Working Paper Series No. 47

ICRISAT Research Program
Markets, Institutions and Policies

Regional Disparities in Rural and Agricultural Development in Undivided Andhra Pradesh, India

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Citation: Reddy AA, Reddy GP, Radhika Rani Ch, Reddy AN and Bantilan C. 2014. Regional Disparities in Rural and Agricultural Development in Undivided Andhra Pradesh, India. Working Paper Series No. 47. Patancheru 502 324, Telangana, India: International Crops Research Institute for the Semi-Arid Tropics. 48 pp.

Abstract

India is a federal union comprising of 28 states. The states are further sub-divided into districts. Andhra Pradesh is one of the largest states in India. The state was formed by merging three regions – Telangana, Rayalaseema and Coastal Andhra – in the year 1956. In terms of development indicators measured in the mid-50s, Coastal Andhra was considered more developed, followed by the Rayalaseema region. Now people of the Telangana region are claiming that their relative backwardness was accentuated after merging with the more developed regions. In this context, this paper examines the regional disparities in agriculture in Andhra Pradesh since its formation in 1956. The most important finding of this study, which is of considerable analytical and policy significance, is that the Rayalaseema region which ranked next to the Coastal region in the beginning of the period has now slipped to third position. It was overtaken by Telangana with many of the development indicators showing convergence. The finding is robust and convincing on account of the poor resource endowments of Rayalaseema and considerable underutilization of resources in the relatively better-endowed Telangana under the earlier feudal setup; and the release of productive forces consequent to the abolition of the princely state and its merger with the rest of the country under independence. Specific analysis at the district level indicated that by and large there is a convergence among the districts in the overall agricultural development, except for resource-poor and remote rural districts. These districts are left out of this convergence process due to poor resource endowment to adopt agricultural intensification through green revolution technology or diversification-led strategies through livestock/high-value crop sector. Livestock/high-value crop sector-led growth is evident in districts surrounded by urban centers since the last two decades. However, it is to be noted that both the green revolution and urbanization benefited only the well-endowed regions (green revolution benefited the landowning class in the Coastal Andhra and urbanization helped the well-educated, resource and capital endowed people, mostly rich migrants from Coastal Andhra who invested their surplus income from the green revolution in the cities either in real estate or in building of non-agricultural enterprises) leaving behind the less educated and resource-deprived sections in poverty.

Working Paper Series No. 47

ICRISAT Research Program
Markets, Institutions and Policies

Regional Disparities in Rural and Agricultural Development in Undivided Andhra Pradesh, India (From 1961 to 2011)

A Amarender Reddy, GP Reddy, Ch Radhika Rani,
Angula N Reddy and Cynthia Bantilan

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This work has
been undertaken
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RESEARCH
PROGRAM ON
Policies,
Institutions
and Markets

2014

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Foreword

The study examines regional disparities in rural and agricultural development over a 50 year period since the formation of Andhra Pradesh in 1956. The most important finding of the paper, which is of considerable analytical and policy significance, is that Rayalaseema region which ranked next to the Coastal region in the beginning of the period has slipped to the third position, being overtaken by Telangana region which now ranks next to Coastal region, with many of the relevant development indicators showing convergence between the latter two regions. The findings bring out that while Rayalaseema languished due to poor resource endowments and low investments. In the relatively better endowed Telangana which stagnated due to considerable underutilization of resources under the feudal set up earlier, surged followed with the release of productive forces consequent to the abolition of the princely state and its integration with the rest of the country after independence.

After a brief survey of literature on the regional development, the various agricultural and rural development indicators based on the district level data from the period 1961 to 2011, collected from the various authentic sources. All the variables are presented in comparable terms like per capita or per hectare basis. The growth rates of the development indicators are supplemented by the levels of relevant indicators in terms of averages for the triennia at the beginning and end of the periods. This will help the reader to see the extent of convergence or otherwise between different regions and districts. There is a detailed discussion on growth and levels of inputs and outputs both in agricultural and livestock sectors. Further, the study also develops a composite indicator like Per Capita Income from Agriculture and Allied sectors which conveys a better picture of development than partial indicators like crop and livestock sectors taken separately. There is a separate section on the regional pattern of development of human capital indicators and levels of educational development at the district level. The study, taking a case from the New Economic Geography, highlighted the growth impact of Hyderabad city on the nearby districts especially since late 1990s. However, it draws attention to lack of spread effects since the people in the adjacent districts of Hyderabad are still not able to take advantage of the fast growth of the Hyderabad due to lack of education, capital and entrepreneurial skills. The study highlights that the Hyderabad agglomeration effects have not reached even the neighboring Mahabubnagar leave alone remote districts like Adilabad. The study bring out that the spread and convergence effects are hardely in evidence and that backward districts are present in all the regions like Adilabad and Mahabubnagar in Telangana; Vijayanagaram and Srikakulam within more developed Coastal Andhra and Ananatapur in even backward Rayalaseema. The study points out that the Green Revolution like development path is not suitable for the backward districts given their less resource endowment, hence emphasis needs to be on diversification of income and employment opportunities through livestock development, high-value crops cultivation and off-farm activities. The study concludes that balanced regional development requires decentralized industrialization and uniform spread of a network of well-connected small towns, diversified growth engines suitable for local conditions. The emphasis in the strategy is on with adequate infrastructure that would serve as the role of government and public investment in the development of backward districts. The study provides basic disparity map of the regions with district level details that may help in designing appropriate interventions.

Overall, the study is an important addition to literature on understanding the evolution of regional disparities in agriculture and rural development at the regional and district level, and hopefully would stimulate more in-depth studies on rural and agricultural development at regional and sub-regional levels.

D Narasimha Reddy, ICSSR

Introduction

Growing regional inequalities are a great challenge in most developing countries, especially those with large geographic areas under their jurisdiction. With liberalization both in factor and product markets, there was free mobility of skilled labor and capital from peripheral regions to core regions, mostly attracted by the higher earnings in high-technology service sector, while the unskilled, illiterate workers, women, and the aged remained in the low productive and less capital-intensive rural and agricultural sectors in the periphery regions. Regional perspectives of the development discourse were seen in the writings of Myrdal (1957), with cumulative causation and core periphery models, which were the widely used models in regional studies. They were of the view that regional imbalances were likely to widen in the absence of state interventions and can be narrowed down with the necessary political interventions, until finally the periphery becomes a beneficiary of the external economies of the core (Williamson 1965). Recently Krugman's 'New Economic Geography' explained the phenomenon of growing inequalities in the core-periphery concept. Some argued (Pike et al. 2006) that the regional disparities were rooted in social constructs and were reproduced through frameworks of socially constructed institutions and conventions. Recently, the traditional development strategies have come under scrutiny and are regarded as relatively ineffective in an integrated, globalized world (Pike et al., 2006) to reduce regional disparities. In India, after 50 years of planned development, regional disparities are still growing and this is a major concern for political and economic unrest in many parts of India.

Theoretical background

In neo-classical regional theories, the most influential writings are by Hirschman (1958), Myrdal (1957) and Williamson (1965), who argued that the concentration of growth in selected sectors or locations attract factors of production and increase efficiencies before the growth spreads to other sectors or areas (Fan 1997). Myrdal and Hirschman believed that factor mobility may increase regional inequality at certain stages of development. Furthermore, Hirschman believed that economic progress cannot be seen everywhere at the same time and therefore the economy must first develop in one or several economic centers. According to Myrdal, when cumulative causation is present, regional inequalities are the greatest because of the high backwash effect and (draining of wealth and labor from the poorer regions) then the spread effects (growth in core regions stimulates other regions through increased demand for backward area products, diffusion of technology and knowledge). Williamson suggests that regional inequality first arises during the initial stages of development and declines when it reaches more advanced stages. The main argument is that in a catching-up country, there are a few growth pole regions in which capital and skilled workers are concentrated. As a consequence of a fast rise in productivity, growth accelerates in these regions, which leads to increasing regional disparities. At later stages, as higher factor costs or diseconomies of agglomeration emerge in the growth pole regions, capital is likely to move to other regions with low capital per worker. This, together with the knowledge spillover effects, may enhance the reallocation of productive factors across sectors and regions, which leads to spatial convergence. If we assume that Williamson's hypothesis is correct and that there are some development hubs in the early stages of development which pull a country's overall performance (while other regions join in later), we can draw a picture of how disparities might evolve during the development phase. The staples-led development propounded by Harold Innis, identified the inherent tendencies for markets to discriminate against peripheral regions in favor of metropolitan ones. Kaldor's subsequent writings on this subject reflect the critique of neo-classical self-equilibrating models based on a Keynesian analysis focused on demand-related factors. More recently, Krugman's New Economic Geography has promoted the consideration of supply-side explanations for the failure of the neo-

classical model, and this has restored attention to supply-based endogenous explanations for disparities in regional productivity within a single jurisdiction. Local development varies with differences in regional endowments or peoples' attitudes towards supply-based factors such as access to training, quality of entrepreneurship, literacy or the tendency in some parts of the state to promote high-tech clusters of employment which are not present in other parts (Pike and Tomaney 2004). In this context, debates on the trajectories and mechanisms of regional development have been intensified in the context of heightened globalization and regional competition (Pike et al. 2006) which resulted in the need for alternative development strategies to meet the demand of reconciling top-down policies with bottom-up approaches. In the globalised world, "even the most remote spaces are exposed to competition, forcing regions to react and adjust to the new economic conditions…" (Pike et al. 2006). In Kaldor's approach, a region could achieve a higher productivity growth in manufacturing sector than in agriculture, because the former sector opens more possibilities to increase productivity through technological innovations. Specialization in non-agricultural sectors especially manufacturing is also important in Myrdal's circular and cumulative causation model of regional divergence. In this approach, manufacturing activities lead to agglomeration economies, which reinforce the advantage of regions that industrialize first. In Andhra Pradesh, the largest city Hyderabad, attracted capital and skilled labor from green revolution areas of coastal Andhra since 1960s and by 1990s it became one of the largest urban conglomerates in south India which attracted capital and skilled labor from not only Andhra Pradesh but from different countries mostly into Information Technology. Krugman (1991) shows that regional specialization is path-dependant, as the effect of economies of scale and external economies make some regions specialize in some industries. Based on those ideas, some economists have argued that public policy can play a role in the development of high-value agriculture and industries characterized by external economies at a regional level. The nurturing of those industries, in particular (as in Information Technology in Hyderabad) through trade protection or tax incentives would put in motion the increasing returns that would reinforce the regional advantage (Pike et al. 2006). Within this broader perspective, the paper attempts to provide evidence of trends in regional disparities, driving forces behind the change in regional disparities with special reference to agricultural sector.

Historical background of the regions

Specific national, regional and local conditions with cultural, historical, institutional and political legacies may all shape up the particular experiences of sub-national governance and economic and social development in certain times and places (Pike and Tomaney 2004). Andhra Pradesh is one of the largest states in India with a population of 84.6 million in 23 districts as per 2011 census. The Telangana region was under the reign of the Nizam of Hyderabad until the year 1948. The Nizam's regime was feudal, thus internal democracy and the social empowerment of people was limited. On the other hand, coastal Andhra and Rayalaseema regions were under the British rule until independence and became independent in 1947 along with the rest of India. Colonial rule and associated Christian missionary schools had a positive effect on human development. Hence, coastal Andhra and Rayalaseema were more developed when compared to Telangana at the time of independence. Figure 1 presents Andhra Pradesh in the years 1956 and 2010. On 1 November 1956, with the State Reorganization Act, Andhra Pradesh state was formed by merging the Telugu speaking areas of Andhra State (Rayalaseema and coastal Andhra) with the already existing Hyderabad State (Telangana) (Figure 1a). The Marathi speaking areas of Hyderabad State were merged with Bombay State and the Kannada speaking areas of Hyderabad State were merged with Mysore State.

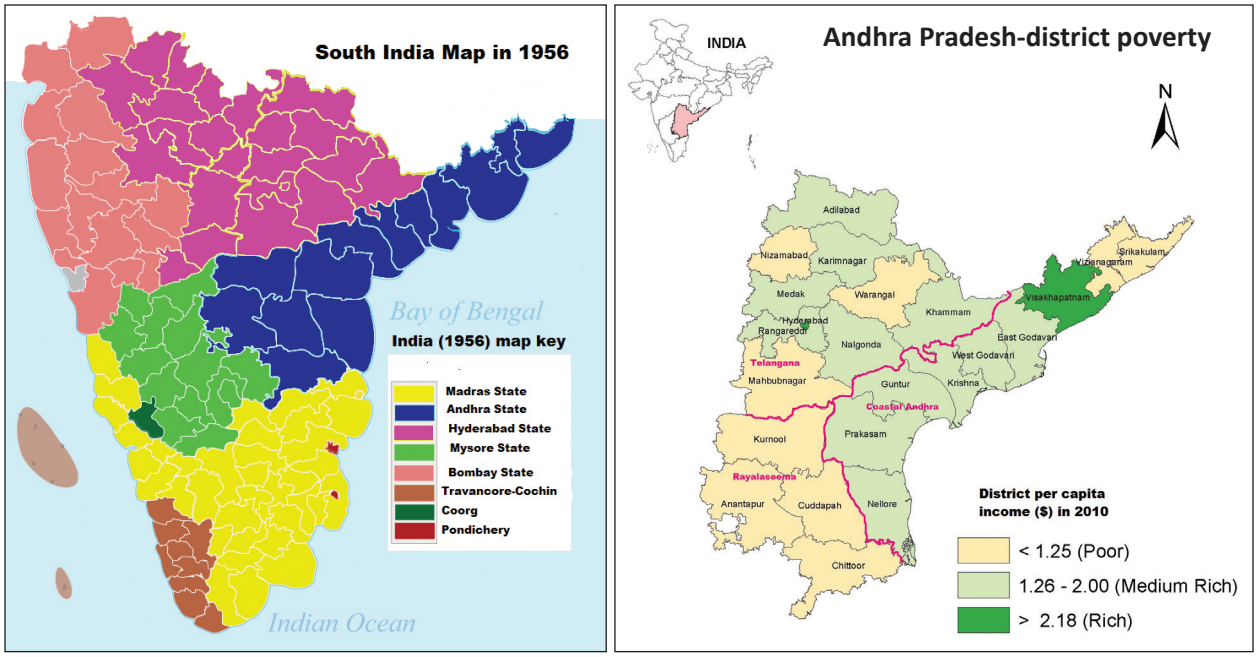

Figure 1. Andhra Pradesh in 1956 and 2010, 1a. Andhra State and Hyderabad State before 1956, 1b. Andhra Pradesh, 2010.

In Figure 1b, districts were grouped into poor, medium rich and rich based on the average monthly per capita expenditure of the district with 1.25 USD/capita/day as poor, 1.26 to 2.00 USD capita/day as and above 2.00 USD/capita/day as rich in the year 2009/10. A cursory look at the figure shows that three districts out of ten were categorized as poor in Telangana, all four in Rayalaseema and only two out of nine districts in coastal Andhra fell under this category. When compared to the other regions, Telangana also has a larger share of scheduled caste and tribes (most backward sections of the society), whose socioeconomic conditions are far inferior to the upper caste population. Even though both coastal Andhra and Rayalaseema regions are similar in human development indicators, the former is prosperous due to its high productive agricultural sector due to high rainfall, irrigated area, while the latter is backward because of frequent droughts, low rainfall and consequent low productive agriculture (Reddy 2010). Telangana stands in between in terms of agricultural development. This region occupies the largest area (42% of total geographical area of the state of 27.5 million ha), followed by coastal Andhra (34%) and Rayalaseema (25%). However, population density is higher in coastal Andhra (367/sq km) followed by Telangana (288/sq km) and Rayalaseema (213/sq km).

Datt and Ravallion (1996) show that poverty responds more to rural and agricultural economic growth than urban economic growth. Hence, agricultural growth is crucial to reduce poverty levels. There are few studies (Reddy and Kumar 2006; Reddy 2010, 2011; Srikrishna Commission Report 2011) on regional disparities in Andhra Pradesh with a regional perspective. This paper presents regional disparities in the agricultural sector in Andhra Pradesh in a historical perspective since 1956, the year of state formation, in order to understand the development process in the agricultural sector. The paper examined whether agricultural growth shows convergence or divergence over the last 50 years among the three regions and among districts, and what the pattern of change is among different sub-sectors of agricultural outputs and inputs. Historically, green revolution (high yielding technology and agricultural intensification) is suitable for increased agricultural growth in favorable regions (like coastal Andhra); the

objective was to see whether the same is also applicable for less developed regions like Rayalaseema and Telangana where rainfed agriculture dominates or a new strategy is probed needs to be examined or experimented. This paper also examines the role played by the large-urban conglomerate (Hyderabad) on the agricultural sector growth in the light of New Economic Geography. Some studies point out that the fruits of green revolution technology are apparent in coastal Andhra due to large scale irrigation and better initial socioeconomic conditions, but not in less-endowed regions (Rayalaseema and Telangana). The paper specifically examines regional policy to address development in the less endowed regions with the following specific questions.

(i) Have the regions and districts shown convergence or divergence over the last five decades?

(ii) What is the pattern of change among different sub-sectors of the economy with special reference to agriculture?

(iii) How did the vulnerable population and regions get transformed over the period?

(iv) What policy options will be effective in addressing the regional disparities?

Methodology

District level data on different development indicators are collected from the ten districts of Telangana region (Mahbubnagar, Ranga Reddy, Hyderabad, Medak, Nizamabad, Adilabad, Karimnagar, Waranagal, Khammam and Nalgonda), four districts of Rayalaseema (Chittoor, Kadapa, Anantapur and Kurnool), and nine districts of coastal Andhra (Srikakulam, Visakhapatnam, Vizianagaram, East Godavari, West Godavari, Krishna, Guntur, Prakasam and Nellore) from Andhra Pradesh Statistical Abstracts from 1961 to 2011. All the prices are converted into 1999/2000 constant prices by using the wholesale price index series to calculate the changes in per capita income per hectare over the period. The analysis has been done by comparing development indicators like gross value of agricultural production per capita from crops, livestock, net cropped area, irrigation intensity etc. Most of the comparisons are made on per capita terms and ratios which are unit free and comparable over the space and time. Inter-district inequalities are quantified by Gini ratio (GR) and Disparity Index (DI). Population census is used to calculate the number of cultivators and agricultural laborers. Cultivator is defined as 'people whose major share of yearly income comes from farming their own land, while an agricultural laborer is defined as people (aged between 15 and 59 years) whose major share of income is from wages earned by working on others' farms. Simple mean and ratios used for tabulation, and further widely used Gini ratio and Disparity Index have been applied for district level data.

Sectoral composition of income and employment

Andhra Pradesh is one of the largest states in India. The total geographical area of Andhra Pradesh is 27.5 million hectares (mha), of which 39.8% is the net area sown (10.9 mha) with a cropping intensity of 1.26. The average annual rainfall in the state is 940 mm. The state's projected population is 80 million, of which 72% lives in rural areas. Even though about 62.2% of workers are dependent on agriculture, its share in the state Gross Domestic Product (GDP) decreased from about 40% in 1980 to about 17% in 2009. Andhra Pradesh ranked fourth-largest in the country in terms of area; its projected population of 84 million as of 2010 makes it the fifth most populous state. The Government of Andhra Pradesh, in its Vision 2020 document, envisaged a still higher growth rate of 6.0% per annum (Government of Andhra Pradesh 1999) to achieve 10% growth in Gross State Domestic Product (GSDP). Andhra Pradesh's growth rate of GSDP was up 5.27% from 1970 to 2010, while the agricultural sector growth was only 2.88%.

Further, there are significant regional disparities in per capita GSDP with coastal Andhra region being rich and Rayalaseema region with lowest and Telangana region in between. The resilience of the state economy is indicated by the decrease in share of the state's agricultural sector in GSDP from about 56% in 1970 to about 17% in 2009 (Figure 2).

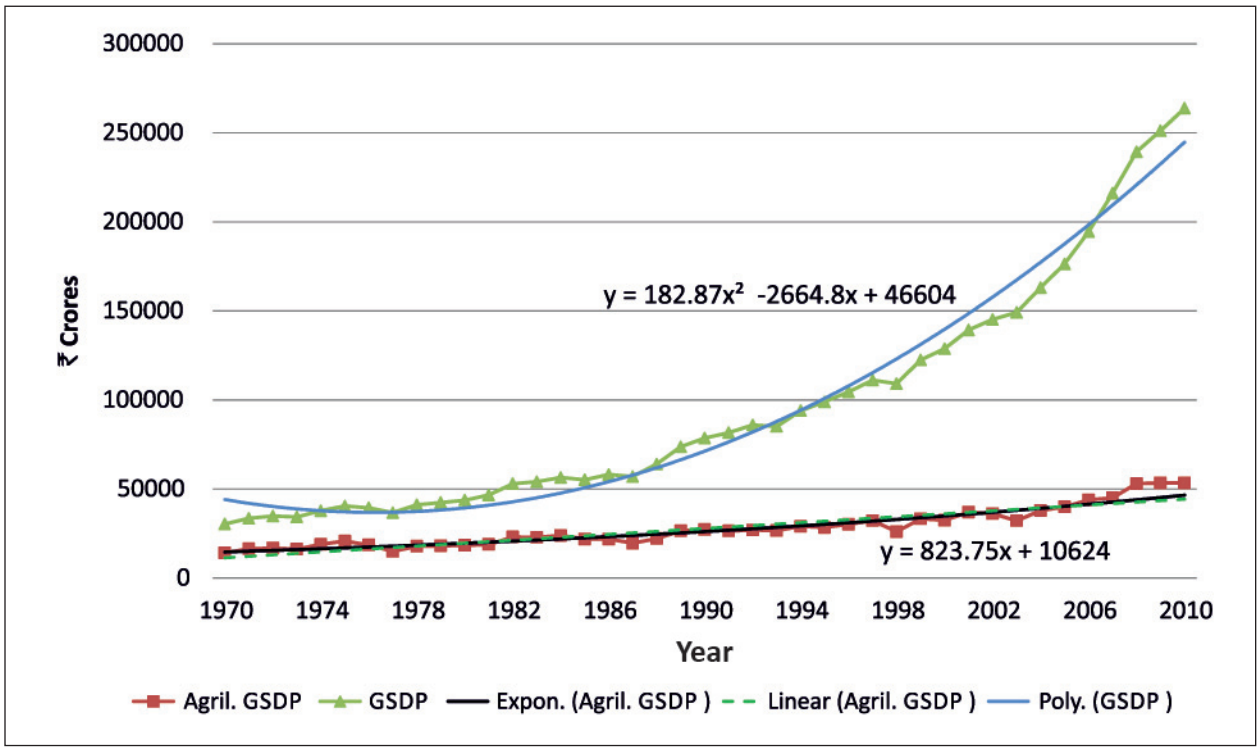

Figure 2. GSDP and agricultural GSDP at 1999-2000 constant prices.

Exorbitant growth of core urban center

Hyderabad is a cosmopolitan urban centre formed about 425 years ago. It is located in the Telangana region of Andhra Pradesh. It constitutes 9.15% of the state population; the second largest city is Vishakhapatnam (only 2.04%), followed by Vijayawada (1.76%), both of which are located in coastal Andhra. In addition to these three cities, about 45 urban centers exist, but with little agglomeration effects. Hence, Hyderabad attracts capital and labor not only from within the state, but also from other states and countries, especially on account of its concentration in IT industry and both public and private service sectors. Hyderabad city also has better public services like primary health centers, roads, educated and more skilled labor, and hence the gulf between Hyderabad and poorer periphery districts has widened. This shifted the power balance in favor of core cities as opposed to peripheral areas which supports Williamson's 1st stage of development.

There is clear evidence that Hyderabad is the largest consumption center. Its 'home market effect' makes it the main growth engine for Andhra Pradesh supporting New Economic Geography (Krugman 1998). This is evident from the share of sales tax collection of Hyderabad, which is 75% of the total sale tax collection of Andhra Pradesh state. Broadly, it can be said that excluding Hyderabad city, the business activity in coastal Andhra was just about 15% of all sales tax collection, followed by 8% tax collection in Telangana (excluding Hyderabad) and just 3% tax collection in Rayalaseema (Table 1). This shows the

Table 1. Consumption and production trends in non-agricultural sectors.

Region	Share of Sales Tax Collection across regions triennium ending 2009 (% of the state)	FDI in AP from 1991 to 2010 (% of AP)	Two wheelers vehicles per 1000 population in 2009	Share of non-agricultural workers in total workforce (%)	Workers with above matriculation qualification (%)	% of above matriculation qualification who are engaged in agriculture	Expenditure per student in govt. degree colleges (average of 2006 to 2010 in Rs)
Hyderabad	75	38.0	252	100	47.9	0	
Coastal Andhra	15	43.2	72	42	8.8	13	11558
Telangana excluding Hyderabad	7.1	13.0	71	38	9	17	7614
Rayalaseema	2.9	5.8	54	38	7.4	24	9192

Source: Srikrishna Committee Report (2011)

importance of Hyderabad as the core consumption center in the state and supports Krugman's NEG theory. In a globalizing world, access to Foreign Direct Investment (FDI) is considered an indicator of economic vibrancy and the future direction of economic growth. Overall, Andhra Pradesh state attracted 124 billion rupees of FDI between 1991 and 2010, of which 51% was invested in Telangana, but with very high concentration in Hyderabad city. The Telangana region excluding Hyderabad has received only 13% compared with 43.2% investments in coastal Andhra. Rayalaseema has received just 5.8% of FDI investments. Notably, Telangana (excluding Hyderabad) received relatively lower amounts of FDI chiefly due to the concentration of investments in Hyderabad city. The following discussion is based on the number of two-wheeler vehicles per one thousand (population) across the region which is a good indicator of economic prosperity, intensity of business activity and social development. The vehicle intensity is greater in Hyderabad. However, Telangana (excluding Hyderabad) and coastal Andhra have uniform intensity, whereas in Rayalaseema there is low intensity of motor vehicles. Kaldor's model predicts that the growth in demand increases productivity and rising productivity induces an increase in competitiveness that leads to an additional increase in demand (Pons-Novell and Viladecans 1999). This is ultimately the basic attraction of the large urban centers like Hyderabad. Some of the benefits of growth of Hyderabad was also captured by people from other regions due to in-migration of entrepreneurial, skilled and highly educated workers who settled in highly-paid information technology and government services from all the regions. Factor mobility will make the supply of factors of production sufficiently elastic that small differences in the size of industry across regions can build up accumulation of capital (Krugman 1998). The higher demand for skilled workers and readily available employment opportunities with less search cost and waiting periods and good public services make Hyderabad city more attractive than other competing small towns. It is also found from other studies that the poverty is less among large cities compared with small towns (Ferre et al. 2012).

Labor demand and supply

Historically, educated people from coastal Andhra migrated to Hyderabad for government employment and investment opportunities in both agriculture and non-agricultural sector. Over the period from 1960s Hyderabad developed exponentially, but most of the gains captured by educated and capitalist

coastal Andhra people, while the Telangana people remained backward. While people from Rayalaseema region dominated politics of undivided Andhra Pradesh, as since for the last five decades most of the chief ministers are from the Rayalaseema. The benefits of development of Hyderabad hardly benefited Telangana people since early 1960s. The share of non-agricultural workers is higher in coastal Andhra (42%), but less (38% each) in both Telangana and Rayalaseema in 2007–2008 (NSSO 2010). In Hyderabad, 100% of workers depend on the non-agricultural sector. Rayalaseema has a much larger share of farmers than agricultural laborers, which is due to low productive land and relatively poorer households who own unproductive land for subsistence survival. The opposite is true for coastal Andhra (Reddy 2011). About 47.9% of workers are educated (above matriculation level) in Hyderabad, while this ranges between 7% and 9% in all three regions. Even though the share of highly educated (above matriculation level) engaged in agriculture is low, there is significant regional variation ranging from 13% in coastal Andhra to 24% in Rayalaseema, with the lowest reported in Hyderabad (Srikrishna Committee Report 2011). This indicates the lower employment opportunities in non-agricultural occupations for the highly educated in Rayalaseema region. It is interesting to note that the expenditure per student is higher in coastal Andhra followed by Rayalaseema and Telangana, which indicates the perceived higher returns to education. Therefore greater investment in human capital in the developed region reinforces regional disparities.

Figure 3 presents district-wise decadal population growth in Andhra Pradesh from 2001 to 2011 (Population Census 2011). In general, the male population in urban areas increased much faster than the rural areas. The districts close to Hyderabad city (which actually fall under the Hyderabad Metropolitan Developmental Authority) such as Ranga Reddy, Medak, Mahbubnagar and Nalgonda, showed a higher

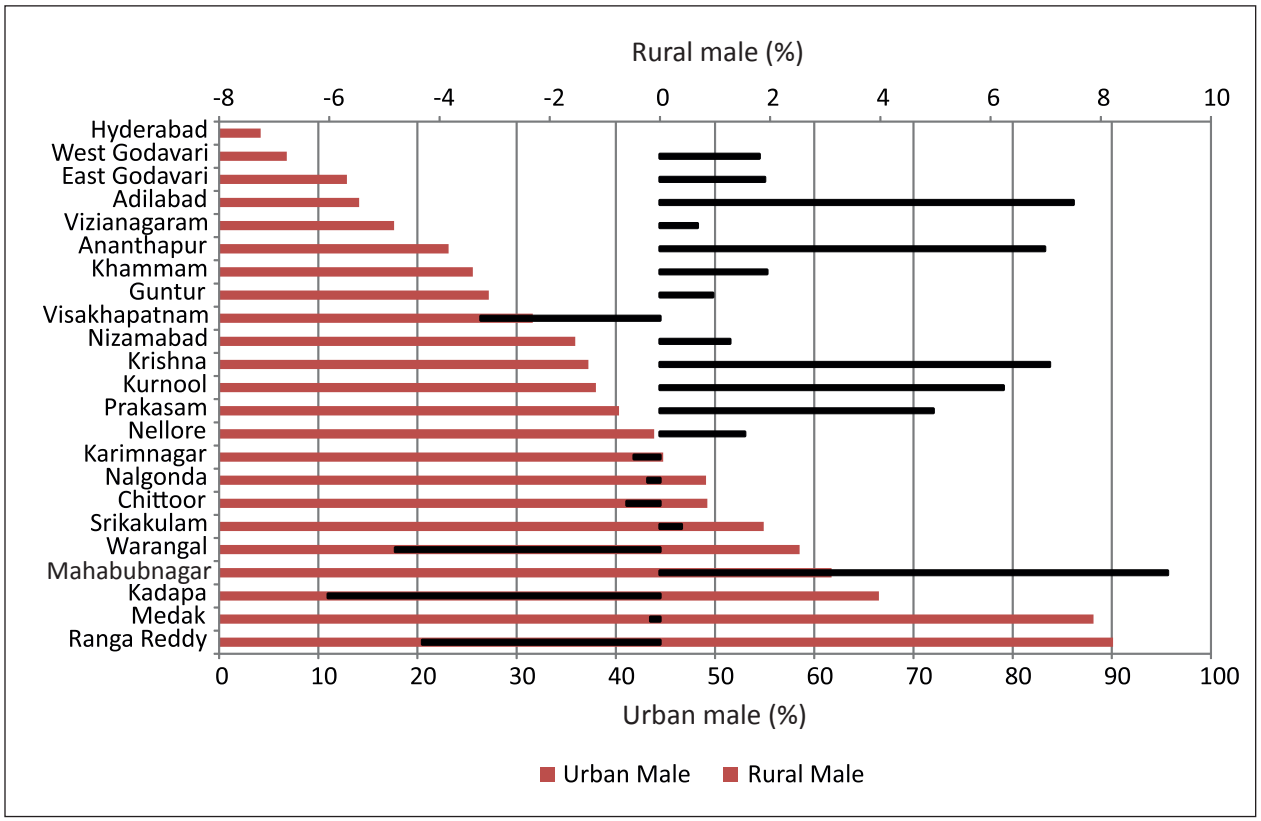

Figure 3. District-wise decadal growth rate of population 2001-2011.

increase in decadal growth rate of the male urban population. It is also interesting that some of the most prosperous districts such as East Godavari and West Godavari showed much less increase in the urban-male population along with remote districts like Adilabad, Vizianagaram and Anantapur.

Most of the high-growth industries generate employment particularly in large urban centers and mostly among males; and the majority of rural workers migrated to urban centers to acquire the necessary skills and were absorbed into the industries. Construction, followed by textiles, IT and ITES, health care, tourism, drugs and pharmaceuticals, banking and insurance, engineering, mines and minerals, food processing, chemicals and fertilizers, and biotech are some of the growing industries in that order, which absorb large employees mostly in urban and semi-urban areas (Table 2). And the largest growth is expected from IT and ITES, biotech, healthcare, textiles, engineering and pharmaceuticals by 2015.

Table 2. Human resource requirements in Andhra Pradesh for high growth industries.

Key industries	Employment in 2011 (in 000)	Projected employment by 2015 (in 000)	Incremental growth (%) in human resources requirement till 2015
Construction	2200	4210	48
Textiles	745	1826	59
IT and ITES	152	893	83
Healthcare	290	850	66
Tourism	851	1366	38
Pharmaceuticals	230	478	52
Banking and Insurance	135	268	50
Engineering	99	215	54
Mines and Minerals	114	225	49
Food Processing	198	280	29
Chemicals and Fertilizers	87	131	34
Biotech	5	24	79
Paper	21	33	36

Source: Government of Andhra Pradesh 2011.

Regional policies and public and private sector investment

Region-wise disaggregation of revenue and expenditures is given in Table 3**.** The share of the largest urban center (Hyderabad) in the state's revenue is nearly 50%, followed by Telangana, and then coastal Andhra and Rayalaseema. It shows that the urban center and its surrounding districts are contributing a larger chunk of state revenues, while the share of the agricultural-based regions is negligible. However, when it comes to state expenditure distribution is more egalitarian. This signifies the role of state and public policy especially in less developed regions.

In Telangana, the total connected load (Watt) of electricits has increased from 48.7 W in 1971–1972 to 463 W in 2008–2009, while in Rayalaseema and coastal Andhra it has increased from 69.1 W to 344.6 W and 58.5 W to 436.9 W respectively (Table 4). This shows that total per capita connected load for Telangana region was the highest compared with coastal Andhra or Rayalaseema from 1999 onward. It

also means that the demand for electricity in Telangana region is higher compared with other regions and the electricity department is meeting the demand. In Telangana, agricultural power consumption in kWh per capita is high compared with Rayalaseema and coastal Andhra regions. The electricity supply for the agricultural sector is provided at highly subsidized rates in the state. The higher power consumption in Telangana is attributed to the dominance of tube-well irrigation which requires electricity to pump water from deeper soils (through private investment), unlike canal irrigation (which flows through gravitation and does not require electricity) in coastal Andhra. The public spending in health and electricity indicates that public investment is more egalitarian, and in many cases helped reduce regional disparities since the early 1970s.

Table 3. Regional share in revenue from important taxes & non-taxes and expenditure on important services (%).

	Revenue from four sources					Expenditure on eight services				
Year	Hyderabad	C	T	R	AP	Hyderabad	C	T	R	AP
2004	34	20	41	5	100 (139.0)	3	33	44	20	100 (65.4)
2005	47	20	28	5	100 (170.6)	2	29	48	21	100 (84.1)
2006	47	18	30	5	100 (199.4)	1	30	49	20	100 (126.2)
2007	46	18	31	5	100 (197.3)	1	27	48	24	100 (109.0)

Sources: Andhra Jyothi Online, Hyderabad March 23, 2007; Vaartha, April 15, 2008; and Socio-Economic Survey of Andhra Pradesh 2007-08.

Notes

1. The four income sources of revenue are: Sales Tax, State Excise, Stamps & Registration and Transport.
2. The eight important expenditure services are: Agriculture, Rural Development, Irrigation, Education, Medical & Health, Water Supply & Sanitation, Housing and Welfare (SC, ST and BC & Minorities).
3. Figures in brackets are Rs Billion.

Table 4. Region wise public sector investment in health and electricity consumption.

	No. of Primary Health Centers (PHCs) per million rural population		Total connected load (Watt/capita)		Agricultural power consumption in KWH/capita	
Region	1999	2009	1972	2009	1972	2009
Coastal Andhra	27.5	25.1	58.5	436.9	11.1	82.3
Telangana	29.4	25.3	48.7	463.0	9.7	256.5
Rayalaseema	33	26.9	69.1	344.6	22.6	237.7

Source: Srikrishna committee report, 2011.

Sectoral share in GDP

In the growth of the non-agricultural sector in recent years, Hyderabad's share is huge with negligible contribution from other regions. In triennium ending (TE) 2008, the service sector contributed to about 45% of GDP in Andhra Pradesh, while its share is 82% in Hyderabad (Figure 4). Agriculture contributed to about 24% of GDP in Telangana, 29% in coastal Andhra and 27% in Rayalaseema. The growth rate of GSDP of AP was 5.3% per annum between 1970 and 2010 mainly driven by the service sector from Hyderabad. Faster growth in the non-agricultural sector compared with the agricultural sector for an extended period and concentration of the service sector in core cities resulted in increased regional disparities in income between core (urban centers) and periphery (rural). Urbanization is higher in Telangana (31% of the population lives in urban areas in Telangana including Hyderabad), followed by coastal Andhra (25%) and Rayalaseema (23%) regions (Reddy and Bantilan 2013). Districts surrounding

the large urban center (Hyderabad) in Telangana are experiencing exponential growth in per capita income from the non-agricultural sector due to rising prosperity and a fast-growing urban population due to 'home market effect' (Reddy 2011). It is also indicated that the higher growth of Hyderabad (core region) is not sufficient to increase per capita incomes of the remote peripheral districts, namely Adilabad, Nizamabad and Karimnagar within Telangana. The per capita income in coastal Andhra is higher than Telangana (excluding Hyderabad) region, but Telangana has shown faster growth since 1999 due to the spread effects of Hyderabad (Figure 5). Rayalaseema region is far behind both the coastal Andhra and Telangana regions. Per capita income is less in Rayalaseema as there is no 'home market effect' due to less population density, lower productive agriculture and less purchasing power; and there is also no large urban center to support economic activity. Per capita income both from agriculture and non-agriculture sectors is higher in coastal Andhra, which indicates that the agricultural income complemented non-agricultural income through backward and forward integration and accumulation of consumption power among people. Only coastal Andhra benefited from productivity enhancing technology in the green revolution period (paddy) and the commercialization of agriculture (such as fruits and vegetables, milk and meat products) due to its initial better resource endowment and subsequent public and private investment in the agricultural sector. In this region, the non-agricultural growth was pro-poor as initial conditions such as higher literacy, higher farm productivity, cultivation of labor intensive crops and higher socio-economic and cultural capital combined with the entrepreneurial attitude of the people favored egalitarian growth (Pike et al. 2006; Ravallion and Datt 2002).

Population and literacy

Given that population and literacy rates are an indicator for the human development in a region, Table 5 presents the trends in population and literacy across three regions from 1971 to 2011. In coastal Andhra

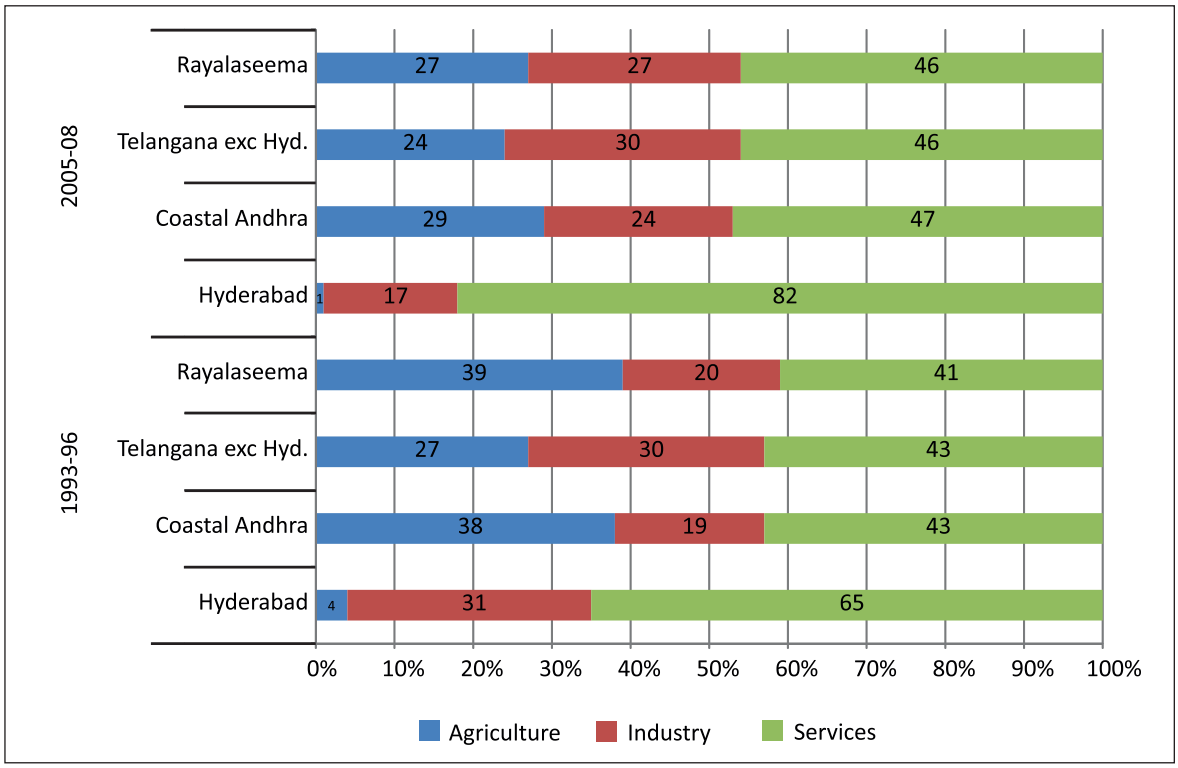

Figure 4. Sectoral share of SGDP.

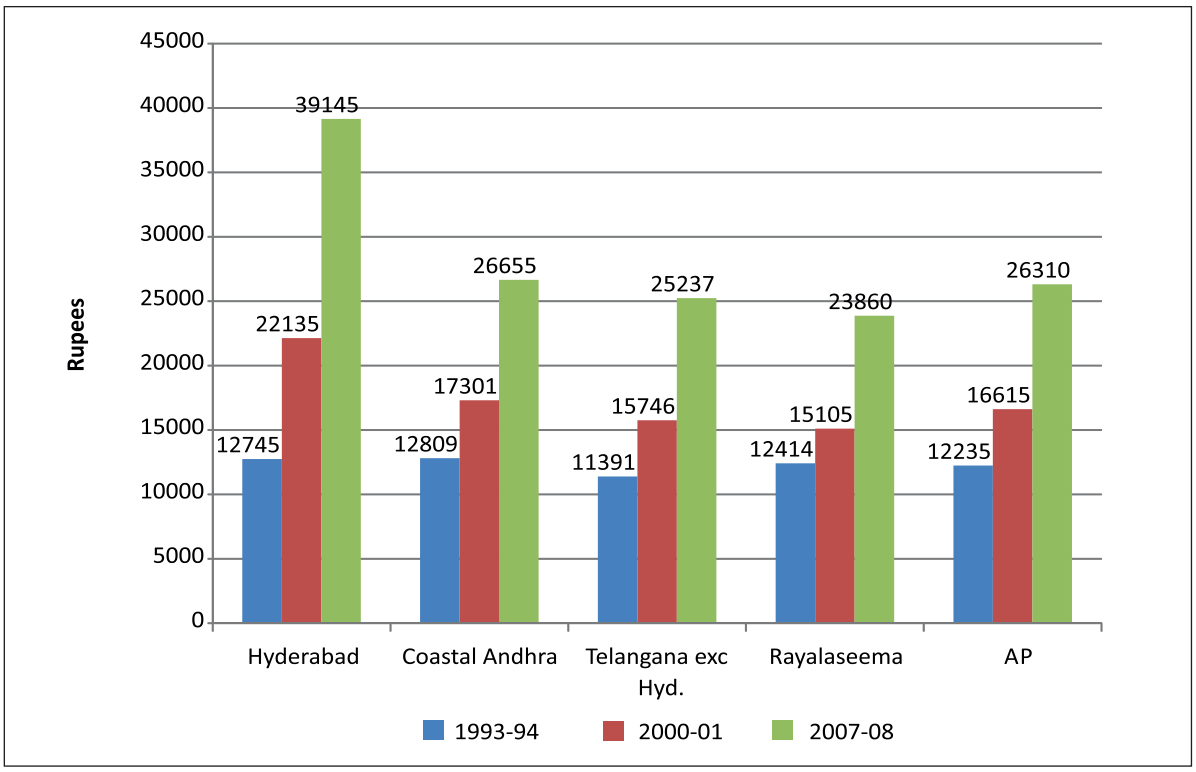

Figure 5. Per capita district domestic product at 1999-2000 constant prices.

population rose from 19.4 million to 33.7 million from 1971 to 2011. In Telangana it increased from 15.8 million to 35.3 million and in Rayalaseema from 8.3 million to 15.7 million during the same period. The steep increase in the population in Telangana shows migration of populations from other regions to Hyderabad in search of employment and livelihood. The same is reflected in the higher growth of urbanization and population density in Telangana compared to the other two regions. In the initial years, rural literacy was higher in coastal Andhra and Rayalaseema; over the period Telangana has improved its position, but literacy rates are still lower here compared to the other two regions. Sex ratio is higher in coastal Andhra since the beginning, whereas it is less in Telangana and Rayalaseema, reflecting the socio-economic backwardness and higher gender discrimination (mainly due to feudal structures) of these regions compared to coastal Andhra.

Regional disparities in educational and human development indicators

A comparison of different regions in Andhra Pradesh on a host of educational indicators surprisingly points to convergence even as back as 1980-81 albeit with few exceptions. Table 6 and Table 7 list a few select indicators on the status of school education[1] in the three regions of the state since 1980. The indicators selected present include, (i) number of schools per 10000 population, (ii) pupil teacher ratio, (iii) number of teachers per school, (iv) ratio of primary sections to upper primary sections, (v) ratio of upper primary sections to high schools, (vi) share of schools by management (regional dimension

1. School education in Andhra Pradesh consists of 10 years of general education of which 5 years are spent at the primary stage (grades I-V), two years at the upper primary stage (grades VI-VII) and three years at the high school state (grades VIII-X). The national pattern is five years for the primary stage, three years for the upper primary stage and two years at the lower secondary stage. Schools affiliated to the state government fall into three categories, viz, primary schools with grades I-V, upper primary schools with grades I-VII and high schools with grades VI-X. Schools affiliated to national boards such as CBSE can run grades I-V, I-VIII, I-X or even I-XII.

Table 5. Trends in population statistics from 1971 to 2011.

Region	Year	Population (million)	Population density (per km^2)	Urbanization (%)	Rural population (%)	Rural Literacy (%)	Rural literacy – males (%)	Rural literacy – females (%)	Sex ratio
Coastal Andhra Pradseh	1971	19.4	216	19.2	81	23	31	16	995
	1981	23.4	260	23.0	77	27	35	19	991
	1991	28.3	315	25.6	74	33	41	25	986
	2001	31.1	346	24.7	75	52	59	45	988
	2011	33.7	374						1000
Telangana	1971	15.8	137	21.1	79	14	21	6	981
	1981	20.2	176	25.3	75	18	27	9	987
	1991	26.1	227	30.2	70	24	35	14	978
	2001	30.7	267	31.4	69	43	53	32	984
	2011	35.3	307						985
Rayalaseema	1971	8.3	118	16.2	84	20	31	9	963
	1981	10.0	143	20.1	80	25	37	13	963
	1991	12.1	174	22.9	77	33	44	20	956
	2001	13.9	200	22.9	77	49	60	38	970
	2011	15.7	224						986
AP	1971	43.4	158	19.3	81	19	27	11	984
	1981	53.6	195	23.3	77	23	32	14	984
	1991	66.5	242	26.9	73	30	39	20	977
	2001	75.7	276	27.1	73	48	57	39	983
	2011	84.7	308						991

source: Districi information system for education; www.dise.in (as in march 2014), census of India.

in privatization), (vii) proportion of children who reach grade V, and (viii) proportion of graduates in the total population. District level data are aggregated by three regions and also Telangana leaving out Hyderabad and Ranga Reddy districts.

As Table 6 denotes, there has been a steady growth in the provision of educational facilities across all three regions since 1980, particularly at the upper primary and high school levels. The availability of schools measured as number of schools per 10000 population is skewed in favor of Telangana compared to coastal Andhra and Rayalaseema with a few exceptions. A result which may perhaps be attributed to the density of population of different regions. The policies in the state for the education sector[2] such as establishment of schools within a radius of one km from each habitation cluster, establishment of secondary schools to increase access etc may have helped in closing the gap between three regions in this matter. The Pupil: Teacher Ratio (PTR) is seen as proxy indicator for quality. A healthy improvement in PTR is noted between 1980-81 and 2010-11. The PTR has come down to 31 in 2010-11 from a high of

2. Several initiatives taken during the last three decades: Operation Black Board (OBB) during the mid-1980s, District Primary Education Programme (DPEP) in the early 1990s, Sarva Shiksha Abhiyan (SSA) to increase access to and participation in education with a focus on educationally backward districts.

Table 6. Region-wise development of school education in Andhra Pradesh.

		Primary				Upper Primary				High Schools			
Indicator	Year	Coastal Andhra	Rayalaseema	Telangana	Telangana excl. Hyd and Ranga Reddy	Coastal Andhra	Rayalaseema	Telangana	Telangana excl. Hyd and Ranga Reddy	Coastal Andhra	Rayalaseema	Telangana	Telangana excl. Hyd and Ranga Reddy
Number of schools per 10000 population	1981	8.2	9.5	5.9	6.5	0.8	0.7	1.0	1.0	0.7	0.7	0.8	0.8
	2001	10.7	13.0	8.9	9.9	1.3	1.9	2.7	2.4	1.4	1.8	2.6	2.4
	2011	7.9	8.8	7.5	8.6	1.7	2.0	1.8	2.1	1.7	2.0	2.8	2.9
Pupil : Teacher ratio	1981	52.5	43.9	41.5	43.7	39.3	29.7	36.9	37.4	27.0	21.9	25.9	23.8
	2001	42.9	35.6	49.0	48.0	42.1	31.7	36.3	38.1	36.5	29.0	33.6	33.9
	2011	29.3	26.1	33.1	31.8	23.6	21.7	25.9	25.3	26.7	21.9	26.1	26.0
Number of teachers per School	1981	2.2	1.8	1.8	1.6	7.8	6.9	7.8	7.1	15.1	13.2	16.8	14.6
	2001	2.5	2.3	2.3	2.3	6.6	6.9	6.7	6.9	11.6	12.0	13.8	11.7
	2011	2.4	2.3	3.0	2.6	6.1	5.6	6.1	5.8	12.3	11.3	10.0	9.6
Schools by management in 1980-81	Govt.	90.7	97.5	97.4	98.4	85.6	89.2	85.9	92.9	81.1	89.3	83.0	90.8
	Aided	8.8	2.2	1.3	1.0	12.8	9.2	6.0	3.4	16.7	9.5	10.7	6.1
	Unaided	0.4	0.3	1.4	0.6	1.6	1.6	8.1	3.8	2.2	1.2	6.3	3.2
Schools by management in 2010-11	Govt.	88.0	89.0	81.0	86.0	60.0	62.0	54.0	60.0	61.0	60.0	51.0	60.0
	Aided	5.0	2.0	2.0	1.0	4.0	2.0	2.0	1.0	6.0	4.0	3.0	2.0
	Unaided	7.0	9.0	17.0	13.0	36.0	36.0	44.0	39.0	32.0	36.0	45.0	38.0

Source: District information system for education; www.disc.in (as in mMarch 2014), census of India.

50 in 1980-81 for primary schools, indicating the success of policy prescriptions. Similar improvements can be seen in the case of upper primary and high schools in all three regions. Further, no significant disparities in PTR could be discerned between regions. This may be due to policy prescriptions in appointment of teachers subsequently leading to some uniformity across the regions of the state. The patterns with respect to the number of teachers per school portray very moderate regional disparities. For example, in Telangana (not counting Ranga Reddy and Hyderabad) and Rayalaseema, there are 11.3 and 9.6 teachers per high school compared to 12.3 in coastal Andhra. The disparities with respect to upper primary schools are also not severe. Further, the number teachers per school increased at the primary level but declined at upper primary and high school levels[3]. The decline appears to be some what sharper in case of high schools in Telangana. Clearly this implies that teacher recruitment is uneven across regions and is not keeping pace with increase in enrolment. The relative size of upper primary and high school levels helps us gauge the opportunities available to continue education beyond primary levels. Usually the ratio of primary schools to upper primary schools and the ratio of upper primary schools to high schools are used to examine the opportunities available at upper primary and high school levels respectively. The norm with respect to ratio of primary to upper primary schools is 2.5. Trends in the ratio of primary to upper primary schools suggest that all the three regions are converging to this norm making regional disparities nearly negligible. Similarly no regional disparities are found with respect to ratio of upper primary to high schools. There seems to be a regional dimension in privatization of school education. During 1980s school education was dominated by government schools followed by private aided (private schools that receive financial assistance from government to the extent of 95% of annual recurring expenditure) and private unaided. Much of private efforts that receive state support in school education are concentrated in coastal Andhra region. Much of schooling in Rayalaseema and Telangana (to the extent of 97% of schools) is managed by the government. However, with sweeping changes in the Indian polity following the adoption of liberal policies in 1990s, the private unaided sector (ie, which does not receive any assistance from the government) increased manifold. The private unaided sector increased steeply in all regions. For example, the share of private unaided schools in total high schools increased from 3.7 percent in 1980-81 to 40 percent in 2010-11 in Andhra Pradesh. Correspondingly the share of government schools fell from 83 percent to 56 percent during the same period. The increase in the private unaided sector appears to be sharper in Telangana region during this period. The share of government schools fell from 81 percent to 60 percent in coastal Andhra whereas in Telangana sans Hyderabad and Ranga Reddy it is from 90 percent to 60 percent during the same period. This implies that provision for the public is inadequate in Telangana or of poor quality.

The regional disparities in school education – at least in the provision of schooling – appear to have been muted to a large extent through policy interventions and norm based provisioning. However, whether this provision has resulted in outcomes/outputs without regional disparities is a moot question. Though non-availability of relevant data restricts further analysis, an attempt is made by looking at the proportion of children who reach grade V. Enrolment in grade V as proportion of grade I enrolment five years back is used as proxy indicator for this. The data availability restricts the analysis only to 2010-11 and 2011-12. There are large regional disparities in the year 2011-12. In Telangana only 77 percent of children who started grade I in 2007-08 reached grade V in 2011-12 compared to 97 in coastal Andhra and 88 in Rayalaseema. However data of the year 2010-11 does not corroborate this. The huge variation in data between two consecutive years raises questions about the reliability of data. In the light of this, no meaningful inferences could be drawn.

3. It is possible that the increase in the number of schools might have dispersed enrolment across many schools resulting in decline of school sizes. As the number of teachers in a school critically depends on enrolment, the number of teachers has also come down.

Table 7. Region-wise development of school education in Andhra Pradesh.

	Ratio of primary to upper primary schools/sections			Ratio of upper primary to high schools/sections			Grade V Enrolment in 2010-11 as % of Grade I Enrolment in 2006-07	Grade V Enrolment in 2011-12 as % of Grade I Enrolment in 2007-08	Graduates and above as per cent of total population	
Region	1981	2001	2011	1981	2001	2011			1991	2001
Coastal Andhra	6.30	4.5	2.8	2.19	1.9	1.4	83	77	1.14	3.51
Rayalaseema	7.26	4.1	2.7	2.05	2.1	1.5	85	97	1.00	3.19
Telangana	3.82	2.2	2.0	2.32	2.1	1.4	80	88	1.57	4.14
Telangana excl Hyd and Ranga Reddy	5.03	3.0	2.2	2.35	2.0	1.4	83	76	0.84	2.35

The educational attainments of the population is another proxy indicator commonly used to examine regional disparities in the spread of education. Ascertaining the percentage of population who are graduates and above is thought to better represent educational attainment of a population. Data from Census 1991 and 2001 census was used to calculate this indicator. Regional disparities are acutely revealed on deploying this indicator. Regional disparities in educational attainment of the population are high and persisting. For example just 2.6 percent of population in Telangana (excluding Hyderabad and Ranga Reddy) have completed graduation compared to 3.5 percent in coastal Andhra and 3.19 in Rayalaseema in 2001. This establishes that Telangana is still relatively backward in this area unless the data from 2011 census (which is yet to be released) reverses the trends.

From this it can be said that overt regional disparities in terms of availability of schools, and human resources and infrastructure facilities were reduced to negligible levels. Partly norm-based public provisioning appears to have brought the regions on equal footing Reddy 2013. Notwithstanding this, examination of trends by districts reveal clusters of districts in each region still lagging behind other, although this could not be explored more fully here. Further, regional disparities are acute in terms of educational qualifications of the population.

Land use pattern, geographical advantage and agricultural growth

Palmer-Jones and Sen (2003) have stressed the importance of initial conditions in determining the rate of agricultural growth in rural India. In Telangana, only 40% of the total geographical area is used for agriculture and a large portion (23% of total geographical area) is fallow land (cultivable, but not cultivated in the reporting year). This large area of fallow land in Telangana is a sign of neglect of the agricultural sector and lack of investments in land development measures over the last five decades (Figure 6). Agricultural development of a region is dependent on the investments in the development of irrigation facilities. The higher irrigated area in coastal Andhra can be attributed to higher public investments in irrigation, which is facilitated by lower gradient and higher rainfall (1100 mm) compared with Telangana (900 mm) and Rayalaseema (772 mm) regions. The success of green revolution technology hastened by irrigation facilities in coastal Andhra cannot be replicated in regions that are not geographically similarly advantaged (Pike et al. 2006). This in turn could explain the poor growth in agriculture of Rayalaseema region to a large extent. The poorer districts of Rayalaseema and Telangana require quite different policy interventions such as encouraging less water-intensive rainfed crops,

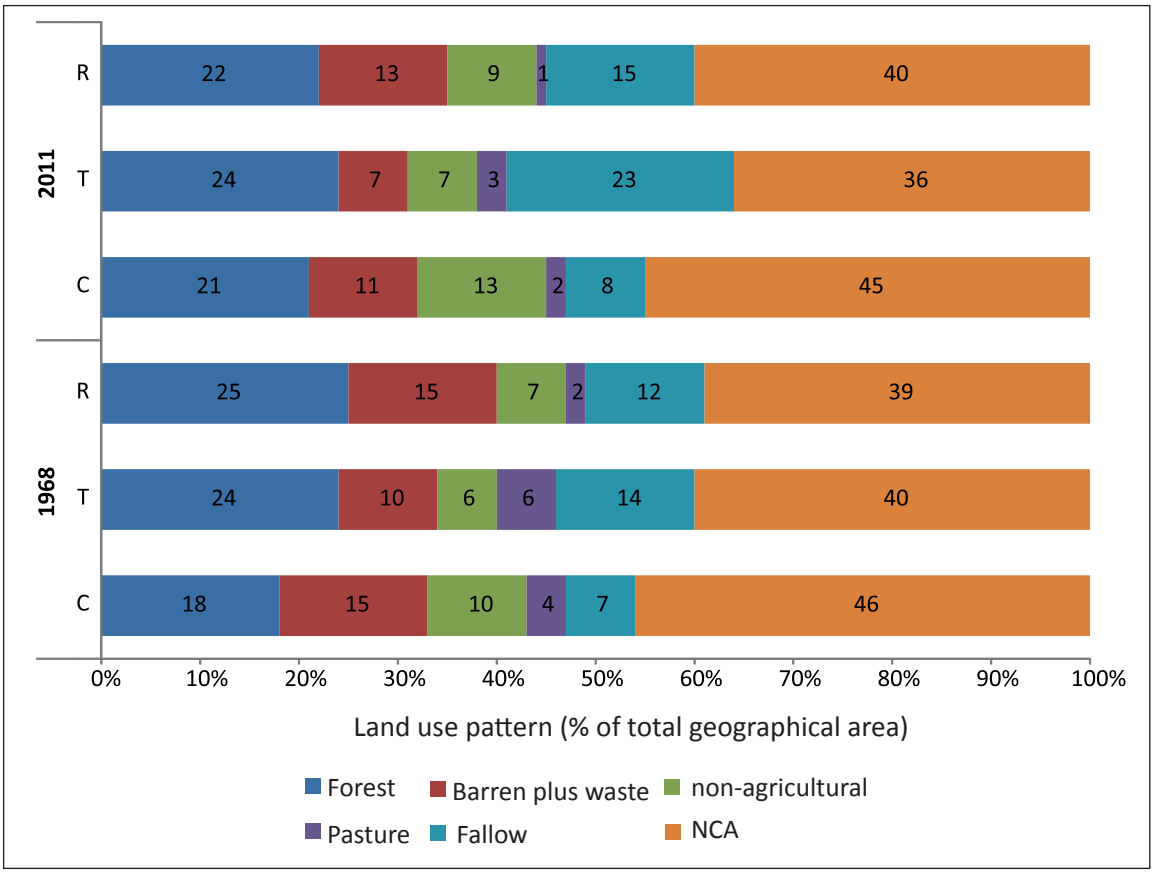

Figure 6. Land use pattern (% of total geographical area).

livestock and non-agricultural employment. Telangana is located in the Deccan Plateau, which, with its higher altitude, is difficult terrain for the construction of canal irrigation and makes it a more expensive proposition. This increases the cost of providing irrigation per unit area, in turn increases the cost of production and reduces competitiveness and profitability of the farm sector.

Trends in agrarian structure

The trends in agrarian structure will determine to a large extent technology adoption, land productivity and farm mechanization. In this section, the share of marginal and small farmers, the extent of farm mechanization among different categories of farmers and the number of cultivators and agricultural laborers are elucidated to understand the structure of the agrarian economy. Given that the population density is higher in coastal Andhra and land is highly productive, landholdings are small and the share of marginal and small farmers is much higher (Figure 7). Over the period the share of marginal and small farmers increased steeply. Given that Rayalaseema is mostly drought-prone, the population density is small; the average landholdings are high, but are less productive. Many studies point out that even though average farm size is less in coastal Andhra, land productivity is higher than the other two regions. As the ownership of the land is rigid over the period, the land lease markets are increasingly active. Most of the times small and marginal farmers lease land from landlords and there is a tendency of reverse tenancy (as in, large farmers leased in land from small and marginal farmers) to cultivate crops suitable for mechanization (in which they reap scale economies) such as chickpea, paddy and soyabean. Small

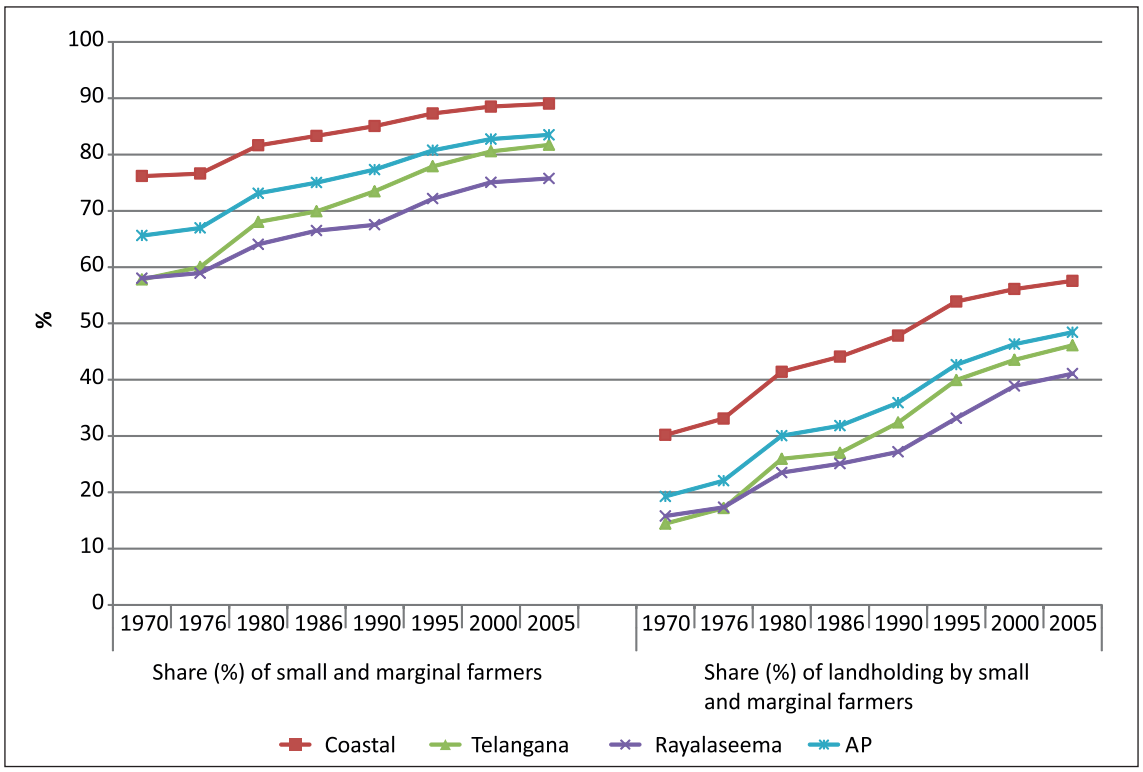

Figure 7. Small and marginal farmers.

and marginal farmers are either engaging as casual laborers or migrating to urban centers to get higher wages and adopt higher living standards.

It is interesting to see that the tractor-drawn implements, power tillers and tractors per 1000 hectare are higher among small and marginal farmers; however, the same statistics per 1000 households is higher among large farmers in general (Table 8). It is interesting to see that even small farmers own a significant number of tractors in Andhra Pradesh. This shows significant mechanization across all the size groups,

Table 8. Farm mechanization by farm size group.

Size group (hectares)	Number of farmers ('00000)	Area ('00000 ha)	Average area per holding (ha)	Tractor-drawn implements per 1000 ha	Power tiller per 1000 ha	Tractor per 1000 ha	Tractor-drawn implements per 1000 hh	Power tiller per 1000 hh	Tractor per 1000 hh
Marginal (<1.0)	61.0	31.3	0.51	743	65	769	381	33	395
Small (1.0 - 1.99)	21.7	31.1	1.43	312	26	289	448	38	414
Semi-medium (2.0 - 3.99)	13.5	38.0	2.81	159	14	135	446	41	379
Medium (4.0 - 9.99)	5.3	31.4	5.92	89	8	64	526	47	377
Large (10 & >)	0.7	10.6	14.27	39	3	23	559	47	327
All groups	102.3	142.4	1.39	296	26	284	413	36	395

Input Survey 2006-2007

which is a recent phenomenon. This has significant influence on many aspects of rural lives, mainly on labor supply, labor productivity, cropping pattern and wage rates.

Region-wise distribution of cultivators and agricultural laborers are presented in Table 9. There is a steep increase in cultivators from 488 to 840 per 1000 ha in Telangana, whereas in coastal Andhra, the number of agricultural laborers increased steeply from 844 to 1701 per 1000 ha. Again the number of cultivators and agricultural laborers per 1000 ha were less in Rayalaseema and Telangana compared to coastal Andhra. It indicates that even though mechanization is widely practiced in coastal Andhra, it did not replace human labor, instead it replaced bullock labor in wide areas of paddy growing areas. The recent introduction of and spread of SRI rice cultivation, wider use of tractors in land preparation, leveling and harvesting and threshing of paddy and other commercial crops such as chickpea replaced bullock labor significantly.

Land productivity

The value of agricultural production (including crop and livestock) per unit area is an important development indicator which reveals not only land but also labor productivity of a region. The value of crop production per hectare (Rs/ha) is higher in coastal Andhra and increased faster than the other

Table 9. Cultivators and agricultural laborers per 1000 ha of net cropped area.

		Cultivators			Agricultural laborer		
		Male	Female	Total	Male	Female	Total
Coastal Andhra	1971	506	93	599	467	376	844
	1981	594	150	744	529	472	1001
	1991	530	178	708	705	632	1337
	2001	504	209	713	886	847	1733
	2011	491	210	701	870	830	1701
Telangana	1971	381	107	488	204	242	446
	1981	475	169	644	255	323	577
	1991	549	253	801	386	523	909
	2001	548	305	853	460	676	1136
	2011	534	306	840	458	670	1128
Rayalaseema	1971	336	64	400	225	216	442
	1981	431	124	554	277	296	573
	1991	425	153	578	344	372	716
	2001	425	221	646	420	516	937
	2011	428	228	656	431	525	956
AP	1971	409	91	501	294	278	572
	1981	504	152	655	351	366	717
	1991	510	201	710	487	522	1009
	2001	500	250	750	596	693	1289
	2011	491	252	744	595	688	1283

regions (Table 10). Interestingly the value of crop production per hectare in Telangana was lower than Rayalaseema until 2001, but later surpassed it. The steep increase in land productivity in Telangana after 2001 is mainly due to the increased productivity of paddy and an increase in area under improved Bt cotton (biotech-based crop varieties) varieties which are high yielding as well as resistant to pests and diseases. Again the value of livestock production increased steeply in Telangana mainly driven by the growing urban demand for meat and milk products. Overall, the figures indicate that, there is a significant convergence of agricultural development among medium developed and developed regions, but left behind the least developed regions (ie, Rayalaseema) in the development process. Value of livestock products significantly increased in Telangana compared to coastal Andhra. Overall, the growth of livestock products is higher in and around major urban centers and high-income regions, which shows that the production of livestock is more dependent on demand factors than supply factors. After taking both crop and livestock value per hectare, coastal Andhra is far ahead of Telangana and the gap between Telangana and Rayalaseema is decreasing over the period.

The districts have been grouped into high, medium and low in terms of agricultural/livestock production (in value terms) in 1956 as well as 2010. The movement of districts in terms of the value of agricultural products (from high to low and vice-versa) from 1956 to 2011 is presented in Table 11. The highest positive shift (from low to high) has taken place in the case of Warangal in agriculture, and in Hyderabad and Medak in the production of livestock. East Godavari, Guntur, West Godavari remain high-cluster in agriculture, while Chittoor, East Godavari and Visakhapatnam remain high-cluster in livestock.

Table 10. Trends in the value of agricultural production (Rs/ha/annum) at constant prices (2011).

Year/Item	Coastal Andhra	Telangana	Rayalaseema	AP
Crop Production				
1961	18710	10363	16861	15356
1971	22703	11941	18873	18015
1981	27184	14819	20179	21207
1991	38012	18986	26695	28632
2001	44131	27359	32947	35549
2011	44815	32594	31566	37570
Livestock production				
1961	1046	823	1031	964
1971	1795	1760	1493	1722
1981	3049	3147	2264	2932
1991	4195	4332	2946	4002
2001	5165	5319	3516	4905
2011	5669	5810	3869	5377
Agricultural production				
1961	19755	11188	17894	16319
1971	24498	13703	20368	19737
1981	30236	17969	22443	24139
1991	42207	23319	29641	32635
2001	49296	32678	36463	40454
2011	50484	38404	35435	42948

Table 11. Shift of districts in relative position in agricultural and livestock production between 1956 and 2010.

Shift from	Agriculture	Livestock	Agricultural and allied
High to low	Nizamabad (T) Srikakulam (C)	Kadapa (R) Srikakulam (C)	Nizamabad (T) Srikakulam (C)
Medium to low	Kadapa (R) Nellore (C)	Kurnool (R) Mahbubnagar (T)	Anantapur (R) Kadapa (R) Mahbubnagar (T)
High to medium	Anantapur (R) Chittoor (R)	Nalgonda (T) Nellore (C)	
Low	Hyderabad (T) Medak (T)	Adilabad (T) Anantapur (R) Nizamabad (T)	Hyderabad (T) Nellore (C)
Medium	Mahbubnagar (T) Nalgonda (T)	Karimnagar (T) Krishna (C) Warangal (T)	Kurnool (R) Nalgonda (T)
High	East Godavari (C) Guntur (C) West Godavari (C)	Chittoor (R) East Godavari (C) Visakhapatnam (C)	East Godavari (C) Guntur (C) Vishakapatnam (C) West Godavari (C)
Low to high	Warangal (T)	Hyderabad (T) Medak (T)	
Low to medium	Adilabad (T) Karimnagar (T) Khammam (T)	Khammam (T)	Adilabad (T) Karimnagar (T) Khammam (T) Medak (T) Warangal (T)
Medium to high	Krishna (C) Kurnool (R) Visakhapatnam (C)	Guntur (C) West Godavari (C)	Chittoor (R) Krishna (C)

C=Coastal Andhra; T=Telangana; R=Rayalaseema

Significant downward movement is recorded for Nizamabad and Srikakulam in agriculture, for Kadapa and Srikakulam in livestock products. In agriculture Hyderabad and Medak remained in the low clusters, while in the case of livestock Adilabad, Anantapur and Nizamabad remained low-cluster, as they are far away from large urban centers. It shows that, irrespective of regions, some districts moved from low to high and vice versa; however, most of the coastal and Telangana districts and districts surrounded by large urban conglomerates shifted from low to high, while Rayalaseema districts and districts located far away from urban areas, especially those with unfavourable agro-climates shifted from high to low clusters. However, Hyderabad and Medak remained low throughout the period as predominantly land in these districts is allocated to urban growth (real estate, residential and industrial growth).

Cropping pattern

One of the important driving forces in differences in land productivity is the specialization of well endowed regions in high-input, high-output crops and that less endowed regions specialize in less productive crops. The crop-wise area under resource incentive crops are presented in Table 12. In

coastal Andhra, the area under rice increased from 19,68,000 ha to 21,89,000 ha, sugarcane increased from 61,000 ha to 1,42,000 ha, mango increased from 61,000 ha to 1,68,000 ha, cotton increased from 32,000 ha to 2,52,000 ha, chillies increased from 65,000 ha to 1,04,000 ha, while the area under tobacco decreased from 1,53,000 ha to 1,08,000 ha. When compared to coastal Andhra, the area in Telangana under resource-intensive crops such as rice, mango, cotton and tomato steeply increased after 1990s, while the area under sugarcane, chillies and tobacco decreased. In Rayalaseema all the crops mentioned decreased except tomato. Chittoor district specializes in tomato for export to both Hyderabad and Bangalore. High-income cluster of districts showed a trend similar to that of coastal Andhra. It indicates that in Rayalaseema, the area under resource-intensive crops was less at the beginning and also declined subsequently, but in the coastal region, the area under these crops was significantly higher at the beginning and also increased subsequently, while Telangana presents mixed results. This also confirms the theory that the initial high resource endowed regions (coastal Andhra) have increased chances of future growth in comparison to the low resource endowed (Rayalaseema) regions, which enhanced regional disparities in Andhra Pradesh to some extent.

Table 13 presents crop-wise area under less resource-intensive crops. Except for sorghum and maize, area of all other less-resource intensive crops decreased in Telangana, while it increased in Rayalaseema (especially groundnut, sunflower and chickpea). In coastal Andhra, except for black gram, the area under other crops is either less than Telangana or has greatly decreased. On the other hand, in Rayalaseema, the area under oilseeds and pulses such as groundnut, sunflower and chickpea is higher than coastal Andhra and continues to increase since the last fifty years.

The crop group-wise information presented in Figure 8 (for cereals, pulses, oilseeds, spices, fruits, vegetables) shows that except cereals and oilseeds, the area under all crops increased in coastal Andhra

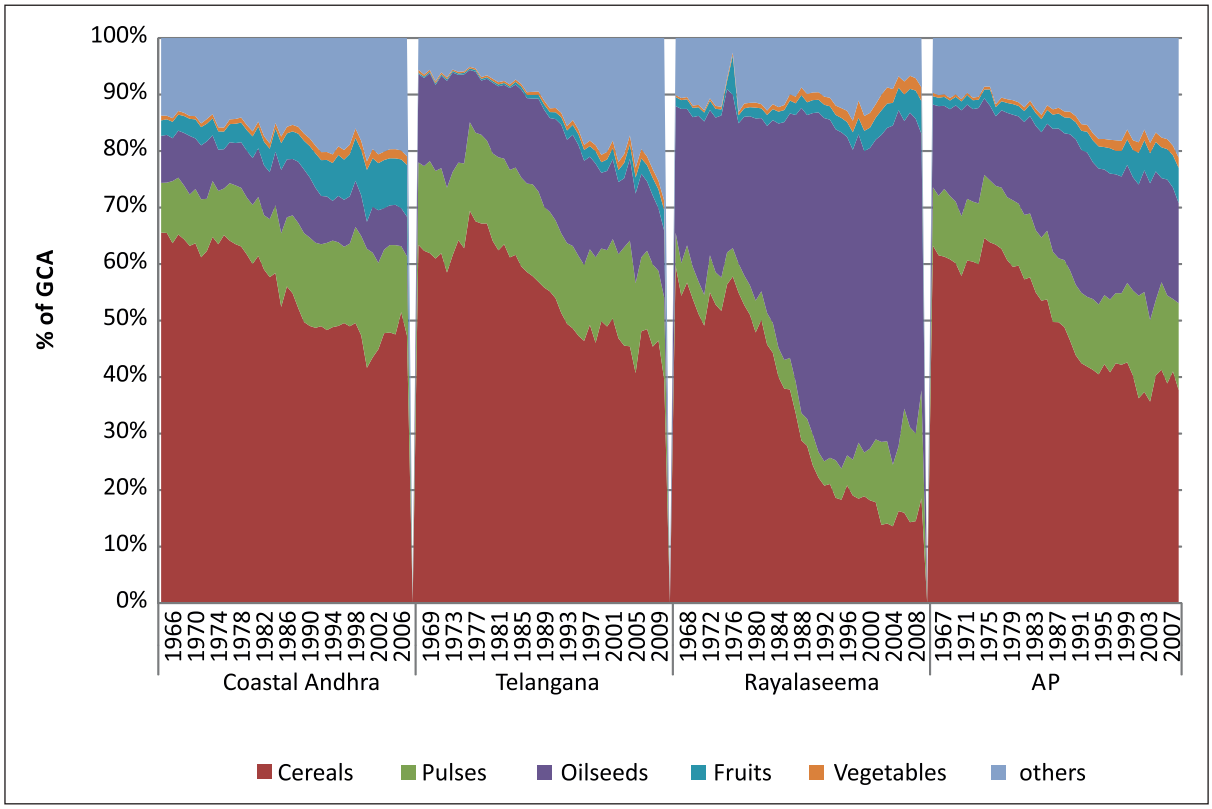

Figure 8. Share of area under major crops (% of GCA).

Table 12. Trends in area under more resource-intensive crops (% of gross cropped area).

Crop	Period	Coastal Andhra	Telangana	Rayalaseema	AP
Rice	1961	57.9	21.6	14.7	32.0
	1971	43.6	17.1	12.0	25.3
	1981	47.3	22.3	12.0	29.1
	1991	45.9	24.7	9.3	29.5
	2001	43.6	26.3	9.2	29.3
	2011	41.3	26.6	7.1	28.0
Sugarcane	1961	1.8	0.6	0.7	1.1
	1971	1.8	0.6	0.7	1.1
	1981	1.9	0.8	0.9	1.2
	1991	2.1	1.1	1.0	1.5
	2001	2.6	1.0	1.2	1.7
	2011	2.7	0.9	0.8	1.6
Mango	1961	1.8	0.1	0.8	0.8
	1971	1.5	0.1	0.8	0.8
	1981	1.9	0.2	0.9	1.0
	1991	2.4	0.8	1.2	1.5
	2001	3.3	1.4	2.2	2.3
	2011	3.2	2.0	2.5	2.6
Tobacco	1961	4.5	0.8	0.6	2.0
	1971	3.2	0.6	0.6	1.5
	1981	3.1	0.5	0.6	1.5
	1991	2.2	0.5	0.6	1.2
	2001	2.3	0.3	0.5	1.1
	2011	2.0	0.2	0.4	1.0
Cotton	1961	0.9	1.8	7.8	3.1
	1971	0.9	2.0	5.9	2.6
	1981	3.4	2.7	4.5	3.4
	1991	5.0	6.9	2.9	5.2
	2001	5.0	13.1	4.3	7.8
	2011	4.8	15.0	1.2	7.7
Chilli	1961	1.9	1.5	0.7	1.4
	1971	1.8	1.3	0.6	1.3
	1981	1.4	1.5	0.6	1.2
	1991	1.7	2.1	0.5	1.6
	2001	1.9	2.2	0.8	1.8
	2011	2.0	1.9	0.7	1.6
Tomato	1961	0.2	0.0	0.1	0.1
	1971	0.2	0.1	0.3	0.2
	1981	0.1	0.1	0.3	0.2
	1991	0.2	0.2	0.5	0.3
	2001	0.2	0.5	1.2	0.5
	2011	0.2	0.5	1.1	0.5

Table 13. Trends in area under less resource-intensive crops (% of gross cropped area)

Crop	Period	Coastal Andhra	Telangana	Rayalaseema	AP
Groundnut	1961	7.6	10.0	22.4	12.5
	1971	5.5	7.1	24.7	10.8
	1981	4.6	5.9	29.4	10.9
	1991	6.4	8.7	47.5	16.9
	2001	3.5	5.8	48.0	14.5
	2011	2.3	3.9	45.5	12.9
Sun Flower	1961	0.0	0.0	0.0	0.0
	1971	0.0	0.0	0.1	0.0
	1981	0.1	1.1	0.3	0.6
	1991	0.2	1.3	4.1	1.5
	2001	0.5	1.4	8.6	2.7
	2011	1.1	1.8	10.2	3.5
Pigeonpea	1961	0.6	1.8	1.2	1.2
	1971	0.7	2.2	1.4	1.4
	1981	0.9	2.8	1.4	1.8
	1991	1.4	3.7	2.2	2.5
	2001	2.2	4.7	2.6	3.2
	2011	2.3	5.2	2.9	3.6
Chickpea	1961	0.1	1.2	0.1	0.5
	1971	0.2	1.1	0.3	0.6
	1981	0.2	0.8	0.4	0.5
	1991	0.1	0.6	1.0	0.5
	2001	0.8	1.0	5.0	1.8
	2011	2.2	1.8	9.6	3.8
Black gram	1961	0.7	0.9	0.0	0.6
	1971	1.5	1.0	0.0	0.9
	1981	3.0	0.9	0.0	1.5
	1991	7.7	1.2	0.0	3.5
	2001	8.2	1.8	0.1	4.0
	2011	7.2	1.6	0.2	3.5
Sorghum	1961	14.8	46.4	25.7	30.3
	1971	8.7	30.9	18.1	19.9
	1981	5.8	28.5	16.6	17.4
	1991	2.0	19.8	9.1	10.2
	2001	0.3	11.2	5.1	5.5
	2011	0.2	6.1	3.8	3.2
Maize	1961	0.0	0.0	0.0	0.0
	1971	0.2	4.8	0.0	2.0
	1981	0.3	6.0	0.0	2.5
	1991	0.5	5.9	0.1	2.4
	2001	1.2	8.6	0.3	3.7
	2011	2.2	12.1	0.8	5.5

in absolute terms. The area under cereals and pulses decreased in Telangana, while the area under fruits, oilseeds, spices, vegetables and land-put-to-non-agricultural use increased compared to the coastal Andhra region. Disparities in the area under fruits are much higher compared to cereals; for example, the area under fruits in Telangana is half that of coastal Andhra. Regional disparities peaked during the mid-1980s with the area under fruits in Telangana being 1/6th of coastal Andhra; however, since the last two decades these disparities have decreased. The area under oilseeds is much higher in Rayalaseema and its concentration has increased over time. The area under pulses increased since 1990s in coastal Andhra mainly due to the expansion of area under black gram in rice fallows. The area under spices decreased in Rayalaseema, while in Telangana it increased compared to the coastal region, as there is a large expansion of area under chillies here. Even though the area under vegetables was higher in initial years both in coastal and Rayalaseema, its share decreased over the years. Overall, even though disparities among regions in fruits and vegetables are stark in the base year, the disparities decreased later, as there was an expansion of area under these crops in backward districts surrounding Hyderabad. However, the proportion of land put to non-agricultural use increased in Telangana due to the high level of urbanization around Hyderabad.

The districts are grouped into high, medium and low based on the absolute area under crop groups in the years 1956 and 2011; and the shift of districts in terms of major crop groups such as cereals, pulses, oilseeds and fruits (from high to low and vice versa) from 1956 to 2011 is presented in Table 14. The highest positive shift (from low to high) is in Karimnagar for cereals, and in the districts of Kadapa, Krishna, Kurnool, Mahbubnagar and Medak for pulses. While the coastal districts of East Godavari, Guntur, Krishna, Nellore and West Godavari remain in the high-group for cereals, significant downward movement is recorded in Chittoor and Srikakulam for cereal production and East Godavari in pulses. In oilseeds, three Rayalaseema districts – Anantapur, Chittoor and Kurnool – remain in the high-group in both 1956 and 2011. In the matter of fruits, East Godavari, Khammam, Visakhapatnam and West Godavari remain in the high group, four Telangana districts viz., Adilabad, Hyderabad, Karimnagar and Medak remain in the low group. Overall, coastal districts dominate in cereals and fruits in both periods, while Rayalaseema districts dominate in oilseed production. Pulses expanded in Telangana and coastal districts due to the expansion of area under short duration varieties for rice fallows.

The GR and DI of total agricultural production, cereal and pulses production are presented in Table 15. Both the DI and GR have increased for both cereals and pulses, while both have decreased for total agricultural production in value. This shows that some districts specialized in cereals and pulses production, but in terms of value of production, districts are converging, as loss from reduction of area under these crops is compensated by income from expansion in area under other specialized crops.

Diffusion of technology and increase in production

The trend in the yield of paddy, groundnut and cotton is presented in Figure 9. The yield of rice increased from 778 kg/ha to 2980 kg/ha, the yield of groundnut increased from 581 kg/ha to 1292 kg/ha, and the yield of cotton increased from 339 kg/ha to 2057 kg/ha in Telangana. The increase of yield of rice, groundnut and cotton is show in both coastal Andhra and Rayalaseema compared to Telangana. It is also to be noted that the spread of High Yielding Varieties (HYVs) already reached its peak by 1980s in coastal Andhra, while it reached its peak during the years 1990s and 2000s in both Telangana and Rayalaseema (Figure 10). Overall, the yield growth of paddy is revolutionizing the agricultural sector in coastal Andhra. While paddy, maize and cotton are picking up in Telangana, in Rayalaseema chickpea and cotton are the dominating forces in driving the agricultural sector. In all these crops, improved varieties are playing an important role in increasing profitability and reducing risk.

Table 14. Shift in relative position of districts in production of crop groups between 1956 and 2011.

Shift from	Cereals	Pulses	Oilseed	Fruit and vegetables
High to low	Chittoor (R) Srikakulam (C)	East Godavari (C)		
Medium to low	Anantapur (R) Kadapa (R)	Nellore (C) Visakhapatnam (C)	Karimnagar (T)	Nizamabad (T) Srikakulam (C)
High to medium		Anantapur (R)	Kadapa (R) Guntur (C) Mahbubnagar (T) Nalgonda (T)	Kadapa (R) Guntur (C) Kurnool (R)
Low	Adilabad (T) Hyderabad (T)	Chittoor (R) Karimnagar (T) West Godavari (C)	Hyderabad (T) Khammam (T) Medak (T) Nellore (C) Nizamabad (T)	Adilabad (T) Hyderabad (T) Karimnagar (T) Medak (T)
Medium	Kurnool (R) Mahbubnagar (T) Nizamabad (T) Visakhapatnam (C)	Khammam (T) Nalgonda (T) Srikakulam (C) Warangal (T)	Karimnagar (T) Warangal (T)	Nellore (C) Warangal (T)
High	East Godavari (C) Guntur (C) Krishna (C) Nellore (C) West Godavari (C)	Guntur (C)	Anantapur (R) Chittoor (R) Kurnool (R)	East Godavari (C) Khammam (T) Visakhapatnam (C) West Godavari (C)
Low to high	Karimnagar (T)	Kadapa (R) Krishna (C) Kurnool (R) Mahbubnagar (T) Medak (T)		
Low to medium	Khammam (T) Medak (T) Warangal (T)	Hyderabad (T) Nizamabad (T)	Adilabad (T)	Mahbubnagar (T) Nalgonda (T)
Medium to high	Nalgonda (T)	Adilabad (T)	East Godavari (C) Srikakulam (C) Visakhapatnam (C) Warangal (T)	Anantapur (R) Chittoor (R) Krishna (C)

Table 15. Trends in Gini ratio (GR) and Disparity Index (DI) of districts' agricultural production.

	Cereals		Pulses		Crop Production		Livestock			
Period	DI	GR	DI	GR	DI	GR	DI	GR	Agricultural and allied	
1961	0.18	0.01	0.29	0.05	0.31	0.39	0.31	0.42	0.28	0.35
1971	0.16	0.03	0.29	0.12	0.27	0.34	0.27	0.37	0.25	0.33
1981	0.20	0.05	0.30	0.01	0.27	0.35	0.25	0.32	0.25	0.32
1991	0.24	0.04	0.34	0.17	0.28	0.35	0.26	0.34	0.27	0.33
2001	0.24	0.09	0.33	0.20	0.24	0.31	0.27	0.35	0.25	0.30
2011	0.24	0.10	0.38	0.17	0.20	0.28	0.27	0.36	0.21	0.28

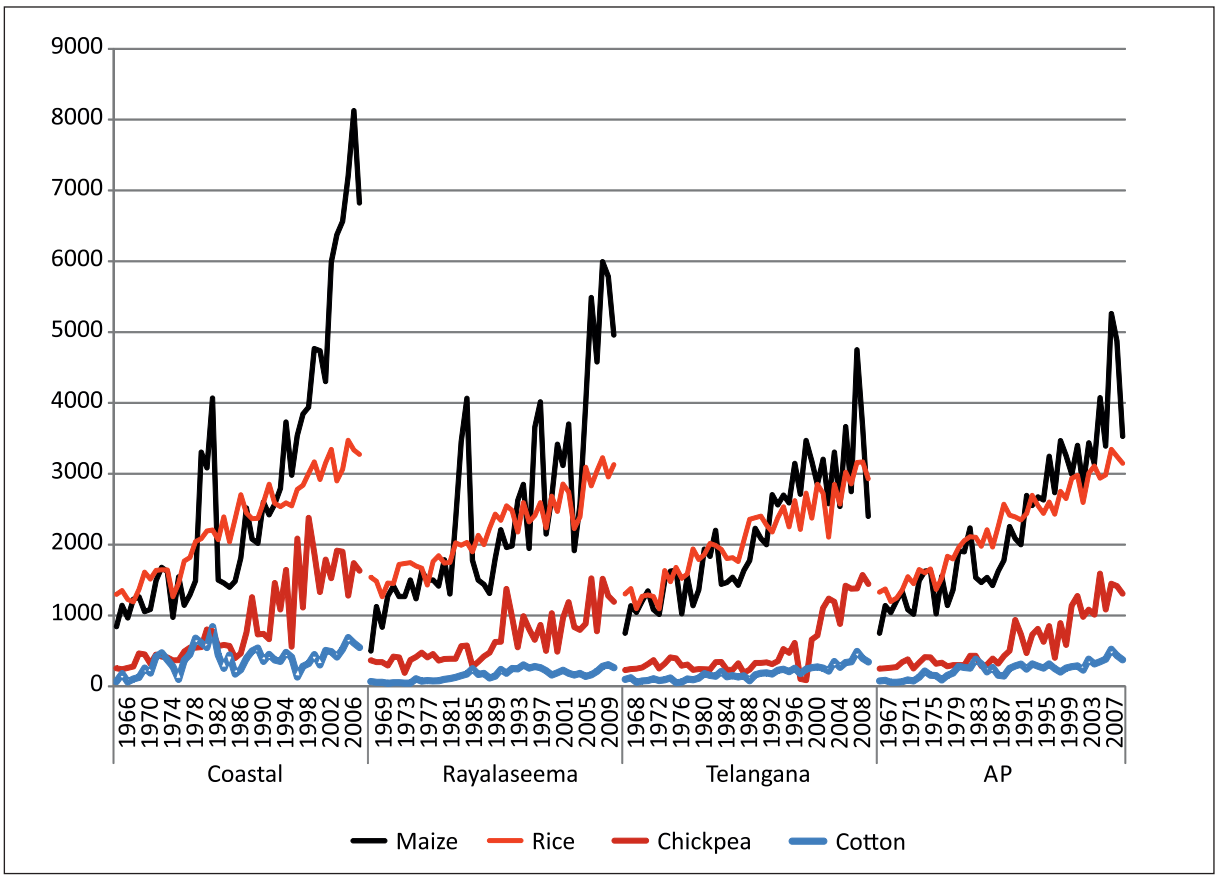

Figure 9. Trends in yields of major crops (kg/ha).

While the revolution in crop production started with paddy in all the regions, it started early in coastal Andhra and reached its peak by the mid-1980s (Figure 10). In Telangana, the adoption of improved varieties is still increasing every year with a simultaneous increase in area and productivity. In Rayalaseema there is little scope for increasing the area except in the Kurnool–Cuddapah Canal (KC Canal) area spanning the two districts. The potential areas under the KC Canal command area were already saturated with improved varieties of paddy by mid-1990s. The farmers in these districts are adopting wide scale mechanization in land preparation, harvesting and threshing by using combined harvesters and threshers since landholdings in these regions are much bigger compared to Telangana and coastal Andhra Pradesh.

The area of another important crop, chickpea, is increasing by about 16% per annum in Andhra Pradesh since 1990s. The crop is mostly spreading in a few districts including Prakasham, Kurnool and surrounding Rayalaseema districts. The spread of area under chickpea is mainly due to the adoption of improved varieties such as JG 11, KAK 2 and ICCV 2, which were released by the state government in collaboration with ICRISAT. In Andhra Pradesh the yield of chickpea increased from 393 kg/ha to 1375 kg/ha from 1987 to 2011 while the area increased from 52.2 thousand ha to 542 thousand ha, which resulted in an increase in production from 19.9 thousand tons to 730.7 thousand tons during the same period (Figure 11a and 11b). The annual compound growth rate of area is 12.41% and the yield is 5.80% and it resulted in a whopping 18.21% per annum growth in production from 1987 to 2008 (Reddy and Bantilan 2013). The spread of JG 11 and KAK 2 is mainly due to the short duration of the crop, suitability

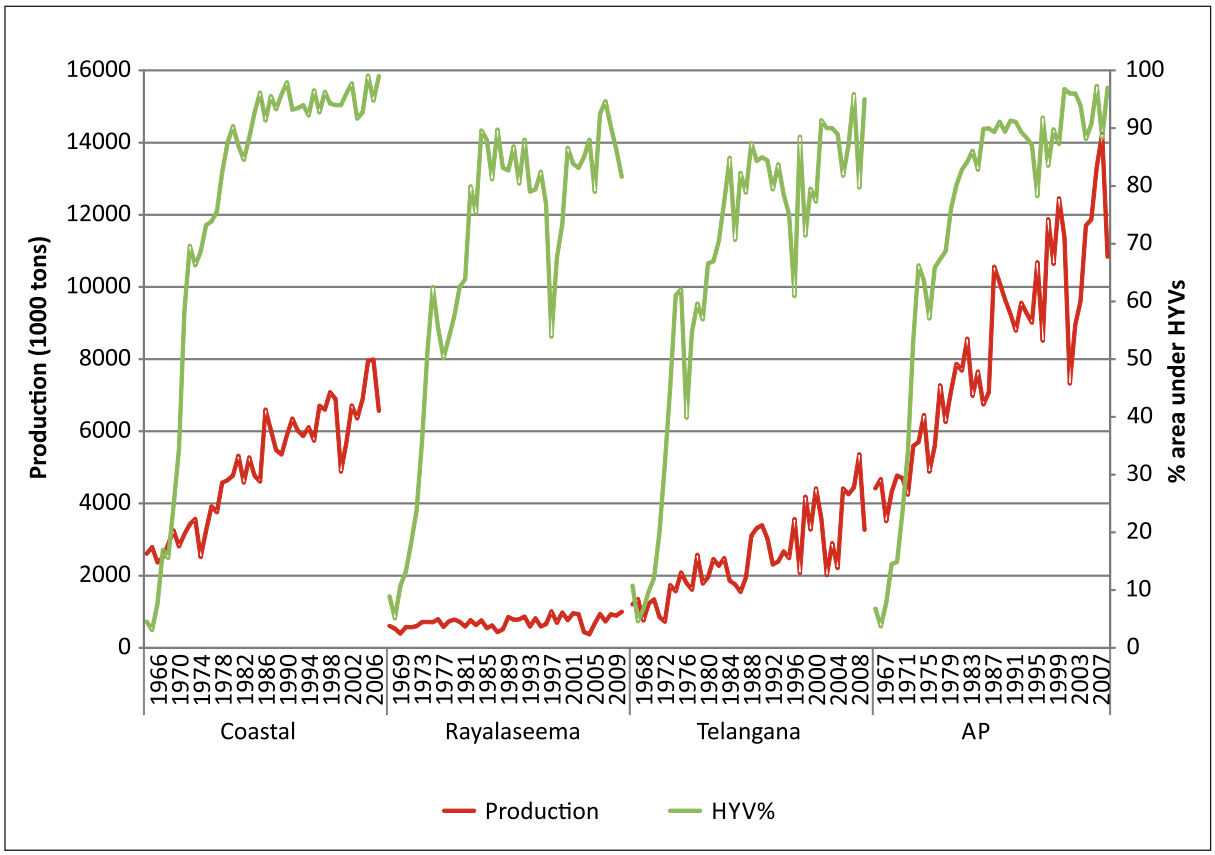

Figure 10. Green Revolution: % Area under HYVs of rice.

for wider mechanized harvesting, flexible land lease market, higher minimum support price and higher market prices due to growing demand.

In addition to chickpea, the revolution in cotton is also spectacular in the state after the release and wide adoption of Bt cotton varieties. As against the area of 650317 hectares under cotton crop in the state during 2002-2003, only 3315 hectares were covered with Bt. cotton which works out to be 0.51 percent. Now the area under the Bt cotton has reached a peak with more than 95% of cotton area devoted to it. The diffusion of Bt cotton varieties picked up immediately after their release by different private companies since 2002-03. The annual compound growth rate of area jumped from 6.1% between 1987 and 2001 to 7.4% between 2002 to 2012. The adoption of Bt cotton varities improved farm incomes tremoundously and at the same time reduced expenses on pesticides. The drylands of Telangana region mostly benefited from the expansion of area under Bt cotton (Figure 12a). The growth rate in production jumped from 7.9% to 12.9% and yield increased from 1.8% to 5.5% per annum during the same period (Figure 12b). The spread of improved varieties including genetically modified crops specifically in paddy, cotton, maize and chickpea revolutionized agricultural production in the state.

Farm inputs and irrigation

The proximate causes of agricultural growth as measured by the growth in land productivity in the Indian context can be found mainly in the increased use of inputs into the agricultural production process: irrigation facilities, labor, the use of fertilizers and tractors (Bhalla and Singh 2001). But investment in irrigation is

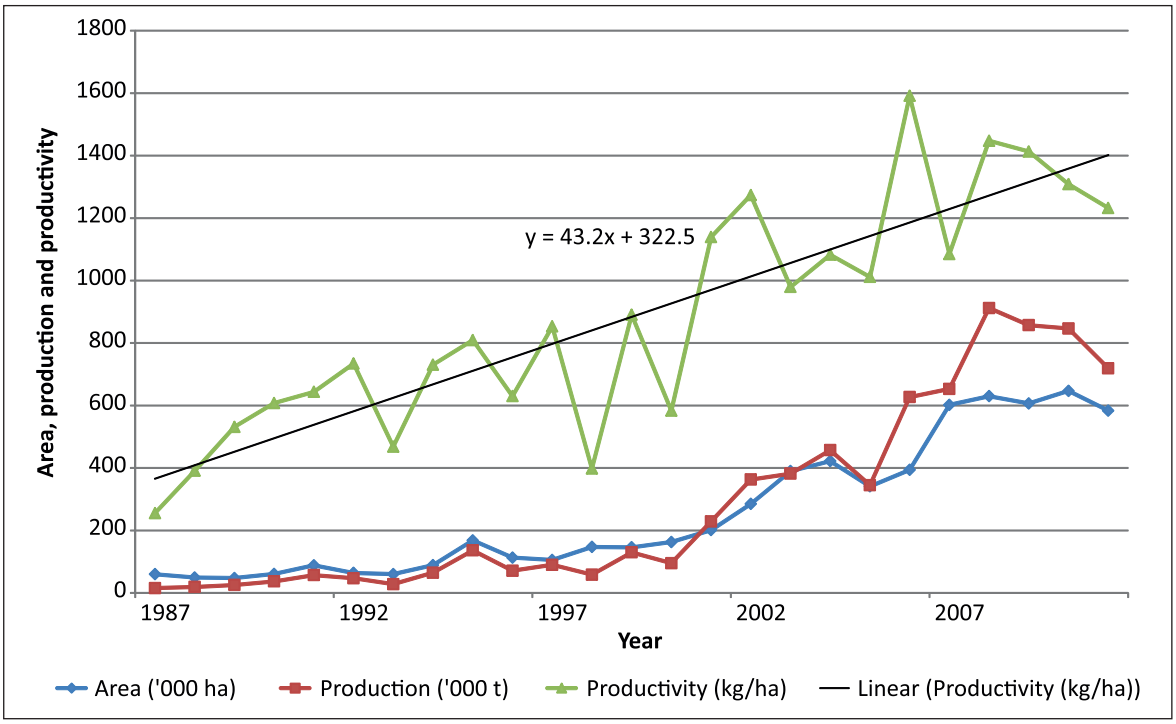

Figure 11a. Trends in chickpea production.

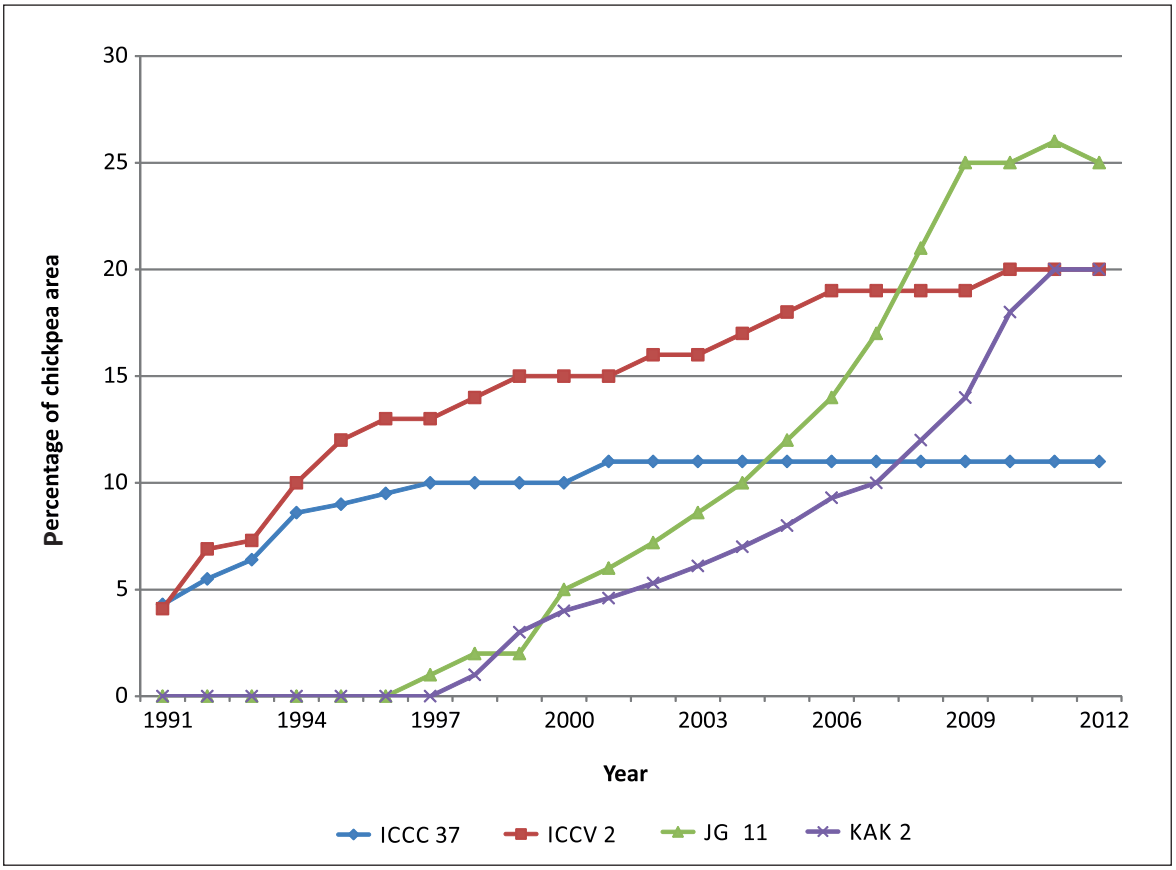

Figure 11b. Diffusion of improved varieties of chickpea.

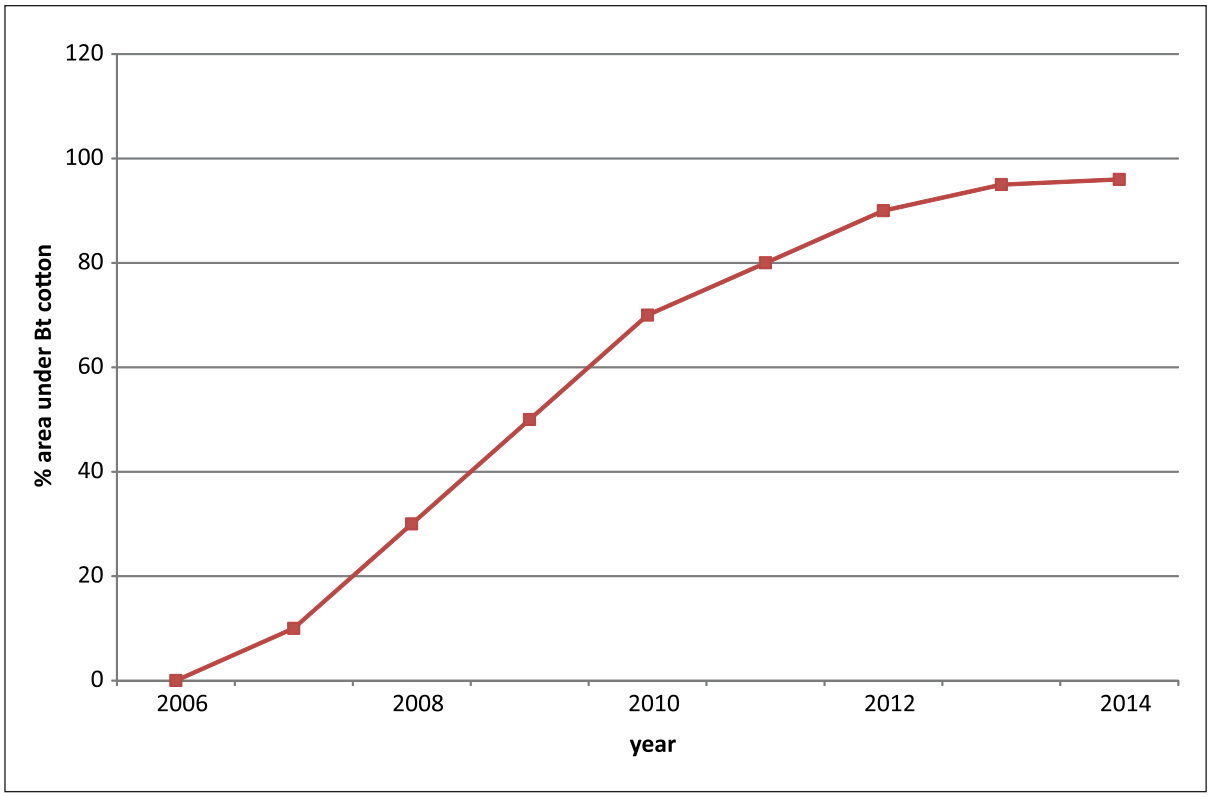

Figure 12 a. Diffusion of Bt cotton area.

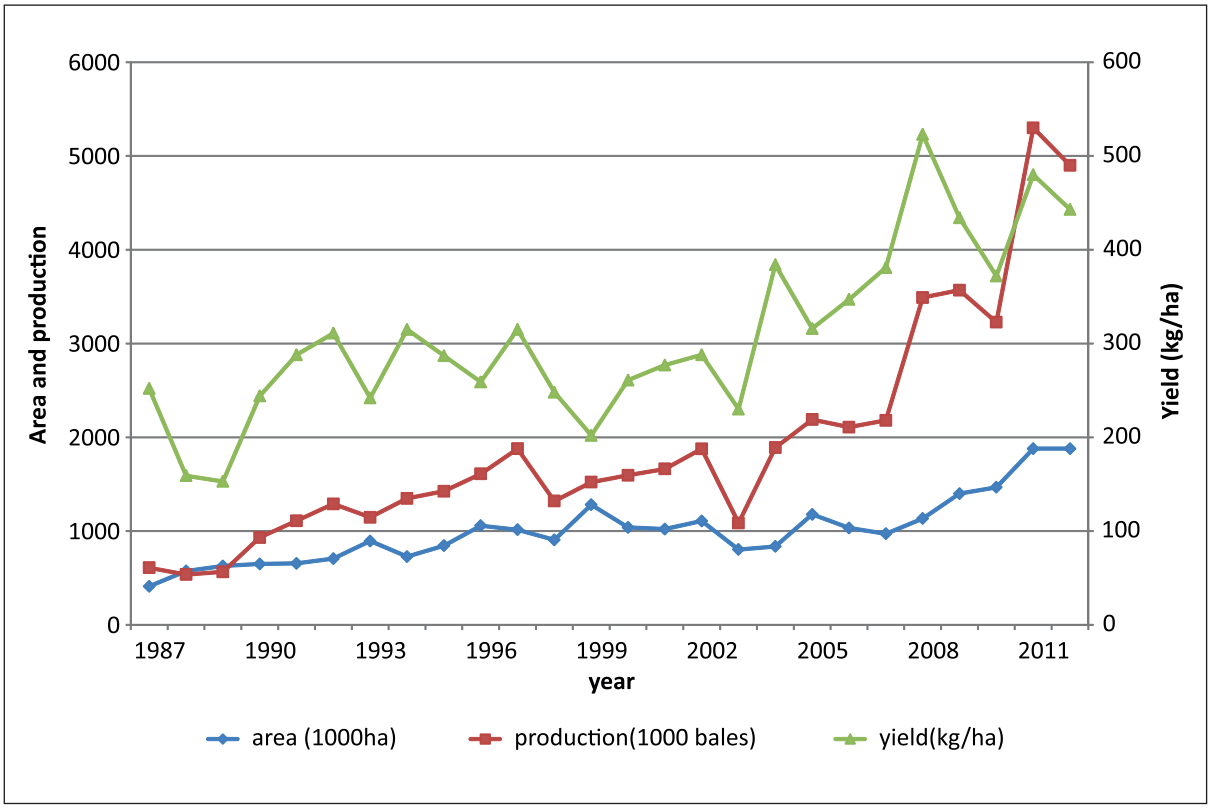

Figure 12b. Cotton area, production and yield.

technically and economically feasible only in favorable areas and is costly in unfavorable areas (for example, building lift irrigation in Telangana). Table 16 depicts the areas categorized as forest, barren wasteland, non-agricultural use, fallow, pasture, the net cropped area as well as cropping intensity. Net cropped area (NCA) has marginally increased over 50 years in coastal Andhra, while it decreased, in comparison, in Telangana and Rayalaseema. Gross cropped area (GCA) also increased in coastal Andhra during 50 years, but it decreased in Telangana and Rayalaseema. The net irrigated area (NIA) increased in coastal Andhra, and the increase is much higher in Telangana as well, but stagnated in Rayalaseema. Cropping intensity increased from 111% to 134% in coastal Andhra, and slightly increased from 101% to 117% in Telangana, but remained stagnant in Rayalaseema. On the same lines, irrigation intensity increased both in Telangana and coastal Andhra, and decreased in Rayalaseema. Overall there is a convergence in irrigated area and cropping intensity between Telangana and coastal, but Rayalaseema region is left out.

The trends in source-wise irrigated area is presented in Table 17, which shows that the area under canals increased from 1087 thousand to 1256 thousand ha, the area under tube wells increased from

Table 16. Trends in land use pattern (% of gross geographical area).

Year	Forest	Barren wasteland	Non-agricultural use	Fallow	Pasture	Net Cropped Area (NCA)	Cropping Intensity (% of NCA)	Geographical Area (1000 ha)
Coastal Andhra								
1971	21.4	14.8	10.6	8.2	3.9	41.1	123	8820
1981	21.4	14.5	10.9	8.4	3.3	41.5	127	8854
1991	21.6	13.0	11.8	7.4	3.2	43.0	136	8856
2001	21.9	11.8	13.3	9.4	2.7	40.9	137	8735
2009	21.7	11.3	13.9	9.5	2.2	41.4	138	8786
Rayalaseema								
1971	22.7	16.0	7.5	9.7	1.6	42.5	107	6957
1981	22.6	15.1	8.0	13.7	1.6	39.0	107	6912
1991	22.3	14.3	8.6	12.6	1.5	40.8	108	6926
2001	22.3	14.0	8.8	13.8	1.4	39.8	109	6911
2009	22.4	13.1	8.9	15.9	0.9	38.7	113	6962
Telangana								
1971	24.7	8.0	5.6	15.0	5.0	41.7	109	11436
1981	23.9	7.6	5.9	17.2	4.5	40.9	110	11406
1991	24.7	6.2	6.3	21.8	3.9	36.9	114	11399
2001	24.1	7.0	6.9	23.5	3.0	35.6	117	11408
2009	24.1	7.0	7.2	22.9	2.7	36.0	126	11368
Andhra Pradesh	-	-	-	-	-	-	-	-
1971	23.1	12.3	7.7	11.4	3.8	41.7	113	27214
1981	22.8	11.8	8.1	13.4	3.4	40.6	115	27172
1991	23.1	10.5	8.7	14.8	3.1	39.9	120	27180
2001	22.9	10.3	9.4	16.4	2.5	38.4	122	27054
2009	22.9	9.9	9.8	16.8	2.1	38.5	127	27116

18 thousand ha to 454 thousand ha, the area under other wells increased from 44 thousand ha to 84 thousand ha, the area under total wells increased from 62 thousand ha to 539 thousand ha, but the area under tanks decreased from 487 thousand ha to 361 thousand ha in coastal Andhra. The area under canals is very low in both Telangana and Rayalaseema compared to coastal Andhra, the area under tube wells increased in both Telangana and Rayalaseema regions, the area under other wells increased in Telangana but reduced in Rayalaseema. Overall, the area under total wells increased steeply in Telangana, but decreased in Rayalaseema compared to coastal Andhra. This disaggregated analysis also shows that there is a convergence in area under irrigation from different sources between coastal

Table 17. Trends in sources of irrigation (% of gross irrigated area).

Source	Year	Coastal Andhra	Rayalaseema	Telangana	AP
Canals	1961	66	32	21	50
	1971	65	34	24	50
	1981	65	35	27	50
	1991	63	28	24	45
	2001	61	27	22	43
	2011	58	22	16	37
Tanks	1961	30	49	62	41
	1971	28	37	47	34
	1981	24	25	38	28
	1991	22	16	25	22
	2001	18	11	18	17
	2011	17	10	12	14
Tube wells	1961	1	1	1	1
	1971	3	1	1	2
	1981	6	1	1	4
	1991	10	12	8	9
	2001	15	29	23	20
	2011	21	51	42	33
Other wells	1961	3	18	16	8
	1971	4	28	29	14
	1981	5	38	34	17
	1991	6	44	43	23
	2001	5	33	37	20
	2011	4	17	30	15
Total wells	1961	4	19	17	9
	1971	7	29	30	16
	1981	11	40	34	21
	1991	16	56	51	33
	2001	20	62	60	40
	2011	25	68	72	49

Andhra and Telangana regions, but in Rayalaseema region, there is little progress. However, in the case of area under tanks, there is a striking reduction in area in all three regions, although the rate of reduction is faster in Telangana and Rayalaseema regions.

Districts were grouped into high, medium and low, based on the sources of irrigated area, gross irrigated area (GIA) and gross cropped area (GCA) and presented in Table 18 for the period 1956 and 2011, and also according to the change in the relative position (eg, high to low and vice versa) between 1956 and 2011. The highest positive shift (from low to high) is in Guntur, Khammam for tanks, Mahbubnagar for wells, and Visakhapatnam in GCA. When it comes to canal irrigation, most of the districts have not changed their position, ie, Adilabad, Chittoor, Hyderabad, Medak and Warangal remain in low category in both the periods, while Anantapur, Kadapa, Karimnagar, Khammam, Nalgonda and Visakhapatnam remain at medium level, East Godavari, Guntur, Krishna, Nellore, Srikakulam and West Godavari remain

Table 18. Shift of districts in relative positions in the matter of area under different sources of irrigation between 1956 and 2011.

Shift from	Tank	Wells	Canals	GIA	GCA
High to low	Medak (T) Mahbubnagar (T)	Srikakulam (C)	Nizamabad (T)	Chittoor (R)	Nellore (C)
Medium to low	Nizamabad (T)	Hyderabad (T) Krishna (C)		Anantapur (R) Kadapa (R)	Srikakulam (C)
High to medium	Chittoor (R) Karimnagar (T)	Kadapa (R) Nizamabad (T)		Nellore (C) Srikakulam (C)	Nalgonda (T)
Low	Adilabad (T) Kadapa (R) Hyderabad (T)	Adilabad (T) East Godavari (C) Visakhapatnam (C)	Adilabad (T) Chittoor (R) Hyderabad (T) Medak (T) Warangal (T)	Adilabad (T) Hyderabad (T) Medak (T)	Chittoor (R) Kadapa (R) Hyderabad (T) Nizamabad (T)
Medium	Anantapur (R) Krishna (C) Nalgonda (T) West Godavari (C)	Khammam (T) Kurnool (R) Nalgonda (T)	Anantapur (R) Kadapa (R) Karimnagar (T) Khammam (T) Nalgonda (T) Visakhapatnam (C)	Nizamabad (T) Visakhapatnam (C)	Adilabad (T) Karimnagar (T) Medak (T) Warangal (T) West Godavari (C)
High	Nellore (C) Srikakulam (C) Warangal (T)	Anantapur (R) Chittoor (R) Nellore (C) Warangal (T)	East Godavari (C) Guntur (C) Krishna (C) Nellore (C) Srikakulam (C) West Godavari (C)	East Godavari (C) Guntur (C) Krishna (C) West Godavari (C)	Anantapur (R) East Godavari (C) Guntur (C) Kurnool (R) Mahbubnagar (T)
Low to high	Guntur (C) Khammam (T)	Mahbubnagar (T)			Visakhapatnam (C)
Low to medium	Kurnool (R)	Guntur (C) Medak (T)	Mahbubnagar (T)	Khammam (T) Kurnool (R) Mahbubnagar (T)	Khammam (T)
Medium to high	East Godavari (C) Visakhapatnam (C)	Karimnagar (T) West Godavari (C)		Karimnagar (T) Nalgonda (T) Warangal (T)	Krishna (C)

at a higher level, with only Mahbubnagar shifting from low to medium and Nizamabad shifting from high to low. With wells, Mahbubnagar shifted from low to high, Guntur and Medak shifted from low to medium, Karimnagar and West Godavari shifted from medium to high. The comparative place in tank irrigation reduced in some Telangana and Rayalaseema districts such as Medak, Nizamabad, Chittoor and Karimnagar, while the comparative place of well irrigation went down for Srikakulam, Hyderabad, Krishna, Kadapa and Nizamabad. While the comparative place of tank irrigation increased in Guntur, Khammam, Kurnool, East Godavari and Visakhapatnam, well irrigation increased in Mahbubnagar, Guntur, Medak, Karimnagar and West Godavari. Overall in GIA the comparative place of Chittoor, Anantapur, Kadapa, Nellore and Srikakulam reduced, while Khammam, Kurnool, Mahbubnagar, Karimnagar, Nalgonda and Waranagal increased. One striking feature is that the area under tank irrigation increased where there is already abundant canal irrigation.

Table 19 presents the Gini ratio and disparity index for NCA, NIA, GCA and GIA during 1956 to 2011. The Gini ratio is slightly increased for NCA, while disparity index is almost stagnant during the period. Both DI and GR decreased in case of NIA, while in the case of GIA, DI decreased, but GR increased. Overall disparity in irrigated area decreased, but geographical concentration slightly increased in gross cropped area during the study period, while in the case of NCA, GCA and GIA there is a mixed trend.

The trends in inputs used in the agricultural sector are stated in Table 18 wherein the number of diesel pump sets increased from 18.6 thousand to 67.2 thousand, the number of electric pump sets increased from 12.4 thousand to 191.7 thousand, the number of tractors increased from 1.2 to 36.3 thousand, iron ploughs increased from 4.7 thousand to 162.8 thousand, while wooden ploughs decreased from 1433 thousand to 545.5 thousand and agricultural credit increased from Rs 576 crore to Rs 35666 crore during the same period in coastal Andhra. In Telangana the number of diesel pump sets/1000 ha of NCA increased and is higher than coastal Andhra, while in Rayalaseema it is less. While the number of electric pumps per thousand ha of NCA increased both in Telangana and Rayalaseema regions compared to coastal Andhra. Even though the number of tractors per thousand ha increased in Telangana, it is much less compared to both Rayalaseema and coastal Andhra. The number of iron ploughs increased faster in Telangana compared to Rayalaseema and coastal Andhra. The number of wooden ploughs increased in both Telangana and Rayalaseema regions compared to coastal Andhra. Trends in credit delivery shows that there is a faster increase in credit uptake in both coastal Andhra and Telangana, but slower in Rayalaseema region. In farm mechanization and inputs there is a convergence between Telangana and coastal Andhra, but Rayalaseema region was left out of growth of important inputs such as tractors and credit.

More or less, the same trends were observed in fertilizer consumption per hectare of NCA. Fertilizer

Table 19. Trends in Gini ratio and Disparity Index of NCA, NIA, GCA and GIA.

	NCA		NIA		GCA		GIA	
Period	DI	Gini	DI	Gini	DI	Gini	DI	Gini
1961	0.168	0.001	0.258	0.034	0.176	0.009	0.252	0.043
1971	0.156	0.014	0.238	0.008	0.149	0.013	0.235	0.038
1981	0.149	0.021	0.224	0.028	0.133	0.014	0.219	0.064
1991	0.142	0.041	0.202	0.034	0.129	0.034	0.209	0.079
2001	0.147	0.058	0.187	0.028	0.144	0.049	0.205	0.074
2011	0.165	0.068	0.187	0.029	0.157	0.053	0.214	0.079

Table 20. Trends in resource endowment (inputs) relating to agriculture (per 1000 ha).

Input	Period	Coastal Andhra	Rayalaseema	Telangana	AP
Diesel pump sets (number/1000 ha)	1961	6.1	10.6	14.0	10.5
	1971	8.1	10.3	14.8	11.5
	1981	11.0	11.8	17.6	13.9
	1991	13.7	12.4	21.2	16.2
	2001	15.9	13.1	22.8	17.9
	2011	17.1	13.7	24.8	19.1
Electric pump sets (number/1000 ha)	1961	4.0	5.8	3.8	4.4
	1971	12.5	23.3	30.6	22.8
	1981	23.8	47.0	71.6	49.4
	1991	33.8	69.4	121.7	77.2
	2001	42.8	90.4	161.0	101.2
	2011	48.6	105.4	191.3	117.8
Tractors (number/1000 ha)	1961	0.4	0.1	0.3	0.3
	1971	1.8	0.7	0.6	1.0
	1981	3.9	1.9	2.2	2.7
	1991	6.2	3.3	4.3	4.7
	2001	7.9	4.2	5.8	6.2
	2011	9.2	5.2	7.2	7.4
Iron plough (Numbers/1000 ha)	1961	1.5	11.3	1.7	4.1
	1971	7.8	24.8	5.9	11.4
	1981	18.2	48.4	21.1	27.0
	1991	27.8	69.9	39.8	43.4
	2001	36.5	90.4	55.5	57.8
	2011	41.3	104.1	67.0	67.2
Wooden plough (numbers/1000 ha)	1961	466.6	242.2	382.8	373.9
	1971	352.1	191.6	316.3	295.9
	1981	294.4	192.3	318.3	278.6
	1991	231.9	178.6	332.1	257.1
	2001	171.8	164.8	309.6	223.9
	2011	138.3	157.8	310.5	209.2
Loans (Rs million/1000 ha)	1961	1.9	0.7	1.3	1.3
	1971	3.1	1.1	2.3	2.3
	1981	27.9	10.1	22.2	21.1
	1991	61.1	23.1	54.5	48.7
	2001	92.2	35.4	82.2	73.7

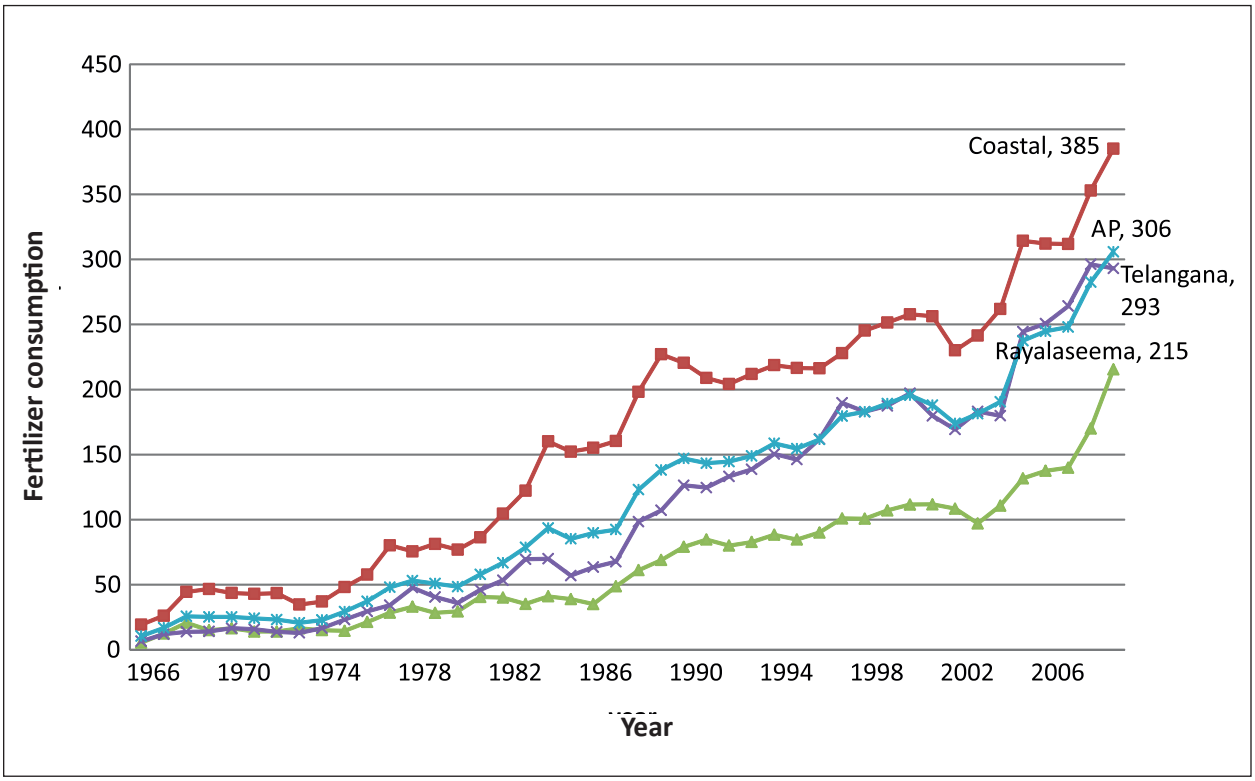

Figure 13. Fertilizer consumption (kg/ha).

consumption in terms of nutrients is depicted in Figure 13. Overall, the fertilizer consumption per ha increased in all the regions. However, consumption in coastal Andhra is much higher than both Telangana and Rayalaseema. The consumption of potash has increased from 5.3 thousand tons to 127.1 thousand tons, nitrogen from 22.9 thousand tons to 738.9 thousand tons, phosphorous from 249.3 thousand tons to 292.6 thousand tons in the coastal region. The consumption of fertilizers has increased in both Telangana and Rayalaseema from the lower base compared to coastal Andhra, but the gap still persists and is much higher compared to the 1960s.

The districts were grouped into high, medium and low based on inputs and their shift from high to low and vice versa, which is presented in Table 21. The positive shift (from low to high) in case of tractors was noted in Chittoor, Anantapur, Khammam and Karimnagar, while the negative shift (high to low) is in Adilabad, Hyderabad, Nizamabad and Medak. Guntur, Krishna, Nalgonda, Nellore and West Godavari remained at a high level in both the years. For electric pumps, Mahbubnagar, Nizamabad, Warangal, Adilabad, Kurnool, Karimnagar, Medak and Nalgonda recorded a positive shift, while East Godavari, Krishna, West Godavari, Khammam, Visakhapatnam, Anantapur, Guntur and Hyderabad recorded a negative shift. In the matter of fertilizer consumption, a positive shift was recorded in Hyderabad, Khammam, Nalgonda, Nizamabad and Karimnagar, while a negative shift was recorded in Anantapur, Chittoor, Visakhapatnam and Srikakulam. East Godavari, Guntur, Krishna, Kurnool, Nellore, West Godavari do not show a change in their position and remained at a high level. Adilabad, Kadapa and Srikakulam are mostly placed in low category in utilization of all inputs, while Guntur, Krishna, West

Table 21. Shifting relative positions of districts for agricultural inputs and machinery between 1956 and 2011.

Shift from	Iron plough	Tractors	Diesel pump	Electric pump	Fertilizer
High to low	Nizamabad (T)	Adilabad (T) Hyderabad (T)	Medak (T) Nalgonda (T)	East Godavari (C) Krishna (C) West Godavari (C)	
Medium to low	Adilabad (T) Visakhapatnam (C)	Nizamabad (T)	Hyderabad (T) Nizamabad (T)	Khammam (T) Visakhapatnam (C)	Anantapur (R) Chittoor (C) Visakhapatnam (C)
High to medium	Kadapa (R) Krishna (C)	Medak (T)	Anantapur (R)	Anantapur (R) Guntur (C) Hyderabad (T)	Srikakulam (C)
Low	East Godavari (C) Hyderabad (T) Nizamabad (T)	Kadapa (R) Srikakulam (C) Visakhapatnam (C)	Adilabad (T) Srikakulam (C)	Srikakulam (C)	Adilabad (T) Kadapa (R)
Medium	Mahbubnagar (T) Medak (T) Srikakulam (C)	East Godavari (C) Kurnool (R) Mahbubnagar (T) Warangal (T)	East Godavari (C) West Godavari (C)	Kadapa (R) Nellore (C)	Mahbubnagar (T) Warangal (T)
High	Anantapur (R) Chittoor (R) Guntur (C) Kurnool (R)	Guntur (C) Krishna (C) Nalgonda (T) Nellore (C) West Godavari (C)	Chittoor (R) Karimnagar (T) Mahbubnagar (T) Nellore (C)	Chittoor (R)	East Godavari (C) Guntur (C) Krishna (C) Kurnool (R) Nellore (C) West Godavari (C)
Low to high	Khammam (T)	Chittoor (C)	Khammam (T)	Mahbubnagar (T) Nizamabad (T) Warangal (T)	
Low to medium	Karimnagar (T) Nellore (C)	Anantapur (R) Khammam (T)	Krishna (C) Kurnool (R) Visakhapatnam (C)	Adilabad (T) Kurnool (R)	Hyderabad (T) Khammam (T) Nalgonda (T) Nizamabad (T)
Medium to high	Warangal (T)	Karimnagar (T)	Guntur (C) Warangal (T)	Karimnagar (T) Medak (T) Nalgonda (T)	Karimnagar (T)

Godavari, Nellore and Chittoor are placed higher.

Trends in livestock and its products

Table 22 depicts the trends in livestock population and its products which are more resource-intensive. Egg production increased from 1000 lakhs to 93000 lakhs, meat from 8 thousand tons to 76 thousand tons, milk from 241 thousand tons to 4434 thousand tons, fish from 237 thousand tons to 4510 thousand tons, poultry (in numbers) from 51 lakh to 2302 lakh between 1956 to 2011 in coastal Andhra region. In per capita terms, egg production is much higher in coastal Andhra (273/capita/year) than Telangana (174/capita/year) and Rayalaseema (only 65/capita/year). Meat production is higher in Telangana (3.1kg/capita/year) followed by Rayalaseema (2.6kg) and coastal Andhra (2.2kg). In per capita production of egg, milk, and fish production, coastal Andhra is on a much higher level than both Telangana and Rayalaseema. This indicates that except goat and sheep rearing (which is considered an inferior occupation and mostly

Table 22. Trends in livestock production and its products.

Livestock products	Period	Coastal Andhra	Rayalaseema	Telangana	AP
Egg (number/capita/year)	1961	6	13	28	15
	1971	7	16	34	18
	1981	59	20	47	48
	1991	158	42	110	118
	2001	236	63	156	174
	2011	273	65	174	196
Meat (kg/capita/year)	1961	0.5	1.0	1.3	0.9
	1971	0.5	1.0	1.1	0.8
	1981	0.9	1.6	1.3	1.2
	1991	1.5	2.1	2.1	1.8
	2001	2.0	2.5	2.8	2.4
	2011	2.2	2.6	3.1	2.6
Milk (kg/capita/year)	1961	1.5	1.0	1.7	1.5
	1971	1.2	0.8	1.3	1.2
	1981	3.6	2.2	2.6	3.0
	1991	8.0	5.7	5.1	6.5
	2001	11.4	8.3	6.8	9.0
	2011	13.0	9.6	7.6	10.2
Fish (kg/capita/year)	1961	1.5	1.1	1.8	1.6
	1971	1.3	0.9	1.4	1.3
	1981	3.7	2.4	2.8	3.1
	1991	8.2	5.8	5.3	6.6
	2001	11.6	8.8	7.2	9.3
	2011	13.2	10.1	7.9	10.5

engaged by backward caste communities such as the Yadavs), in all other resource-intensive livestock products, coastal Andhra is far ahead of Telangana and Rayalaseema regions in per capita terms.

Table 23 presents the trends in livestock population per thousand hectares which are less resource-intensive. The number of cattle decreased from 2958 thousand to 1782 thousand; goat population increased from 1262 thousand to 1601 thousand but pig population decreased from 360 thousand to 256 thousand in coastal Andhra from 1956 to 2007. Except for cattle population, both buffalo and poultry increased in coastal Andhra. In Telangana, cattle, sheep and goat populations increased steeply compared to coastal Andhra and Rayalaseema. However, a recent spurt in demand for meat benefited sheep and goat rearing enterprises which benefited both Telangana and Rayalaseema. However, most of the goat farmers still follow age-old methods of rearing with very little productivity. To improve profitability from goat and sheep rearing, there is a need for adopting improved practices and breeds. The high demand from Hyderabad for meat drew many farmers to rear sheep and goats in Telangana region, while unprofitable crop cultivation and frequent droughts pushed Rayalaseema farmers to

Table 23. Trends in livestock population (per 1000 hectare).

Region	Year	Cattle	Buffalo	Sheep and Goat	Livestock	Poultry
Coastal	1966	414	401	396	1252	808
	1972	398	417	378	1235	976
	1977	369	423	362	1197	1133
	1983	386	496	418	1414	1529
	1987	359	491	368	1258	1827
	1993	309	511	345	1202	2448
	1999	309	542	436	1324	3328
	2003	256	586	680	1550	5194
	2007	317	690	819	1846	6095
Rayalaseema	1966	360	160	526	1063	424
	1972	344	166	552	1085	557
	1977	346	174	421	963	581
	1983	360	204	584	1215	747
	1987	350	210	492	1073	849
	1993	311	191	462	979	1027
	1999	332	206	549	1103	1158
	2003	300	232	966	1520	1841
	2007	376	291	1382	2061	2837
Telangana	1966	532	181	395	1126	392
	1972	569	187	477	1254	557
	1977	550	187	457	1220	643
	1983	630	246	457	1405	1176
	1987	584	251	436	1296	1457
	1993	523	281	504	1332	1806
	1999	480	292	628	1431	2215
	2003	403	327	1289	2062	3728
	2007	501	439	1582	2545	4308
AP	1966	450	247	429	1151	536
	1972	456	257	464	1205	694
	1977	439	261	416	1147	787
	1983	482	317	477	1360	1182
	1987	451	319	428	1227	1423
	1993	399	334	442	1199	1818
	1999	386	352	545	1312	2310
	2003	328	387	1008	1756	3727
	2007	409	484	1282	2193	4518

Table 24. Shift in relative position of districts in the production of livestock products between 1956 and 2011.

Shift from	Egg	Meat	Milk	Buffalo	Cattle	Fish	Poultry
High to low	Adilabad (T) Kadapa (R) Khammam (T) Kurnool (R)	Srikakulam (C) Adilabad (T) Kadapa (R) Khammam (T)			Nellore (C)	Medak (T)	Srikakulam (C) Kadapa (R)
Medium to low		Nizamabad (T) West Godavari (C)	Nizamabad (T) Warangal (T)	Mahbubnagar (T)	East Godavari (C) West Godavari (C)	Hyderabad (T) Anantapur (R) Chittoor (R)	Adilabad (T) Anantapur (R) Kurnool (R)
High to medium		Kurnool (R) Nellore (C)		Srikakulam (C)	Chittoor (R)	Karimnagar (T) Mahbubnagar (T) Nalgonda (T) Nizamabad (T)	Nalgonda (T) Nellore (C)
Low	Srikakulam (C) Anantapur (R)		Srikakulam (C) Kadapa (R)	Adilabad (T) Chittoor (R) Nizamabad (T)	Guntur (C) Kadapa (R) Krishna (C)	Adilabad (T) Kadapa (R)	Nizamabad (T)
Medium	Guntur (C) Visakhapatnam (C) Krishna (C) Nalgonda (T)	Anantapur (R) Chittoor (C) Karimnagar (T) Nalgonda (T)	Karimnagar (T) Khammam (C)	Anantapur (R) Kadapa (R) East Godavari (C) Khammam (T) Warangal (T)	Anantapur (R) Kurnool (R) Medak (T)	Khammam (T) Kurnool (R)	Karimnagar (T) Krishna (C) Mahbubnagar (T) Warangal (T)
High	Hyderabad (T) Nellore (C) West Godavari (C)	Mahbubnagar (T)	East Godavari (C) Krishna (C) Kurnool (R) Mahboobnagar (T) Medak (T) Nalgonda (T), West Godavari (C)	Guntur (C) Visakhapatnam (C) Krishna (C) Kurnool (R) Nellore (C) West Godavari (C)	Mahbubnagar (T) Nalgonda (T) Warangal (T)	Guntur (C) Visakhapatnam (C)	Visakhapatnam (C) Chittoor East Godavari (C)
Low to high		Guntur (C) Hyderabad (T) Visakhapatnam (C)	Visakhapatnam (C)			East Godavari (C) Krishna (C)	Hyderabad (T) Medak (T)
Low to medium	Karimnagar (T) Nizamabad (T) Warangal (T)	East Godavari (C)	Hyderabad (T) Adilabad (T)	Hyderabad (T) Karimnagar (T) Medak (T)	Hyderabad (T) Nizamabad (T)	Warangal (T)	Khammam (T)
Medium to high	Medak (T) East Godavari (C) Chittoor (C)	Krishna Medak (T) Warangal (T)	Guntur (C) Chittoor (C) Nellore (C)	Nalgonda (T)	Srikakulam (C) Visakhapatnam (C) Adilabad (T) Karimnagar (T)	Nellore (C) WestGodavari (C)	Guntur (C) West Godavari (C)

rear sheep and goat for the supplementary income. Many buffalos reared in coastal Andhra region are improved varieties with high milk productivity in semi-intensive structures which are more profitable than conventional cattle rearing.

The shift of districts in terms of livestock and its products from 1956 to 2011 is examined in Table 24. A positive shift (from low to high) in meat production was found in Guntur, Hyderabad, Visakhapatnam, East Godavari, Krishna, Medak and Warangal, while in milk production a positive shift is observed in Visakhapatnam, Hyderabad, Adilabad, Guntur, Chittoor and Nellore. In the matter of fish production, a positive shift is noted in East Godavari, Krishna, Warangal, Nellore and West Godavari. In poultry the positive shift is observed in Medak, East Godavari, Chittoor, Karimnagar, Nizamabad and Warangal. In egg production Hyderabad, Nellore and West Godavari; in meat production Mahbubnagar; in milk production East Godavari, Krishna, Kurnool, Mahbubnagar, Medak, Nalgonda and West Godavari; in fish production Guntur and Visakhapatnam districts maintained their position at a high level upto 2010. The highest negative shift (high to low) was recorded in Adilabad, Kadapa, Khammam and Kurnool for egg production, Srikakulam, Adilabad, Kadapa and Khammam in meat production, Srikakulam and Kadapa in poultry production. Overall the highest positive shift was recorded in urbanized and developed districts; overall, Telangana and Rayalaseema regions experienced a a negative shift except in districts close to urban centers such as Medak and Mahbubnagar.

Conclusion and policy options

In most of the development indicators, coastal Andhra is at a higher position, but growth rates are higher in Telangana and the least development is seen in Rayalaseema especially in the recent decades (Reddy 2011). The green revolution witnessed accentuation of inter-regional disparities favoring well-endowed regions (like coastal Andhra) (Evenson and Gollin 2003). However, since the 1980s (the second phase of green revolution) the high-input, high-output technology diffused to other crops with the invention of Genetically Modified (GM) crop varieties like Bt cotton, which is grown in less favored regions (like Telangana) reduced regional disparities to a certain degree in later years (Subramanian and Qaim 2009). This supports the Kuznet curve and Williamson hypothesis. The spread of GM technology and increased profitability of cotton crop was also helped to some extent by new private investment in terms of tube-well irrigation and free electricity in the backward Telangana region. However, the negative side is the shift from food crops to capital-intensive crops like cotton which increased the risk of farming, debt burden on small farmers and reduced food security as a result of which some farmers attempted suicides (Gaurav and Mishra 2012; Reddy 2010). High concentration of commercial activities in large urban centers (in Hyderabad) also helped the adjacent backward districts of Telangana region through spread effects outlined by Myrdal and is also in line with the theory of New Economic Geography. However, benefits have not reached the remote districts (periphery). In fact, Hyderabad's contribution to town population increased from 33% in 1991 to 37% in 2011, while the share of Vishakhapatnam (the state's second largest city) and Vijayawada (the third largest city) are stagnant at 8% and 7%. The most backward region (Rayalaseema) does not have a growth engine in terms of trade or large urban consumer base, production centres or through agricultural productivity growth. For example, the major crop of Rayalaseema, productivity of groundnut (an edible oilseed crop) has been stagnant in the last three decades (Reddy and Bantilan 2012). After the 1980s, the policy orientation also targeted towards reducing regional inequalities as the policymakers realized that the strength of trickledown effect could not percolate to the periphery districts (backwash effects are more than spread effects in the initial stages of development) unless there were direct measures to curtail regional disparities. Hence, there is a need to promote large urban centers with large public investments at a sub-regional level in the

backward areas to boost growth. This will attract human and physical capital and rejuvenate the local industry for employment and income generation through 'home market effect. One way of doing this is to promote sub-national governance, which has the potential to be more 'inclusive', through promotion of local bodies and institutions, involving and giving voice to formerly marginalized underrepresented groups, such as women, scheduled castes and tribal populations, youth, and other communities as well as the traditionally organized interests of capital and labor (Pike et al. 2002).

A significant proportion of new investments have gone into infrastructure in urban metropolitan locations like Hyderabad. There should be a policy to maximize the positive effects of urban centers on the local periphery through policies which increase the spread effects through development of good transportation and communication facilities and link roads from the hinterlands to main urban centre. The regional policy should provide incentives in the promotion of large industries in periphery areas of large urban centers.

Emphasis on social safety net programs, employment guarantee programs, watershed programs in drought-prone areas, programs like 'Development of Backward Districts Initiative', which will enhance sustainable livelihoods in remote villages, is crucial in the transition phase. Promoting transparency in the implementation of development programs to prevent leakages and corruption is an immediate need. These social safety nets enhance the income and employment opportunities for vulnerable groups of population such as women, children and aged who may not be able to participate in the faster urban sector growth. The faster urban sector growth requires affordable housing, public investment in sanitation, healthcare, etc., that directly targets poor urban slum dwellers.

The agricultural development in the less developed districts is a big challenge as they are resource-poor regions and crops are grown under more risky agro-ecological conditions. Over a period of time they become specialized in dryland crops, which are technologically less productive and high risk crops. Farmers are deprived of physical and financial capital, higher costs in developing, delivering and accessing services (for input or output markets, or research, extension from both public and private sectors). Greater competition in output markets make such agriculture unsustainable. Many of these difficulties are endogenous, such as agro-ecological, locational, demographic and socioeconomic which affects agricultural transformation and is a direct result of these differences. It is unfortunate that an already difficult task has been made harder by broader processes of change (for example some aspects of globalization and withdrawal of state from support services). Governments must try to reduce transaction costs and increase profitability to farmers and traders where high transaction costs and low profits are constraining development of these unfavorable regions. With more variability, risk and uncertainty and with lower densities of economic activity (for example, in areas such as Anantapur and Mahbubnagar), the need for state support is even greater than it was in the high-income regions. So far in this paper we have argued that agricultural growth, particularly rice-based intensification along with diversification to high value crops like fruits and vegetables, offers the best potential in coastal region. On the other hand Telangana and Rayalaseema regions are not suitable for such a strategy. This leaves policymakers with a major challenge to reduce transaction costs and raise the profitability of agricultural diversification-led growth. What then are the best policy options for agricultural growth in these areas in the long run, keeping their competitiveness? Some policy options are not controversial: the benefits of education, improved governance and communications infrastructure are widely recognized and benefit farm sectors in under-developed regions. Some researchers also question the effectiveness of research and extension services without complementary markets and infrastructure, and there is a continuing process of experimentation about the best means and practices to finance and deliver these

services to commercial and subsistence farmers. High transaction costs may be even more constraining on agricultural diversification towards commercial crops; there is a greater need for price support and stabilization to make the technologies financially attractive to farmers (Reddy 2009a, 2009b). The role of prices in changing producer decisions also depends on farmers' allocative and technical efficiency as well as the operating land tenurial system (Streeten 1986; Krishna 1984). Due to the lack of policies which address regional disparities, the gap widened between the potential and actual productive capacities of agriculture (Hayami and Ruttan 1985).

Some policy options

These are some policy options that will help reduce regional disparities:

(i) There needs to be more emphasis on rainfed agriculture for wider dissemination of location-specific technology.

(ii) There is a need for the promotion of small and medium enterprises in backward regions through fiscal incentives.

(iii) Funding for the development of backward districts needs to be increased.

(iv) Efforts need to be focused on reducing regional disparities by promoters in small towns and encouraging decentralized industrialization.

(v) Market access by small farmers at the village level for inputs and outputs must be ensured.

(vi) Policy intervention to promote agricultural diversification growth strategy for inclusive growth.

(vii) Direct and indirect costs and benefits need to be accounted for while addressing exposure to risk in the more marginal agro-ecological regions in development planning.

(viii) Policy analysis should consider the costs, benefits and difficulties of market interventions together with those of welfare interventions as they both compete for the same resources with similar objectives and outcomes.

(ix) Action research is needed in institutional innovation, trying out innovative institutional arrangements involving elements of interlocking transactions, producer groups, regulated monopsony, cooperative competition and use of agents such as traders and trader information groups

(x) It is important to promote new communication technology, transport, contract farming and market infrastructure to reduce transaction costs, for inclusive and balanced growth of backward districts.

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25-2014