



*“Sources of Agricultural Growth in Andhra Pradesh, India:
Scope for Small Farmer Participation”*

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Abstract

Andhra Pradesh is one of the largest states in India, with agriculture providing the major source of income for about 60 % of the population even though it contributes only 19% state GDP. In the last 40 years, annual growth rate of agriculture is 2.88% as against targeted growth of about 4% per annum. This paper analyses the sources of crop sub-sector growth in pre-liberalization period (from 1970-1989) and post-liberalisation period (from 1990-2009). The growth rate in value of production in pre-liberalisation period is lower (2.4% per annum) than post-liberalisation period (2.7%). Even though contribution of both yield and crop diversification to growth in value of production is higher, the negative contribution of real prices is the main reason for slower growth in pre-liberalisation period. While positive contribution of prices along with yield and diversification in the post-liberalisation period contributed for higher growth rate. In the post-liberalisation period, regions are specializing based on their resource endowment (coastal Andhra in paddy, Telangana in cotton and Rayalaseema in groundnut), even though all the regions show general tendency of diversification towards high value crops

like fruits and vegetables. The paper highlights that the small farmer's participation in diversification towards High Value Crops (HVCs; fruits, vegetables, spices, cotton and sugarcane) is limited, but they adopted the yield increasing technology components like HYVs, irrigation and cropping intensity compared to large farmers. As a result gross and net returns per hectare are higher among small farms. This might have positive effect on small farmers who comprise 86% of the total farm households, and cultivate, on average, half a hectare of land. The paper also demonstrates that there is positive association between reduction of poverty and area under high value crops. Agricultural diversification in favour of HVCs that generate larger returns and are labor-intensive, which are demand driven to be explored for the benefit of small farmers. In many agricultural development indicators, coastal Andhra is better positioned followed by Telangana and Rayalaseema.

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I. Introduction

Andhra Pradesh is ranked fourth largest in India in terms of area, its projected population of 84 million as of 2010, makes it the fifth most populous State. In its Vision 2020 document, the government of Andhra Pradesh envisaged a still higher growth rate for agriculture at 6 % per annum in the state (Government of Andhra Pradesh, 1999) to achieve a 10% growth in Gross State Domestic Product (GSDP). It is interesting to note that, Andhra Pradesh is considered as one of the progressive states in India and rural poverty in Andhra Pradesh declined steeply from 48.4% in 1973-74 to 11.2% in 2004-05, while at all-India level, poverty reduced slowly from 56.4% to 28.3%. The GSDP growth during pre-liberalisation period (1970 to 1989; period-I) is 4.03%, with agricultural sector growth rate of 2.3%, while in the post-liberalization period (1990 to 2009; period-II) growth rate of GSDP increased to 6.17% per annum, with a slightly better rate of growth of agriculture at 3.63% per annum (figure 1). The over all growth rate of GSDP of AP was 5.27%, accompanied by agricultural sector growth of 2.9% per annum from 1970 to 2009. However, within the agricultural sector, crop sub-sector is growing at slower phase (2.32%) than livestock sector (7.54%) and fishing (5.6%) during period-II¹. The slow growth of crop sub-sector is a concern for sustaining the agricultural sector growth in Andhra Pradesh. Enhancing crop sub-sector growth, therefore, is a major policy challenge. Some studies estimated that the growth rate of crop output decelerated steeply in 1990s to 2.2% from 3.4 in 1980s (Reddy, 2011a; Reddy, 2010a Reddy and Batilan, 2012b).

Background information of Andhra Pradesh

The total geographical area of Andhra Pradesh is 27.5 million hectares. Out of which 39.8% is under Net Cropped Area (10.9 million hectares) with a cropping intensity of 1.26. Average annual rainfall in the state is 940 mm. About 72% of population lives in

¹ Before 1993-94 dis-aggregated data is not available

rural areas. Even though about 62.2% of workers are dependent on agriculture (out of which 22.5% are cultivators and remaining 39.6% are agricultural labourer) its share in the GSDP declined from about 40% in 1980 to about 17% in 2009. Agriculture in Andhra Pradesh primarily consists of smallholder agriculture. Approximately 84 % of the land holdings are of less than or equal to 2 hectares (ha), with a mean holding size of 0.7 ha. Evidence suggests that agricultural diversification, from lower- to higher-value activities, possesses substantial potential to increase opportunities of income and employment for small farmers (Weinberger and Lumpkin 2007; Birthal et al., 2008). On the demand side too, there are significant opportunities to diversify towards high-value commodities. Demand is witnessing exponential growth and the factors such as rising per capita incomes and a fast-growing urban population are responsible. For example, between 1990 and 2000, the per capita consumption of HVCs ((includes fruits, vegetables, cotton and sugarcane) increased by 10-20%, as against a decline of 5% in the per capita consumption of cereals (Mittal, 2006; Reddy 2010b).

In this paper, we examine (i) whether agriculture in Andhra Pradesh is diversifying from lower- to higher-value commodities? What is the pattern across regions? (ii) What are the sources of agricultural growth, and how much? (iii) Is diversification-led growth inclusive? And, (iv) what kind of technologies, policies and institutions are required to faster agricultural diversification and hence, agricultural growth? The paper is organized into six sections. The following section describes the data and methodology. Section 3 discerns the trends in agricultural growth at the state and regional levels, and the contribution of diversification to growth is discussed in section 4. The issue of the benefits distribution of agricultural productivity and diversification with an emphasis on small farmers' participation in high-value agriculture is investigated in section 5. The final section presents conclusions of the study and their implications from technological and institutional policy point of view.

II Data and Methodology²

In this paper we have analyzed the sources of growth of crop sector in Andhra Pradesh for the period 1970/71 to 2008/09. This period is further divided into two sub-periods: pre-liberalisation period (1970/71 to 1989/90) and post-liberalisation period (1990/91 to 2008/09). The period from 1970 to 1989, witnessed the Green Revolution at its peak spread throughout the state leading to a wide spectrum of growth of agricultural sector. At the beginning of the 1990s, the Government of India initiated a series of economic reforms including the de-regulation of liberalization of agricultural markets and opening up of trade in agricultural commodities. Further, the consumption pattern also underwent a shift- from staple cereals towards high-value food/non-food commodities. Andhra Pradesh is distinctly divided into three regions, namely the coastal Andhra, Telangana and Rayalaseema regions due to the considerable heterogeneity in the socio-cultural, economic and agro-climatic conditions, which are also likely to have influenced the nature, extent and speed of agricultural growth across the regions. Therefore, the dynamics of agricultural growth and its outcomes are also investigated at the regional level.

² This section is based on [Birthal et al. \(2006\)](#)

The data for studying the dynamics of agricultural diversification and its contribution to agricultural growth were compiled from various published and unpublished sources. State-level data on the area and production of crops were collected from various issues of the ‘statistical abstracts’ published by the Directorate of Economics and Statistics, Government of Andhra Pradesh. The prices of different agricultural commodities were obtained by dividing their value of output (at current prices) by their respective production levels. The current prices of different agricultural commodities were then converted into real prices using the wholesale price index of all commodities (1990/2000 base) for Andhra Pradesh as a deflator. The data were de-trended by applying the Hodrick-Prescott (HP) filter³ with a modifying factor of 6.25.

Any change in the value of agricultural output or the growth can emanate from any or all of the following sources: (i) an increase in the total cropped area, (ii) land reallocation from lower- to high-value crops or diversification, (iii) improvements in the yields or technological change, and (iv) an increase in the real prices of agricultural commodities. To quantify the contribution of area, yield, prices and land reallocation or diversification to agricultural growth we followed the ‘growth accounting approach’ developed by Minot (2003). Let A_i be the area under crop i , Y_i be its yield, and P_i be its price, then the gross revenue (R) from n crops ($i \dots n$) is:

$$R = \sum_{i=1}^n A_i Y_i P_i \text{ ----- (1)}$$

Further, to quantify the effect of land reallocation or diversification A_i , is expressed as the share of crop i in the total cropped area, that is $a_i = A_i / \sum_i A_i$ and equation (1) can be re-written as:

$$R = \left(\sum_{i=1}^n a_i Y_i P_i \right) \sum_{i=1}^n A_i \text{ ----- (2)}$$

Total derivative of equation (2) provides the change in the gross value of output due to area, yield, prices and land reallocation.

$$dR \cong \left(\sum_{i=1}^n a_i Y_i P_i \right) d \left(\sum_{i=1}^n A_i \right) + \left(\sum_{i=1}^n A_i \right) d \left(\sum_{i=1}^n a_i Y_i P_i \right) \text{ ----- (3)}$$

The second term on the right-hand side of equation (3) can be further decomposed from a change in sums to the sum of changes as:

$$dR \cong \left(\sum_{i=1}^n a_i Y_i P_i \right) d \left(\sum_{i=1}^n A_i \right) + \sum_{i=1}^n A_i \sum_{i=1}^n d(a_i Y_i P_i) \text{ ----- (4)}$$

Further expansion of the term $\sum_{i=1}^n A_i \sum_{i=1}^n d(a_i Y_i P_i)$ in equation (4) yields following expression:

$$dR \cong \left(\sum_{i=1}^n a_i Y_i P_i \right) d \left(\sum_{i=1}^n A_i \right) + \sum_{i=1}^n A_i \sum_{i=1}^n a_i Y_i dP_i + \sum_{i=1}^n A_i \sum_{i=1}^n a_i P_i dY + \sum_{i=1}^n A_i \sum_{i=1}^n Y_i P_i da_i \text{ ----- (5)}$$

³ Hodrick-Perscott filter is a data smoothening technique, commonly applied to remove short-term fluctuations from time series data. It generates a smoothened non-linear representation of a time series. The adjustment of the sensitivity of the trend to short-term fluctuations is achieved by applying a suitable adjustment factor.

Equation (5) decomposes growth due to change in the total cropped area, crop yields and their prices and crop diversification. Equation (5) is an approximation of the change in the gross revenue explained by area, yield, price and diversification as it does not contain ‘interaction effect’ of these variables. The first term on the right-hand side represents the change in the gross revenue due to the change in the total cropped area. The expression

$\sum_{i=1}^n a_i Y_i P$ is the weighted average of the gross revenue per hectare, the weights being the share of each crop (a_i) in the total cropped area. The second term on the right-hand side denotes the change in gross revenue due to a change in the real prices of commodities. The third term measures the change in the gross revenue due to changes in crop yields or technology. The fourth term provides an estimate of the contribution of diversification to the change in the gross revenue. Dividing both sides of equation (5) by the overall change in gross revenue (dR) provides us with the proportionate share of each source of the overall change in the gross revenue or agricultural growth.

III Trends in agricultural growth

Trends in GSDP and share of agriculture

Figure 1 depicts the trends in GSDP and agricultural-GSDP; it is interesting to note that GSDP increased at exponential growth rate, while agricultural-GSDP increased at linear growth rate, as a result the share of agriculture in GSDP is reduced from about 40% in 1980 to about 17% in 2009. Table 1 tracks changes in the composition of agricultural GSDP in the past three decades. Share of crop sub-sector (including horticulture) decreased from 71% in 1973 to 61% in 2009, but it continued to dominate the agricultural sector. Livestock comprises of the next most important income source after crops, and its share in the agricultural GSDP has increased from less than 13% in 1973 to 27% in 2009.

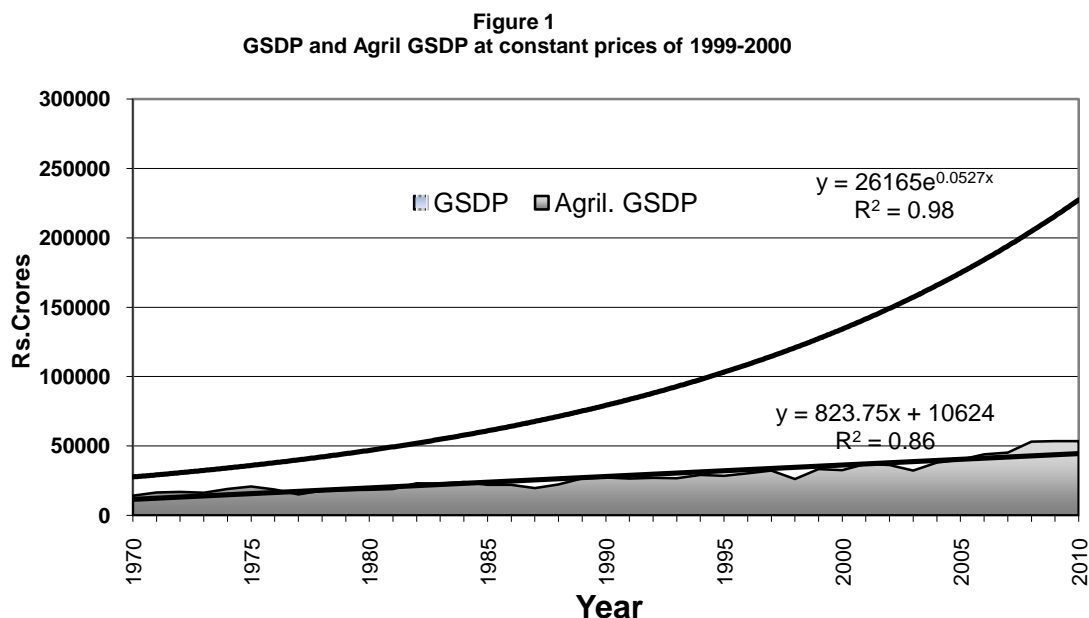


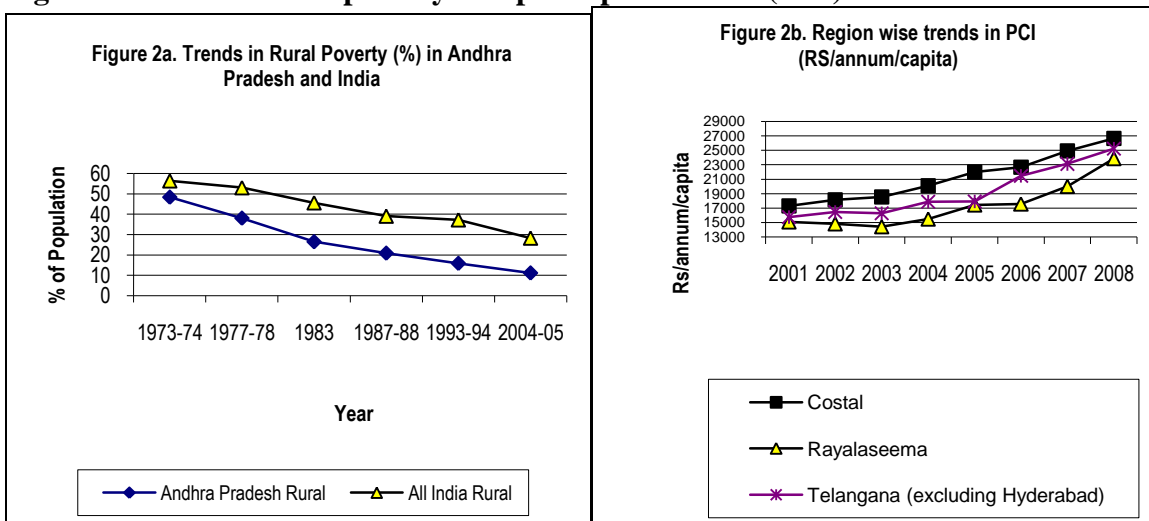
Table 1: Changes in the composition of APs agricultural sector (% of the agricultural-NSDP)

Sector	1973	1993	2009

Crop	71.2	70.4	61.6
Livestock	13.0	20.0	26.6
Crop and livestock	84.2	90.4	88.2
forestry & logging	7.9	4.6	2.5
Fishing	7.9	5.0	9.3
agricultural sector	100	100	100
Agril SGDP (Rs.1000 crores at constant prices of 1999-000)	19.6	29.3	51.3

It is interesting to know that poverty reduction is faster in rural Andhra Pradesh compared to the decline in all-India rural poverty from figure-2a. Figure 2b depicts regional trends in the change in the per capita income (PCI); it indicates that, prominently PCI is higher in coastal Andhra, followed by the Telangana and Rayalaseema regions. The reasons for consistent performance in PCI by the Rayalaseema and Telangana regions were explored in section-IV. Since crop-sub-sector dominates the agricultural sector and its growth was slow in recent years, we examine the dynamics of sources of growth of crop sub-sector.

Figure 2. Trend in rural poverty and per capita income (PCI)



Annual growth rates n Value of Production and Area

The growth rate in value of production (VoP) of crop sub-sector is 2.9% per annum (2.7% in period-II; 2.4% in period-I) in AP for the entire period. Its growth is much higher in the Telangana region (3.6%) and least in Rayalaseema region (2.7%) (Table 2). Growth rate is higher in period-II in the Telangana region, while it is higher during period-I in the coastal Andhra and Rayalaseema regions. The overall, highest positive growth is recorded for the VoP of pulses (5.8%), followed by HVCs (includes fruits, vegetables, cotton and

sugarcane) (5.2%), oilseeds (2.2%) and the least growth recorded in cereals (1.5%) for entire period. The growth rate in the VoP in period-I is higher for pulses (9%), oilseeds (3.1%) and cereals (1.5%), while the growth rate is higher for HVCs in the period-II (5.7%). Growth in area under cereals is negative in all three regions, while the growth rate in VoP of cereals is negative only in the Rayalaseema region. Growth in VoP of cereals was higher in coastal Andhra during period-I, and in Telangana during period-II. In the case of pulses, the growth rate in the area was higher in period-II, but the growth in the VoP was higher during period-I. Most of the growth in pulses came from the coastal Andhra and Rayalaseema regions. In the case of oilseeds, most of the growth took place during the period-I, while the period-II recorded negative growth due to the impact of liberalization and competition from low-priced palm oil and soyaoil (Reddy, 2009b; Reddy et al., 2011; Reddy and Bantilan, 2012a). The growth in oilseeds is much higher in Rayalaseema compared to other two regions. The growth in area under HVCs is 3.1% mostly contributed by the Telangana (4.9%) and coastal Andhra (3.0%) regions. The growth in VoP of HVCs is higher in period-II due to higher growth in area, yield and prices in all three regions.

Share of Area and Value of Production

Share of area under the cereals decreased from 59% to 43% of GCA, while the share of area increased for HVCs (from 10% to 18%), pulses (from 11% to 14%) and oilseeds (from 18% to 23%) from period-I to period-II (Table 2). This indicates that there is significant diversification of area from cereals to HVCs, pulses and oilseeds. In the VoP, the reduction was much more significant in cereals from 49% to 36%, it increased significantly for HVCs from 27% to 43%. In the case of pulses and oilseeds even though share in area is 14% and 23% respectively in period-II, their share in the VoP was only 5% and 13%, mainly due to the lower levels of yields of both these crop groups. In coastal Andhra, the share of area under cereals is still more than half of gross cropped area, but its share reduced to 19% in Rayalaseema during period-II. The share of area under pulses is also higher in coastal Andhra at 17%, while only 8% in Rayalaseema in period-II. The share of area under oilseeds was highest in Rayalaseema (60% of GCA) followed by Telangana (16%) and coastal Andhra (9%) in period-II. The share of area under HVCs was at 20% in both the coastal Andhra and the Telangana regions, while in Rayalaseema it was just 13% in period-II. Overall, still the coastal Andhra and the Telangana regions are dominated by food grains and HVCs, while Rayalaseema region is dominated by oilseeds.

Table 2. Growth rates (% per annum) and share of different crop groups in area and VoP

		Coastal Andhra			Rayalaseema			Telangana			A		
		P-I	P-II	Total	P-I	P-II	Total	P-I	P-II	Total	P-I	P-II	Total
		Growth (% per annum)											
Cereals	Area	-0.2	-0.8	-0.6	-2.0	-3.0	-3.7	-1.0	-0.5	-1.3	-0.9	-0.9	-1.4
	VoP	2.2	0.9	1.8	-1.3	-0.6	-1.0	1.6	2.0	1.9	1.5	1.0	1.5
Pulses	Area	0.7	1.0	2.2	1.1	8.2	3.3	0.1	0.8	-0.2	0.3	1.8	1.3
	VoP	14.0	0.5	7.4	4.9	11.7	8.5	5.5	3.1	3.4	9.0	3.0	5.8
food grains	Area	-0.1	-0.3	-0.1	-1.7	0.5	-2.2	-0.8	-0.2	-1.1	-0.7	-0.2	-0.8
	VoP	2.8	0.9	2.1	-1.1	2.2	0.3	2.0	2.1	2.0	2.0	1.3	1.9
Oilseeds	Area	0.1	-2.3	-0.1	1.9	-0.2	2.3	-1.0	-2.1	-0.3	0.6	-1.1	1.1
	VoP	2.8	-1.6	1.3	4.1	-2.1	2.6	1.4	-0.1	1.9	3.1	-1.9	2.2

HVCs	Area	3.5	1.4	3.0	-0.7	0.1	0.4	3.4	3.6	4.9	2.3	2.2	3.1
	VoP	3.8	5.2	4.5	3.2	5.7	4.6	4.9	6.3	7.0	3.8	5.7	5.2
all crops	Area	0.3	-0.2	0.3	-0.1	0.0	0.3	-0.5	0.2	-0.3	-0.1	-0.1	0.1
	VoP	2.6	2.5	2.8	2.2	1.8	2.7	2.5	3.7	3.6	2.4	2.7	2.9
Share (% of total crop sector)													
		P-I	P-II	Total	P-I	P-II	Total	P-I	P-II	Total	P-I	P-II	Total
Cereals	Area	63	51	57	45	19	32	63	49	57	59	43	51
	VoP	52	42	46	30	14	20	58	40	46	49	36	41
Pulses	Area	11	17	14	5	8	7	15	14	14	11	14	12
	VoP	3	6	5	1	5	3	6	5	5	4	5	5
food grains	Area	73	67	70	50	27	38	78	64	71	70	57	63
	VoP	55	48	51	31	19	23	64	45	51	53	41	45
Oilseeds	Area	9	9	9	38	60	49	15	16	15	18	23	20
	VoP	5	4	5	38	39	38	12	9	10	14	13	13
HVCs	Area	12	20	16	12	13	12	7	20	13	10	18	14
	VoP	30	42	38	29	42	37	22	45	37	27	43	37

Note: HVCs (including fruits, vegetables, cotton, sugarcane)

Table 3 depicts the share of different crops in GCA and VoP. The share of rice was stagnant at 30% GCA in AP, while its share in VoP declined from 39 % to 32 % from period-I to period-II. On the other hand, the share of area under sorghum decreased from 18% to 6% and the share in VoP reduced from 5.4% to 1.4% due to faster decline in the real prices. Overall, the share of coarse cereals (excluding maize) in GCA and VoP steeply declined in period-II. The share of all pulse crops (pigeonpea, chickpea and other pulses) increased considerably both in GCA and in VoP during period-II. Among the oilseeds, share of groundnuts area increased from 12.7% to 15.7% and share of sunflower area increased from 0.1% to 2.8%, while share of area under all other oilseeds decreased from 6.0% to 4.6 %. However, share of oilseeds (except sunflower) in VoP decreased due to decline in real prices in period-II. The Share of the area under cotton increased from 3.6 to 7.5%, with consequent increase of share in VoP from 4% to 4.8% from period-I to period-II. The Share of area under fruits was also a major gainer from 2% to 4.4 %, along with increased share in VoP from 8% to 14.5%. The Share of area under spices also increased from 2% to 3.3% with VoP increased from 6.5% to 7.9% from period-I to period-II. A significant jump in the share in the VoP and area of sugarcane, vegetables, but decrease in the share of tobacco in all three regions is an indication of diversification of cropping pattern towards commercial crops which are demand driven. Agriculture is more diversified towards water-intensive crops like sugarcane and rice in the coastal Andhra, and irrigated-dry crops which fetch higher prices like spices, cotton, maize and pigeonpea in the Telangana region due to growing consumption demand for these crops from major urban centers (Hyderabad) and towards less water consuming crops like groundnut and chickpea in Rayalaseema region during period-II.

Rice is still a dominant crop in the state due to favourable pricing policies, assured procurement, the availability of high-yielding seeds and better irrigation facilities. Further, it is interesting to note that HVCs accounts for 43% of the total VoP of the crop sector during period-II, rising from 27% in period-I. A congenial climate, higher prices and constant demand explain the dominance of HVCs. Coastal Andhra has emerged as an

important hub for cultivation of fruits. However, this remains under-exploited due to the poor infrastructure, mainly roads and markets in other two regions.

Table 3. Share (%) in area and VoP of different crops

	year	Coastal Andhra		Rayalaseema		Telangana		Andhra Pradesh	
		P-I	P-II	P-I	P-II	P-I	P-II	P-I	P-II
Rice	Area	48.4	45.6	13.4	9.5	21.5	26.4	29.7	30.0
	VoP	47.7	41.2	19.3	11.1	38.7	31.1	39.3	31.9
Sorghum	Area	6.3	0.7	18.2	5.8	29.4	12.5	18.4	6.3
	VoP	1.5	0.1	6.4	2.1	11.9	3.0	5.4	1.4
Maize	Area	0.3	1.3	0.0	0.3	5.8	8.5	2.5	3.8
	VoP	0.2	1.0	0.1	0.3	6.2	6.5	1.9	2.7
other cereals	Area	7.9	3.3	13.2	3.1	6.3	1.9	8.4	2.7
	VoP	2.6	0.7	5.1	0.9	1.9	0.3	2.9	0.6
Pigeonpea	Area	1.0	2.1	1.8	2.6	2.9	4.6	1.9	3.2
	VoP	0.2	0.6	0.3	0.7	0.9	1.4	0.5	0.9
Chickpea	Area	0.2	0.9	0.5	5.0	0.9	1.0	0.5	1.9
	VoP	0.1	0.7	0.2	3.3	0.4	0.6	0.2	1.2
other pulses	Area	9.6	13.6	2.4	0.9	10.8	8.7	8.5	8.9
	VoP	2.7	4.4	0.6	0.3	4.4	2.9	2.8	3.1
GN	Area	5.4	4.3	35.7	50.1	6.9	6.7	12.7	15.7
	VoP	4.8	3.3	36.5	34.2	8.8	5.7	12.4	10.3
Sunflower	Area	0.0	0.5	0.5	8.4	0.1	1.7	0.1	2.8
	VoP	0.0	0.2	0.3	4.6	0.0	1.0	0.1	1.4
other oilseeds	Area	3.7	4.0	1.4	1.1	8.1	7.6	5.0	4.6
	VoP	0.5	0.9	0.4	0.3	2.9	2.4	1.2	1.1
Cotton	Area	3.2	5.2	5.2	3.6	3.0	12.3	3.6	7.5
	VoP	5.4	3.9	3.1	2.1	2.6	7.4	4.0	4.8
other fibre	Area	2.3	1.4	0.0	0.0	0.1	0.0	0.9	0.6
	VoP	3.3	1.0	0.0	0.0	0.1	0.0	1.7	0.5
Fruits	Area	3.5	7.2	2.2	3.4	0.4	2.1	2.0	4.4
	VoP	8.1	14.0	13.2	19.9	3.7	11.9	8.0	14.5
Vegetables	Area	0.8	1.5	0.8	2.2	0.4	1.2	0.6	1.5
	VoP	1.0	3.6	1.3	6.7	1.0	4.3	1.1	4.5
Spices	Area	2.4	3.6	3.1	2.5	2.2	3.4	2.5	3.3
	VoP	6.1	6.7	4.7	3.3	8.2	12.9	6.5	7.9
Tobacco	Area	3.1	2.3	0.7	0.5	0.6	0.4	1.5	1.2
	VoP	7.1	4.3	2.2	1.3	2.4	1.2	4.8	2.7
Sugar cane	Area	2.0	2.5	1.0	1.1	0.7	1.1	1.2	1.8
	VoP	8.8	13.3	6.0	9.0	5.7	7.4	7.3	10.4

To sum up, AP is steadily diversifying towards HVCs, but not at the cost of staple food crop like rice. The growth in the HVCs was quite impressive in all the regions, and was fuelled by their increasing urban demand for fruits, vegetables, sugarcane, and maize (as poultry feed) and also the expanding demand from national/international markets for sugarcane (for sugar production) and cotton (from textile industry).

IV Sources of growth in Value of Production

In this section, we present the decomposition of the crop sub-sector growth in VoP by crops and sources - area, prices, yield, and land reallocation or diversification- to distinguish their contributions. First, we examine the trends in the VoP of different crops and their contributions to the crop sub-sector growth (at 1999/2000 real prices). At the state level, crop sub-sector grew at an annual rate of 2.4% during period-I, and marginally increased to 2.7% during period-II (Table 4). Trends in growth rates in period-II are different from period-I. During period-II, growth rates in the VoP of maize, pigeonpea, chickpea, other oilseeds, fruits, vegetables, spices and sugarcane higher, while growth rates of rice, sorghum, other coarse cereals, other pulses (mung and urd), groundnut, sunflower and cotton lower than period-I in AP. The growth in VoP accelerated in sugarcane, other fibre, chickpea and pigeonpea during period-II, while decelerated in coarse cereals, groundnut and cotton in all the three regions. In period-II, the highest growth rate is recorded in chickpea(16.8%) followed by sugarcane (9.5%), maize (8.3%), other oilseeds (7.8%), vegetables (6.3%), fruits (6.2%), pigeonpea (5.4%), sunflower (4.5%) and spices (3.2%), while highest negative growth rate is recorded for other cereals (-7.1%), groundnut (-4.6%), sorghum (-3.7%), other pulses (-2.6%) and tobacco (-1.4%).

Table 4 also presents contribution of each crop to change in the VoP of crop sub-sector in period-I and period-II. The figures indicates that, during period-I, the contribution of rice (36% of change in VoP in the state) was the highest followed by groundnut (20%), fruits (15%), other pulses (9%), vegetables (5%) and spices (5%), while sorghum (-3%), other coarse cereals (-1%) and other fibre (-1%) contributed negatively in change in VoP in the state. During period-II, the contribution of sugarcane (27%) was the highest followed by fruits (25%), rice (14%), maize (6%), vegetables (6%), cotton (5%) and other oilseeds (5%) while other coarse cereals, sorghum, other pulses (mung, urd) contributed negatively.

During period-I, in coastal Andhra, contribution of rice was the highest (44%) followed by fruits (14%), cotton (13%), other pulses (13%), while the contribution of sorghum and other fibre was negative. In Rayalaseema, the contribution of groundnut was the highest (69%), followed by fruits (17%), vegetables (7%) and sunflower (5%), while other cereals and spices contributed negatively to change in VoP. In Telanagana contribution of rice (45%) was the highest followed by fruits (13%), spices (12%), groundnut (9%), cotton (8%), while negative contribution recorded in sorghum (-7%), and other coarse cereals (-1%). While during period-II, in the coastal Andhra, the contribution of sugarcane (41%), fruits (19%) and rice (18%) is significantly higher than other crops. In Rayalaseema the contribution of fruits (39%) was the highest followed by sugarcane (16%), chickpea (14%), groundnut (11%) and vegetables (10%) and contribution of coarse cereals, cotton and tobacco was negative. In Telanagana, the contribution of fruits (24%), followed by sugarcane (17%), cotton (13%), maize (10%), vegetables (7%), spices (6%) and other oilseeds (6%) is positive, while sorghum, other pulses, groundnut contributed negatively to change in VoP during period-II.

Table 4: Growth rates and share of different crops in changes in Value of Production

	Coastal Andhra		Rayalaseema		Telangana		Andhra Pradesh	
	P-I	P-II	P-I	P-II	P-I	P-II	P-I	P-II
Rice	2.5	0.7	-1.7	-0.5	3.2	1.6	2.2	0.8

Sorghum	-6.4	-3.7	-0.4	-1.6	-3.5	-4.6	-3.4	-3.7
Maize	7	14.8	5.2	22	2.3	6.9	2.4	8.3
other cereals	-1.2	-6.7	-1.2	-7.9	-2.2	-4.9	-1.6	-7.1
Pigeonpea	9	4.4	2.8	4.1	4.3	6.8	4.9	5.4
Chickpea	1.2	24.8	10.4	14.8	-2.9	16.4	0.9	16.8
other pulses	14.9	-3	3.7	1.9	6.6	-1.8	10.3	-2.6
GN	3.3	-7.2	4	-3.1	2.3	-4.1	3.4	-4.6
sunflower		10.6		4.4		1	62	4.5
other oilseeds	-1.5	9.4	1.5	5.3	-1.4	7.3	-1.2	7.8
Cotton		-3.5	1	-10.7	5.8	4.6	8.3	-0.2
other fibre	-5.9	-0.6	-8.9	1.9	-5.7	-5.1	-6.4	-0.9
Fruits	6	4.5	5	6.5	8.6	7.7	6.1	6.2
Vegetables	8.1	3.9	9.8	6.6	8.9	8.5	8.5	6.3
Spices	1.8	3.9	0.1	1.9	4.3	2.6	2.8	3.2
Tobacco	-0.9	-0.5	-2.7	-2.9	-0.7	-4.6	-1.2	-1.4
Sugar cane	-1	9.7	1.1	7.8	1.7	9.8	-0.2	9.5
Total	2.6	2.5	2.2	1.8	2.5	3.7	2.4	2.7
	Change in the share of VoP							
Rice	44	18	1	3	45	16	36	14
Sorghum	-1	0	0	-1	-7	-2	-3	-1
Maize	0	5	0	2	5	10	2	6
other cereals	0	-1	-3	-2	-1	0	-1	-1
Pigeonpea	1	1	0	1	1	2	1	1
Chickpea	0	3	1	14	0	2	0	5
other pulses	13	-2	0	0	7	-1	9	-1
GN	8	-3	69	11	9	-1	20	0
sunflower	0	1	5	8	1	2	1	3
other oilseeds	0	7	0	1	0	6	0	5
Cotton	13	0	0	-1	8	13	9	5
other fibre	-3	0	0	0	0	0	-1	0
Fruits	14	19	17	39	13	24	15	25
Vegetables	5	4	7	10	5	7	5	6
Spices	4	6	-3	1	12	6	5	5
Tobacco	2	1	1	-1	0	0	1	0
Sugar cane	0	41	3	16	3	17	1	27
Total	100	100	100	100	100	100	100	100

Rice accounted for a larger share of the growth in the coastal Andhra region in period-I and sugarcane during period-II mainly because of widespread cultivation of their improved varieties, the availability of a good irrigation infrastructure and effective implementation of procurement at MSP. Likewise, the oilseeds production has remained concentrated in the Rayalaseema region, and its higher contribution to the overall growth can be attributed to the policies that favored their growth and also lack of alternate crop choice among farmers of these region. In period-II, high-value crops (including sugarcane,

fruits, maize, vegetables and cotton) emerged as an important driver of growth because of growing demand.

Another way to disaggregate growth is by its source that is, area, yield, prices and land reallocation among crops. Table 5 presents the contribution of these sources to the overall growth of the crop sub-sector, separately for period-I and period-II. In absolute terms the change in the VoP is more than double in period-II compared to period-I. In both the periods, the change in the VoP is much higher in the coastal Andhra followed by the Telangana and the least in Rayalaseema region. Overall, in the state, change in the VoP is Rs.8610 crores in period-I and Rs. 22290 crores in period-II at constant prices of 1999-2000. It translates to Rs.431 crores per year during period-I and Rs.1173 crores per year in period-II. Yield improvements – a proxy of technological change - had been the main source of growth in AP agriculture, but more prominently in period-I when these contributed close to 86% to the overall growth as against 74 % in period-II.

Table 5: Contribution of diversification to agriculture growth (%)

	Coastal Andhra		Rayalaseema		Telangana		AP	
	P-I	P-II	P-I	P-II	P-I	P-II	P-I	P-II
Area	17	10	-4	12	-14	10	3	11
Yield (technology change)	93	77	73	72	85	73	86	74
Price	-32	8	-1	0	-21	-6	-22	1
Diversification (land reallocation)	20	5	37	16	49	22	32	14
Interaction	2	-1	-4	0	1	1	0	0
Total	100	100	100	100	100	100	100	100
Change in VoP (Rs. 10 Crores)	429	920	175	436	257	873	861	2229

A larger contribution of the improvements in yield in period-I was an outcome of the investment made in agricultural research and development and spread of HYVs especially cotton, groundnut, chickpea, fruits and vegetables (under green revolution). During this period, there was a considerable increase in the use of modern inputs, like improved seeds, chemical fertilizers and electricity, which fuelled a rapid rise in crop yields. For instance, the yield of rice, cotton and groundnut grew at an annual rate of 3.1%, 7.5% and 1.1% in this period, but this decelerated considerably during period-II (Annexure I). The contribution of yield to the VoP is much higher in the coastal Andhra (93%), followed by the Telangana (85%) and the least in Rayalaseema (73%) in period-I, while it reduced slightly in period-II in all regions. Mainly due to decline in the growth rate in yield of major crops during the period-II to 1.6%, 2% and -1.0% for paddy, cotton and groundnut respectively. The deceleration in yield growth can be attributed to a slow increase in input use and irrigated area besides unsustainable agricultural practices. The negative growth in yield of groundnut in period-II may be due to the fading of the effects of TMOs and low domestic prices which reduced attractiveness of groundnut as cash crop. However, also during this period also, there was a significant improvement in the yields of cotton (due to Bt cotton). The contribution of the yield to the change in VoP is still 74% in period-II in the state. Even though yield levels in Rayalaseema region low, the yield improvements accounted for 73% and 72% of the overall growth in period-I and II, and most of it came from a significant increase in the yield of main crop groundnut. The performance of other crops, like rice, sunflower and chickpea was also noticeable, but because of their smaller share in GCA, their contribution to the overall growth was low.

Next to yield major source of income growth is the diversification effect; its share is 32% in period-I, which was declined to 14% during period-II. The diversification effect was higher in Telangana (49% in period-II and 22% in period-I) followed by Rayalaseema and lowest in the coastal Andhra (20% in period-I, 5% in period-II). Diversification occurred from coarse cereals, other pulses (mung, urd), other fibre and tobacco towards sugarcane, fruits, maize, chickpea, vegetables, cotton, groundnut and spices and all of them together accounted for about two-thirds of the diversification induced growth in period-II. Even though relative importance of diversification declined during period-II, still it is a major source of increase in the VoP; this can be attributed to the rapid rise in demand for HVCs - the demand for sugarcane, fruits and vegetables saw a rise at an annual rate of 4.5% in period-II. The demand-driven growth was supported by the investment in public infrastructure (roads and markets) and favourable policies.

Next to yield and diversification effect is the area expansion and its contribution increased from 3% in period-I to 11% in period-II. Higher contribution of area expansion to the overall growth can be attributed to the both increases in net cropped area in the initial years, then after increase in cropping intensity, as the cropping intensity increased from 125% to 134% in the coastal Andhra, from 108 to 110% in the Rayalaseema and 110 to 117% in the Telangana from 1960s to 2000s (Reddy 2011b). The high cropping intensity is mainly due to the introduction of short duration varieties of paddy, groundnut, chickpea and mung, which facilitated even three crops per year in assured irrigated conditions mainly in the coastal Andhra.

Contribution of price is negative (as real prices declined in both the periods) in all the regions, while negative effect of the price is higher in period-I compared to period-II. Hence, contribution of prices to agriculture growth was not encouraging; it reflects that terms of trade were moving against agriculture which is in line with the other studies.

In the long-run, the growth in agriculture must emanate from technological change and diversification. The fading away of the technology effect is a matter of concern. This could be due to a number of factors, such as under-investment in agricultural research, under developed and inefficient markets, gap in recommended and actual use of fertilizers except paddy (Table 6). It is interesting to note that the cost of production of paddy, cotton and groundnut is much higher in Andhra Pradesh than competing states (Table 7). It is also to be noted that except paddy and chillies to some extent cotton, fertilizer consumption is much less than the recommended practices in the state. To increase yields and to reduce the cost of production, this technology gaps to be bridged across regions and crops. Again worth noting is the cropping intensity, which is much higher in the coastal Andhra, followed by the Telangana and Rayalaseema regions, with similar trend in irrigation intensity and fertilizer consumption per hectare of land (Reddy, 2010, Reddy 2011a).

Table 6. Gap in fertilizer consumption per hector

Crop	Fertilizer consumption (kg/ha)	Recommended dose (kg/ha)	% of deficit
Paddy	202	160	-26
Chillis	241	240	0
Cotton	226	240	6

Sugarcane	250	300	17
Sorghum	80	130	39
Groundnut	64	120	47
Sunflower	68	130	47

Source: Cost of Cultivation scheme (2009); Negative sign indicates excess use of fertilizer

Table 7. Cost of production (Rs/quintal) of crops of AP and major competing states

Crop/year	AP	Average of major competing states	% of excess of AP cost of production over major competing states
Rice			
1978	117	109	7.8
1997	370	336	10.3
2010	609	656	-7.2
Cotton			
1978	497	295	68.8
1997	1628	1526	6.7
2010	2315	2261	2.4
Ground nut			
1984	362	343	5.7
1997	1189	955	24.6
2010	2092	1649	26.9

Source: Cost of Cultivation scheme (2009); major competing states in case of rice is Punjab and Madhya Pradesh; for cotton and groundnut Tamil Nadu and Gujarat

V Sources of growth and Small Farmers

Small farmers are a big deal in India and also in Andhra Pradesh. Small land holdings (<2.0ha) comprise 83.5 % of the total land holdings and share 49.7% of the land area in the state (Table 8) with their average size is small (0.7 ha). Share of small farmers is the highest in the coastal Andhra (88.9%) followed by the Telangana (81.7%) and the least in Rayalaseema (75.6%); they share 57.2%, 49.7% and 41% of area in respective regions. It shows the importance of small farmers in the agrarian economy of Andhra Pradesh (Reddy and Kumar, 2006).

Table 8: Distribution of land holdings according to farm size in AP (2001-02)

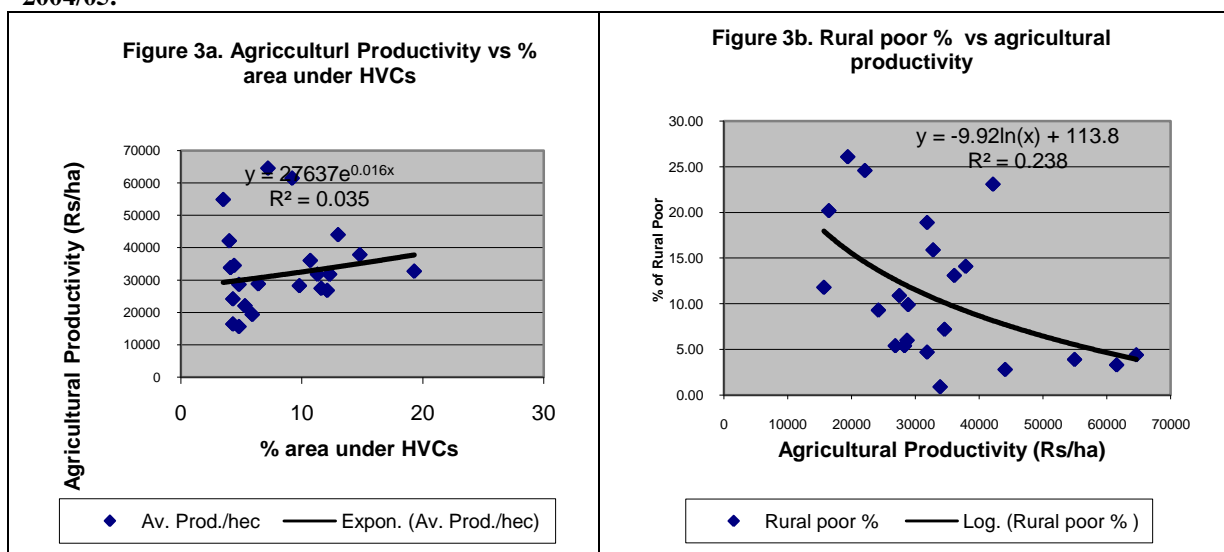
Farm size category	Coastal Andhra	Rayalaseema	Telangana	AP
	% of holdings			
Small	88.9	75.6	81.7	83.5
Medium	10.9	23.7	17.7	16.0
Large	0.2	0.8	0.6	0.5

	% of area			
Small	57.2	41.0	49.0	49.7
Medium	39.0	51.7	43.5	44.1
Large	3.8	7.3	7.5	6.2
	average size of holding (ha)			
Small	0.6	0.8	0.8	0.7
Medium	3.4	3.4	3.0	3.2
Large	16.3	14.9	15.9	15.7
All	0.9	1.6	1.2	1.2
number of holdings (million no)	5.0	2.3	4.8	12.0

Source: Agricultural input survey (2002)

Birthal *et al.*, (2006) compared the gross returns per ha for a number of crops across different farm categories in a pan-India study. On average, the HVCs generate more than Rs30000 per ha which is around twice the gross revenue from rice and wheat, 2.5-3.0 times larger than from oilseeds, 4.0-4.5 times more than that from pulses and 5.0-6.0 times more than that from coarse cereals. It is thus conjectured that the growth in high-value segment of agriculture might have contribution more towards poverty reduction keeping the high gross returns per hectare of land. To verify this, we mapped some relationships among the agricultural productivity, the head-count poverty ratio and the share of fruits and vegetables in the total cropped area using district-level data (Figure 3a and 3b). The association between the area share of high-value crops and the agricultural productivity, as expected, is positive (Figure 3a) indicating that the agricultural productivity is higher in the districts that have a larger share of the cropped area given to the cultivation of fruits and vegetables. Figure 3b maps the rural head-count poverty ratio against the agricultural productivity, and the association between the two is negative, providing an indication that diversification towards high-value crops has a greater potential to contribute towards poverty reduction. The growth in livestock production is also more pro-poor (Ojha 2007).

Figure 3. Relationship between high-value crops, agricultural productivity and rural poverty, 2004/05.



Source: District level poverty data calculated from NSSO 61st round for Andhra Pradesh, land productivity indices and % area under HVCs is from statistical abstracts of Andhra Pradesh

Keeping the importance of HVCs in increasing gross returns and reducing poverty table 9 presents the cropping pattern according to the farm size group. The marginal and small farmers devote 15% and 19.6% of GCA to HVCs, as against 24.1% by large farmers. Still marginal and small farmers devote 71.2% and 60.9% are GCA towards food grains as against 44.9% by large farmers. Marginal and small farmers devote small share of GCA compared to large farmers for spices, fruits and vegetables. Among marginal and small farmers, share of paddy in GCA is 43.2% and 34.9% as against 18.4% among large farmers. It is also interesting that under irrigated conditions farmers increase the area under paddy and sugarcane at the cost of area under coarse cereals, pulses and oilseeds, but there is no change in the % share of the HVCs (Reddy, 2004; Reddy, 2009a; Reddy et al., 2007). Although, HVCs enhance income and employment opportunities for the farmers; often the capability of small farmers to diversify towards these is doubted (BIRTHAL *et al.*, 2006; Reddy 2005a). Some of the hindrances are food household food security concern, poor access to capital/credit, technology, inputs and information, higher production and price/market risk, high costs of transportation and transaction as most of the high value crops are perishable need immediate marketing (Reddy, 2004a; Reddy, 2005; Reddy, 2006; Reddy and Malik, 2011).

However one silver lining is that, all profitability indicators like % area under HYVs, % area irrigated and cropping intensity are at higher level among small farmers than large farmers. These results are inline with the results of BIRTHAL (2008) that compared to large farms, the gross returns on small farms is more, even though returns/operational holding is less due to small farm size. And cropping intensity is much higher on small farms than large farms, which indicates that the small farms use more intensively their resources than large farms.

Table 9. Cropping pattern in Andhra Pradesh according to farm size (2001-02)

size group	Marginal	Small	Semi-medium	Medium	Large	All groups
	Gross Cropped Area (%)					
Paddy	43.2	34.9	27.9	25.3	18.4	32.8
coarse cereals	12.5	12.5	13.0	12.3	13.1	12.6
Pulses	15.5	13.5	13.3	13.7	13.4	14.0
Food grains	71.2	60.9	54.2	51.3	44.9	59.4
Oilseeds	13.7	19.4	23.4	24.0	30.9	20.3
Cotton	5.6	8.4	9.3	10.0	8.2	8.2
Sugarcane	1.7	1.9	1.8	1.8	1.6	1.8
Spices	1.5	1.9	2.4	2.5	2.9	2.1
Fruits	2.7	3.5	4.3	5.1	5.6	3.9
Vegetables	0.7	0.9	1.2	1.3	1.5	1.0
Others	2.9	3.0	3.4	3.9	4.3	3.3
HVCs	15.1	19.6	22.4	24.6	24.1	20.2
% area under HYV seeds	71.6	66.2	62.3	59.1	51.1	64.7
Total	100	100	100	100	100	100

Net Area (ha/holding)	0.5	1.4	2.7	5.6	13.7	1.2
Cropping Intensity	128.4	120.0	116.0	112.5	109.5	119.1
Gross Returns (Rs/ha of NCA) at 2003/4 prices	35985	33222	31827	31124	29502	32987
Cost(Rs/ha of NCA)	30698	28407	27196	26526	25200	28165
Net Returns (Rs/ha of NCA)	5287	4816	4631	4598	4302	4822
Gross Returns (Rs)/operational holding	17993	46511	85933	174295	404178	39584
Cost(Rs)/operational holdings	15349	39769	73429	148543	345241	33798
Net Returns (Rs)/operational holdings	2644	6742	12503	25751	58938	5787
	Gross Irrigated Area (%)					
Paddy	79.6	73.4	66.3	63.0	56.2	71.5
coarse cereals	4.0	4.4	4.7	3.7	6.0	4.3
Pulses	0.5	0.5	0.6	0.7	0.6	0.6
Oilseeds	5.5	6.5	8.2	8.6	11.5	7.1
Cotton	1.8	3.3	4.0	4.7	4.2	3.2
Sugarcane	2.8	3.8	4.4	4.6	5.3	3.8
Spices	2.0	3.0	4.2	4.3	5.3	3.2
Fruits	1.7	2.4	3.9	6.0	7.3	3.2
Vegetables	0.9	1.0	1.4	1.5	1.2	1.2
Others	1.4	1.6	2.2	2.9	2.5	1.9
HVCs	10.5	15.1	20.1	23.9	25.8	16.6
% area under HYV seeds	93.3	90.7	89.6	87.8	84.7	90.6
Total	100	100	100	100	100	100
% irrigated area	40.0	35.7	29.6	28.6	19.0	33.3
Cropping Intensity	128.2	126.7	126.0	123.2	123.2	126.3
Note: marginal (<1 ha), small (1-1.99 ha), semi-medium (2.0-3.99), medium (4.0-9.99), large (>10 ha); HVCs include cotton, sugarcane, spices, fruits, vegetables and others						

Sources: Agricultural input survey (2001-02); Gross returns, costs and net returns are calculated by using cost of cultivation scheme (2009) data.

VI Conclusions and Implications

The evidence from this study clearly reveals that in Andhra Pradesh agriculture, productivity growth and diversification towards high value commodities have played a key role in the change in the value of production. The study considered only the crop sector for decomposition analysis to validate sources of growth in value of production from the crop sector. The crop sub-sector growth is higher in post-liberalisation period (1990-2009) compared to pre-liberalisation period (1970-1989). In the pre-liberalisation period, negative contribution of real prices to the value of production is the main reason for slow growth compared to post-liberalisation period. It shows that the terms of trade between agriculture and non-agriculture are going against farming. Technology (yield contribution) and diversification were the most important sources of growth both in pre- and post liberalization periods, its share in growth, however, declined marginally during post-liberalisation period. The share of food grains reduced from 53% during 1970-1989 to 41% during 1990-2009 of the total value of crop production; while share of HVCs increased from 27% to 43% during the same period. The contribution of diversification

was higher in Telangana (22%) followed by Rayalaseema (16%) and only 5% in the coastal Andhra during post-liberalisation period. The coastal Andhra is specialized in rice cultivation, while the Telangana region specialized in cotton cultivation and the Rayalaseema region specialized in groundnut cultivation based on regional resource endowment and competitiveness. However, high-value crops were the important sources of growth in all the regions. Price increases and area expansion were not sustainable sources of growth, only technological change and diversification are drivers of agricultural growth in future.

In line with some past studies (Birthal et al, 2006, Joshi et al., 2006) it is important to note that the small farmer's are more efficient in production of high value crops as their labour and supervision cost advantages could compensate for the disadvantages of higher marketing and transaction costs, and limited access to credit and information. Even though small farmers are putting higher area under staple crops, they are not reluctant to cultivate high value crops, in the recent years they are increasing area under high value crops without compromising household food security. Further small farms are using their resources more intensively through increasing cropping intensity than large farms. Technology, though, remains main source of growth, yield growth of most crops have been decelerating in post-liberalisation period. There is a decline in the share of diversification to growth of crop sector mainly specialization of regions in few crops based on the resource endowment and competitiveness like Coastal Andhra in paddy, Telangana in Cotton and Rayalaseema in groundnut (Reddy, 2011b). Diversification from lower to higher-value commodities like fruits and vegetables are taking place in all regions, and are a driving force to faster and sustained growth in agriculture, and an opportunity for small farmers to improve their income, and escape poverty.

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Annexure I: Annual growth (%) in yield of important crops in India

growth rates		Coastal			Rayalaseema			Telangana			Andhra Pradesh		
		P-I	P-II	total	P-I	P-II	total	P-I	P-II	total	P-I	P-II	total
Rice	Area	0.3	-0.5	0.0	-2.5	-1.3	-1.5	1.4	0.5	0.9	0.3	-0.4	0.1
	Production	3.8	1.3	2.8	-0.4	0.1	0.7	4.5	2.1	3.4	3.4	1.2	2.8
	Yield	3.5	1.8	2.8	2.1	1.4	2.2	3.1	1.6	2.6	3.1	1.6	2.6
	Price	-1.3	-0.6	-0.9	-1.3	-0.6	-0.9	-1.3	-0.6	-0.9	-1.2	-0.5	-0.8
Jowar	Area	-5.7	-10.6	-11.0	-3.7	-4.3	-5.1	-2.7	-6.7	-4.9	-3.3	-6.3	-5.4
	Production	-4.0	-2.8	-7.3	2.0	-0.8	-1.3	-1.2	-3.7	-2.5	-1.0	-2.9	-2.5
	Yield	1.7	7.8	3.7	5.7	3.6	3.9	1.6	3.1	2.4	2.2	3.4	2.9
	Price	-2.4	-0.9	-1.1	-2.4	-0.9	-1.1	-2.4	-0.9	-1.1	-2.3	-0.8	-1.1
Maize	Area	3.8	9.4	7.5	2.6	18.2	8.2	0.7	5.4	1.8	0.8	6.1	2.3
	Production	7.9	16.2	12.2	6.1	23.4	11.4	3.2	8.3	5.4	3.2	9.5	6.3
	Yield	4.1	6.8	4.7	3.4	5.2	3.2	2.5	2.8	3.6	2.4	3.4	3.9
	Price	-0.9	-1.4	-1.4	-0.9	-1.4	-1.4	-0.9	-1.4	-1.4	-0.8	-1.3	-1.3
other cereals	Area	0.1	-5.6	-3.8	1.0	-7.8	-6.4	-2.9	-5.8	-6.1	-0.4	-6.3	-5.2
	Production	0.7	-5.2	-2.5	0.7	-6.4	-4.5	-0.3	-3.4	-3.3	0.3	-5.6	-3.3
	Yield	0.6	0.4	1.3	-0.3	1.4	1.8	2.6	2.4	2.8	0.7	0.7	1.9
	Price	-1.9	-1.5	-1.5	-1.9	-1.5	-1.5	-1.9	-1.5	-1.5	-1.9	-1.5	-1.5
Arhar	Area	4.9	3.5	4.4	2.0	2.4	2.4	1.8	2.6	2.2	2.4	2.8	2.7
	Production	6.7	6.2	7.1	0.5	5.9	5.2	1.9	8.5	4.9	2.6	7.2	5.5
	Yield	1.8	2.6	2.7	-1.5	3.4	2.9	0.1	5.9	2.8	0.2	4.4	2.9

	Price	2.3	-1.7	0.6	2.3	-1.7	0.6	2.3	-1.7	0.6	2.3	-1.7	0.6
Gram	Area	-3.9	20.6	6.3	5.6	13.7	10.7	-5.7	8.3	0.3	-3.2	13.2	5.1
	Production	-1.2	26.1	11.8	8.0	16.1	14.6	-5.2	17.7	4.5	-1.5	18.1	9.7
	Yield	2.7	5.5	5.5	2.4	2.3	3.9	0.5	9.4	4.2	1.7	4.9	4.7
	Price	2.4	-1.3	0.4	2.4	-1.3	0.4	2.4	-1.3	0.4	2.4	-1.3	0.5
other pulses	Area	0.4	-0.5	1.6	-1.2	2.2	-3.5	0.0	-1.2	-1.2	0.1	-0.8	0.2
	Production	12.6	-1.1	6.2	1.3	3.8	-0.4	4.3	0.1	1.6	8.0	-0.7	3.8
	Yield	12.2	-0.6	4.5	2.5	1.6	3.1	4.3	1.3	2.7	7.9	0.1	3.7
	Price	2.3	-1.9	0.4	2.3	-1.9	0.4	2.3	-1.9	0.4	2.4	-1.9	0.4
GN	Area	0.5	-7.3	-1.6	1.6	-1.1	1.7	-0.3	-5.7	-1.2	0.9	-2.5	0.8
	Production	1.9	-6.2	-0.1	2.5	-2.2	2.1	0.8	-3.2	0.7	2.0	-3.6	1.3
	Yield	1.3	1.0	1.5	0.9	-1.1	0.4	1.1	2.5	1.9	1.1	-1.0	0.5
	Price	1.4	-0.9	-0.1	1.4	-0.9	-0.1	1.4	-0.9	-0.1	1.4	-1.0	-0.1
sunflower	Area		10.3			4.9			-0.1		61.9	4.8	35.9
	Production		11.5			5.4			2.0		61.0	5.5	38.0
	Yield		1.3		0.7	0.5	2.5		2.1		-0.9	0.7	2.1
	Price	1.0	-1.0	-0.5	1.0	-1.0	-0.5	1.0	-1.0	-0.5	1.1	-1.0	-0.5
other oilseeds	Area	-0.7	1.2	0.6	3.8	1.7	0.3	-1.7	0.5	-0.6	-1.0	0.8	-0.2
	Production	-2.5	10.4	4.0	0.5	6.3	1.3	-2.4	8.3	3.1	-2.2	8.7	3.4
	Yield	-1.9	9.2	3.4	-3.3	4.6	1.1	-0.7	7.8	3.7	-1.3	8.0	3.6
	Price	1.0	-1.0	-0.5	1.0	-1.0	-0.5	1.0	-1.0	-0.5	1.1	-1.0	-0.5
Cotton	Area	12.3	-0.2	4.7	-6.2	-4.0	-2.5	4.6	4.8	6.4	2.9	2.6	3.7
	Production		1.3		3.1	-5.8	2.3	7.9	9.5	11.8	10.4	4.6	7.9
	Yield		1.5		9.3	-1.8	4.8	3.3	4.7	5.4	7.5	2.0	4.3
	Price	-2.1	-4.9	-3.6	-2.1	-4.9	-3.6	-2.1	-4.9	-3.6	-2.1	-4.8	-3.6
other fibre	Area	0.2	-1.7	-1.6	-20.2	10.7	-5.2	-5.2	-4.1	-8.6	-0.9	-2.0	-1.8
	Production	2.7	0.6	1.8	-0.2	3.0	-0.5	3.0	-4.0	-5.7	2.5	0.4	1.7
	Yield	2.5	2.3	3.4	20.0	-7.7	4.7	8.2	0.1	2.9	3.4	2.4	3.5
	Price	-8.7	-1.1	-4.9	-8.7	-1.1	-4.9	-8.7	-1.1	-4.9	-8.9	-1.2	-4.8
Fruits	Area	2.7	3.1	3.7	0.7	4.4	2.5	5.3	5.2	7.7	2.5	3.7	3.9
	Production	5.7	5.0	6.0	4.7	7.0	5.5	8.4	8.2	9.9	5.8	6.7	6.6
	Yield	3.0	1.9	2.3	4.0	2.5	3.0	3.0	3.1	2.3	3.4	3.0	2.7
	Price	0.2	-0.5	-0.4	0.2	-0.5	-0.4	0.2	-0.5	-0.4	0.3	-0.5	-0.4
Vegetables	Area	3.8	1.4	3.4	5.4	3.7	5.4	3.4	5.6	5.2	4.1	3.3	4.5
	Production	7.8	3.6	8.5	9.5	6.3	10.5	8.7	8.2	10.5	8.3	5.9	9.7
	Yield	4.0	2.2	5.1	4.1	2.6	5.1	5.3	2.6	5.3	4.1	2.6	5.2
	Price	0.3	0.3	0.5	0.3	0.3	0.5	0.3	0.3	0.5	0.3	0.4	0.5
Spices	Area	0.5	1.4	2.0	5.1	-5.4	-0.4	1.3	-0.3	1.5	2.1	-0.7	1.5
	Production	5.7	5.2	5.3	4.0	3.3	3.2	8.2	4.0	7.5	6.6	4.3	6.2
	Yield	5.2	3.8	3.3	-1.2	8.8	3.7	6.9	4.3	6.0	4.5	5.0	4.7
	Price	-3.9	-1.4	-2.1	-3.9	-1.4	-2.1	-3.9	-1.4	-2.1	-3.8	-1.2	-2.1
Tobacco	Area	-2.1	-0.8	-1.2	-0.1	-4.1	-1.6	-1.5	-6.9	-3.3	-2.0	-2.1	-1.5
	Production	1.0	0.0	1.0	-0.8	-2.3	0.3	1.2	-4.0	0.0	0.6	-1.0	0.8
	Yield	3.1	0.9	2.2	-0.7	1.8	1.9	2.7	2.9	3.2	2.6	1.1	2.3
	Price	-1.9	-0.5	-0.9	-1.9	-0.5	-0.9	-1.9	-0.5	-0.9	-1.8	-0.4	-0.9

Sugar cane	Area	-0.3	-0.3	1.1	0.3	-0.1	1.0	3.4	-0.9	1.9	0.4	0.4	1.5
	Production	-1.1	2.3	1.9	0.9	0.5	1.9	1.5	2.5	2.3	-0.4	2.0	2.0
	Yield	-0.9	2.6	0.8	0.6	0.6	1.0	-1.9	3.3	0.5	-0.8	1.6	0.5
	Price	0.2	7.4	2.6	0.2	7.4	2.6	0.2	7.4	2.6	0.2	7.5	2.5
Total	Area	0.3	-0.2	0.3	-0.1	0.0	0.3	-0.5	0.2	-0.3	-0.1	-0.1	0.1
	Production	1.5	2.5	2.8	2.0	2.6	2.9	2.6	4.0	3.6	1.7	2.9	3.0
	Yield	1.1	2.7	2.5	2.0	2.6	2.7	3.2	3.8	3.9	1.9	2.9	3.0
	Price	1.2	0.0	0.0	0.2	-0.8	-0.3	-0.1	-0.4	0.0	0.6	-0.2	0.0