. Agricultural growth also influences the supply side of the rural nonfarm economy through labour market. As nonfarm sector expands, the opportunity cost of labour becomes very high in farming sector and surplus labor moves out of agricultural sector. Increase in per capita income leads to a rise in demand. Increased demand induces diversification of consumption into nonfood goods and services, many of which are provided by local firms. Empirical studies have found that each dollar increase in agricultural value added leads to an additional $0.5 to $1.0 of value added in the rural nonfarm economy. The income multipliers from agricultural growth are found to be stronger in areas with better infrastructure, higher population density, and higher per capita agricultural incomes. For instance, studies conducted in India have found that the income multipliers were particularly large in Punjab and Haryana, which score better on these fronts whereas they were found to be lower in Madhya Pradesh and Bihar, which score poorly.

Source: Rosegrant and Hazell 2000.

Figure 3.3 Share of agricultural labour in total labor force



Source: UNDP 2002; World Bank 2001a.

rising at a rate of 1.42 per cent and 3.84 per cent, respectively.

On the other hand, it was primarily due to negative growth in per capita agricultural GDP that some South Asian economies, where agricultural sector was dominating non-agricultural sector, did not develop faster. For instance in Bangladesh, a huge percentage of its GDP is drawn from the agricultural sector, its per capita growth in agriculture was, however, negative in 1971-80. The per capita income in non-agricultural sector, therefore, grew by only 0.22 per cent. In the last two decades, agricultural sector progressed at a rate above 4.0 per cent and with a coincident decline in population growth, the per capita agricultural value grew by 0.17 per cent and 1.03 per cent in 1981-90 and 1990-2000, respectively (cross analysis of table 3.1, 3.2, and 3.3). In the 1990s, a stable growth in agriculture led to a high growth rate in the manufacturing and services sectors, thereby increasing per capita incomes in non-agricultural sector by more than 5.0 per cent (table 3.3).

In case of Nepal too, the linkages from agricultural to non-agricultural sector are very strong. During 1971-80, per capita agricultural value added declined at a rate of –1.63 per cent and did not generate enough surplus for the nonagricultural sector, which grew by only 0.89 per cent. During later years, agricultural sector grew at more than 5.0 per cent due to which non-agricultural incomes increased.

Labour absorption capacity of non-agricultural sector

As the share of agriculture in GDP declines in the process of transformation, demand for labour grows in other sectors of the economy. In South Asia, the absorption of labour in other sectors has been relatively slower. It is obvious from the trend of agricultural share in GDP that as agricultural share in GDP has declined slowly, the rate of labour absorption in other sectors is sluggish. In case of Bhutan and Nepal, the transformation of labour is almost non-existent during the period 1960-98: the share of labour employed in agriculture declined from 95 per cent to 94 per cent for both countries. In the case of India, the process is relatively slower in comparison to Bangladesh, Pakistan, and Sri Lanka. In India, the share of labour employed in agricultural sector decreased from 74.3 per cent to 60 per cent in the last 38 years. In Pakistan and Sir Lanka, the share of agricultural labour force decreased at a moderate pace (Figure 3.3).

Economic transformation and agricultural exports

A declining share of raw agricultural exports is an important aspect of transformation. For instance, Bangladesh was a major exporter of jute and jute

products during the 1970s. With progressive economic transformation, the jute production and exports declined in the past two decades and the share of agricultural exports in total exports declined rapidly from almost 40 per cent in 1971 to merely 2.7 per cent in 1999. In 1999, the agricultural exports contributed very little towards national income (figure 3.4).

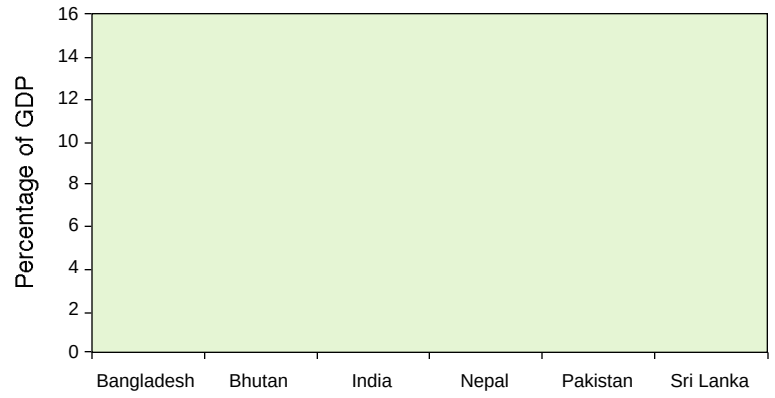
India has witnessed a relatively lower share of agricultural exports in its total exports, yet it did not decrease rapidly over the period 1966-1980. The last two decades have seen a more rapid decline. The decline in the share of agricultural exports is most dramatic in case of Nepal, Pakistan and Sri Lanka. It decreased from 93.8 per cent in 1970 to 10.1 per cent in 1999 for Nepal, 89.3 per cent in 1966 to 14.9 per cent in 1999 for Pakistan, and 95 per cent in 1970 to 20.7 per cent in 1999 for Sri Lanka.

As a percentage of GDP, the share of agricultural exports is declining in almost all the South Asian countries. In Pakistan, the agricultural exports as percentage of GDP fluctuated considerably; from 3.5 per cent in 1966 to 2 per cent in 1970 and rose again to above 4 per cent and then fell again to 1.8 per cent in 1988. In case of Nepal and Sri Lanka, share of agricultural exports in GDP declined rapidly from 8.8 per cent to 1.2 per cent in 1998 and 18.5 per cent to 6.8 per cent, respectively, over a period of 32 years.

Bhutan and India are the only exceptions. In India, agricultural exports as percentage of GDP did not decline significantly. It fluctuated around 1.3 per cent in 1966 to 1.2 per cent in 1998. In Bhutan it averaged around 4 per cent over a period of 28 years.

During the process of transformation, per capita incomes in non-agricultural sector grow faster than agricultural sector and income disparity increases. When resources such as labour move out of agriculture, per capita incomes in agricultural sector start rising. Though per capita incomes have risen in some South Asian countries yet rising absolute poverty suggests that a lot of effort is still required to distribute the fruits of growth evenly among its contributors.

Figure 3.5 Agricultural exports as percentage of GDP



Note: For Bhutan the latest year is 1980.
Source: FAO 2001c.

Intersectoral gap, income inequality and poverty

Poverty in South Asia is mostly a rural phenomenon and rural incomes are predominantly dependent on agriculture. Almost 72 per cent of South Asians still live in rural areas. Evidence from several South Asian countries, particularly Pakistan and Sri Lanka, suggests that there has been a considerable decrease in rural poverty in percentage terms, yet several studies indicate that the absolute number of people living below poverty line has increased. Rural poverty is still very high in Bangladesh, India and Pakistan (table 3.4).

Table 3.4 Poverty in selected South Asian countries 1970-1998

	Persons below $ 1/day (Based on incidence %)		Rural poverty %		Income consumption distribution		
					Lowest 20%	Highest 20%	
	1990	1995-98	1991-93[b]	1994-98	1970-75	1995-98	1995-98
Bangladesh	29.1	–	46.0	39.8	6.8	8.7	12.0
India	52.5	44.2	43.5	36.7	5.9	8.1	11.6
Nepal	37.7	–	44.0	…	…	7.5	11.5
Pakistan	11.6	31.0	49.11	31.95	8.0	9.5	12.9
Sri Lanka	4	6.6	20.0	25.0	7.3	8.0	11.8

Note: a: Refers to national level only.
b: Rural poverty data for Pakistan refers to 1969-70 from Economic Survey of Pakistan 2002/2003)
*: Note US$ 1/day is the international poverty line (Purchasing power parity, 1985 dollars).
…: Not available.
Source: World Bank 2001a, 2002a.

Another important feature of these economies is rising income disparity. There are many different measures of income disparity. In recent years, intersectoral GDP gap has turned out to be an important measure of unequal distribution of income among different sectors of the economy. Over the last three decades, the intersectoral income gap is increasing much faster in many countries of the region[11].

The widening intersectoral GDP gap is also a measure of a deepening transformation in the economy. In the beginning, non-agricultural sectors grow faster and the gap widens. As non-farm employment increases, the opportunity cost of working on farms increases. Once the transformation is complete, resources like labour move out of the agricultural sector, per capita agricultural income starts increasing and the gap between per capita agricultural and non-agricultural income narrows. In South Asia agricultural transformation has been slower than East Asia and the Pacific. Therefore, widening intersectoral gap is deepening the income inequality.

Poverty, inequality and per capita income growth are all interrelated. A rise in per capita income may alleviate poverty only if there is a corresponding improvement in its distribution. The distribution of wealth is skewed in this region and it has deteriorated further. The percentage of people with the lowest 20 per cent share in income consumption distribution has increased for almost all the countries of the region over the last 28 years. Income consumption inequality between the lowest 20 per cent and highest 20 per cent of population has increased in Pakistan from 8.0 per cent to 12.9 per cent, in Bangladesh from 6.8 per cent to 12.0 per cent, in India from 5.9 per cent to 11.6 per cent, and in Sri Lanka from 7.3 per cent to 11.8 per cent between 1970-75 and 1995-98.

The above discussion can be summed up as:

- Slow and sometimes negative growth rate in per capita agricultural GDP in South Asia has led to lower incomes in rural areas.
- Slow growth in per capita agricultural incomes has led to widening intersectoral GDP gap and deepening income disparity in urban and rural sectors of South Asia.
- As majority of people live in rural areas, therefore, they bear the major burden of intersectoral income inequality.
- Rising income inequality has led to higher number of people living below poverty.
- Absolute poverty in South Asia has increased.

Performance of agriculture through time

Structural change in South Asian agriculture

The widening gulf between the agricultural and non-agricultural incomes is reinforced because of structural transformation in a growing economy. The share of agriculture in GDP decreases rapidly, which is normal to the process of economic transformation. It should not be taken as a negative outcome of development as long as agriculture keeps growing at a reasonably good pace. The Engel's Law, which states that as income increases expenditure on food declines rapidly, provides sufficient reason for decreasing share of agriculture in overall production.

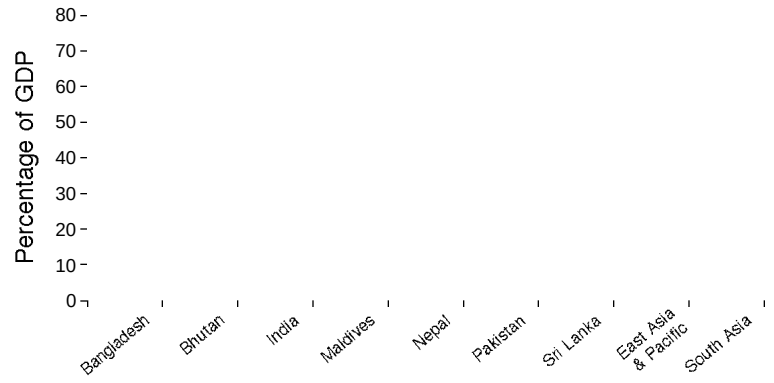
South Asia has witnessed a declining trend in its share of agriculture. From 44.9 per cent in 1960, it has declined to 25 per cent by 2000. The pace of reduction is relatively faster than East Asia and the Pacific: in East Asia the share of agriculture in GDP declined from 31.0 per cent in 1960 to 13.0 per cent in 2000, an 18 percentage point reduction (figure 3.6). South Asia witnessed a reduction of 20 percentage points, over the same period.

In Bangladesh, during the period 1971-2000, the share of agriculture in GDP declined at a moderate pace from about 39.2 per cent in 1971 to 25.0 per cent in 2000. It must be noted that transformation was slow in the early years of independence as its share of GDP declined to only 38.1 per cent by 1980. As a matter of fact there was no industrial base in Bangladesh before independence. However, the manufacturing and industrial base started expanding and share of agriculture in GDP decreased sharply by almost 10 per cent in 1990 (table 3.5).

In India, the share of agriculture in GDP declined at a slower pace from 45.2 per cent in 1960 to 25 per cent in 2000 (table 3.5). During the 1960s and 1970s, the share of agriculture in GDP did not decline at a fast pace. The most important reason was the sudden increase in agricultural value added due to the Green Revolution, which increased the share of agriculture in GDP.

In the case of Pakistan, though agricultural production increased dramatically during the 1960s yet the pro-industrialisation drive of 1960s led to a sharp reduction of agricultural share in GDP. The pace slowed in the 1970s as private sector investment declined sharply due to nationalisation drive. In the 1980s and 1990s the share of agriculture in GDP did not decline much as the decentralisation and privatisation policies increased more uncertainty because of increasing political instability.

Figure 3.6 Agriculture as percentage of GDP



Note: The Latest year available for Bangladesh is 1971; for Bhutan 1980; for Maldives 1990.
Source: World Bank 2001a.

In Sri Lanka, the pace of transformation was even slower. The share of agriculture in GDP declined from 31.7 per cent in 1960 to 20 per cent over the last 40 years (table 3.5).

In Nepal, the share of agriculture in GDP is highest among other South Asian economies. Although the transformation was slower in first 20 years of the period 1960-2000, it declined significantly in later years. Within the last 20 years, it declined rapidly from 61.8 per cent in 1980 to 40 per cent in 2000.

In case of Bhutan and Maldives, the data is only available for the 1980s and 1990s, respectively. For Bhutan, the share of agriculture in GDP declined rapidly in the last 16 years. On the other hand, it is

Table 3.5 The changing structure of the economy

(Value added as percentage of GDP)

	Agriculture					Manufacturing					Services				
	1960[a]	1970[d]	1980[b]	1990[c]	1997-2000[d]	1960[a]	1970[d]	1980[b]	1990[c]	1997-2000[d]	1960[a]	1970[d]	1980[b]	1990[c]	1997-2000[d]
Bangladesh		39.2	38.1	28.3	25.0		11.4	23.8	23.6	24.0		49.4	38.1	48.1	5.10
Bhutan			56.7	43.2	38.2			12.2	25.3	36.4			3.11	31.5	25.4
India	45.2	44.8	37.8	30.8	25.0	18.9	20.0	23.7	27.1	27.0	35.9	35.2	38.5	42.1	48.0
Maldives				21.9	16.4				6.0	6.5					
Nepal	65.5	67.3	61.8	51.6	40.0	11.0	11.5	11.9	16.3	23.0	23.5	21.2	26.3	32.1	37.0
Pakistan	46.2	36.8	29.5	26.0	26.0	15.6	22.4	24.9	25.2	23.0	38.2	40.8	45.6	48.8	51.0
Sri Lanka	31.7	28.3	27.6	26.3	20.0	20.4	23.8	29.6	26.0	27.0	47.9	47.9	42.8	47.7	53.0
East Asia & Pacific	31.0	32.6	24.3	20.0	13.0	30.5	32.4	42.4	40.4	46.4	38.5	35.0	33.3	39.6	40.6
South Asia	44.9	43.3	36.6	31.0	25.0	17.9	19.9	24.0	25.5	26.0	37.2	36.8	39.4	43.5	49.0

very hard to comment about Maldives because of unavailability of information and data. Maldives has the smallest agricultural base in South Asia. It relies more on tourism and fisheries.

Trends in sub-sectors

During the last few decades, many South Asian economies have seen strong growth in crop production (above 2 per cent). At times crop production growth rates closely matched or outpaced population growth rates. In particular, the growth rates were very impressive in Bangladesh, India, Nepal and Pakistan.

From 1970-71 to 2000, agricultural production increased in Pakistan by 199 per cent, in India by 128 per cent, Nepal by 124 per cent, Bangladesh by 107 per cent, and Sri Lanka by 47 per cent. There has also been tremendous growth in production of food, cash crops and livestock in all the countries (table 3.6)

During the 1960s, scientifically modified semi-dwarf varieties of wheat and rice were introduced in South Asian countries. The new varieties were highly responsive to input usage such as water and fertilisers. The small farmers benefited the most as high yield per hectare from their small tracts of land suddenly increased their incomes. An increase in income was used for nonfarm transformation. On the other hand increasing food supply ensured that there is enough food available for growing number of people in South Asia.

The Green Revolution was regarded as truly an Asian miracle. It increased cereal production dramatically in Bangladesh, Nepal, India, Pakistan and Sri Lanka. The introduction of high yielding semi dwarf varieties of rice and wheat led to a rapid increase in input usage. International Rice Research Institute (IRRI) played an important role in introducing new varieties of rice and wheat in Asia. With its help, Pakistan, India, and Bangladesh developed many high yielding varieties. Soon after the introduction of high yielding varieties of rice, new high yielding varieties for maize, wheat, soybean, and some major vegetables were introduced. The growth rates for wheat were high in Bangladesh, Pakistan, and India

The impact of Green Revolution was tremendous in alleviating hunger and poverty. It not only increased agricultural incomes but transformed rural livelihood throughout Asia. It changed the cropping patterns and strengthened food supply. As cereal production per hectare increased, more and more arable land became free for other types of crops. Area under wheat and rice relatively decreased and farmers diversified crop production. The diversification was narrowed as farmer focused on cash crops such as oil seed crops and soybean and abandoned other crops, which were not yielding good production and incomes. This was an indication of growing commercialisation as well.

In South Asia, the growth rate for total area under cereal production has shown a declining trend over the last three decades. For instance, in case of Bangladesh, India, and Pakistan area under cereal production has shown a consistent decline for the last thirty years,

Table 3.6 Performance of agriculture from 1970-71 to 2000

	Agricultural Production			Food Production		
	1970-71[a]	2000	Growth rate	1970-71[a]	2000	Growth rate
Bangladesh	64.6	133.6	106.8	63.8	131.6	106.3
Bhutan	64.1	114.4	78.5	64.3	114.4	77.9
India	55.7	126.9	127.8	55.5	127.4	129.5
Maldives	64.6	132.4	105.0	64.6	132.4	105.0
Nepal	55.8	124.9	123.8	55.2	125.3	127.0
Pakistan	46.9	140.2	198.9	49.0	146.6	199.2
Sri Lanka	79.0	116.4	47.3	71.8	115.7	61.1
	Crops			Livestock		
	1970-71 [a]	2000	Growth rate	1970-71 [a]	2000	Growth rate
Bangladesh	62.8	132.6	111.1	75.7	140.0	84.9
Bhutan	65.0	122.7	88.8	62.7	93.9	49.8
India	60.4	125.7	108.1	42.4	132.6	212.7
Maldives	64.8	132.9	105.1	61.0	124.5	104.1
Nepal	55.1	126.3	129.2	58.2	126.7	117.7
Pakistan	49.0	129.9	165.1	44.0	153.1	248.0
Sri Lanka	78.8	114.7	45.6	81.5	131.2	61.0

a: The data year for Bangladesh is 1971.
Source: FAO 2001c.

while cereal output per hectare continued to increase. During the same period there has been an unprecedented increase in total oil seed crops, nuts, soybean and cotton.

Many South Asian countries witnessed relatively high growth rates of crop production in the 1960s and 1970s, but since the 1980s they have been experiencing second generation problems of Green Revolution. These problems have arisen due to excessive fertiliser and pesticide use, intensive cropping, and over use of water, which have resulted in chemical toxicity, water logging, salinity, and soil degradation for example, the growth has slowed down in 1991-98 as compared to 1965-70 (figure 3.7a & 3.7b).

Even if the overall crop production growth rates were impressive, they failed to leave an imprint as per capita crop production growth rates did not increase fast enough. As a matter of fact, the growing population has been a major concern. In per capita terms, agricultural production, crop production and food production have not changed much due to high population growth in many South Asian countries. For instance, in Bangladesh the per capita crop production growth rates were negative for almost two decades, from 1971-80 to 1981-90 (table 3.8). The situation has improved recently as its population growth has slowed down and per capita agricultural production increased to 1.1 per cent in 1991-2000.

The per capita agricultural production indices show only a slight improvement in case of Bangladesh, India, Nepal and Pakistan over the last 30 years (figure 3.8). For other countries, the index has shown a relative decline. This holds true for per capita crop production indices as well. However, the per capita livestock indices have improved for almost all the countries of the region except for Maldives and Bhutan. The change in livestock production index is dramatic in case of Bangladesh. India and Pakistan have also shown dramatic changes in this regard. This fact reinforces the existence of strong linkages between farm and nonfarm sectors of the economy.

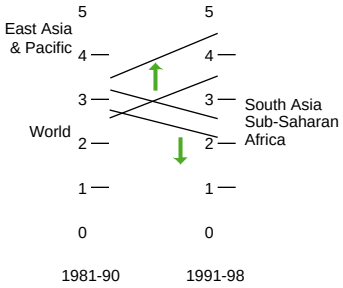
Non-crop transformation and commercialisation[12]

The confluence of the declining share of agriculture in GDP and increase in overall economic growth sets the broad foundations for the process of commercialisation and diversification of agriculture. Diverse sets of support policies prove very effective for fostering this process such as, enhanced agricultural research, supportive macro policies, access to credit; growth of rural financial markets, public investment in infrastructure, and establishment of secure property rights.

Though the post Green Revolution period is marred with second-generation problems, however, non-crop transformation has particularly picked up pace during this period. In post Green Revolution era, there was a clear shift in production towards meat, milk, butter, poultry and fruits. Rapid technological change in agricultural production and the changing pattern of food-demand resulting from higher personal disposable incomes triggered the process of diversification and commercialisation in South Asian agriculture.

The non-crop transformation is much more visible in India and Pakistan as compared to Bangladesh, Nepal and Sri Lanka. For instance, in India the growth rate of livestock production increased from only 1.2 per cent in 1971-80 to 2.7 per cent in 1981-90. Over the last

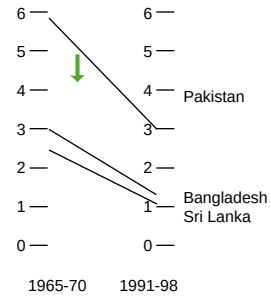
Figure 3.7a



Crop production annual average growth rate

Source: World Bank 2001a.

Figure 3.7b



Crop production annual average growth rate

Source: World Bank 2001a.

Table 3.8 Per capita agricultural and crop production growth rates (percentages)

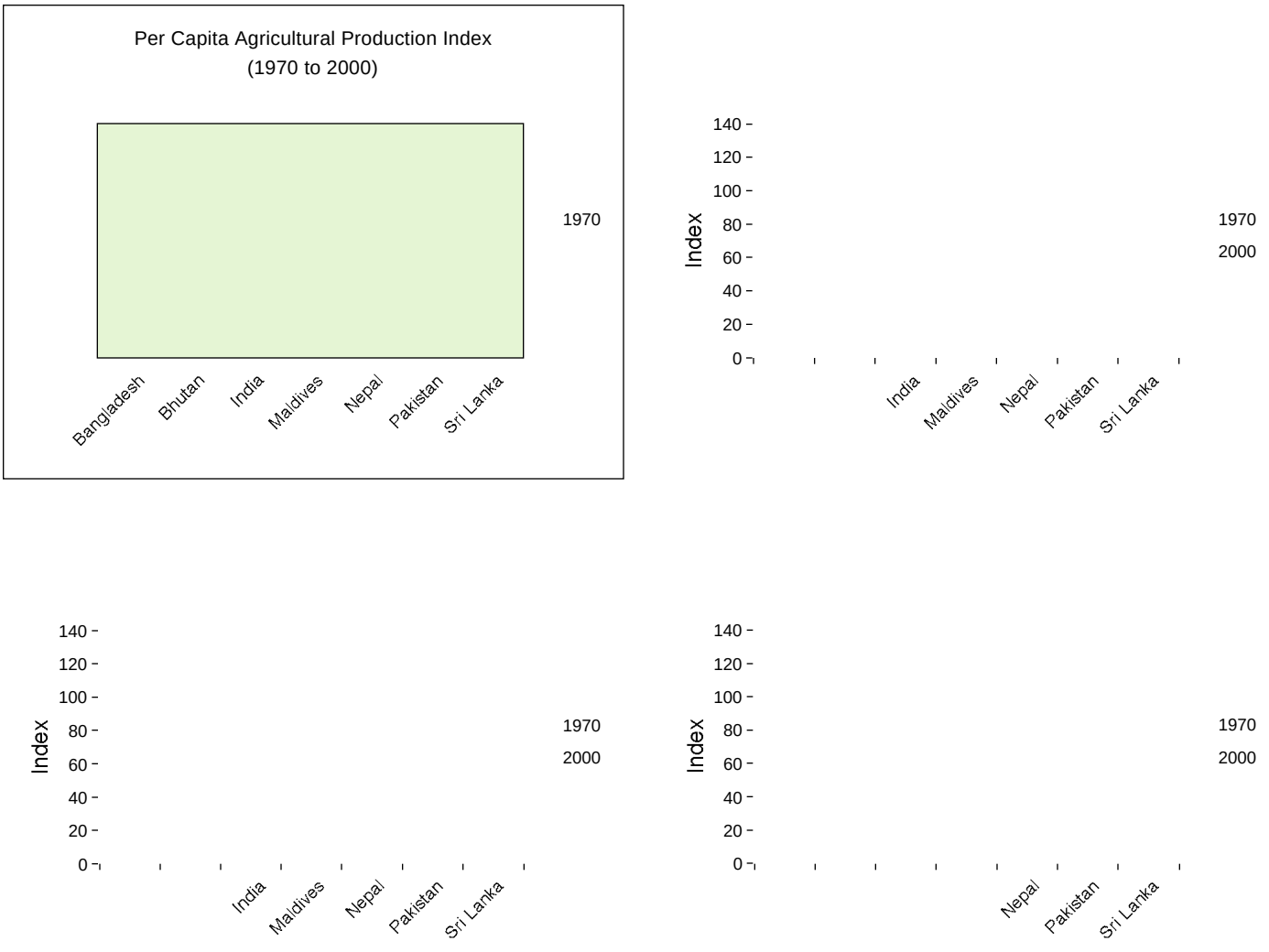
	1970	1971-80	1981-90	1991-2000	1970	1971-80	1981-90	1991-2000
Bangladesh	-1.8	-1.4	-0.5	1.1	-2.1	-1.4	-0.3	1.0
Bhutan	0.2	0.3	-0.3	-0.6	0.2	0.2	-0.4	0.3
India	2.5	0.3	1.6	0.8	3.3	0.1	1.3	0.6
Nepal	0.4	-0.5	-0.5	-0.1	0.4	-0.5	-0.5	0.0
Maldives	1.0	-0.6	1.8	-0.2	1.5	-1.0	2.8	-0.1
Pakistan	1.5	0.2	1.2	1.2	2.3	0.1	0.8	0.5
Sri Lanka	0.4	0.3	-0.7	0.7	0.4	0.5	-0.7	0.5

Source: FAO 2001c.

thirty years (1970-2000); livestock production has increased by 212.7 per cent; meat production by 141 per cent; milk production by 251.4 per cent and fruit production by 211.6 per cent (table 3.9). One may notice that per capita incomes in agricultural and non-agricultural sector increased relatively faster in the 1980s and 1990s.

Similarly, in Pakistan the growth of livestock production jumped from mere 0.4 per cent in 1971-80 to 1.7 per cent in 1981-90 and further to 2 per cent in 1991-2000. The agricultural value added increased by 2.07 per cent in 1981-90 and 2.22 per cent in 1991-98 and non-agricultural value added increased by 4.17 per cent in 1981-90 and 2.45 per cent in 1991-98. A faster increase in incomes fueled demand for livestock and fisheries products. Changing food demand has led to increase in milk and egg production (table 3.9).

Figure 3.8 Per capita production index



Note: For Bangladesh the latest year is 1971.
Source: FAO 2001c.

Table 3.9 Changing patterns in non-crop production

Country	Total meat production (1000 MT)					Total milk production (1000 MT)				
	1970	1980	1990	2000	Growth over 1970-2000	1970	1980	1990	2000	Growth over 1970-2000
Bangladesh	245	209	308	424	73.1	1065	1162	1594	2096	96.8
India	2003	2608	3900	4827	141.0	20800	31560	53678	73100	251.4
Nepal	81	127	187	237	192.6	625	747	922	1170	87.2
Pakistan	462	713	1325	1752	279.2	7445	9014	14723	25566	243.4
Sri Lanka	56	53	53	91	62.5	141	243	252	295	109.2

	Hen eggs (000 million)					Total fruit production (1000 MT)				
	1970	1980	1990	2000	Growth over 1970-2000	1970	1980	1990	2000	Growth over 1970-2000
Bangladesh	36	35	61	132	266.7	1407	1304	1332	1340	-4.8
India	290	583	1161	1782	514.5	15787	20357	27359	49199	211.6
Nepal	12	15	17	22	83.3	112	135	463	457	308.0
Pakistan	13	96	220	331	2446.2	1577	2533	3894	5409	243.0
Sri Lanka	19	31	46	51	168.4	520	2032	718	834	60.4

Source: FAO 2001c.

The growth in production of fruits is another indication of diversification and increasing commercialisation in South Asia (table 3.10). It is not only used for domestic consumption but for export as well to the Middle East and other countries of the world. In India, Nepal, and Pakistan, the fruit production has increased by 211.6 per cent, 308.0 per cent, and 243 per cent, respectively (table 3.9).

The growth in non-cereal and non-farm production is not the only indicator of diversification and commercialisation. The production of forest products also increased during the transformation period. In South Asia people rely on forests for their shelter and energy needs. The round wood is used for roofing and furniture manufacturing, while fuel wood is used for burning in stoves for cooking and heating in winters. Agro forestry is growing very fast in many South Asian countries. It not only provides wood for human needs but also protects farm embankments from degradation. It also provides protection from heavy storms and winds. Fast growing trees are very popular among farmers. In Pakistan, the production of round wood and fuel wood is growing at more than 3 per cent for the last 20 years.

Evolution of institutions and policies for agriculture

The evolution of institutions and policies is a historical process; it neither happens nor is implemented overnight. Although there is no guarantee that institutions that evolve over time will produce economic growth, yet they provide a framework that is necessary to understand the economic performance of economies in a historical perspective[13]. Institutional and organisational change is an important aspect of dynamically growing economies. In the past, many countries have tried to circumvent the need for policy reforms and institutional change by the introduction of new technologies. For instance, the Green Revolution technology has been effectively used to circumvent the need for policy and institutional reforms[14] without realising the fact that institutions and technology complement each other. The technology determines the process of production while institutions make rules and laws that govern this process. There is no doubt that South Asian governments provided required institutional support to agriculture during the Green Revolution period (1960 to 1985), yet in post-Green Revolution period it was realised that the policy and institutional framework

adopted earlier had not been well-conceived, keeping in view the holistic nature of agriculture in South Asia.

During the Green Revolution the new plant technology came with top to down government support for seed distribution, expanding irrigation operations, enhanced fertiliser usage, and credit disbursement with subsidies and price support policies. The irrigation, fertiliser and credit subsidies along with price support policies were highly desirable as the traditional farmers viewed new crop technology with suspicion and uncertainty. The government set up extension operations for demonstrating new technologies. In many cases, the farmers started adopting new technology by realising the potential of high-yielding varieties (HYVs) in demonstration plots. It was a relatively new technology and not much was known about its side effects. After two decades of its introduction, the second generation problems of the Green Revolution started appearing in South Asia. These and the changing patterns of social and economic institutions in rest of the world made it imperative for policy makers in South Asia to reassess the role of institutions and policies for agriculture.

Irrigation development received high priority by farmers as well as governments in South Asia

Historical trends in policy and institutional reforms

The process of institutional and policy reforms to promote agricultural growth can be divided into two periods: the period of the Green Revolution from 1960 to 1985, and the post-Green Revolution period from late 1980s to the present.

The Green Revolution period (1960 to 1985)

The 1960s and 1970s is considered as a period of technological change, infrastructure building and institutional development through investment in agricultural sector. The Ford Foundation helped to establish rice research institutions in Pakistan, Bangladesh and India. The new high yielding varieties (HYVs) of rice increased production dramatically. The success in rice production led to development of high yielding varieties of wheat, maize, and soybean crops as well. This created a dramatic increase in cereal production. The extraordinary performance of high yielding varieties of cereal crops was not possible without the support of government policies for various inputs that included seeds, irrigation, fertiliser and credit. During the 1960s and 1970s, fertiliser and water usage grew manifold.

IRRIGATION INFRASTRUCTURE DEVELOPMENT: Irrigation development, being one of the key inputs for enhancing agricultural production, received high priority by farmers as well as governments in South Asia. There were two main aspects of irrigation policies in most countries[15].

- First, the governments conducted comprehensive water resource assessment surveys and invested in short and long-term irrigation development projects. The short-term projects were expensive from small farmer cost effectiveness point of view, while long-term projects involved huge investments and had longer gestation periods. The small-scale irrigation projects were popularised by demonstrating government sponsored low lift pump and tubewell projects. The long-term projects were carried out in collaboration with international donors. The modern irrigation technology of shallow and deep tubewells and low lift irrigation pumps was first introduced in India in the 1950s. Later it spread across South Asia by the early 1960s.
- Secondly, the subsidy to cover the cost of tubewells and lift pumps was an important part of government policy to introduce the irrigation technology through public/private partnership.

In the case of Pakistan, Bangladesh, and India the low lift pump technology was very successful at the small scale. It relied

on human, animal and electric power and provided much needed water input for irrigating new HYV plants. At a larger scale, regional water treaties for settlement of water disputes and associated infrastructure development projects played an important role in irrigation infrastructure development. For instance, the Indus Water Treaty (IWT) was negotiated and signed between India and Pakistan, under the World Bank supervision, that evolved into Indus Basin Development Project (IBDP), and transformed agriculture especially in Indian and Pakistani Punjab provinces. The project dominated the irrigation development scene not only in South Asia but in the whole of Asia as well. The IBDP was meant to implement provisions of IWT in India and Pakistan[16]. Under this project several dams and a network of canals were to be built on the river Indus and its tributaries. In Pakistan, the construction of the world's largest earth filled dam at Tarbela, and another big dam at Mangla was carried out under this project. Bangladesh entered into water treaties with India soon after its independence. An Indo-Bangladesh Joint Rivers Commission was signed at Dacca on 24 November 1972. Irrigation infrastructure development was initiated in other countries of the region. Following the patterns of small-scale irrigation development in India, Pakistan and Bangladesh, the government of Nepal initiated capital subsidies for shallow tubewell schemes in the early 1980s[17]. Similarly in Sri Lanka, one of the largest infrastructure investments ever made was the development of the irrigation sector under the accelerated Mahaweli Development Programme in the early part of 1980s. Irrigation facilities were made available to farmers to expand their cultivation extents especially in the dry zones.

RURAL INFRASTRUCTURE: ELECTRICITY AND ROADS: The construction of dams and canals in Indus Basin and elsewhere not only helped to build power projects on these dams but also facilitated the construction of roads in the area. The main source of energy in Bangladesh, Bhutan, Nepal, India and Pakistan is hydroelectric power. In order to transport raw materials, machines and labour to dam and canal construction sites, a network of roads were built which later proved to be a precursor in linking farms to urban markets. For instance, the Gandak Irrigation and Power Project treaty signed between India and Nepal included articles on construction and maintenance of roads in the project area. Similarly, in Sri Lanka, under the Mahaweli Development Programme of 1980s road construction, rural electrification and other community services were also developed in line with irrigation development facilities.

FERTILISER DISTRIBUTION POLICY: The advent of the Green Revolution expanded fertiliser use in India, Bangladesh, Pakistan, Nepal and Sri Lanka. The improved varieties of crops required higher fertiliser dosages on irrigated lands. For instance, during 1964-70 fertiliser usage per hectare of arable land grew by 23.7 per cent in Bangladesh, 24.7 per cent in India, and 29.9 per cent in Pakistan. In order to provide relief to small farmers, the governments gave subsidies for chemical fertiliser use.

LAND REFORMS: The introduction of the Green Revolution in South Asia raised the controversial debate on land reforms. The debate revolved not only around the issues of efficiency and equity but the vested interests of the ruling elite. Those in favour of land reform used the equity and efficiency arguments in favour of small farmers. Land reform in India under Zamindari Abolition Act was very successful as the reform was based on simple transfer of land to the tenant who already knew the land and managed it well using family labour and draft animals[18]. The landlords are also known to divide their land into small parcels and assign to peasants under sharecropping or tenancy agreements[19]. The major opposition to

Those in favour of land reform used the equity and efficiency arguments in favour of small farmers

land reforms came from landlords who had managed to get vast tracts of lands from the British in return for political favours[20]. They argued that poor farmers, peasants, and landless poor did not have enough resources to buy all the inputs, therefore they needed support and assistance which was readily provided under sharecropping and tenancy agreements. Hence, they argued, land reforms would hurt the poor peasants as they lacked money to farm small parcels of land efficiently. But in many parts of South Asia the empirical evidence suggests inverse relationship between farm size and productivity (box 3.3).

AGRICULTURAL RESEARCH AND EXTENSION: Agricultural research and extension services are considered vital for agricultural development. The advent of new plant technology stipulated the establishment of support infrastructure and institutions. The success of the Green Revolution was not possible without institutionalising extension services. The Ford foundation helped to establish rice research institutions in South Asia and other parts of the world as well for the advancement of HYVs of rice. Subsequently, agricultural universities and crop research departments were set up to promote research on other cereal and cash crops as well. Such initiatives played an important role in developing agriculture in South Asia. In the early years of agricultural development, the extension departments, managed by the governments were run with a great deal of efficiency. They played an important role in introducing high yielding plant varieties, fertiliser use, and irrigation practices.

AGRICULTURAL CREDIT: The introduction of the Green Revolution rendered credit an indispensable input. Although irrigation, fertilisers and seeds were highly subsidised, yet small farmers did not have much financial resources to

Box 3.3 Land reforms in South Asia: An unfinished agenda

Pakistan

Pakistan has had a mixed experience with the three land reforms that have been carried out since independence in 1958, 1972 and 1977. These reforms were ceiling-based land reforms. However, these attempts have suffered from a number of flaws and have not impacted the agrarian structure in any meaningful manner. Concentration of land ownership has exacerbated the problem of rural poverty. The tenants on the other hand had low productivity due to lack of tenant proprietorship rights and the absence of cash remuneration in return for share-cropping.

Sri Lanka

Sri Lanka has also experimented with a limited degree of land reforms. The Land Development Ordinance that came into effect in 1935 did not permit lands to be leased out or to be sold by imposing a restricted land tenure system. In 1958 demand arose to enact the Paddy Lands Act with an objective to grant security of tenure to tenant cultivators who were engaged in the share cropping of paddy lands. The land policy in Sri Lanka hindered the achievement of optimal productivity of lands. Therefore it was amended in 1968. The absolute ownership, provisions to mortgage, and obtain optimum productivity were the main objectives of this amendment. In the absence of a clear legal position regarding the ownership of the land, the peasants were not interested in effecting permanent improvements and making investment. Therefore, land titling and registration became another important aspect in the latter period of 1990. However, these Ordinances still maintain their supremacy as the core legislation for the allocation, utilization and development of state lands.

Nepal

Although a number of interventions were initiated by the State to reform land tenure, the measures started by the Lands' Act of 1964 bore promise of genuine reform. But the ruling elite thwarted the promises of the Act almost immediately. Although intended to redistribute land to the landless and smallholder peasants, the Act was largely ineffective as most of the large landholders were able to take measures to conceal their actual land holdings. Government was able to redistribute only 1.5 per cent of agricultural land in the following thirty years. Provisions of the Lands Act of 1964 protected the tenant against eviction and authorised a registered tenant to claim one-fourth of the land area or equivalent value of land from the owner. This provision effectively resulted in 'dual ownership' and encouraged landowners to seek alternative non-formal tenancy arrangements.

Source: Land Reforms in Pakistan by Naqvi *et al.* and country papers on Nepal and Sri Lanka.

invest in new technologies. The agricultural banks and farmer cooperatives played an important role in credit advancement for agricultural purposes. The commercial banks in many countries were also directed to provide agricultural loans on subsidised interest rates. For instance, in India commercial banks played a complementary role to that of farmer cooperatives in providing a comprehensive institutional support to agriculture through various lending programs.

PRICE SUPPORT POLICIES: The agricultural pricing policies in South Asian countries were introduced to achieve the following objectives:

- Protection of farmers from losses that may be incurred due to declining prices resulting from an excess supply of agricultural products.
- The provision of a price floor during the harvest and post-harvest season. This can act both as a form of incentive and insurance. In many countries crops under the price support programme fared very well and ensured a stable source of income for producers.
- The protection of urban consumers against a sudden rise in prices of cereals.
- Maintaining balanced terms of trade between agriculture and other economic sectors.
- To encourage the use of new technologies.

The agricultural support prices are not determined on the basis of a pre-determined formula but rather on a variety of factors that include production costs, import/export parity prices, supply situation, local and world demand and government-imposed production targets. Thus despite limitations, support prices assisted in reducing uncertainty of prices and created an environment that helped investment prospects in agriculture sector. In many South Asian countries, the output and input price polices have encouraged the adoption of new technology and enhanced both production and productivity by promoting use of inputs, such as fertilisers and HYV seeds.

THE POST-GREEN REVOLUTION ERA (1985 TO 1990s): By the late 1980s, South Asia failed to sustain the gains achieved through Green Revolution due to second-generation problems resulting from inefficiencies induced by price distortions and agricultural subsidies. Lack of policy and institutional reforms had created many problems not only in agricultural sector but at the overall economy level as well. For instance,

- The irrigation practices are very old and wasteful. Increasing demand for water is pressing against water resource limits.
- Substantial loss of arable land to increasing environmental degradation, soil erosion, and escalating urban and industrial use has mounted pressure on remaining croplands.
- Agricultural investments in public and private sector are inadequate for accelerating growth.
- The broken link between research and extension system has become a major obstacle in agricultural development.
- Agricultural price, taxation, and subsidy policies in the past have led to inefficient resource allocations.
- Lack of legal framework to define property rights and delay in land reforms have negatively impacted on agricultural investment.
- The macroeconomic framework in many South Asian countries has not been conducive for agriculture and rural development.
- The small farmer and landless poor have always been at a disadvantage in agricultural pricing and credit policies.

In South Asia, lack of major reforms in these areas has threatened the foundation of sustainable agriculture. The

In South Asia, lack of major reforms has threatened the foundation of sustainable agriculture

policy distortions in the form of expensive irrigation and fertiliser subsidies, credit market inadequacies, absence of physical infrastructures, excessive government controls, heavy indirect taxes and almost no direct income tax on agriculture made the governments and the donors more aware of the imperatives to make policy and institutional reforms. There had been some success in this respect. There had been gradual correction of price and credit distortions. However, in some countries the reforms were oversimplified and haste was shown in implementing lessons learned in other parts of Asia. For instance, public suppliers of services were eliminated too quickly even before private enterprises could step in to fill the gap; government expenditures on agriculture were reduced abruptly before private sector had taken any steps to replace the void created. Some of the important features of institutional and policy reforms implemented across South Asia are discussed below.

IRRIGATION REFORMS AND MANAGEMENT OF WATER: The irrigation development projects of 1960s and 1970s focused on infrastructure development and overlooked the importance of institutionalising water and irrigation management. The irrigation infrastructure and operational mechanism was highly subsidised in Pakistan and Bangladesh. The water charges paid by farmers were so small that they did not help to cover the maintenance, operation and depreciation costs. In Pakistan, the surface water irrigation subsidies comprised 60 per cent of the costs of maintenance and operation, while the electricity charges were 50 per cent below the cost in 1989-90. Similarly, in 1989 the proportion of subsidies on the sale price of tubewell was 40 per cent in Bangladesh[21]. This exacerbated the maintenance and operation problems in later years. The waterways embankments were eroded and passages were filled with earth and weeds. According to some estimates only 50 per cent of the water supplied by an irrigation system reached the farmers' field due to seepage, erosion, and wastage. On the other hand, lack of knowledge base in the Green Revolution era caused excessive water use. In many areas the ground water table has dropped due to excess water pumping. The use of excess ground water has increased the salt content in land, thereby, causing salinity and water-logging.

As almost 70 to 80 per cent of fresh water is used for agricultural purposes, the efficient management of water resources is essential. The problems in water management and irrigation and drainage operations led policy makers to seriously re-examine the existing policies. There has been an ongoing debate about decreasing public sector involvement and increasing private sector role in irrigation management. On the other hand, subsidies are gradually being removed and farmers are encouraged to construct cemented waterways around their farms to minimise water losses.

MARKET REFORMS: Efficient markets are key to economic development. Although there are many instances of market failure in developed countries yet it is more prevalent in low-income countries[22]. A market is unable to function competitively without a supporting institutional and legal framework. Efforts are underway in South Asia not only to provide infrastructure facilities for markets to work efficiently but also to liberalise the markets from the constraints of government-controlled prices and financial institutions. The market reforms can be divided into three main areas:

- Provision of physical infrastructure
- Rethinking agricultural price and subsidy policies
- Instituting credit market reforms

A well-established network of roads and physical marketplaces are highly desirable for agricultural development.

Though in the past public sector has played an important role in providing inputs and marketing outputs, the inefficiencies and lack of infrastructure necessary for competitive markets created huge bottlenecks. Since the late 1980s and 1990s, doors have been opened for public/private partnership and establishment of basic infrastructure and deregulation of delivery mechanisms.

The prices of agricultural commodities in South Asia are well below the international markets. The agricultural price policy distortions and associated disincentives have resulted in inefficient resource allocations. In the case of irrigation, corruption and rent-seeking behaviour has resulted in the diversion of water to large farms. Such malpractices have increased the cost of irrigation subsidies, thus enhancing the costs for the governments and farmers. During 1991 structural adjustment, the international financial institutions required many countries to institute agricultural price policy and subsidy reforms. Pricing and subsidy policies have been modified in many South Asian countries. For instance in Pakistan, subsidies on fertilisers, seed and tube-wells have either been removed or gradually eliminated. Nevertheless, subsidies continue in sectors such as electricity, water and credit. In a changing economic environment, currently the major objectives of agricultural price policy in many South Asian countries are: to ensure that long-run domestic price trends conform with the world prices; to eliminate extreme fluctuations in prices in domestic markets, and increase the role of private sector in import, export and stocking of agricultural commodities.

During the 1990s, financial institutions around the world were restructured at an unprecedented pace with the main objective of becoming more cost effective and resilient to shocks. These developments made the subsidy-dependent agricultural development banks white elephants of development finance, and many donor agencies excluded them from their support. Reforming agricultural development banks became a favourite strategy in Asia. The flaws of directed credit led to the formulation of a new paradigm, which is a shift away from the administration of directed credit programmes that rely on continuous government subsidies. Major attention is now given to the performance of financial institutions and two performance indicators, outreach and financial sustainability, are considered important for any viable rural financial institution.

AGRICULTURAL INFORMATION SYSTEMS: Increasing problems in drought management in India and Pakistan; and Bangladesh's vulnerability to flood and cyclone related destruction, and post-Green Revolution second generation problems in particular have led to reexamination of the existing knowledge and agricultural information base in South Asia. Many agricultural information systems have been launched in the region. In this regard the establishment of South Asia Network on Plant Genetic Resources (SANPGR) is worth mentioning. Six countries of South Asia, namely, Bangladesh, Bhutan, India, Nepal, Maldives and Sri Lanka are members of this Network. The major objective of the SANPGR is to improve conservation and use of plant genetic resources through collaborative efforts among the member countries[23]. The SAARC Agricultural Information Center (SAIC) is also an important development in this respect[24].

Prices of agricultural commodities in South Asia are well below the international markets

Conclusions

The introduction of the Green Revolution led to a dramatic increase in agricultural production. Although the Green Revolution suffered from top to down approach, yet increasing government support for agriculture helped to increase not only agricultural incomes but also non-agricultural incomes, leading to commercialisation and diversification of agriculture and

economic transformation in general. The benefits of the Green Revolution, however, could not be sustained in the long run because of the absence of the required institutional and policy framework. Recently, many South Asian countries have started undertaking institutional and policy reforms with a hope that a healthy interaction between agricultural and rural development with industrial and service sectors will enhance and sustain long-term development of South Asian economy and South Asian people.

Chapter 4

Agricultural Productivity and its Determinants

Introduction

As we have seen previously, agriculture has historically played an important role in the economies of the South Asian region. The Green Revolution phenomenon of the late sixties and early seventies has brought about a significant transformation in productivity in the agriculture sector at a time when the region was facing a growing land constraint due to the pressure of a rising population.

This chapter presents a comparative analysis of agricultural performance in South Asia showing the relative contribution of land, labour productivity, irrigation, fertiliser and tractor use and of research and extension.

It will be seen from this analysis that in the past twenty years, all the countries of South Asia achieved sustained growth in the agricultural sector at a rate that was faster than the increase in their population. This rate ranged from about 2.5-3 per cent in Sri Lanka and Nepal to 4.7 per cent in Pakistan.

The resource endowment of each country determined relative priorities. In Bangladesh and as Sri Lanka, with little scope for expanding the area under cultivation, the application of fertiliser per unit of land is the highest, whereas in Pakistan total irrigated area as a percentage of total area under cultivation has gone up to a record 82 per cent. Public expenditure on research is the highest in India. Almost all countries now face the difficult challenge of maintaining their productivity growth in the face of declining land resources, ecological degradation, adverse climatic factors and unfavourable conditions in the international markets.

Growth in agricultural output

Agriculture has always been the backbone of South Asian economy and society, besides being one of the major contributors to GDP growth. During the last two decades, however, due to structural changes that have been taking place in most South Asian economies, the share of agriculture in GDP has started declining. This change has been most significant in Nepal and Bangladesh; in Nepal the share of agriculture in GDP declined from around 62 per cent in 1980 to 42 per cent by 1999—a decline of 20 percentage points, while in Bangladesh the value added by agriculture went down from 39.6 per cent to 25.25 per cent in the same period (table 4.1). However, the agricultural sector in Nepal still continues to be the biggest contributor to GDP and the largest employer of labour force—the percentage of population involved in agriculture saw little or no variation during 1980-99 (table 4.2). In India, the agriculture sector contributed 39 per cent in GDP in 1980 but by 1999-2000 had gone down to 27.7 per cent.

In case of Pakistan and Sri Lanka, the structural transformation has been more gradual with the share in GDP of agriculture declining from 29.5 per cent to 27.2 per cent between 1980-99 in Pakistan. In Sri Lanka, the value added

Table 4.1 Agricultural value added and its growth in South Asia

	Agriculture, value added (% of GDP)					Growth in value added in agriculture (Average annual %)	
	1980	1985	1990	1995	1999	1980-89	1990-99
India	38.70	33.56	31.45	28.40	27.71	4.48	3.14
Pakistan	29.52	28.54	25.98	25.89	27.18	5.11	4.23
Bangladesh	39.63	33.34	29.42	25.33	25.25	2.29	3.48
Nepal	61.77	51.71	51.63	41.76	41.73	3.59	2.58
Sri Lanka	27.55	27.69	26.32	23.01	20.67	2.37	2.63

Source : World Bank 2001a.

Table 4.2 Economically active population in agriculture

(% of total labour force)

	Labour force in agriculture (% of total)				
	1980	1985	1990	1995	1999
India	69.53	67.02	64.43	62.40	60.60
Pakistan	64.04	59.35	54.96	54.43	53.23
Bangladesh	72.47	68.16	62.69	58.44	55.55
Nepal	90.02	92.14	93.18	95.38	96.57
Sri Lanka	51.21	49.69	46.96	45.32	44.33

Source: FAO 2001c.

by agriculture had reached 21 per cent by 1999—down from 27.55 per cent in 1980; the decline in agricultural value added being more pronounced in the 1990s.

During the period 1980-99, Pakistan experienced the highest growth in agricultural GDP in the region—an average annual increase of 5.11 per cent during the eighties with growth being slightly lower in the nineties at 4.23 per cent (table 4.1). In India, the agricultural sector grew at an average annual rate of 4.48 per cent in the eighties with growth being comparatively lower during the nineties at 3.14 per cent. In Bangladesh, on the other hand, agricultural growth was higher in the 1990s where the value added in agriculture grew at an average rate of 3.5 per cent between 1990-99, while growth during 1980-89 was only 2.3 per cent. The lowest growth in agriculture value added was experienced by Sri Lanka, where the agricultural GDP grew at an average annual rate of only 2.6 per cent but even this growth rate was faster than the increase in its population.

The share of labour engaged in agriculture declined throughout South Asia in the eighties and nineties as the agriculture sector gave way to industry and services sectors. India, which had about 70 per cent of its labour force employed in agriculture in 1980 had around 61 per cent of it employed in agriculture by 1999. The proportion of agricultural labour in the total labour force declined throughout the region between 1980-99 with the exception of Nepal where by 1999, 96.6 per cent of total labour force was employed in agriculture, up from 1980 figure of 90 per cent. The highest decline in the percentage of labour force engaged in agriculture was seen in Bangladesh with the share of labour force employed in agriculture declining from 72.5 per cent in 1980 to 55.5 per cent in 1999.

Table 4.3 Agricultural land use in South Asia

	Agriculture, land use in South Asia					Growth in land use (Average annual %)	
	1980	1985	1990	1995	1999	1980-89	1990-99
India	168255	169015	169438	169750	159000	0.06	-0.61
Pakistan	20300	20610	20940	21550	21880	0.40	0.40
Bangladesh	9158	9135	9437	8148	8440	0.35	-1.11
Nepal	2320	2335	2350	2968	2968	0.12	2.42
Sri Lanka	1880	1876	1900	1886	1900	0.07	0.00

Source: FAO 2001c.

Growth in the use of agricultural inputs

Agricultural land use in South Asia

The expansion of agricultural land has contributed very little to output growth in South Asia although in the first two decades after independence there was considerable expansion in cultivated area due to increased irrigation. During 1990-99, the increase of agricultural land was negative in some countries such as India and Bangladesh (table 4.3). Rising population in the region exerted tremendous pressure on land. In Bangladesh, for instance, the pressure of rising population has shifted a large area from directly productive activities such as crop cultivation to other uses such as housing, roads and urban development. The population density in Bangladesh is now one of the highest in the world leading to a drastic reduction in cultivable land. In India, agricultural land expanded nominally between 1980-95, but in the later part of the nineties the growth declined sharply contributing to an overall negative growth of 0.61 per cent during 1990-99. Nepal has seen the highest growth in agricultural land use during the 1990s: the agricultural land grew at an average rate of 2.42 per cent between 1990-99, while growth in the eighties was only 0.12 per cent. Growth in land

accounted for 51 per cent of the growth of production in Nepal[1]. Pakistan saw very low rates of growth in land use averaging 0.4 per cent per year in both the eighties and the nineties, while growth in agricultural land was virtually non-existent in Sri Lanka during these twenty years.

As regards the productivity of land, all countries have witnessed an increase in their land productivity. The growth rate of land productivity however varies from country to country (table 4.4). In 1980, land productivity was highest in Sri Lanka where a hectare of land produced on average $780 worth of output. This was followed by Bangladesh at $561 per hectare. Nepal and Pakistan had the lowest levels of land productivity in the region, where a hectare of land produced just $242 and $290 worth of output respectively in 1980. But by 1994, land productivity had reached $1119 per hectare in Sri Lanka, while it increased to only $382 in Nepal. The highest growth in land productivity was witnessed by Pakistan where land productivity grew by 4.8 per cent during the eighties which then slowed down to 3.12 per cent during 1990-94. India too saw a high growth in land productivity during the eighties and the early nineties, with growth being relatively higher in the eighties. In case of Bangladesh, growth in land productivity was the highest during 1990-94 at 4.37 per cent, while it was the lowest during the eighties at just 1.97 per cent. The value added per hectare of agricultural land in Nepal grew by only 1.1 per cent in the early part of the nineties even though the agricultural land in Nepal grew by 2.42 per cent during the nineties.

Use of irrigation

Trends in irrigated area show that most of the South Asian countries have still less than half of their agricultural area covered by irrigation. Pakistan is the only exception to this pattern: by 1999 it had a remarkable 82 per cent of its agricultural area covered by irrigation which is the highest proportion in the entire region (table 4.5). Bangladesh experienced the highest growth in irrigated area during both the eighties and the nineties at 3.85 and 5.1 per cent, respectively. By 1999 it had more than 47 per cent of its agricultural land covered by irrigation while in 1980 only 17 per cent of the agricultural area was covered by irrigation. In Sri Lanka, on the other hand, growth in irrigated areas was actually negative in the eighties. The cost of new irrigation went up in many countries, including India and Sri Lanka, giving rise to negative growth in irrigated areas. In India for instance, the real costs of new irrigation have doubled since the late 1960s and early 1970s; in Sri Lanka too it has doubled which combined with falling cereal prices has resulted in negative rates of return to irrigation in these countries[2]. This is not an encouraging trend for food supply since irrigated area accounts for nearly two thirds of South Asia's rice and wheat production[3].

Use of Labour

The agricultural labour force increased more rapidly than agricultural land in the

Table 4.4 Land productivity in South Asia

	Value added per hectare of agricultural, land (constant 1995 US $)				Growth in land productivity (%)	
	1980	1985	1990	1994	1980-89	1990-94
India	324.04	375.63	454.68	515.28	4.49	3.37
Pakistan	290.25	365.58	446.63	500.62	4.80	3.12
Bangladesh	561.49	684.63	718.68	831.43	1.97	4.37
Nepal	241.79	302.91	383.70	381.58	3.70	1.08
Sri Lanka	780.36	977.00	1023.05	1118.72	232	3.54s

Source: World Bank 2001a.

Table 4.5 Growth of irrigated area in South Asia

	Irrigated area as % of agricultural area in South Asia					Growth in irrigated area (Average annual %)	
	1980	1985	1990	1995	1999	1980-89	1990-99
India	22.87	24.72	26.64	31.22	37.11	1.66	2.79
Pakistan	72.32	76.47	80.90	79.81	82.04	1.73	0.61
Bangladesh	17.13	22.69	31.11	42.08	47.22	6.30	3.85
Nepal	22.41	32.55	40.43	38.21	38.24	7.48	1.89
Sri Lanka	27.93	31.08	27.37	30.22	34.84	-0.21	3.00

Source: FAO 2001c.

Table 4.6 Land to labour ratios in South Asian agriculture

	Land to labour ratio					Growth in agricultural labour (Average annual %)	
	1980	1985	1990	1995	1999	1980-89	1990-99
India	0.81	0.77	0.73	0.68	0.61	1.10	1.38
Pakistan	1.06	1.00	0.95	0.88	0.81	1.65	2.14
Bangladesh	0.30	0.28	0.28	0.23	0.22	1.09	1.23
Nepal	0.35	0.32	0.29	0.32	0.29	2.15	2.54
Sri Lanka	0.66	0.61	0.57	0.53	0.51	1.64	1.27

Source: FAO 2001c.

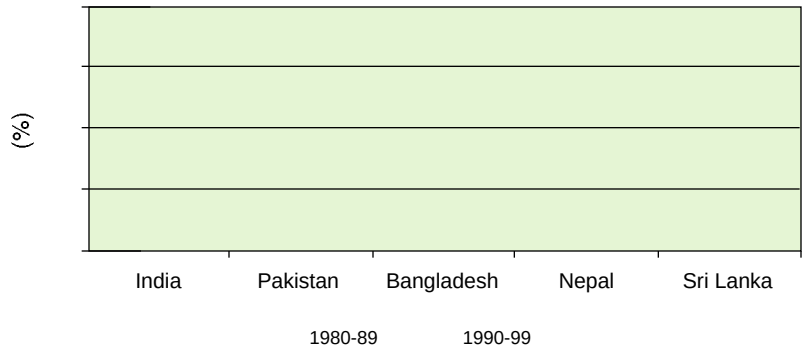
South Asia. As a result land to labour ratios declined in all countries during the past two decades. This ratio was as high as 1.06 hectares per worker in Pakistan in 1980, which came down to 0.81 hectare per worker by 1999. In the same period, labour use in agriculture in Pakistan grew by 1.9 per cent per year on average. The labour force employed in agriculture saw the highest growth in Nepal where it grew at an average annual rate of 2.15 per cent between 1980-89 and 2.54 per cent between 1990-99. The growth in agricultural labour was the lowest in Bangladesh during both the eighties and the nineties where labour employed in agricultural activities grew at an average annual rate of 1.1 per cent during 1980-89 with growth between 1990-99 being slightly higher at 1.23 per cent.

Table 4.7 Labour productivity in agriculture in South Asia

	Agricultural value added per worker (constant 1995 US $)				
	1980	1985	1990	1995	1999
India	276.47	304.15	350.67	363.09	402.31
Pakistan	386.71	455.18	529.25	578.79	629.06
Bangladesh	216.39	246.40	264.92	267.87	301.07
Nepal	154.31	177.29	194.72	184.08	188.18
Sri Lanka	630.16	719.55	708.31	746.49	752.49

Source: World Bank 2001a.

Figure 4.1 Growth in labour productivity



Source: World Bank 2001a.

Trends in labour productivity show that by 1999, the value of labour productivity measured as the agricultural value added per worker at constant 1995 US dollar was the highest in Sri Lanka at $752 per agricultural worker (table 4.7). Nepal had the lowest value of labour productivity in the region at $188 and its average growth during the nineties was also the lowest in the region—labour productivity in Nepal grew only at an average annual rate of 0.05 per cent between 1990-99, while during the eighties it was 1.4 per cent (figure 4.1). Pakistan saw the highest growth in labour productivity in the eighties where the value added per worker grew at an average annual rate of 3.4 per cent between 1980-89, which slowed down to 2 per cent in 1990-99. In India, the growth in labour productivity during the eighties was considerably higher than growth in the nineties. Labour productivity in Bangladesh saw the highest growth in the nineties, the overall growth between 1990-99 being 2.23 per cent per annum. In Sri Lanka, the growth in labour productivity was modest at around 1 per cent during 1980-99.

It is clear that in all countries of South Asia, growth in labour productivity lagged behind growth in land productivity in the 1980s and 1990s. The slower growth of labour productivity as compared to growth in land productivity indicates that the South Asian countries have generally adopted land saving agricultural technologies[4]. The decline in cultivable land led most countries in South Asia to increase their cropping intensity. In Bangladesh for instance the cropping intensity increased from 147 per cent during 75-80 to 180 per cent in recent years[5].

Fertiliser use

Data on fertiliser use in the South Asian countries is presented in table 4.8. The

highest level of fertiliser application per unit of land was recorded in Bangladesh in 1999, where a hectare of land received 154 kg of fertiliser on average. In Sri Lanka, 136 kg of fertiliser was applied on a hectare of land while in Pakistan the fertiliser application per unit of land stood at 129-kg per hectare. The fertiliser use in Nepal was much below the levels prevalent in the region—a hectare of land there received just 30 kg of fertiliser on average in 1999 while in 1980 only 10 kg of fertiliser was used on a hectare of land. Increased application rates of fertiliser led to high rates of growth in all countries of the region between 1980 and 1999. In Bangladesh, the fertiliser application per unit of land grew at an average annual rate of 8.8 per cent during the nineties—the highest in the region. In Nepal, the growth in fertiliser application was very high at 12.5 per cent during the eighties which slowed down to just 1.1 per cent during the nineties. Sri Lanka, on the other hand, saw relatively lower rates of growth in fertiliser application in both the eighties and the nineties.

Use of tractor

South Asia lags far behind other Asian countries as far as the use of tractors and other agricultural equipment is concerned. In 1980, there was fewer than one tractor available for every thousand agricultural workers in Bangladesh and Nepal—the lowest in the region. In Pakistan, there were 5 tractors for every thousand people employed in agriculture on average in 1980, which had increased to 12 tractors per thousand workers by 1990—an average annual growth of 9.1 per cent. During the nineties, however, there was virtually no growth in tractor use in Pakistan. There were 5 tractors per 1000 agricultural workers available in India in 1999; the growth in the use of tractors was highest in India between 1980-89 as well as 1990-99. The use of tractors per 1000 workers actually saw a decline in Sri Lanka during 1980-99; in 1980 around 4 tractors were available to every thousand agricultural workers but by 1999 this number had declined to only 2 tractors per 1000 workers. The slow growth of tractor use has occurred as a result of the realisation by policy makers that the speed of mechanisation through subsidised agricultural credit had not only reduced rural employment but also accelerated income inequalities in rural areas.

Table 4.8 Fertiliser application per unit of land in South Asia

	Fertiliser application per unit of land					Growth in fertiliser application (Average annual %)	
	1980	1985	1990	1995	1999	1980-89	1990-99
India	32.88	50.32	71.72	81.74	115.55	8.15	5.77
Pakistan	53.20	73.31	90.40	116.38	129.07	6.65	3.89
Bangladesh	45.53	59.22	74.18	146.66	154.03	5.76	8.76
Nepal	9.48	18.42	31.06	31.67	29.65	12.53	1.05
Sri Lanka	87.77	103.94	90.00	109.23	136.32	3.92	2.53

Source: World Bank 2001a.

Growth trends in some selected crops in South Asia during the nineties

Table 4.10 presents growth in the area, yield and output of four major crops in South Asia during the period 1990-2000. The major conclusions that emerge from analysis of data provided in the table are the following:

1. RICE: Rice is the most important food crop in the region. In Bangladesh, rice accounts for 70-72 per cent of the total value of gross output. During 1990-2000, Pakistan and Bangladesh saw the highest growth in production of rice at an average annual rate of 4.26 and 3.25 per cent respectively. However, the area cultivated grew by only 0.3 per cent in Bangladesh

Table 4.9 Tractor use in South Asian agriculture

	Tractors per thousand agricultural labour					Growth in use per 1000 workers (Average annual %)	
	1980	1985	1990	1995	1999	1980-89	1990-99
India	1.83	2.76	4.28	5.43	5.78	9.39	3.67
Pakistan	5.10	7.58	12.08	12.42	11.90	9.05	0.66
Bangladesh	0.14	0.15	0.15	0.15	0.14	1.88	-0.65
Nepal	0.38	0.38	0.54	0.49	0.45	5.25	-1.57
Sri Lanka	4.24	2.75	1.96	2.10	2.15	-6.95	0.49

Source: FAO 2001c.

Table 4.10 Growth in area, yield and production of major crops in South Asia (1990-2000)

a. Rice

	Area	Yield	Production
Bangladesh	0.30	2.90	3.25
India	0.29	0.98	1.56
Nepal	0.93	1.20	2.67
Pakistan	1.21	2.81	4.26
Sri Lanka	2.46	1.36	3.86

b. Wheat

	Area	Yield	Production
Bangladesh	3.86	2.07	5.97
India	1.22	2.02	3.29
Nepal	0.65	2.91	3.55
Pakistan	0.86	2.84	3.76

c. Sugarcane

	Area	Yield	Production
Bangladesh	-0.05	0.41	0.39
India	2.30	1.51	3.91
Nepal	6.45	1.63	8.06
Pakistan	1.50	0.96	2.66
Sri Lanka	-1.34	7.74	5.98

d. Cotton

	Area	Yield	Production
Bangladesh	7.19	-1.79	6.20
India	0.98	1.14	2.10
Nepal	1.28	1.51	1.67
Pakistan	1.22	2.33	3.71

Source: Extrapolated using data from FAO 2001c.

whereas it grew by 1.21 per cent in Pakistan during the nineties The yield per hectare of rice was the highest in Bangladesh followed by Pakistan. The lowest growth in production was recorded in India between 1990-2000, where rice production grew only at an average rate of 1.6 per cent.

2. WHEAT: Wheat is the second most important cereal in the region and is the staple diet of Pakistan and India. Growth in wheat production during 1980-99 was the highest in Bangladesh at nearly 8 per cent. However, this growth was mainly the result of land expansion; the land under wheat cultivation grew at an annual average rate of 6.9 per cent between 1980-99 while the yield per hectare grew only at 1.1 per cent per annum—the lowest in the region and was negative during the eighties.

3. COTTON: Bangladesh saw the highest growth in cotton production during the nineties averaging 6.2 per cent per year between 1990-2000. However, this growth was accompanied by falling yield levels and was mainly the result of expansion of the cultivated area which grew at an average rate of 7.2 per cent. During the nineties, cotton has been the major contributor to agricultural growth in South Asia.[6] Cotton yield in Pakistan experienced the highest growth at 2.33 per cent.

4. SUGARCANE: Trends for sugarcane show that the highest growth in production was experienced by Nepal, where sugarcane production grew at an average annual rate of 8.1 per cent between 1990-2000. This high growth was mainly the result of area expansion, which grew at nearly 6.5 per cent during this period although the yield per hectare grew only by 1.6 per cent per annum. Production of sugarcane grew at an average rate of 6 per cent in Sri Lanka during 1990-2000 resulting mainly from the high growth in yield per hectare while area under cultivation actually declined.

Trends in total factor productivity (TFP)

Total factor productivity has been one of the major sources of agricultural productivity in South Asia. In India for instance, growth in TFP accounted for nearly one half of agricultural production growth between 1956 and 1987.[7] The total factor productivity in South Asian countries has generally been low compared to other Asian economies. Several factors have contributed to low TFP in the region, the most prominent among them are low

investment in agricultural research and extension and underdeveloped rural infrastructure. In India for instance, research and extension accounted for 70 per cent of the growth in total factor productivity[8]. In Bangladesh, major factors contributing to low agricultural TFP were low investment in research, extension, rural infrastructure and irrigation, and dislocations arising from the civil war and independence of Bangladesh[9]. In Sri Lanka, civil unrest is cited as one of the major factors responsible for low TFP. In Nepal, difficult agroclimatic environment, limited funding available for research and its misallocation, have all contributed to low TFP. In Pakistan, research, rural literacy, modern seed varieties, and irrigation had the highest positive effects on productivity growth[10]. A study conducted by Murgai *et al*.[11] covering the Pakistani and Indian Punjab found that India experienced higher growth in yields of food crops than Pakistan.

In the early phase of the Green revolution (1967-75), the TFP growth in India was mainly due to the adoption of modern varieties of seed and sharp increases in irrigation investment, but somewhat low rates of growth in investment on extension and research. In Pakistan, during the same period, TFP growth accelerated due to sustained growth in irrigation development and high growth in the use of modern varieties, which was able to offset the decline in growth of investment in research[13].

The later phase of Green Revolution (1975-85) was characterised by relatively lower growth in the adoption of modern varieties in Pakistan and India leading to declining productivity growth. In India, investment in public research, extension and literacy increased in comparison to the previous decade, while investment in irrigation infrastructure dropped slightly but was able to sustain growth in proportion to irrigated area. In Pakistan, the growth in investment in research, irrigation and human capital declined sharply, and expansion in irrigated area virtually stopped during this period[14]. But as a result of past investments in irrigation and research combined with favourable macro economic policies, Pakistan was able to achieve an average agricultural growth of 4.7 per cent per annum in the 20 year period from 1980 to 2000.

Box 4.1 Resource degradation; Taking a heavy toll on agricultural productivity in South Asia

Resource degradation has severely hampered the growth of agricultural productivity in South Asia. Over the period of 1945-1990, the region has suffered an estimated loss of yield of approximately 16.5 per cent, which is well above the global figure of 5 per cent during the same period[12]. Data from Pakistan shows that resource degradation reduced overall productivity growth from technical change, education and infrastructure investment by almost one third. Several factors have led to the degradation of agricultural resource base in the region, the most prominent among them is the increase in the intensification of inputs. The intensification of inputs is often caused by inappropriate polices that provide incentives to use certain inputs in an excessive manner. In Pakistan, for instance, subsidies on some agricultural inputs have caused damage to the environment. In particular, the provision of irrigation water at prices below the cost of delivery has increased water logging, salinity and diminished bio-diversity. Subsidies for pesticides have encouraged its overuse. Water logging and salinity are causing serious environmental problems affecting agriculture. In India, studies have found that salinity problem affected nearly 4.5 million hectares and water logging 6 million hectares of land. In Nepal Tarai area, water logging reduced yields by half a ton per hectare.

Source: Rosegrant and Hazell 2000; Murgai *et al*. 2001; Faruqee 1997.

Investment in South Asian agriculture

Public expenditure on agriculture expressed as a percentage of agricultural GDP gives a good indication of the level of public commitment to agriculture. India spent the highest on agriculture, nearly 12 per cent of its agricultural GDP

Table 4.11 Government expenditure on agriculture as a percentage of agricultural GDP

(%)

	1975	1980	1985	1990	1993
Bangladesh	1.3	2.7	3.6	2.3	3.2
India	8.0	12.3	13	13.9	11.7
Pakistan	4.6	4.3	2.9	3.1	3.6
Nepal	2.4	4.3	7.8	2.7	3.7
Sri Lanka	7.1	7.7	26.9	8.1	8.1
China	7.9	9.1	6.0	6.5	6.3
Malaysia	6.1	13.5	14.7	10.7	8.1
South Korea	5.6	6.5	10.6	19.9	18.7

Source: Rosegrant & Hazell 2000.

in 1993 (table 4.11). Moreover, its expenditure has remained above 12 per cent of agricultural GDP since 1980, reaching the highest point in 1990 when nearly 14 per cent of the agricultural GDP was spent on agriculture. A comparison of India with China shows that while in 1975 both countries spent around 8 per cent of their agricultural GDP on agriculture sector, the pattern of spending diverged considerably for the two countries later on in the eighties and the nineties with public expenditure on agriculture rising in India while declining in China.

The levels of government expenditures on agriculture have been the lowest in Pakistan and Bangladesh throughout the eighties and the early nineties, with expenditures generally falling in Pakistan. In 1993, both Pakistan and Bangladesh spent only 3.6 and 3.2 per cent of their agricultural GDP on agriculture. In Nepal, public expenditure on agriculture has seen fluctuations with a high of 7.8 per cent in 1985 to a low of 2.7 per cent in 1990. Overall, it can be seen that the South Asian countries (with the exception of India and Sri Lanka) have spent a considerably smaller percentage of their agricultural GDP on their agricultural sectors as compared to other Asian countries like China, Malaysia and Thailand.

The agriculture sector has been given high priority in government spending in India and Nepal as can be seen from table 4.12, which shows government expenditure on agriculture as percentage of total government expenditures. Both these countries have consistently spent a relatively higher proportion on the agriculture sector than other countries in the region. In Pakistan, the proportion of government expenditure on agriculture has been the lowest in the region and has seen a declining trend during the eighties and the early nineties. In Bangladesh, the public sector expenditure on agriculture as a percentage of total public expenditure has varied throughout the eighties and the nineties—recording a high of 15.7 per cent in 1985 and a low of 5.4 per cent in 1990.

Table 4.12 Percentage of government expenditures in total govt. expenditures

	1975	1980	1985	1990
Bangladesh	12.3	15.7	5.4	6.9
India	14.6	12.6	11.5	9.6
Nepal	16.4	22	8.5	10.5
Pakistan	5.4	2.9	2.6	2.6
Sri Lanka	5.7	20	5.8	5.1

Note: Expenditures include those at both central and local government levels.
Source: Rosegrant & Hazell 2000.

Agricultural knowledge system

Research

Agricultural research and extension has been found to be the most important contributor to growth in total factor productivity (TFP) in South Asia. An investment of 100 billion rupees of investment in research and extension in India, for instance are estimated to increase growth in TFP by 6.98 per cent and reduce the incidence of rural poverty by 48 per cent[15]. Not only that, it has high economic rates of return particularly for India and Pakistan. Several studies have found economic rates of return to agricultural research that range from 40 to 100 per cent for India and 20 to 65 per cent in Pakistan.[16] Yet the South Asian governments continue to under invest in agricultural research and extension.

In 1993, India spent more than $ 1.6 billion on agricultural research, more than double the amount spent in 1980. The expenditure on agricultural research in India grew at an average annual rate of around 7 per cent during the 1980s, which slowed down to 1.8 per cent between 1990-93. In Pakistan, only $ 188 million were spent on agricultural research in 1993, the growth in agricultural expenditure being negative during the early part of the nineties. This compares unfavourably with Thailand—

a much smaller country which spent more than twice this amount on agricultural research in 1993. Agricultural research expenditures peaked in Bangladesh at $ 144 million in 1990, while in Sri Lanka only $ 35.5 million was spent on research.

India has one of the largest and institutionally well developed system of agricultural research in the world, where more than 10,000 scientists are engaged in different branches of agricultural sciences[17]. Agricultural research spending averaged about US $ 150 million (Rs. 5000 million) annually between 1989-92 at 1996 prices[18]. The Central Government provides 60 per cent of funds for agricultural research, the state governments about 20 per cent, private companies about 12 per cent and foreign donors the rest[19]. At the national level, the Indian Council of Agricultural Research (ICAR) is responsible for overlooking, coordinating and directing agricultural research and education in the country. The ICAR has 4 multi-disciplinary national institutes, 45 central research institutes, 30 national research centres, 4 bureaus, 10 project directorates, 84 All India Coordinated Research Projects/Networks and 16 other projects/programmes[20]. The ICAR is funded mainly through lump sum grants from the Central Government and proceeds of levy on certain export commodities. ICAR institutes conduct about 43 per cent of the research done in India; the state agricultural universities about 33 per cent; the private sector about 16 per cent and international centres about 8 per cent[21]. At the state level, the 28 state agricultural universities (SAUs) are also engaged in research spending about 45 per cent of their budgets on average on research[22], operating over 300 research stations across the country. In addition, general universities, scientific organisations, other government departments, private and voluntary organisations and scientific societies are involved in agricultural research in India.

In Pakistan, both the federal and provincial governments are involved in agricultural research. The Pakistan Agricultural Research Council (PARC) is the apex body for agricultural research in the country. It is an autonomous body working under the Ministry of Food, Agriculture and Livestock and has overall responsibility for coordinating agricultural research in the country. Besides the PARC, several other federal ministries and autonomous organisations are also engaged in agricultural research, while the share of private sector in agricultural research is still relatively small. At the provincial level, agricultural research is dispersed between many provincial departments including agriculture (crops), animal husbandry/livestock and fisheries[23].

The National Agricultural Research System (NARS) of Bangladesh is composed of 10 primary research organisations mandated to carry out research on crops, livestock, forests and fisheries. The Bangladesh Agricultural Research Institute (BARI) is the main planning and coordinating body of the agricultural research system. There are separate research institutes for conducting research on rice, jute, sugarcane, forests, livestock and fisheries. Besides the NARS institutes, the agricultural universities and some other universities are also involved in agricultural research.

In Nepal, the Nepal Agriculture Research Council (NARC) is the apex body for agricultural research in the country. NARC consists of 15 divisions with 14 commodity programmes, 41 regional agriculture stations and 18 agricultural stations[24]. In 1998 it had 350 researchers working on different projects across the country[25]. Other govt bodies/departments also conduct research in agriculture and related disciplines; the Forestry Survey and Research Department is responsible for research in forestry while the Jute Development Corporation and Tobacco Development Board focus their research on jute and tobacco, respectively.

In Sri Lanka, the Sri Lanka Council for Agricultural Research Policy (CARP) has been established to coordinate and direct agricultural research within the country. It formulates national agricultural research policy and priorities and reviews the performance of agricultural research projects and institutions from time to time. The Department of Agriculture is one of the major organisations conducting applied agricultural research in the country which consists of three divisions and has 3 institutes and 4 centers working under it[26]. In 1998 it had a total budget of Rs. 560 million of which around 54 per cent have been utilised for research and related activities[27].

Extension

Presently, in India the Training and Visit (T&V) system of extension as developed by the World Bank is in place at the state level. The T&V system emphasises single purpose professional extension workers, regular training of extension workers and transfer of technology through personal contact with farmers. This mode of extension has been formalised through the establishment of the National Agricultural Extension Project (NAEP). In 1987, more than 17,000 workers in 17 major states were involved in extension work throughout India[28]. The ICAR research institutes as well as the state agricultural universities are engaged in extension activities. The ICAR funds 48 national demonstrations, 152 operational research projects, 89 Krishi Vigyan Kendras (farm science centers) and 107 Lab to Land Projects[29]. The KVKs which now number around 260 'are aimed at providing need based, skill oriented vocational training for farmers, farm women and farm youth through different on campus and off campus training programs'[30].

Agricultural extension in Pakistan is a provincial subject with the provincial agricultural departments being responsible for carrying out extension work in their respective provinces. All provinces have separate directorates of agricultural extension working under the agriculture departments. Presently, two extension approaches are in use in Pakistan: the traditional approach to extension and the World Bank sponsored T&V system introduced in the 1980s. Initially, the T&V system was introduced to only five districts of the Punjab in 1978, but by 1988 it had expanded to the whole province[31].

In Bangladesh, the Department of Agricultural Extension is the main government agency responsible for providing extension services to farmers. The Department includes eight wings; four of which provide technical support to extension staff in issues related to water management and agricultural engineering, food crops, cash crops and plant protection[32]. The Training and Visit (T&V) approach to extension is currently in use in the country and the Department of Agricultural Extension has developed the Revised Extension Approach (REA) to increase the efficiency of the extension system. Linkage between research and extension is provided by the National Agricultural Technical Coordination Committee (NATCC) and the Agricultural Technical Committee; both these committees meet at least four times a year to ensure close working relationship between research and extension and to review the technical contents of extension plans[33]. The Department of Livestock Services (DLS) is responsible for carrying out extension services in the livestock sector while the Department of fisheries provides extension services on aquaculture.

In Nepal, the Department of Agriculture is responsible for undertaking extension activities related to agriculture. In the livestock sector which is an important component of the agricultural GDP of Nepal, the Dairy Development Corporation and Nepal Food Corporation are the two major public sector institutions involved in livestock development and extension services. New technologies in the livestock sector are

transferred through District Livestock Development and Services Office, which has 999 service centers working under it[34]. Besides these there are about 5000 NGOs working on different aspects of agricultural development which are also involved in extension work[35]. The T&V approach to extension had been adopted since 1975 to overcome the shortcomings of the traditional system, which however has not been very successful to date.

In Sri Lanka, the Department of Agriculture (DOA) under the national Ministry of Agriculture and Lands and the provincial DOAs are responsible for providing extension services in the food crop sector. The Agricultural Extension and Adaptive Research Project (AEARP) funded by the World Bank brought about a significant expansion in the extension services and introduced the Training and Visit (T&V) extension system[36]. The T&V system has been instrumental in establishing research and extension linkages with systematic scheduling of farm visits and proper monitoring of the extension staff and their activities. There are 6 In Service Training Institutes (ISTIs) which conduct a variety of training programmes for the extension workers while there are 22 District Agricultural Training Centers (DATCs) operated by both the Central and provincial DOAs that provide vocational training to farmers[37]. For the livestock sector, extension services are provided by the provincial Department of Animal Production and Health (DAPH).

Agricultural education

In India, at present, there is no provision for agricultural education at the secondary level of schooling although the Central and state governments have been contemplating the introduction of agriculture in the curriculum at the 10+2 level. In India, presently agricultural education is imparted through a network of 28 state agricultural universities (SAUs) and one Central Agricultural University. Besides these there are 4 ICAR (Indian Council of Agricultural Research) institutes with university status. Under these universities, there are 172 constituent colleges where each year 15,300 students are annually admitted for undergraduate, masters and doctoral programs[38]. The state agricultural universities offer education from undergraduate to doctoral level not only in agriculture but also in veterinary and animal sciences, dairy science and technology, fisheries, horticulture. On average, 9,500 students are admitted annually into India's agricultural universities[39].

In Pakistan, agricultural education is a provincial subject with education in agriculture being provided by 4 agricultural universities functioning at the provincial level. These include; the University of Agriculture at Faisalabad (UAF), the NWFP Agricultural University at Peshawar, the Sindh Agricultural University (SAU) at Tandojam and the University of Arid Agriculture at Rawalpindi, which has recently been upgraded to university status. However, all universities (including those for agriculture and related subjects) are provided financial support by the federal government. The four agricultural universities offer bachelors, masters and doctoral programmes in a variety of disciplines. Besides these four agricultural universities, there are several agricultural colleges, which are engaged in providing agricultural education[40]. In addition, there are five agricultural training institutes in Punjab, two in Sindh, two in the Frontier province and one in Balochistan responsible for training field and livestock assistants.

In Bangladesh, agricultural education is incorporated into general education from the primary level of schooling. At the secondary level, agricultural education had been a compulsory subject for male students although it has now been made an optional subject. Higher agricultural education is completely controlled by the Central Government in Bangladesh with local governments having no control over

A comparison of land and labour productivity shows that growth in labour productivity lagged behind growth in land productivity

any college or university. The Bangladesh Agricultural University is the main agricultural education institution in the country. In 1999, it had an enrolment of 4686 students and a teaching staff of 390[41]. Besides there are 2 other agricultural universities and 3 agricultural colleges.

In Sri Lanka, agricultural education is confined only to the senior secondary level as a technological subject. After senior secondary level, further opportunities in agricultural education are provided through one year certificate courses and two year national diploma courses in agriculture and animal husbandry offered by 13 agricultural colleges including 6 institutions. Higher education in agriculture in the country is provided by 7 faculties of agriculture and one faculty of veterinary science at 7 universities which have a combined enrolment of 1500 students[42]. There is also a Post Graduate Institute of Agriculture (PGIA) in addition to these faculties which offers programmes at the M.Sc, M.Phil and Ph.D levels.

Agricultural education in Nepal is the sole responsibility of the Institute of Agriculture and Animal Science (IAAS), which is the only institution of higher education in agriculture in the kingdom. The IAAS functions under the Tribhuvan University offering courses in various disciplines of agriculture at the Bachelors and Masters level. Forestry education is provided by the Institute of Forestry which is also a part of the Tribhuvan University.

Conclusion

This chapter provides an analysis the performance of the agricultural sector in South Asia in the eighties and the nineties. There has been a decline in the contribution of agriculture in all the economies of the region during this period. Overall, the growth in agricultural GDP has been comparatively higher in the eighties than the nineties for most countries of the region with the exception of Bangladesh and Sri Lanka. Agriculture continued to be one of the major sources of employment in South Asia although the percentage of labour employed in agriculture has seen a decline throughout the region. However, in Nepal the proportion of labour employed in agriculture actually increased during 1980-1999 where by the end of the nineties nearly 97 per cent of the total labour force was engaged in agriculture.

Trends in agricultural input growth reveal that agricultural labour grew at a much faster pace than agricultural land during this period. Consequently, the land to labour ratios declined in all countries of the region. A comparison of land and labour productivity shows that growth in labour productivity lagged behind growth in land productivity. The decline in cultivable land has led the South Asian countries to adopt land saving techniques and increased cropping intensity.

The growth of output in the region has been due to greater adoption of chemical fertilisers and mechanisation of agriculture although use of tractors in South Asia is still far behind other Asian countries. Fertiliser application rates on the other hand have seen higher rates of growth between 1980-1999. The growth in irrigation facilities has been modest during the eighties and the nineties. However, Pakistan had a phenomenal 82 per cent of its cultivated area under irrigation by the end of the nineties, while the other countries had only 30-50 per cent of their cultivated areas covered by irrigation.

The agricultural knowledge system consisting of agricultural research, extension and education has an important role to play in increasing agricultural productivity in South Asia in the coming years as agricultural land shrinks. India and Pakistan possess well developed National Agricultural Research Systems (NARS) which are essential for introducing new inputs and technologies which can result in increased yield levels.

The other countries of the region are also in the process of developing effective NARS but are facing financial constraints. Agricultural education systems in South Asia are also in need of reform to improve their performance and to provide an improved linkage with extension services to assist farmers in improving their farming methods and increasing their production efficiency.