Chapter-III

Trends in Agricultural Production and Productivity: An Inter-State Comparison

3.1 The Indian Experience

Agricultural sector was the most dominant sector during the time of India's independence, both in terms of its contribution to gross domestic product and in providing employment to the country's labour force. In the international perspective, Indian agriculture has left a strong imprint. India is presently holding second position in the world after China in production of wheat, rice, ground nut, fruits and vegetables, sugarcane and cotton. In terms of production of pulses and jute and fibre, India holds the first position. However, in terms of inter-country comparison of productivity, India is lagging much behind. Among fourteen major rice producing countries, in 2007, India achieved 13th position in terms of productivity (3370 kg/ha). The highest productivity in rice production was achieved by Egypt having productivity of 9731 kg/ha, U.S.A holds the second position with productivity of 7672 kg/ha. The productivity of wheat production of nineteen major wheat producing countries when compared, India is positioned at 11th position. The highest productivity in wheat production was achieved by U.K. (8281kg/ha) followed by France (7101 kg/ha), Egypt (7101kg/ha), China (4762 kg/ha) respectively (FAO, 2007).

Indian economy over the years experienced a structural change with the decline in the share of agriculture in Gross Domestic product (GDP) and gradual increase in the share of industries and services. Although, share of agriculture has come down to 17 percent in 2008-09 from 55.1 percent in 1950-51, the dependence of the rural workforce on agriculture has not diminished in proportion to share of agriculture to the GDP. In spite of being tagged as one of the fastest growing economy of the world, 72 percent of population and 76 percent of the workforce were rural (Reddy & Mishra, 2008). Unlike developed countries, India failed to transfer her labour force from agriculture to non-agricultural sector, more precisely to manufacturing sector. India also failed to increase agricultural productivity and income (Gollin *et al.*, 2002). India's manufacturing sector experienced volatility in its growth rate and share of manufacturing has never exceeded 15 percent of GDP. As a result, income differential between agricultural sector and non-agricultural sector has been widening (Chand and Chauhan, 1999).

The agricultural performance and the fortune of agrarian community in India largely depend on the vagaries of monsoon. Inspite of the efforts of building irrigation network initiated by the British during the 1920s, cultivation of 80 percent of the net sown area continued to depend on rainfall even after independence. As a consequence production and productivity continued to remain low. Such experience speaks for the absence of any sound agricultural policy in colonial India.

3.2 Agricultural Policies in post-Independence Era (1947 to 1960)

Agricultural policies assume paramount importance in post-independence India. If achieving self sufficiency in food production is considered as one of the basic minimum objective of a sovereign country then economic well being of two-third population of the country is equally important because they are deriving their livelihoods directly or indirectly from agriculture. India, immediately after independence, was mostly preoccupied to bring in institutional changes in the agrarian sector and the growth in production and productivity did not receive adequate attention till the 1960s. Raising public investment in irrigation also received attention because it was identified as prime carter of farm growth at least in the First Five Year Plan and 20 percent of the plan outlay was earmarked for irrigation. The allocation on irrigation, however, continued to decline since Second Five Year plan and onwards. The slow growth of irrigation contributed to the slow growth in productivity in Indian agriculture. Therefore, between 1949-50 and 1964-65, the rise in production was mostly driven by rise in area under cultivation (Narain, 1977; Vaidyanathan, 1986).

3.2.1 Agricultural Policies from late-1960s to 1980s

In the mid-sixties, the scope of increase in agricultural production through area expansion became almost saturated and agricultural production also got stagnated. Food availability for the rapidly increasing population of India remained insufficient. Situation further worsened as the food import from the United States under PL-480 scheme was about to be discontinued with the fear of impending food crisis, a number of programmes for 'intensive agricultural development' was introduced. These programmes encouraged to adopt a package of high yielding inputs, combining improved technology, credit, high yielding seeds and assured irrigation (Dantwala, 1986). After 1966-67 serious efforts were made to accentuate the 'Intensive agricultural development' across the country and this came to be known as the Green Revolution. To make this techno-biological programme a success, four types of support, viz. price support, credit support, input subsidy support and marketing support were

extended. In 1965, Agricultural Prices Commission was established and they took responsibilities to suggest two sets of administered prices: minimum support price and procurement price. Food Corporation of India was also established in 1965 to manage the procurement of foodgrains and for maintaining buffer stock. It was to be the agency that would remain responsible for ensuring food availability for the poor at affordable prices and also maintain inter-temporal price stability. The nationalisation of commercial banks in 1969 also increased the availability of credit for the agricultural sector. It also mopped up the rural liquidity and put a check on the usurious moneylenders in rural areas (Ramchandran and Swaminathan, 2001; Chavan, 2005). It was also decided during 1970s that key inputs like fertilisers, pesticides and electricity for irrigation would be available for the farmers at subsidised rates. To regulate the marketing of farm produce through suitable mechanism for minimising distortions in exchange, the Agricultural Produce and Marketing Committee (APMC) Act and Essential Commodities Act were passed. Under the APMC Act a number of regulated markets were set up across the country (Acharya and Agarwal, 1987).

3.2.2 Agricultural Policies in the 1980s and during the period of Economic Liberalisation (1991 to the recent)

The period of 1980s has been identified as the period of 'wider technology dissemination' (Chand, 2004). The agricultural GDP also attended an annual growth rate in 3.4 percent in 1980s (Bhalla, 2004). In 1986, The Technology Mission on oilseeds was launched which was aimed to reduce dependence on imports and to achieve self-reliance in oilseeds production. The agricultural policies followed during late-eighties and the early-nineties have seriously been criticised on the ground that the earlier policy deliberately kept the terms of trade against agriculture through protectionist industrial and trade polices and overvalued exchange rate (Parikh,1997; World bank,1986,1991; Pursell and Gulati,1993). India resorted to a policy of comprehensive economic reforms in June 1991. The reforms brought significant changes in macro economic policy including trade and exchange policy, especially in the external sector. While introducing economic reforms and liberalisation in 1991, agricultural sector did not receive any explicit mention; however, devaluation of rupee, moving away from fixed exchange rate policy to flexible exchange rate policy, trade liberalisation, and Indian membership of the WTO etc. had considerable impact and raised serious debate on the impact of reforms on agricultural the sector.

Pro-liberalisation economists are of the opinion that once the prices would be corrected through the free play of market, farmers would be able to realise better price for their

agricultural produce and they would be encouraged to produce more. It was pointed out by Gulati and Sharma (1997), agricultural income would have increased by 16 to 25 percent had domestic prices aligned with international prices. Liberalisation of agricultural trade has been accepted on the argument that free trade and opening up of economy would maximise efficiency and gains. It was advocated that India has comparative advantages in producing high valued export oriented crops like fruits, vegetables and flower and therefore farmers should be encouraged to diversify their crops in favour of high valued crops. Pro-reformists also concluded that input subsidies and output support prices had suppressing effects on domestic prices and in turn kept the terms of trade against agriculture. As one author pointed out that agricultural subsidies were, 'fiscally unsustainable...inefficient and costly to farmers' (Parikh, *ibid.*: 11). It was also pointed out by Gulati and Sharma (1995) that cut down in agricultural subsidy would arrest the long term declining trend in public investment in agriculture. It was further suggested that government should withdraw from procurement of food as 'government can not manage commodity trade in an efficient way'. Government should cut down the buffer stock and instead private trade should be encouraged. Import and export should be promoted in a manner so that the requirement of tightness or slackness in the domestic market could be regulated (Parikh, *op.cit.* : 12). In fact trade reforms intensified since 1995 immediately after the introduction of the WTO agreement on agriculture. Targeted agricultural subsidies were suggested in lieu of universal subsidies in agriculture (Jha and Srinivasan, 2004). The agricultural sectors experienced consequent policy changes e.g., agricultural credit was deregulated, contract farming was conceived to expedite crop diversification in agriculture. Therefore, it was urgently felt that land ceiling should be raised so that rich farmers, agri-business firms, corporate bodies can lease-in lands.

The decade of 1990s also experienced declining trend in public investment in agriculture. However, terms of trade became highly favourable for agricultural sector and this happened because of substantial rise in cereal prices through government support, trade liberalisation, and exchange rate devaluation and through removal of protection to industry. Contemporary researches argue that economic reforms primarily emphasised on price factors and infrastructure, however, institutional aspect of agriculture has grossly been neglected and as a consequence, deceleration in agricultural growth as well as decline in growth of output were accentuated since 1991 (Chadha,2002; Majumdar,2002; Bhalla,2002; Kumar, 2002). The public sector gross capital formation in agriculture declined to one-third in 1999-2000, in comparison to the level attained in 1980-1981 (Reddy 2006b). Other studies also revealed

that fall in public sector investments in agriculture had adversely affected the agricultural productivity and growth (Chand, 2001; Gulati and Bathla, 2001; Shangen *et al.* 1999). According to the observations of Planning Commission, Government of India (GoI, 2001) during the 10th Five Year Plan, agricultural GDP grew at an annual rate of mere 2.1 percent against the targeted growth rate of 4 percent and this was possibly as a consequence of stagnation and decline in agricultural productivity over the past decade. Agriculture Strategy for Eleventh Plan (GoI, 2007) has focused that a particular area of concern is foodgrains, whose production during 10th Five Year Plan was less than that of 9th Five year Plan. Per capita annual production of cereals had declined from 192 kg in 1991-1995 to only 174 kg in 2004-2007 and of pulses from 15 kg to 12 kg in India. As a cumulative effect, in the recent past food security has emerged as a matter of concern in the national as well as in international level.

After 1995, India had to remove quantity restrictions on agricultural imports as per WTO agreements and in 1997 as international prices started falling, it put downward pressure on domestic prices of most of the agricultural commodities. Since, mid-2000s, various development programmes like Interest Subvention on Crop Loans, the National food Security Mission, the National Agricultural Development Programme (*Rashtriya Krishi Vikas Yojana*) and the Pulses Development Programme were initiated to revive agricultural growth. A synoptic view on different policy interventions during different phases in post-independence India, may help reveal growth in agricultural production, productivity of major crops, changing in cropping pattern over the periods.

3.3 Growth Performance of Production, Productivity of Major Crops in India in post-Independence Period

To begin with, the exponential (log-linear) form is generally chosen to measure the growth. The rationale behind choosing log-linear form instead of linear form that in case log-linear form, is the change of in output at a given time is more likely to be a constant percentage of the output in the preceding year, where as in case of simple linear form, the change in output in a particular year is constantly diminishing percentage of the preceding year. The Linear growth curve can be expressed in the following form:

$Y_t = a + bt$

This curve implies if $b>0$, there is growth (G_t).

Since growth $G(t) = (1/Y_t)^* (dY_t / Y_t)$ or $Y_{t+1} - Y_t / Y_t$

The growth rate at period t is given by

$G(t) = b / Y_t$

Therefore, if b> 0, the simple linear growth curve will characterise falling growth rates as stated by Boyce earlier and as a result exponential form (log-linear) of growth curve received more acceptance.

In addition, larger errors in statistical sense of deviations of actual values from fitted trend values are associated with larger output and hence that a multiplicative error term (for log-linear) is more appropriate than an additive one (linear growth curve) (Boyce 1987:258). Exponential form of growth curve can be projected as

$Y_t = ae^{bt}v_t$

This can be transformed linearly as follows

$\ln Y_t = a + bt + u_t$

Where Y_t = Output

a = Constant term

t = time (in years)

$u_t = \ln v_t$

= error term such that $\ln v_t \sim IND\ (0, \sigma^2)$

By deducting one (1) from the antilog of the estimates of the coefficient of b and multiplying it by 100 the growth rate may be calculated.

Growth rate = (antilog of estimated b -1)*100

Or, growth $G(t) = (1/Y_t)^* (dY_t / Y_t) = b$ which implies that if b>0 growth rates are constant over time. The accepted fact is that the trend estimation is 'a convenient way of summarising a long term series' (Vaidyanathan, 1980:3-4) and 'analysis of the output-time relation serves a useful purpose' (Boyce, *op. cit.*).

The exponential form of growth curve assumes a constant growth rate; therefore it is difficult to ascertain any acceleration, deceleration in the growth rates over time. To overcome this problem log-quadratic form is proved to be convenient. It can be written in the following form:

$\ln Y_t = a + bt + ct^2 + u_t$

If estimated value of c assumes significantly (t-ratio is used as test statistics) positive value, it will be having accelerating growth rate and in case of significantly negative value of c that

will indicate deceleration (Boyce, *op.cit.*:262, Reddy, 1978: 807, Srinivasan, 1979: 1283, Saha and Swaminathan, 1994: A2-A3)

Now taking the functional form of log-quadratic equation ($\ln Y_t = a + bt + ct^2$)
the growth rate $G(t) = (1/Y_t)^* (dY_t / Y_t)$ or $Y_{t+1} - Y_t / Y_t$

$= b + 2ct$

To measure the acceleration or deceleration, change in growth rate is to be considered and it will be as follows (Reddy, *op. cit.*: 708):

$dG(t) / dt = 2c$

If $b > 0$ and $c > 0$, this implies that growth rate is increasing over time.
If $b < 0$ and $c > 0$, this implies that G(t) may be negative but growth curve is accelerating provided $t > -b/2c$

Now, if $b > 0$, $c < 0$, the conclusion is that $dG(t)/dt$ is negative that is growth rates are falling.

Finally, $b < 0$ and $c < 0$, this implies retardation or deceleration of growth rates.
The incorporation time squared on the right hand side of (3), may give rise to problem of multicollinearity. This is avoided by the normalization of time in mean deviation form, that is, by setting $t = 0$ at the mid point of the series and this allows the time (t) and its square (t^2) to become orthogonal (Boyce, *op. cit.*: 262, 278). As it is further pointed out by Boyce that the normalization of time affects only the estimate of b (coefficient of t), the estimate of c (coefficient of t^2) remains unaffected with respect to the normalization (*ibid.* 278).

By using the above mentioned statistical tools, it has been observed that from 1970-71 to 2008-09 (Table 3.1), foodgrain production and productivity grew at exponential rates of 2.24 percent and 2.3 percent per annum and growth rates are found to be statistically significant at 1% level.

To analyse the growth performances in different sub-periods, the whole period (form 1949-50 to 2007-08) has been sub-divided into five sub-periods, viz. 1949-50 to 1964-65, 1967-68 to 1979-80, 1980-81 to 1989-90, 1990-91 to 1999-2000 and 2000-01 to 2007-08. The sub-period of 1949-50 to 1964-65 was considered as pre-Green Revolution period, the period 1967-68 to 1979-80 has defined as period of early-Green Revolution and that of 1980-81 to 1989-90 as late-Green Revolution period. On similar line, the era of economic reforms has been subdivided into two parts, the period between 1990-91 and 1999-2000 was considered as early phase of economic reforms while the period from 2000-2001 has been identified as second stage of economic reforms. These sub divisions have been precisely done to explore

the correlation between agricultural policies conceived and implemented in different time periods and their concomitant impact on agricultural production, productivity at national level.

While identifying long term acceleration and deceleration of growth in production and productivity, coefficient of t^2 for both growth in production and productivity if assumes significantly (T-statistics ascertain the significance at 1 % level) negative value suggests long run deceleration. Exponential growth in area from 1970-71 to 2008-09 assumed negative value (significant at 1% level) and the estimation of log-quadratic form further reveals that coefficient of t^2 has turned out to be negative and implied deceleration of growth in area under foodgrain production. Therefore, it can also be said that growth in production was primarily driven by growth in productivity. In case of rice, the growth estimation shows similar trend as observed for foodgrains. Growth in production and productivity are found to be positive and significant between 1970-71 and 2008-09 but long term significant deceleration was observed. Though the growth area was positive but deceleration has become significant.

For wheat, high and significant (at 1% level) growth in production was achieved and it was achieved through positive and significant growth in both productivity and area. Deceleration was observed for growth in production and productivity of wheat, however, growth in area under wheat is showing acceleration but not statistically significant. The growth scenario of pulses at all-India level is not that satisfactory. In spite of achieving positive growth rates for both production and productivity, the growth rates remained below 1 percent and exponential growth in area turned out to be negative. In addition, long term deceleration was observed for the growth in production, productivity and area under pulses.

Table 3.1: Exponential Growth in Production, Area and Productivity of Foodgrain, Rice, Wheat and Pulses (1970-71 to 2008-09) and Acceleration or Deceleration

	Exponential Growth in Production	Acceleration/ Deceleration	Exponential Growth in Productivity	Acceleration/ Deceleration	Exponential Growth In Area	Acceleration/ Deceleration
Foodgrain	2.24 (20.4)*	-0.00031 (-3.1)*	2.3 (26.4)*	-0.00023 (-2.7)*	-0.09 (-2.49)*	-0.000832 (-2.27)*
Rice	2.5 (18.3)*	-0.00033 (-2.5)*	2.03 (19.33)*	-0.00022 (-2.1)*	0.44 (10.64)*	-0.00011 (-2.9)*
Wheat	3.46 (21.77)*	-0.000739 (-7.17)*	2.4 (20.8)*	-0.000504 (0.02)	1.02 (15.14)*	0.024236 (0.02)
Pulses	0.73 (4.97)*	-0.000105 (-7.17)*	0.80 (7.09)*	-0.0005 (-6.10)*	-0.06 (-0.92)	-0.00024 (-4.1)*

*T stats are shown in parentheses, * implies significance at 1% level*

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

3.3.1 Growth in Area, Production and Productivity from 1949-50 to 1964-65 (pre-Green Revolution Period)

It was observed that between 1949-50 and 1964-65, the rise in production was mostly driven by rise in area under cultivation (Narain, 1977; Vaidyanathan, 1986). The above observations of Narain and Vaidyanathan get reaffirmed from Table 3.2. It was observed that between 1949-50 and 1964-65 compound annual growth rates (CAGR) in area under foodgrains and non-foodgrains were 1. 40 percent and 2.50 percent respectively and for the same period growth rates for yield were calculated to be 1.40 percent and 0.90 percent respectively. CAGR for area and productivity for all crops were 1.60 and 1.30 respectively. Crop-wise disaggregation further revealed that growth in area remained higher than the growth in productivity for wheat, maize, pulses, oilseeds and fruits and vegetables. The general conclusion thus followed that during 1950s to 1960s, growth in production was primarily driven by expansion of area.

Table 3.2: CAGR of Area, Production, Productivity of Major Crops in India between 1949-50 and 1964-65

Crops	Area	Production	Productivity
Foodgrains	1.40	2.90	1.40
Cereals	1.20	3.40	1.90
Rice	1.30	3.50	2.10
Wheat	2.70	4.00	1.30
Jowar	1.00	2.50	1.50
Bajra	1.10	2.30	1.20
Maize	2.70	3.90	1.20
Pulses	1.90	1.40	-0.20
Oilseeds	2.60	3.40	0.60
Fruits and Vegetables	5.90	7.90	1.80
Non- Foodgrains	2.50	3.50	0.90
All Crops	1.60	3.10	1.30

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

3.3.2 Growth in Production, Area and productivity from 1967-68 to 1979-80 (early-Green Revolution Period)

The period between 1967-68 and 1979-80 is generally identified as early Green Revolution period. The rate of growth of agricultural production in early Green Revolution period was, however, not impressive and was lower in comparison to the early planning years. Crop-wise comparison of growth rate in area, production and productivity between pre-Green Revolution period (1949-50 to 1964-65) and early-Green Revolution period (1967-68 to 1979-80) would strengthen this argument. Growth in area, production and productivity for rice, pulses, oilseeds and foodgrain were found to be higher in pre-Green Revolution period in comparison to early-Green Revolution period. Only noticeable change was found for

wheat. When compared with pre-Green Revolution period the compound annual growth rates in area, production and productivity showed a substantial increase over early-Green Revolution period (Tables 3.2 & 3.3). In the initial years of Green Revolution, the success was primarily confined to Punjab, Haryana and Western Uttar Pradesh. Impressive growth of agricultural production in those regions failed to push up the national agricultural growth because of stagnation in other crops and regions. It was also observed that Punjab, Haryana and Western Uttar Pradesh were well endowed with irrigation in comparison to other regions of the country and sections of peasantry were in a position to mobilise the investment necessary for adopting 'Green Revolution' technology. Inadequacy in implementation of land reform measures also hindered the spread of Green Revolution technology because diffusion of technology and structure of property rights are closely linked. As pointed out by Mohan Rao (1994:13), 'failure of planners...to see agriculture as a strategic, system transforming sector that would have required a focus away from the supply side to the centrality of property relations and mass demand as a propellant for the whole economy.' In addition, the success was limited to two crops i.e., rice and wheat. In spite of slow national growth in agriculture, initial years of Green Revolution were successful in bailing out the country from severe food insecurity in the 1960s. According to M.S. Swaminathan, Green Revolution established the linkage between national sovereignty and food self-sufficiency'.

Table 3.3: Compound Annual Growth Rates in Area, Production and Productivity of Major Crops in India (in percent)

Crops/Year	Area				Production				Yield			
	1967-68 to 1979-80	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2007-08	1967-68 to 1979-80	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2007-08	1967-68 to 1979-80	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2007-08
Rice	0.74	0.41	0.68	-0.11	1.84	3.62	2.02	1.9	1.09	3.19	1.34	2.01
Wheat	2.87	0.46	1.72	1.25	5.03	3.57	3.57	1.38	2.10	3.10	1.82	0.13
Coarse Cereals	-0.98	-1.34	-1.83	-0.47	1.11	0.04	-0.48	3.52	2.11	1.39	1.37	4.01
Pulses	0.71	-0.1	-0.6	1.93	-0.26	1.49	0.67	3.31	-0.97	1.59	1.28	1.35
Total Cereals	0.39	-0.26	0.12	0.14	2.16	2.26	1.72	2.20	1.77	2.52	1.59	2.05
Foodgrains	0.43	-0.23	-0.08	0.48	2.19	2.73	2.26	2.01	1.75	2.97	2.34	1.53
Groundnut	0.01	1.65	-2.31	-0.4	1.64	3.76	-1.25	3.0	1.64	2.08	1.08	3.41
Rapeseeds & Mustard	1.05	1.94	0.62	6.15	0.64	7.29	0.73	8.22	-0.40	5.24	0.11	1.95
Oilseeds	0.76	2.44	0.15	3.43	1.88	5.46	2.27	7.44	1.11	2.95	2.12	3.88
Fibre crops	-0.34	-1.50	2.44	1.08	3.44	1.52	2.03	9.68	3.79	3.07	-0.40	8.51
Cotton	0.38	3.50	2.34	0.42	-0.41	5.19	2.69	3.21	-0.79	6.01	0.34	2.79
Sugarcane	1.41	1.26	1.67	1.91	1.99	2.71	3.05	2.39	0.57	1.43	1.36	0.47
Potatoes	4.08	2.93	3.84	3.46	8.07	5.17	5.44	1.65	3.83	2.18	1.54	-1.74

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

3.3.3 Growth in Production, Area and Productivity from 1980-81 to 1989-90 (late-Green Revolution Period)

Indian agriculture experienced a turn around after 1980-81; the poor growth rate in early-Green Revolution period was reversed and this phase was termed as late-Green Revolution period. Table 3.3 clearly reveals that highest CAGR figures of production and productivity were reached from 1980-81 to 1989-90 for rice, wheat, pulses, foodgrains, Rapeseeds and mustards, oilseeds, potato, sugarcane. For all these crops deceleration of growth in area were observed and therefore, the growth in production was primarily driven by the growth in productivity. It can safely be concluded that the period of the 1980s was characterised by the spread of Green Revolution to larger areas and more crops (Bhalla and Singh, 2001).Even these figures when compared with the decade (1990-91 to 2008-09), registered to be the highest. The upsurge in agricultural growth rates was driven by two factors: first, there was a major rise in agricultural production, especially rice in the eastern region or more precisely in West Bengal and second, there was major improvement in the production of oilseeds in the central Indian region. The Technology Mission on Oilseeds launched in mid-1980s had put emphasis on raising productivity of oilseeds and reducing yield gaps between experimental stations and farmers' fields by adopting improved package of practices. Increase in cropping intensity and crop diversification also contributed positively towards the increase in agricultural output and enhanced agricultural growth in the country.

3.3.4 Growth in Production, Area and Productivity from 1990-91 to 2007-08

The growth rate so achieved during the eighties could not be sustained during the nineties or precisely between 1990-91 and 1999-2000. Growth in most of the crops decelerated. Crop by crop account would show that there was marginal rise in the growth in area under rice but fall in productivity had pulled down the growth in production of rice. Wheat and pulses had experienced the similar growth scenario like rice. The cumulative impact was that country experienced fall in the growth rate in area, production and productivity of foodgrains. Drastic fall in growth in productivity and yield was observed for Rapeseeds and mustards and also for oilseeds. Sugar and potato were the only exceptions. In fact for both sugar and potato, growth in area has offset the fall in growth of yield and pulled up the growth in production for these two crops at national level (Table 3.3).

There were some improvements in the growth in production and yield of some crops from 2000-01 to 2007-08 in comparison to the initial periods of economic reforms (1990-91 to 1999-2000). For rice, inspite of the growth in area under rice, fall in the growth in

productivity has pulled down the growth in production. For wheat, however, the rise in yield level has negated the impact of fall in cultivated area while pulling the growth in production. There was a substantial rise in yield level for coarse cereals and growth in area was also marginally improved, as a result, there was significant growth in production. From 2000-01 to 2007-08, there was striking growth in area under pulses and productivity had also increased and consequently impressive growth in production of pulses was noticed. But yield growth of foodgrain had decelerated and as a result, growth in production had also experienced a deceleration. For Rapeseeds and mustards as well as for oilseeds, growth in area along with growth in productivity had pushed up the growth in production. Again, for fibre crops and cotton, impressive growth in productivity had contributed to the rise in the growth in production. Potato experienced simultaneous fall in growth in area, productivity and production. For sugarcane, fall in yield level had pushed down the production growth inspite of marginal rise in growth in area.

Agrarian investment scenario precipitated further with the decline in the growth of private investment in agriculture. Gross capital formation increased by 2 percentage point between 1980-81 and 2006-07. Public sector investment has consistently declined during that period (Table 3.4). NSS 59th Round (2003), revealed that almost 50 percent of the farming households are indebted. The rise in prices of various agricultural inputs has raised the cost of cultivation across the country. As a matter of fact, the fertiliser price index increased from 99 in 1990-91 to 228 in 1998-99 at a compound annual rate of growth of 11 percent (Acharya, 2004).

Table 3.4: Gross Capital Formation (GCF) in Agriculture as a share of GDP from Agriculture, India from 1980-81 to 2006-07 (in percent)

Period/Year	GCF in Agriculture as a Share of Agricultural GDP		
	Public Sector	Private Sector	Total GCF
1980-81 to 1984-85	5.0	5.5	10.5
1985-86 to 1989-90	3.5	5.2	8.7
1990-91 to 1994-95	2.4	5.9	8.4
1995-96 to 1999-2000	2.0	5.9	5.9
2000-01	1.8	7.8	9.6
2001-02	2.0	9.1	11.1
2002-03	2.0	9.8	11.8
2003-04	2.1	8.0	10.2
2004-05	2.8	8.3	11.1
2005-06	3.2	8.5	11.7
2006-07	3.7	8.9	12.5

Source: *GoI, 2008*

3.4 Crop Diversification at all-India Level

After evaluating the cropwise growth pattern, the changes in the cropping pattern needs to be examined. The given circumstances for Indian agriculture were that first, she has to feed ever rising population, second, rapid urbanisation is usurping agricultural land and third, famers need incentives to stay with agriculture and for that reason either agriculture has to be remunerative or viable alternatives ought to be available with the farmers outside agriculture. A close look at the changes in cropping pattern (Table 3.5) from 1970-71 to 2007-08 reveals that area under foodgrains in gross cropped area (GCA) has declined from 75.54 percent to 63.52 percent. This decline however, primarily caused by the decline in the area under cultivation of coarse cereals and as a matter of fact, between 1970-71 and 2007-08, the area under coarse cereals as percentage of GCA has declined by 13.34 percent. During the same period, a marginal fall was observed for rice and for wheat area under cultivation as percentage of GCA has increased by almost 4 percentage points. A marginal fall was also observed for cereals. It has also been observed that during the period of study, area under non-foodgrains has increased. Cultivation of oilseeds, fruits, vegetables and non-food crops increased by 4 percent, 2.86 percent and 7.02 percent respectively between 1970-71 and 2007-08. Therefore, a strong possibility is there that farmers have shifted from coarse cereals to high value crops and this may contribute to the rise in farm income. As pointed out by Srinivasan (2005), favourable market conditions for refined oil and protein-rich soya food might have contributed to the rise in area allocation under oilseeds. However, commercial crops like cotton and sugarcane did not show much improvement in area allocation.

Table 3.5: Share of Area under Major Crops of India (percentage of GCA)

Crops	TE 1970-71	TE 1980-81	TE 1990-91	TE 2000-01	TE 2007-08
Rice	23.02	23.18	23.00	23.82	22.57
Wheat	10.42	12.98	13.04	14.28	14.18
Coarse Cereals	28.42	24.25	20.48	16.17	15.14
Total Cereals	61.93	60.41	56.53	54.27	51.88
Total Pulses	13.50	13.23	12.94	11.49	11.93
Total Foodgrains	75.54	73.67	69.47	65.32	63.52
Total Oilseeds	9.85	10.11	12.51	12.96	13.93
Groundnut	4.42	4.14	4.64	3.68	3.20
Cotton	4.70	4.27	4.08	4.70	4.68
Jute	0.42	0.51	0.39	0.45	0.41
Total Fibres	5.41	5.08	4.64	5.27	5.18
Sugarcane	1.62	1.62	1.90	2.23	2.47
Tobacco	0.27	0.25	0.22	0.21	0.19
Condiments and Spices	1.04	1.23	1.32	1.52	1.55
Potato	0.31	0.43	0.51	0.69	0.76
Onion	-	0.14	0.17	0.24	0.36
Total Fruits and vegetables	2.24	2.77	3.57	4.35	5.10
Fodder Crops	4.15	4.50	4.59	4.55	4.26

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

At macro level, India has achieved self-sufficiency in food production but at the same time confronting high percentage of malnourished children and high incidence of rural poverty. High proportion of rural folk (more than 70 percent) as a percentage of total population are confronting declining share of national income/product. No significant improvement has been observed in the rural non-farm sector employment (Reddy & Mishra, op.cit.). Since early 1990s, more precisely after the adoption of neo-liberal path of globalization, rural India has become a cause of concern with the continuing rise in rural-urban disparities (Bhalla, 2005). Since the introduction of economic reforms, there has been a substantial increase in landlessness among the rural population in India (Reddy 2006a). This indicates that the casualisation of the rural workforce and engagement in low-paid works is on the rise during the reforms period (Rao and Hanumappa, 1999). The gap between the rate of growth of foodgrain production and population growth are also narrowing down. From 2000-01 to 2007-08, the population has grown at the rate of 1.64 percent and foodgrain production has been growing at the rate of 2.1 percent, and this is indication that hard achieved self sufficiency in food is also now under threat.

3.5 Inter-State Comparison of Growth of Major Crops in India over Different Sub-Periods

India is a vast country with high degree of variation in climate and resource endowment. Before getting into detailed discussion on inter-state comparison of growth of major crops, it becomes imperative to provide classification of production by agro-ecosystem in India. Agro-climatic condition is the key determinant for the crops to be grown in a particular region. India has been divided into five agro-climatic regions: arid, coastal, irrigated, rainfed and hill and mountain. Heterogeneity in agro-climatic condition may occur within a state or within a country and therefore, it also brings variations in the nature and type of crops produced within a state or country. The following table (Table 3.6) will provide us with systematic information on various crops grown in various states falling under above mentioned agro-climatic zones.

However, for crop-wise and statewise analysis of growth, geographical categorisation of states will be used. For this, India has been divided into four regions: North-Western India that includes Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab and Uttar Pradesh; Eastern India comprises Assam, Bihar, Orissa and West Bengal; Central India consisting of Gujarat, Madhya Pradesh, Maharashtra and Rajasthan and the Southern Region includes states of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu. Regional variation in cropping

pattern and growth of crop output is considerably impacted by variation in climate and moisture adequacy including irrigation. In addition, it can safely be presumed that rising population and rapid urbanisation and industrialisation is putting huge stress on land and water resources. Against this backdrop, we would analyse the inter-state changes in the cropping pattern and growth of some important crops in India.

Table 3.6: Classification of Production by Agro-ecosystem in India

Agro-Ecosystem	Crop Production System	States
Arid	Millets and oilseeds	Gujarat and Rajasthan
	Millet	Rajasthan
Coastal	Rice and groundnuts	Andhra Pradesh, Tamil Nadu and Orissa
	Coconut and rice	Karnataka, Kerala, Goa, Maharashtra and Tamil Nadu
Irrigated	Rice and Wheat	Bihar, Haryana, Punjab, Uttar Pradesh and West Bengal
	Cotton and wheat	Haryana, Punjab and Rajasthan
	Sugarcane and Wheat	Haryana and Uttar Pradesh
Rainfed	Rice	Assam, Bihar, Madhya Pradesh, Maharashtra, Orissa and West Bengal
	Coarse Cereals	Karnataka and Maharashtra
	Oilseeds	Andhra Pradesh, Gujarat, Madhya Pradesh, Rajasthan, Tamil Nadu and Uttar Pradesh
	Cotton	Gujarat and Maharashtra
Hill and Mountain	Rice, maize and fruits	North-Eastern states, Assam and West Bengal
	Rice, wheat and fruits	Uttar Pradesh, Himachal Pradesh, Jammu and Kashmir
	Horticulture	Himachal Pradesh and Jammu and Kashmir

Source: *National Centre for Agricultural Economics and Policy Research, New Delhi, 2001*

3.5.1 Production of Major Crops in India: An Inter-State Comparison

Let us now consider region-wise and statewise contribution to Indian food basket. To understand the changes in contribution over the periods, four sub-periods have been considered and they are respectively 1970-71, 1980-81, 1990-91 and 2007-08. In addition, among various crops grown in different parts of the country, only foodgrains, rice and wheat have been considered because for majority of the states, foodgrains occupy more than half of the area under cultivation.

As the Table 3.7 reveals, North-west India continues to be the highest contributor in India's foodgrain production. The contribution of this region to the total foodgrain production continues to increase since 1970-71 (29.2 percent) and reached its peak in 2000-01 (41.3 percent). The state of Uttar Pradesh acts as prime mover in foodgrain for this region as well as for the country. Even at all-India level, Uttar Pradesh continues to occupy the number one position in terms of its contribution to national foodgrain production. In 1970-71, the contribution was 18.1 percent and continued to increase in the two subsequent decades, the eighties and nineties, and finally tapered of in 2007-08.

Second highest contribution to India's foodgrain production is from central India consisting of Gujarat, Madhya Pradesh, Rajasthan and Maharashtra. In 1970-71, the contribution to total foodgrain production of this region was 27.4 percent, which however, declined to 16.7 percent in 2000-01 and improved thereafter and the share reached to 22.3 percent in 2007-08. Eastern India includes Assam, Bihar, Orissa and West Bengal and Southern region consisting of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu are almost having the same share to national foodgrain production. In 1970-71, the contribution of eastern India and southern India were respectively 20.8 percent and 20 percent. In 1980-81 and 1990-91, the share of eastern region was higher in comparison to southern region of India and they were 20.8 percent and 19.2 percent respectively where as, the figures for southern regions in the two sub-period were respectively 17.5 percent and 15.5 percent.

From foodgrains, if we turn to rice, the picture that emerges from Table 3.8, is that Uttar Pradesh from north-west region, West Bengal, Orissa, Bihar from eastern region, Andhra Pradesh and Tamil Nadu from southern region are contributing bulk of the production of rice for the country. Among the states, West Bengal and Andhra Pradesh are occupying first and second position in terms of share to rice production of the country. One of the prime reasons for high production of rice in West Bengal is that it is located in Indo-Gangetic plain and the river Ganges and its tributaries through continuous deposition of silts created soils which is very fertile and conducive to rice production. Similarly, the rivers Krishna, Godavari and Penner had created similar favourable condition for growing rice in Andhra Pradesh.

Another important feature which should be pointed out that contribution to total rice production for the state of Uttar Pradesh was rising from 1980-81 and reached at its peak between 1990-91 and 2000-01. Same trend was also observed for other north-western state, Punjab. However, for West Bengal and Andhra Pradesh, the share remained almost static during the eighties and nineties. And between 1990-91 and 2007-08, West Bengal increased its share marginally where as for Andhra Pradesh a marginal decline has been observed. Other eastern-Indian states like Orissa and Bihar experienced a slow but consistent decline in share. Since 1990 and onwards, a sharp fall in share in rice production was also observed for central Indian state of Madhya Pradesh. However, since the1990s, most of the states experienced a fall in their share to the national rice production as well as total foodgrain production.

If we shift attention from rice to wheat (Table 3.9) then the scenario that emerges is the complete domination of north-west region of India. In 1970-71, the share of north-west

region to total wheat production was 23.1 percent. It continued increasing by leaps and bounds in every subsequent decade. In 1980-81, the share stood at 33.4 percent and in 1990-91, it further went up to 54.2 percent. It reached the peak in 2000-01, when the share of north-west region to total wheat production reached 72.3 percent. However, deceleration observed thereafter and the share came down to 65.7 percent in 2007-08. As a matter of fact, Uttar Pradesh and Punjab together are growing more than half of the wheat grown in the country. In eastern India, other than Bihar, rest of the states are producing negligible amount of wheat while share of West Bengal, Assam and Orissa in total wheat production in the country remained static as well as nominal. The southern states hardly produce wheat and all southern states together are contributing less than 0.5 percent of the national wheat output. However, in central India, the production of wheat has increased over the periods under consideration. In 2007-08, Gujarat, Madhya Pradesh, Maharashtra and Rajasthan together are contributing 24.3 percent of total wheat produced in India. In 1970-71, the contribution was only 9.1 percent and since then it is continuously increasing. The increase in share is more pronounced in Madhya Pradesh and Rajasthan.

Table 3.7: Regionwise and Statewise Contribution to Total Foodgrain Production (in percent)

Region	State	1970-71	1980-81	1990-91	2000-01	2007-08
North-West	Haryana	4.4	4.7	5.4	6.8	6.6
	Punjab	6.7	9.2	10.9	12.9	11.6
	Uttar Pradesh	18.1	19.0	20.2	21.7	18.2
	TOTAL	**29.2**	**32.8**	**36.6**	**41.3**	**36.5**
Eastern	Assam	1.9	2.1	2.0	2.1	1.5
	Bihar	7.3	7.6	6.9	6.1	4.7
	Orissa	4.7	4.6	3.9	2.5	3.5
	West Bengal	6.9	6.4	6.4	7.0	7.0
	TOTAL	**20.8**	**20.8**	**19.2**	**17.8**	**16.7**
Central	Gujarat	4.1	3.5	2.7	1.3	3.6
	Madhya Pradesh	10.1	9.5	10.2	5.2	5.2
	Maharashtra	5.2	7.5	6.9	5.1	6.6
	Rajasthan	8.2	5.0	6.2	5.1	7.0
	TOTAL	**27.4**	**25.5**	**26.1**	**16.7**	**22.3**
Southern Region	Andhra Pradesh	6.8	7.7	7.0	8.1	8.4
	Karnataka	5.5	4.5	3.6	5.6	5.3
	Kerala	1.2	1.0	0.6	0.6	0.2
	Tamil Nadu	6.4	4.3	4.2	4.4	2.9
	TOTAL	**20.0**	**17.5**	**15.5**	**18.7**	**16.7**

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

Table 3.8: Regionwise and Statewise Contribution to Total Rice Production (in percent)

Region	State	1970-71	1980-81	1990-91	2000-01	2007-08
North-West	Haryana	1.1	2.3	2.5	3.2	3.7
	Punjab	1.6	6.0	8.8	10.8	10.8
	Uttar Pradesh	8.8	10.1	13.8	13.7	12.2
	TOTAL	**11.5**	**18.4**	**25.1**	**27.7**	**26.8**
Eastern	Assam	4.7	4.7	4.4	4.7	3.4
	Bihar	9.8	10.5	8.8	6.4	4.6
	Orissa	10.3	8.1	7.1	5.4	7.8
	West Bengal	14.5	13.9	14.0	14.6	15.2
	TOTAL	**39.4**	**37.2**	**34.4**	**31.2**	**31.0**
Central	Gujarat	1.4	1.0	1.1	0.6	1.5
	Madhya Pradesh	8.8	7.5	7.7	1.2	1.5
	Maharashtra	3.9	4.4	3.1	2.3	3.1
	Rajasthan	0.3	0.3	0.2	0.2	0.3
	TOTAL	**14.4**	**13.2**	**12.1**	**4.2**	**6.4**
Southern Region	Andhra Pradesh	11.34	13.07	13.00	14.66	12.20
	Karnataka	4.6	4.1	3.3	4.5	3.5
	Kerala	3.1	2.4	1.5	0.9	0.8
	Tamil Nadu	12.6	7.8	7.8	8.7	7.1
	TOTAL	**31.6**	**27**	**25.5**	**29**	**23.5**

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

Table 3.9: Regionwise and Statewise Contribution to Total Wheat Production (in percent)

Region	State	1970-71	1980-81	1990-91	2000-01	2007-08
North-West	Haryana	3.56	4.84	9.38	13.88	13.03
	Punjab	7.82	10.67	17.71	22.32	20.01
	Uttar Pradesh	11.69	18.20	27.10	36.12	32.68
	TOTAL	**23.1**	**33.7**	**54.2**	**72.3**	**65.7**
Eastern	Assam	0.02	0.16	0.15	0.12	0.09
	Bihar	1.91	3.20	5.19	6.37	5.66
	Orissa	0.03	0.17	0.08	0.02	0.01
	West Bengal	1.32	0.66	0.77	1.52	1.17
	TOTAL	**3.3**	**4.2**	**6.2**	**8.0**	**6.9**
Central	Gujarat	1.43	1.80	2.10	0.93	4.88
	Madhya Pradesh	3.94	4.24	8.50	6.99	7.68
	Maharashtra	0.69	1.29	1.34	1.36	2.65
	Rajasthan	2.97	3.31	6.28	7.96	9.07
	TOTAL	**9.0**	**10.6**	**18.2**	**17.2**	**24.3**
Southern Region	Andhra Pradesh	0.02	0.01	0.01	0.01	0.01
	Karnataka	0.14	0.25	0.18	0.35	0.33
	Kerala	0.00	0.00	0.00	0.00	0.00
	Tamil Nadu	0.00	0.00	0.00	0.00	0.00
	TOTAL	**0.2**	**0.3**	**0.2**	**0.4**	**0.3**

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

3.5.2. Compound Annual Growth Rates in Production and Productivity of Foodgrains in India: An Inter-State Comparison

In the above presentation, the region-wise contribution of foodgrain, rice and wheat production has been attempted. Let us consider the region-wise growth in production of foodgrain, rice and wheat in major Indian States. As we know that major contribution to foodgrain output is coming from the states of north-west region of India, therefore, growth in production and productivity of foodgrain assume special importance in maintaining self-sufficiency in foodgrain production as well as food security for the people of the country. It has been observed that since 1990-91, deceleration was observed both in production and productivity among all the states of north-west region (Table 3.10 & 3.11). Deceleration was most pronounced in the state of Uttar Pradesh in the north-west region. During the 1960s, foodgrain production grew at a rate of 3.3 percent; it decreased to 2.3 percent between 1970-71 and 1980-81. Highest growth in foodgrain production was achieved from 1980-81 to 1990-91and foodgrain production grew at a rate of 3.8 percent per annum. Since 1990, the growth rate in production started declining and between 2000-01 and 2007-08, the growth rate became negative; it grew at a rate of -0.8 percent per annum for the state of Uttar Pradesh. The other agriculturally prosperous state of North-west region, Punjab experienced a high growth of foodgrain production from 1970s to 1990s and there after it started decelerating and it reached to a plateau between 2000 and 2008, where the annual growth rate had been just 0.8 percent. Haryana showed an upsurge in growth in foodgrain production between 1990-91 and 2000-01 and thereafter decelerated. If we look at the growth figures of productivity for the north-western states of India, it became prominent that acceleration or deceleration of growth in productivity was primarily driven by the acceleration or deceleration in productivity. At the outset it needs to be mentioned that since late-sixties, area under foodgrains had either become static or had declined. Therefore, acceleration or deceleration of growth of foodgrain was primarily driven by the growth in productivity. Uttar Pradesh, Punjab and Haryana, three major contributors of foodgrains, experienced deceleration in the growth in productivity since 1990s and the deceleration was sharper for the state of Uttar Pradesh and Punjab.

If we look at the states of eastern India, then it was observed that the growth of foodgrain production increased between 1980s and 1990s and since then it is decelerating. Assam experienced negative growth from 2000-01 to 2007-08 while for Orissa; the growth rate became negative in the decade of 1990s as well as from 2000-01 to 200-08. The scenario was relatively better for West Bengal. In West Bengal, the decade of the 70s experienced negative

growth in foodgrain production (-0.75 percent), the turn around started since 1980s and the growth rate picked up. The growth of foodgrain production grew at 3.2 percent per annum from 1980-81 to 1990-91 and from 1990-91to 2000-01 and it grew at a rate of 3.1 percent per annum. However, deceleration in growth of foodgrain started from 2000. The growth rate in foodgrain production from 2000-01 to 2007-08 plummeted to 1.78 percent. If we look at the growth figures of productivity of foodgrain in eastern India, we would see that Assam was having lowest growth rate in productivity among all the eastern Indian states, however, Orissa experienced negative growth in productivity of foodgrain in the three decades, the decades of sixties, seventies and nineties and highest growth rate was achieved from the period 2000-01 to 2007-08. Excepting Gujarat, no other Indian states had experienced such growth in productivity in foodgrains. For West Bengal, the decades of eighties and nineties had observed acceleration on growth of foodgrain production and it only started decelerating since 2000-01. In West Bengal, the decade of eighties experienced highest growth rate in productivity (3.27 percent per annum) of foodgrain.

Most of the states of central India had experienced growth in foodgrain production and productivity which passed through serious ups and down since 1960s. The fluctuations were more prominent for the central Indian states excepting Madhya Pradesh where fluctuations were relatively moderate. Gujarat had experienced a growth rate in 9.8 percent per annum between 1960s and 70s and then it had sharply reduced to 0.2 percent during the decade of 70s. It became negative in the nineties and thereafter, between 2000-01 and 2007-08, it sharply increased to 18.2 percent. Similar trends were also observed for the state of Maharashtra, though unlike Gujarat, it experienced negative growth during the decade of 60s. For the state of Rajasthan, the decades of 1970s and 1990s experienced positive growth in foodgrain production, rest of the decades under study experienced negative growth rates.

Among the southern states, Andhra Pradesh emerged as most consistent performer. If we look at growth figures of production and productivity of foodgrain, we observe that in Andhra Pradesh, foodgrain production grew at a rate of 2.1 percent in the decade of 60s, while it increased to 3.1 percent in the decade of 70s and then it declined to 2.1 percent from 1980-81 to 1990-91 and then again it increased and continue to grow at a rate of 2.7 percent per annum from 1990-91 to 2000-01 and 2000-01 to 2007-08. The growth in productivity of foodgrain production in Andhra Pradesh reached the highest level during the period of 1970-71 to 1980-81, where the productivity grew at a rate 3.85 percent; it slightly declined from 1980-81 to 1990-91, when it grew at a rate 3.38 percent per annum. The decade of 90s

observed further slowing down in the growth rate in productivity in foodgrain production (2. 78 percent), however a revival of growth in productivity was observed for Andhra Pradesh since 2000-01 when growth rate was again increased to 3.25 percent.

The next important state of southern region, Tamil Nadu, experienced negative growth in foodgrain production and productivity from 1970-71 to 1980-81 and 2000-01 to 2007-08 and the highest growth was achieved from 1980-81 to 1990-91. During this period foodgrain production had grown at a rate of 3.3 percent per annum and productivity grew at a rate of 3.63 percent. The state of Karnataka experienced highest rate of growth in production and productivity of foodgrain from 1960-61 to 1970-71. During this period, the production and productivity grew at 5.5 percent and 5.2 percent per annum respectively. However, in Karnataka, the decades of 80s and 90s observed severe deceleration in growth in production and productivity of foodgrain. However, from 1990-91 to 2000-01 both production and productivity growth registered significant upturn but again was sluggish from 2000-01 to 2007-08. Kerala's contribution to total foodgrain production remained very low and declined over the periods and the growth in production continued to remain negative from 1960-61 to 2000-01 and excepting the period 1990-91 to 2000-01 productivity remained at a very low level.

Table 3.10: Statewise CAGR in Foodgrain Production in India (1960-61 to 2007-08)

Region	State	1960-61 to 1970-71	1970-71 to 1980-81	1980-81 to 1990-91	1990-91 to 2000-2001	2000-01 to 2007-08
North-West	Haryana	-	2.4	4.7	3.4	2.0
	Punjab	1.7	5.0	4.9	2.8	0.8
	Uttar Pradesh	3.3	2.3	3.8	1.8	-0.2
Eastern	Assam	2.0	2.9	2.4	1.9	-2.6
	Bihar	0.8	2.3	2.2	-0.2	-1.5
	Orissa	2.5	1.6	1.5	-3.3	7.3
	West Bengal	3.0	-0.75	3.2	3.1	1.8
Central	Gujarat	9.5	0.2	0.8	-6.3	18.2
	Madhya Pradesh	1.4	1.2	3.9	-5.5	2.5
	Maharashtra	-2.5	5.7	2.2	-1.8	6.0
	Rajasthan	-3.0	5.3	-0.8	6.9	-2.5
Southern Region	Andhra Pradesh	2.1	3.1	2.1	2.7	2.7
	Karnataka	5.5	-0.1	0.9	5.6	1.5
	Kerala	0.0	-1.7	-0.2	-9.5	4.5
	Tamil Nadu	2.8	-2.3	3.0	1.5	-3.8

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

Table 3.11: Statewise CAGR in Productivity of Foodgrain in India (1960-61 to 2007-08)

Region	State	1960-61 to 1970-71	1970-71 to 1980-81	1980-81 to 1990-91	1990-91 to 2000-2001	2000-01 to 2007-08
North-West	Haryana	-	2.08	4.45	2.69	1.60
	Punjab	8.12	2.81	3.28	1.75	0.77
	Uttar Pradesh	2.57	1.97	3.67	1.93	0.67
Eastern	Assam	0.68	0.98	1.67	1.42	-0.80
	Bihar	1.00	2.20	2.78	2.68	-1.30
	Orissa	-0.17	-0.16	1.44	-0.54	6.57
	West Bengal	1.49	-0.57	3.27	2.61	1.24
Central	Gujarat	7.94	1.48	0.46	-2.34	12.03
	Madhya Pradesh	0.23	0.73	3.69	-.0.57	1.78
	Maharashtra	-2.97	4.85	1.99	-1.10	6.15
	Rajasthan	5.39	-2.58	5.04	0.22	4.23
Southern Region	Andhra Pradesh	0.99	3.85	3.38	2.78	3.25
	Karnataka	5.24	0.69	0.24	4.49	1.33
	Kerala	0.89	1.13	1.62	4.72	-4.08
	Tamil Nadu	2.25	-0.06	3.63	2.59	-2.08
All India		2.08	1.61	3.04	1.66	1.94

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

3.5.3 Inter-State Long Term Growth Patterns in Area, Production and Productivity of Major Crops in India

To add further, that how growth in area, production and productivity for various crops in the various states are changing over the years, especially after the introduction of Green Revolution, compound annual growth rates were calculated for the period 1967-68 to 2007-08 and growth rates were classified into four groups, viz., high (> 4%), medium (2-3.9%), low (0-1.9%) and negative (< 0%). From Table 3.12, it is evident that in terms of growth in area, oil seeds crops like Rapeseeds and mustard, sunflower, sesamum and coconut experienced growth in area exceeding 4 percent per annum. In many states, area under onion also registered a growth of more than 4 percent. In north-western region, Haryana, in eastern India West Bengal, Gujarat, Maharashtra, Rajasthan in central India, in southern region, Andhra Pradesh, Karnataka and Tamil Nadu. Onion registered high growth in area in Gujarat, Karnataka and Maharashtra. Potato in West Bengal has shown high growth in area along with Rapeseeds and mustard and sesamum. In Tamil Nadu, coconut registered highest growth in area expansion under cultivation. Among all the major states, the growth in area under rice exceeded 4 percent only in the state of Punjab. During 1967-68 to 2007-08, at all-India level, only sunflower registered area growth of more than 4 percent.

If we look at the statewise and crop-wise growth in area under cultivation then it becomes apparent that most of the states has achieved moderate rate of growth (2.0 -3.9%) in area under cultivation of oilseeds and other commercial crops like arecanut, sugarcane, potato, onion, pigeon peas. Haryana and Andhra Pradesh have shown medium growth in area under

cotton. Kerala is the only state that showed medium growth in area under pepper cultivation. The crops that showed medium growth in area at all-India level are respectively coconut, onion, arecanut, pepper, Rapeseeds and mustard and potato.

Most of the foodgrains across the states, however, achieved negative growth in area during the period 1967-68 to 2007-08. Negative growth in area under foodgrains are prominent among Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Orissa and this indicates that crop diversification is gradually tilting towards commercial crops. The area under coarse cereals and small millets are being substituted by commercial crops in these states. However, in West Bengal, no crops have achieved negative growth in area and thus reflect that cropping pattern has remained relatively uniform over the years. All-India scenario shows that cereals, pulses, small millets, oilseeds like groundnut, linseed, sunflower and sesamum have registered negative growth in area.

If we follow the long term growth (1967-68 to 2007-08) of production of different crops across the states (Table 3.13), we observe that oilseeds, especially Rapeseeds and mustard have grown at more than 4 percent in most of the states. These states are namely, Haryana, West Bengal, Gujarat, Madhya Pradesh and Maharashtra. At all-India level also Rapeseeds and mustard have achieved growth rate in production which was more than 4 percent per annum from 1967-68 to 2007-08. Along with Rapeseeds and mustard, sesamum production was growing more than 4 percent in West Bengal and Gujarat. High growth in production of sunflower was observed in Andhra Pradesh, Karnataka and Maharashtra. Along with the states of Punjab, Uttar Pradesh and West Bengal potato have registered high growth in production at all-India level .

Table 3.12: Compound Annual Growth rates in Area for Major Crops by States (1967-68 to 2007-08)

Region	State	High (>4%)	Medium (2.0-3.9%)	Low (0-1.9%)	Negative (< 0 %)
North-West	Haryana	Rapeseeds & Mustard	Wheat, Cotton	Total Foodgrains, Total Cereals	Bajra, Barley, Gram, Sugarcane
	Punjab	Rice	Potato	Wheat, Cotton, Total foodgrains, Total Cereals	Barley, Sugarcane, Sunflower
	Uttar Pradesh	-	Potato	Rice, Wheat, total Foodgrains, Sugarcane, Total Cereals	Bajra, Maize, Total Pulses, total Oilseeds, Barley, Gram, Linseed, Rapeseeds & Mustard, Sesamum, Pigeon Pea
Eastern	Assam	-	Arecnut, Onion, Potato	Rice, Total Foodgrains, Rapeseeds & Mustard	Jute
	Bihar	-	-	Wheat, Jute, Onion, Potato, Tobacco	Rice, Ragi, Maize, Barley, Total Foodgrains, Linseed, Total Cereals
	Orissa	-	Pigeon Pea	Rice, Onion	Ragi, Total Pulses, Total Foodgrains, Total Cereals
	West Bengal	Potato, Rapeseeds & Mustard, Sesamum	-	Rice, Wheat, Total Foodgrains, Total Cereals	-
Central	Gujarat	Onion, Rapeseeds & Mustard, Sesamum	Pigeon Pea	Maize, Cotton, Total Oilseeds, Groundnut	Bajra, Tobacco
	Madhya Pradesh	-	Total Oilseeds, Rapeseeds & Mustard	Wheat, Maize, Cotton, Total Pulses, Gram	Rice, Total Foodgrains, Groundnut, Linseed, Safflower, Sesamum, Total Cereals
	Maharashtra	Onion, Sunflower	Gram, Sugarcane, Pigeon Pea	Total Pulses, Total Oilseeds, Cotton	Bajra, Ragi, Jowar, Total Foodgrains, Groundnut, Linseed, Safflower, Sesamum, Total Cereals
	Rajasthan	Total Oilseeds, Rapeseeds & Mustard	Total Pulses	Bajra, Wheat,Maize, Total Foodgrains, Total Cereals	Barley, Gram, Sesamum
Southern Region	Andhra Pradesh	Sunflower	Maize, Cotton, Onion, Pigeon Pea	Groundnut, Rice, Total Pulses, Total Oilseeds	Total Foodgrains, Ragi, Jowar, Sesamum, Tobacco, Total Cereals
	Karnataka	Onion, Sunflower, Maize	Arecnut, Total Oilseeds, Coconut, Sugarcane, Tobacco, Pigeon Pea	Total Pulses, Total Foodgrains, Groundnut, Sesamum	Ragi, Jowar, Cotton, Cardamom, Small Millets, Total Cereals
	Kerala	-	Pepper	Arecanut, Coconut	Cardamom
	Tamil Nadu	Coconut	Sugarcane	Total Pulses, Onion	Rice, Ragi, Jowar, Cotton, Cardamom, Total Foodgrains, Groundnut, Sesamum, Small Millets, Tobacco, Tur, Total Cereals
India		Sunflower	Arecanut, Coconut, Onion, Pepper, Potato, Rapeseeds & Mustard	Cardamom, Cotton, Jute, Maize, Sugarcane, Pigeon Pea, Rice, Wheat, Total Oilseeds	Bajra, Barley, Total Foodgrains, Gram, Groundnut, Jowar, Linseed, Safflower, Sesamum, Small Millets, Tobacco, Total Cereals, Total Pulses, Ragi

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

Table 3.13: Compound Annual Growth rates in Production for Major Crops by States (1967-68 to 2007-08)

Region	State	High (>4%)	Medium (2.0-3.9%)	Low (0-1.9%)	Negative (< 0 %)
North-West	Haryana	Wheat, Cotton, Rapeseeds & Mustard, Total Cereals	Total Foodgrains	Bajra, Sugarcane	Barley, Gram
	Punjab	Potato, Rice	Wheat, Total Foodgrains, Total Cereals	Cotton, Barley, Sugarcane	Sunflower
	Uttar Pradesh	Potato	Wheat, Total Foodgrains, Total Cereals, Rice, Sugarcane	Bazra, Maize	Total Pulses, Total oilseeds, Barley, Gram, Linseed, Rapeseeds & Mustard, Sesamum, Tur
Eastern	Assam	Onion, Potato	Rapeseeds & Mustard, rice	Total Foodgrains	Ragi, Jute
	Bihar	-	Wheat, Total Cereals	Rice, Maize, Total Foodgrains, Jute, Potato, Onion, Tobacco	Ragi, barley, Linseed
	Orissa	Pigeon Pea	-	Total Foodgrains, Total Cereals, Rice, Onion	Ragi, Pulses
	West Bengal	Potato, Rapeseeds & Mustard, Sesamum	Jute, Total Cereals, Rice	Total Foodgrains	-
Central	Gujarat	Onion, Rapeseeds & Mustard, Sesamum, Pigeon Pea	Maize, Cotton, Total Oilseeds	Groundnut, Tobacco	Bajra
	Madhya Pradesh	Total Oilseeds, Rapeseeds & Mustard	Wheat, Maize, Gram	Pulses, Total Foodgrains, Total Cereals	Rice, Linseed, Small Millets, Pigeon Pea
	Maharashtra	Total Oilseeds, Gram, Onion, Sunflower	Bajra, Cotton, Pulses, Sugarcane, Pigeon Pea	Total Foodgrains, Total Cereals, Jowar	Ragi, Groundnut, Linseed, Sesamum
	Rajasthan	Wheat, Total Oilseeds, Rapeseeds & Mustard	Total Foodgrains, Total Cereals, Bajra, Maize	Pulses, Sesamum	Barley, Gram
Southern Region	Andhra Pradesh	Cotton, Maize, Pulses, Onion, Sunflower, pigeon pea	Total Foodgrains, Rice	Groundnut, Oilseeds, Tobacco, Cereals	Jowar, sesamum, ragi
	Karnataka	Maize, Onion, Sunflower	Arecnut, Pulses, Oilseeds, Coconut, Sesamum, Sugarcane, Tobacco	Ragi, Cotton, Total Foodgrains, Cereals, Groundnut, Pigeon pea	Jowar, Cardamom, Small Millets
	Kerala	Cardamom Coconut	Pepper Pulses, sugarcane	Arecanut, Coconut Total Foodgrains, Rice, Groundnut, Onion, Cereals, Sesamum	-
	Tamil Nadu				Ragi, Jowar, Cotton, Cardamom, Small millets, Tobacco, Tur
India		Cardamom, Onion, Potato, Rapeseeds & Mustard, Sunflower	Rice, Wheat, Arecanut, Cotton, Pepper, Total Foodgrains, Maize, Jute, Sugarcane, Total Cereals, Total Oilseeds	Bajra, Gram, Groundnut, Sesamum, Pulses, Tobacco, Pigeon pea	Barley, Jowar, Linseed, Small Millets, Ragi

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

During the period 1967-68 to 2007-08, high growth in production for onion was achieved at all-India level and by the states of Assam, Gujarat, Maharashtra, Andhra Pradesh and Karnataka. Under foodgrains, only rice in Punjab, wheat in Rajasthan, pigeon pea in Orissa, Gujarat and Andhra Pradesh achieved growth in production more than 4 percent. Medium growth in production (2-3.9 %) of foodgrain has been achieved by Andhra Pradesh, Haryana, Punjab, Rajasthan and Uttar Pradesh and other states achieved a growth in foodgrain production even less than 2 percent per annum from 1967-68 to 2007-08. This has started posing doubts on the ability of the country to sustain food sufficiency in the long run.

Proliferation of industrial poultry in Karnataka and Andhra Pradesh has enhanced growth of maize in these two states because maize is primarily used as feed for the poultry industry. In comparison to other states, Uttar Pradesh and Tamil Nadu have highest number of crops that have registered negative growth; however, expansion of area under potato and sugarcane in Uttar Pradesh and coconut and sugarcane in Tamil Nadu might be responsible for this change.

Table 3.14: Compound Annual Growth Rates in Productivity for Major Crops by States (1967-68 to 2007-08)

Region	State	High (>4%)	Medium (2.0-3.9%)	Low (0-1.9%)	Negative (< 0 %)
North-West	Haryana	-	Wheat, Bajra, Barley, Total foodgrains, Rapeseeds & Mustard, Total Cereals	Cotton, Gram, Sugarcane	-
	Punjab	-	Wheat Barley, Total Foodgrains, Total Cereals	Rice, Cotton, Potato, Sugarcane, Sunflower	
	Uttar Pradesh	-	Rice, Wheat, Bajra, Maize, Total Oilseeds, Barley, Total Foodgrains, Total Cereals, Potato, Rapeseeds & Mustard	Total Pulses, Gram, Linseed, Sesamum, Sugarcane	Pigeon pea
Eastern	Assam	-	-	Rice, Total Foodgrains, Jute, Potato, Rapeseeds & Mustard	Arecanut
	Bihar	-	Maize, Barley, Total Cereals	Rice, Wheat, Ragi, Total Foodgrains, Jute, Linseed, Tobacco	Potato
	Orissa	-		Rice, Total Foodgrains, Total Cereals, Pigeon pea	Ragi, Total Pulses
	West Bengal	-	Rice, Rapeseeds & Mustard, Total Cereals	Total Food gains, Jute, Potato, Sesamum	
Central	Gujarat	-	Cotton, Rapeseeds & Mustard	Bajra, Maize, Total Oilseeds, Groundnut, Sesamum, Tobacco, Pigeon pea	
	Madhya Pradesh	-	Wheat, Total Oilseeds, Total Foodgrains, Total Cereals, Rapeseeds & Mustard	Rice, Maize, Total Pulses, Gram, Linseed, Small Millets, Tur	
	Maharashtra	-	Bajra, Cotton, Total Oilseeds, Total Cereals, Gram	Ragi, Jowar, Total Pulses, Total Oilseeds, Total Foodgrains, Ground nut, Linseed, Sesamum, Sunflower, Pigeon Pea	Sugarcane
	Rajasthan	Total Oilseeds	Wheat, Bajra, Barley, Total Foodgrains, Total Cereals, Rapeseeds & Mustard, Sesamum	Maize. Gram	Total Pulses
Southern Region	Andhra Pradesh	-	Cotton, Total foodgrains, Rice, Maize, Total Pulses, Total Cereals, Sunflower	Groundnut, Ragi, Jowar, Total Oilseeds, Sesamum, Tobacco, Pigeon pea	
	Karnataka	Safflower	Cotton	Ragi, Jowar, Total Pulses, Total Oilseeds, Total Foodgrains, Total Cereals, Sesamum, Small Millets, Sugarcane, Tobacco	Maize, Cardamom, Coconut, Sunflower, Pigeon Pea, Arecanut
	Kerala	Cardamom		Arecanut, Coconut, Pepper	-
	Tamil Nadu	-	Groundnut	Rice, Ragi, Jowar, Cotton, Total Pulses, Coconut, Total Foodgrains	Cardamom
India		Cardamom	Rice, Wheat, Arecanut, Cotton, Barley, Bajra Total Foodgrains, , Total Cereals, Rapeseeds & Mustard	Arecanut, Coconut, Jowar, Gram, Jute, Linseed, Potato, Small Millets, Total Pulses, Total Oilseeds, Groundnut, Pulses, Tobacco, Sugarcane	Sunflower, Pigeon Pea, Ragi

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

If we look at the cropwise and statewise figures of compound annual rate of growth in productivity (Table 3.14) from 1967-68 to 2007-08, sunflower in Karnataka, Cardamom in Kerala, total oilseeds in Rajasthan and cardamom at all-India level attained growth rate that exceeded 4 percent mark. Rest of the crops (both foodgrain and non foodgrains) have achieved medium growth ranging between (2-3.9%) and negative growth (< 0 percent).

Importantly, rice growing states like Assam, Bihar, Madhya Pradesh, Orissa and Tamil Nadu attained yield growth less than 2 percent. At all-India level, foodgrains like rice, wheat, maize, barley and bajra showed medium growth and sunflower, pigeon pea and ragi showed negative growth rates. Most pulse growing states have either registered yield growth rate less than two percent or negative. Similarly, sugarcane in Maharashtra, pigeon pea and maize in Karnataka has been showing deceleration in growth in productivity.

3.5.4 Growth in Foodgrain Production and Growth of Population (1960-61 to 2007-08): An Inter-State Comparison

In the above context and also given the recent initiatives of the Central Government to ensure the rights of the people to have minimum of food intake, raising food production across the states assumes special importance. For that matter, we need to delve into the issues of the states which were gradually becoming food deficient states, and remained food deficient states from the beginning and the states self-sufficient in food production. To do so, a comparative statement has been prepared by taking into account the growth of foodgrain and growth of population in five sub-periods for major Indian states, viz., 1960-61 to 1970-71, 1970-71 to 1980-81, 180-81 to 1990-91, 1990-91 to 2000-01 and 2000-01 to 2007-08. The growth of population between 2001 and 2011 has been considered for estimating the period 2000-01 to 2007-08 (Table 3.15). If growth of foodgrain production exceeds the growth of population, we assume that the state is generating surplus in foodgrain production and if population growth surpasses the growth of foodgrain then the state is being considered as deficient in foodgrain production (Table 3.16). However, import and export of foodgrain has not been taken into account.

In north-west region, Punjab was food deficient state during sixties, and it turned out to be food surplus state by the 70's and the trend was maintained till 2000-2001.But from 2000-01-2007-08, it turned out to be a foodgrain deficient state. In Uttar Pradesh, the major contributors of foodgrain production in India, the growth of foodgrain production continued to be lower than the growth of population since 1990-91. Since the state of Uttar Pradesh continued to remain the highest contributor of foodgrain for India, deceleration in this particular state is not only a matter of concern for the state but for the country as a whole. However, the state of Haryana is still maintaining a surplus. In the eastern region, Assam turned out to be a food deficit state from 2000-2001; however, Bihar became food deficient since 1990-91. The state of Orissa remained food deficient state in the decades of 1970s,

1980s and 1990s but from 2000-01, it became a foodgrain surplus state. In West Bengal, since 1980-81, growth of foodgrain continued to remain higher than the population growth.

Among the states of Central India, Madhya Pradesh and Maharashtra experienced the longest spell of foodgrain deficit. The growth of foodgrain production remained lower than population growth from 1960-61 to 1970-71, 1980-81 to 1990-91 and 1990-91 to 2000-01in Maharashtra and 1960-61 to 1970-71, 1970-71 to 1980-81 and 1990-91 to 2000-01. However, the trend got reversed for both the states from 2000-01 to 2007-08. Rajasthan, though, turned out to be food deficient state from 2000-01 to 2007-08. In southern region, Kerala experienced higher population growth in comparison growth in production from 1960-61 to till 2000-01. For Andhra Pradesh, except the period between 1980-81 and 1990-91, in rest of the periods, the growth in foodgrain remained higher than the growth of population. In Tamil Nadu, foodgrain production growth was outweighed by the growth of population from 2000-01 to 2007-08. At all-India level, the decade of 1970's (1970-71 to 1980-81) and 1990s (1990-91 to 2000-01) experienced a situation where in population growth exceeded the growth in foodgrain production. However, the trend got reversed from 2000-01 to 2007-08; the growth in foodgrain production remained higher than the growth of population.

Mention has been made that the contribution of agriculture to Gross Domestic Product has continuously declined and reached to just 17 percent in 2008-09 and the percentage of people relying on agriculture has marginally declined in comparison to 1950-51. Therefore, it becomes obvious that per-capita income from agriculture has declined at all-India level and this was bound to result in an increase in rural indebtedness and poverty. The Eleventh Plan had set the target for growth of agricultural GDP at 4 percent. The Eleventh Plan document stated that the growth of agricultural GDP has declined from 3.5 percent per annum from 1981-82 and 1996-97 to only around 2 percent from 1997-98 and 2004-05 (Eleventh Five Year Plan: 4). It had further declined to below 1 percent during first three years of Ninth Plan. National Sample Survey (59th Round) clearly showed the security of rural indebtedness. According to this survey, in Andhra Pradesh 82 percent of farmer households are in debt, in Tamil Nadu the percentage stood at 74.5 percent, the figures for agriculturally prosperous states like Punjab and Haryana are respectively 65.4 percent and 53.1 percent. According to this survey, eastern states are relatively better placed. However, it is not clear that to what extent the indigenous money lenders are active and to what extent farmer households are depending on them for their credit needs.

Table 3.15: Inter-State Comparison of Growth in Foodgrain Production and Growth of Population (1960-61 to 2007-08)

Region	State	CAGR-FOODGRAIN	CAGR-POPULATION	CAGR-FOODGRAIN	CAGR-POPULATION	CAGR-FOODGRAIN	CAGR-POPULATION	CAGR-FOODGRAIN	CAGR-POPULATION	CAGR-FOODGRAIN	CAGR-POPULATION
		1960-61to 1970-71		1970-71 to 1980-81		1980-81 to 1990-91		1990-91 to 2000-2001		2000-01 to 2007-08	
North-West	Haryana	-	2.83	2.40	2.56	4.70	2.45	3.40	2.53	2.00	1.83
	Punjab	1.70	1.98	5.00	2.17	4.90	1.91	2.80	1.85	0.80	1.30
	Uttar Pradesh	3.30	1.82	2.30	2.30	3.80	1.77	1.80	2.33	-0.20	1.85
Eastern	Assam	2.00	3.04	2.90	2.12	2.40	2.19	1.90	1.75	-2.60	1.58
	Bihar	0.80	1.95	2.30	2.18	2.20	-0.80	-0.20	2.55	-1.50	2.26
	Orissa	2.50	2.26	1.60	1.85	1.50	1.84	-3.30	1.52	7.30	1.32
	West Bengal	3.00	2.41	-0.75	2.11	3.2	2.23	3.10	1.65	1.8	1.31
Central	Gujarat	9.50	2.61	0.20	2.47	0.80	1.94	-6.30	2.06	18.20	1.77
	Madhya Pradesh	1.40	2.55	1.20	2.28	3.90	-0.71	-5.50	2.20	2.50	1.87
	Maharashtra	-2.50	2.46	5.70	2.22	2.20	2.32	-1.80	2.07	6.00	1.49
	Rajasthan	-3.00	2.49	5.30	2.89	-0.80	2.53	6.90	2.53	-2.50	1.96
Southern Region	Andhra Pradesh	2.10	1.92	3.10	2.10	2.10	2.19	2.70	1.37	2.70	1.06
	Karnataka	5.50	2.19	-0.10	2.40	0.90	1.93	5.60	1.63	1.50	1.47
	Kerala	0.00	2.36	-1.70	1.77	-0.20	1.35	-9.50	0.90	4.50	0.48
	Tamil Nadu	2.80	2.03	-2.30	1.63	3.00	1.44	1.50	1.11	-3.80	1.46
India		2.83	2.24	1.80	2.23	3.13	2.16	1.10	1.97	2.30	1.64

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

Table 3.16: Inter-State Comparison of Food production Sufficiency or Insufficiency (1960-61 to 2007-08)

Region	State	1960-61to 1970-71	1970-71 to 1980-81	1980-81 to 1990-91	1990-91 to 2000-2001	2000-01 to 2007-08
North-West	Haryana	Surplus	Deficit	Surplus	Surplus	Surplus
	Punjab	Deficit	Surplus	Surplus	Surplus	Deficit
	Uttar Pradesh	Surplus	Surplus	Surplus	Deficit	Deficit
Eastern	Assam	Deficit	Surplus	Surplus	Surplus	Deficit
	Bihar	Deficit	Surplus	Surplus	Deficit	Deficit
	Orissa	Surplus	Deficit	Deficit	Deficit	Surplus
	West Bengal	Surplus	Deficit	Surplus	Surplus	Surplus
Central	Gujarat	Surplus	Deficit	Deficit	Deficit	Surplus
	Madhya Pradesh	Deficit	Deficit	Surplus	Deficit	Surplus
	Maharashtra	Deficit	Surplus	Deficit	Deficit	Surplus
	Rajasthan	Deficit	Surplus	Deficit	Surplus	Deficit
Southern Region	Andhra Pradesh	Surplus	Surplus	Deficit	Surplus	Surplus
	Karnataka	Surplus	Deficit	Deficit	Surplus	Surplus
	Kerala	Deficit	Deficit	Deficit	Deficit	Surplus
	Tamil Nadu	Surplus	Deficit	Surplus	Surplus	Deficit
	India	Surplus	Deficit	Surplus	Deficit	Surplus

Source: *Calculation based on data collected from Directorate of Economics and Statistics, Government of India*

3.6 Conclusion

Anticipating the problem of impending food scarcity, increase in the incidence of poverty and rural indebtedness in Indian agriculture, both at all-India level and state level, following areas of concern have been identified by Eleventh Plan document (Chapter-1:4) and which may be presented as follows:

- Deceleration in growth.
- Widening gap between irrigated and rain-fed areas.
- Increased vulnerability to world commodity price fluctuation following trade liberalisation.
- Uneven and slow development of technology.
- Inefficient use of available technology and inputs
- Lack of adequate incentives and appropriate institution.
- Degradation of natural resource base.
- Rapid and widespread decline in ground water table with particularly adverse impact on small and marginal farmers.
- Increased non-agricultural demand for land and water as a result of the higher overall GDP growth and urbanisation.

Having accepted the above impediments that Indian agriculture is facing, observation may be made that it is not necessarily true and uniform for all the states of India, West Bengal for example, is suitable case. Notwithstanding the fact that in West Bengal, agriculture is certainly experiencing deceleration in agricultural growth of income, production and productivity in the recent past but its situation is much better compared to agriculturally prosperous states of North-west India. Again, in West Bengal, a wide variation is bound to happen in various districts of West Bengal in agrarian scenario because of the influences of various economic and non-economic factors that affect agricultural production and productivity of a particular region.

The following chapter proposes to explore the pattern of agricultural growth that the state of West Bengal has been experiencing since 1970-71 to date, taking all the districts into consideration, for presenting unbiased and statistically qualified agrarian scenario of the state.

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