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Growth and cropping pattern of food crops: A case study of rice in Andhra Pradesh (food security for all)

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Abstract
Agriculture plays vital role in Andhra Pradesh. The changes that are accruing in this sector since the eighties are often causing great distress to the farmers. The declaration is caused mainly by the slow growth of crop yields. The yields of important crops like rice, groundnut, cotton and sugar cane are lower in the state compared to other states. Andhra Pradesh is pre dominantly an Agricultural economy as agriculture is the main source of livelihood for nearly 70 percent of the population. Therefore agriculture is the most vital and sensitive sector of the state. Agriculture in Andhra Pradesh, which was traditionally based on food crops accounting for 70 per cent of net sown area (NSA), witness considerable diversification in the cropping pattern since the 1980's. The latest policy of the Government of India is "Food Security for all". It is often said that India lives in two different worlds separated by countries. The reality of a globalised and industrialized India, endowed with a vast pool of world acclaimed entrepreneurs, computer save by mangers and / or professional, is as true as the bullock cart and the illiterate farmer. Agriculture is not only the provider of gainful employment and incomes to a vast majority of population, but it is also a safety net available to the realities and for those who do not have any other employable skills. But, it is alarming that agriculture seems to have been neglected in recent times which led to a deceleration of growth and sub-potential performance of agriculture. As India, at present juncture is making all her efforts to provide food security to her citizens and provide better and nutrition's food has to be encouraged on a wider scale. Food security, therefore, has become the responsibility of modern state. Food security must necessarily be looked as an integrated issue. National securities is an important component of food security Andhra Pradesh, Karnataka and Maharashtra face the Problem of food security and are in the category of "high food security", a reflection of manifestation of the agrarian crisis. Though efforts are needed to raise productivity of any crop, excessive stress on rice crop needs to be reviewed in the back drop of huge buffer stocks being wasted due to improper storage and record exports of rice last year. Twice that value of edible oils is being imported. Policy makers may consider raising the production of edible oils and pulses which in fact need lesser irrigation. More support may be given to popularize minor millets that have more nutritional value. Broader policy initiatives may be undertaken to make availability of wide spectrum food grains in PDS programs. As a whole it can be concluded that the reason for showing significance of yield rates may be due to the quality seed but not due to the changes in any of other variables.

Keywords: agriculture, security, yield, food crops, illiterate farmer, buffer stocks

1. Introduction
Andhra Pradesh is pre dominantly an Agricultural economy as agriculture is the main source of livelihood for nearly 70 percent of the population. Therefore agriculture is the most vital and sensitive sector of the state. The changes that are accruing in this sector since the eighties are often causing great distress to the farmers. The state agricultural sector performed well in the eighties by recording a growth rate of 2.67 percent annum. but in the nineties the growth rate of decelerated to 1.16 percent per annum. The declaration is caused mainly by the slow growth of crop yields. The yields of important crops like rice, groundnut, cotton and sugar cane are lower in the state compared to other states. The growth rate of the value of agriculture output per hectare also showed a declaration in the 90s from 3.52 of eighties to 2.67 percent per annum. The confirmation of agriculture to NSDP in the state has declined from about 40 percent in the early eighties to 31 azyy percent in 1999-2000. Agriculture in Andhra Pradesh, which was traditionally based on food crops accounting for 70 per cent of net sown area (NSA), witness considerable diversification in the cropping pattern since the 1980's. By 2004-05, three crops viz., cotton, groundnut, and rice, emerged as major crops, together accounting for over 50 per cent of the total cropped area (GoAP). The latest policy of the Government of India is "Food Security for all". It is often said that India lives in two different worlds separated by countries. The reality of a globalised and industrialized India, endowed with a vast pool of world acclaimed entrepreneurs, computer save by mangers and / or professional, is as true as the bullock cart and the illiterate farmer. Agriculture is not only the provider of gainful employment and incomes to a vast majority of population, but it is also a safety net available to the realities and for those who do not have any other employable skills. But, it is alarming that agriculture seems to have been neglected in recent times which led to a deceleration of growth and sub-potential performance of agriculture.

As India, at present juncture is making all her efforts to

provide food security to her citizens and provide better and nutrition's food has to be encouraged on a wider scale. Food security, therefore, has become the responsibility of modern state. Food security must necessarily be looked as an integrated issue. National securities is an important component of food security (K.Venkata Reddy-2012) Andhra Pradesh, Karnataka and Maharashtra face the Problem of food security and are in the category of "high food security", a reflection of manifestation of the agrarian crisis. Hence, in this background the following are the main objectives of present paper.

2. A Brief Review of Agricultural Development of the State

The condition of agriculture in the State has improved considerably after a long period of stagnation in the mid-1990s to mid-2000s. Although global recession and drought effected agricultural growth in 2008-09 and 2009-10, the sector picked up considerably in 2010-11. The sector recorded an average growth rate of 6.12% pa during 2005-11. This performance provides the basis for contemplating an average growth rate of 5-6 % during the 12th five year plan. There are wide fluctuations in the growth of crop and fisheries in the agricultural sector. While the livestock sector recorded a substantial growth the forestry and logging showed only a moderate improvement. There are considerable differences across the districts in their contribution to the GSDP from agriculture. The contribution of agriculture in about half of the districts is less than 4% each to the State GSDP. With respect to crop sector there is a shift in the cropping pattern from food to non-food crops in the State. Rice, maize, groundnut and cotton are the important crops which occupy more than 60% of total gross cropped area in the State. However, spread of cotton farming in regions with light textured soils is a serious issue as it has resulted in unexpected crop failures and replacement of cotton with conventional crops such as jowar and castor. It is better that maize is confined to areas receiving good rainfall in kharif with medium to heavy soils and jowar encouraged in areas with less rainfall and in soils with less water holding capacity. While the improvement in rice yield in recent period is welcome, the increase is however more due to expansion of area under this crop in coastal regions. There has been a significant improvement in the productivity of maize. The productivity of groundnut is subjected to fluctuations as it is grown in rain-fed areas. The productivity of cotton also has improved due to the introduction of hybrid varieties of cotton for irrigated lands. There are considerable variations in yield across districts within the state. The cost of production is relatively high in Andhra Pradesh compared to other States.

3. Significance of the study

Lot of impetus has been given to research in Rice production and many programmes were launched to break the yield platen that has been experienced in rice crop in the past. A number of steps are being taken by the government to popularize new hybrid rice varieties through frontline demonstration, minikit supply, organizing training programmes for farmers, farm women, seed growers, seed production personnel of public and private seed agencies, extension functionaries of state departments of agriculture, researchers of state agricultural universities and NGOs. But there is no clear data to estimate the results of the concerted efforts put in by the government. Therefore, it has become necessary to conduct a study to assess the actual spread of newly developed varieties in terms of area with simultaneous reduction in area under conventional HYVs of rice and the increase in the average yield per hectare.

4. Objectives of the study

Hence, the above backdrops the following are the main objectives of present study.

1. To examine the performance cropping pattern in the state.
2. To study the Rice production and productivity in Andhra Pradesh, and
3. To give suitable suggestions to achieve the food security in the study area.

5. Methodology

This paper is based on secondary data collected from the published sources of various government departments like office of the Commissioner and Directorate of Agriculture, Government of Andhra Pradesh, Directorate of Economics and Statistics, Government of Andhra Pradesh. Time series data from 1990-91 to 2014-15 are used for the analyses of the study. The compound (long –Linear) growth rates are estimated by employing the equation $\boldsymbol{Y = ae^{bt}}$, where 'b' is the growth rate. For analytical convents united Andhra Pradesh taken as a one unit.

Growth of Important crops in A.P. 1990-2015

Table 1: Area and production of major crops in the state – Andhra Pradesh (Area in lakh hectares, production in lakh tones)

Year	Rice		Coarse cereals		Pulses		Foodgrains		Oilseeds		Horticultural crops		Palm Oil		GCA
	Area	Prodn.	Area	Prodn.	Area	Prodn.	Area	Prodn.	Area	Prodn.	Area	Prodn.	Area	Prodn.	
TE 90-91	25.30	59.51	34.68	67.61	8.46	4.59	43.14	72.20	20.88	23.47	3.04	-	-	-	78.91
TE 91-92	26.68	63.51	34.41	70.98	9.14	5.09	56.92	94.47	22.84	25.50	3.29	-	-	-	81.86
TE 92-93	25.92	63.23	32.90	70.26	9.47	5.22	55.74	93.87	23.77	26.70	3.38	-	-	-	82.34
TE 93-94	25.65	66.26	32.04	73.04	9.40	4.95	54.81	96.39	24.35	29.25	3.60	-	-	-	82.65
TE 94-95	25.57	67.53	31.68	74.02	9.45	4.45	41.12	76.16	23.87	28.68	3.50	-	-	-	82.7
TE 95-96	25.71	67.68	31.41	73.78	9.57	4.48	40.98	75.95	23.78	28.46	4.10	-	-	-	83.07
TE 96-97	26.40	67.52	31.79	73.66	9.80	4.97	41.59	76.32	23.20	25.93	4.33	62.43	0.29	0.48	83.99
TE 97-98	26.34	66.95	31.34	72.88	9.67	4.99	41.01	77.87	22.20	23.10	4.86	63.28	0.23	0.48	82.78
TE 98-99	26.98	70.82	31.58	76.50	9.44	5.12	41.02	81.61	20.76	19.92	5.05	63.59	0.24	0.45	82.93
TE 99-00	36.13	71.62	30.95	77.00	9.43	4.86	40.39	81.86	19.66	13.95	5.25	62.85	0.27	0.88	82.52

TE 00-01	36.56	76.97	31.47	83.22	10.26	6.20	41.74	89.42	19.98	14.47	5.49	72.54	0.28	1.01	84.06
TE 01-02	35.68	77.42	30.42	83.91	11.20	7.15	41.63	91.06	19.96	12.27	5.52	72.07	0.29	1.18	82.41
TE 02-03	23.59	70.60	27.69	77.22	12.47	8.03	40.16	85.26	19.71	12.53	5.63	75.40	0.31	0.96	78.80
TE 03-04	21.13	63.98	25.49	71.81	12.93	7.89	38.43	79.70	19.35	9.38	5.70	79.61	0.33	1.07	76.59
TE 04-05	20.17	62.87	24.76	72.05	12.59	7.38	37.35	79.44	22.15	11.03	5.74	83.55	0.35	1.18	77.09
TE 05-06	22.35	69.45	26.97	80.46	11.76	8.03	38.06	88.48	23.51	11.45	6.51	88.10	0.41	1.52	80.16
TE 06-07	24.33	76.22	28.50	88.18	11.54	9.11	39.04	97.33	20.77	9.66	6.74	96.99	0.49	1.90	80.73
TE 07-08	25.49	80.85	29.60	94.70	12.48	10.69	41.07	105.52	17.92	14.44	7.56	110.57	0.60	2.88	82.20
TE 08-09	26.08	86.15	30.40	103.63	12.46	10.79	42.52	114.70	17.41	15.70	6.62	123.92	0.72	3.96	82.84
TE 09-10	25.33	84.43	29.77	103.07	12.37	10.87	42.14	114.18	18.66	20.25	6.11	132.04	0.81	4.86	82.15
TE 10-11	25.98	81.11	30.39	101.69	12.34	10.15	42.73	111.99	17.54	18.24	5.21	142.48	0.82	7.23	82.47
TE 11-12	24.81	77.32	29.41	97.77	13.02	9.98	42.43	107.74	15.59	19.58	5.00	151.38	0.80	9.42	81.21
TE 12-13	24.43	74.97	29.55	97.97	13.41	10.10	42.97	108.07	15.42	20.35	4.94	181.78	0.74	11.78	82.21
TE 13-14	23.80	75.33	29.52	99.83	12.53	10.48	42.05	110.31	14.91	19.91	4.80	214.44	0.74	12.46	80.48
TE 14-15	23.96	77.71	29.70	102.69	11.63	10.54	41.33	113.23	13.53	20.45	4.93	216.87	0.85	14.68	79.26

Source: Various Statistical Abstracts of Andhra Pradesh, Directorate of Economics and statistics, government of Andhra Pradesh.
Note: NA - Data Not Available

6. Results and Discussions

To have a comparative picture of growth of major crops in the state, the growth rates estimated on the basis of semi log trend and the growth rates based on annual averages (End Period growth rates) for major crops in the state for the given respective periods are presented in Table 2.Glancing over the growth behaviour of major crops across four decades, the area under Rice is reported a positive growth in the period 1990-91 to 1990-2000, While the yield showed a positive growth in the period 2000-01 to 2009-10. Over a period i.e., from 1980-90 to 2010-15 the area under rice has decreased showing a negative non-significant growth. On the other hand the yield of rice which was reported a positive significant growth in the first period ultimately showed a positive non-significant growth. No significant growth is observed in the area of coarse cereals across the three periods except in second period is negatively significant growth, while the yield of coarse cereals which showed a positive significant growth in the second and third periods, ultimately showed a decrease in the fourth period. The area under pulses showed a positive significant growth 3.01 in the first period, ultimately shoed a negative significant growth of -7.20 in the fourth period. Except in the second period the yield of pulses is reported a positive significant growth in the other three periods. The area under food grains showed a significant negative growth in the first and fourth periods, showing a negligible positive growth in third period. The yield of food grains showed a continuous positive significant growth across the four periods.

The area under Oil seeds showed a positive significant growth in the first period gradually reported a continuous significant negative growth in the subsequent periods. On the other hand the yield of Oil seeds showed a positive significant growth in the first period, decreased to -8.76 per cent in the second period and showed a positive but not significant growth in the subsequent two periods.

The area under Horticultural crops which negative growth in the first period has improved to a positive significant growth in the second period. From there a decrease in the growth of area is observed in the subsequent two periods. More over the yield of Horticultural crops showed a positive significant growth in the period 2000-01 to 2009-10, but reported a positive non-significant growth in the period 2010-11 to 2014-15.

The area and yield of Palm Oil showed a positive significant growth in the period 2000-01 to 2009-10 but significant growth is not observed in both the subsequent periods 2010-11 to 2014-15.

The decrease in the area of Oil Seeds and increase in the area of Palm Oil in the two periods 2000-01 to 2009-10 and 2010-11 to 2014-15 indicate inclination of farmers towards growing Oil Palm than the Oil Seed Crops.

Growth rates based on annual averages

The Growth Rates based on Annual Averages indicate a decrease in the growth of area under Rice, Coarse Cereals and Food Grains in the four continuous periods. While the yield of Rice, Coarse Cereals and food grains showed a continuous negative growth in the four periods. More over the area under pulses showed a positive increase in the growth in the four periods except in the period 2010-11 to 2012-13. On the other hand the yield of pulses showed a positive growth except in the period 2010-11 to 2013-14.The area under Oil Seeds showed a continuous increase in the growth across the four periods. While the fluctuating trend is observed in the case of yield of Oil Seeds across the periods. A continuous decrease in the growth of area and yield of Horticultural crops is observed across the periods. The area under Oil Palm showed a negative growth in the period 2010-11 to 2011-12 and improved to 0.55 per cent in the period 2010-11 to 2012-13. But a steep fall in the growth is observed in the period 2010-11 to 2013-14 and finally the area under Oil Palm showed a growth of -0.83 per cent in the period 2010-11 to 2014-15. On the other hand the yield of Oil Palm showed a continuous negative growth across the four periods.

Table 2: Growth rate in area and yield rate of major crops in the state (%)

1	Rice		Coarse cereals		Pulses		Foodgrains		Oilseeds		Horticultural crops		Palm Oil	
	Area	Yield	Area	Yield	Area	Yield	Area	Yield	Area	Yield	Area	Yield	Area	Yield
1980-81 to 1989-90	-1.06 (0.99726)	1.66* (5.06709)	-1.80 (0.3916)	1.51 (0.33992)	3.01* (3.89570)	4.12* (4.2021)	-2.11** (2.7265)	2.18* (4.3647)	5.68* (8.2684)	6.54* (3.7457)	-0.29 (0.5074)	N.A	N.A	N.A
1990-91 to 1999-00	4.50*** (2.0243)	-2.76 (1.2244)	-0.73*** (2.2906)	2.06* (3.6460)	1.17 (0.5592)	-0.16 (0.0980)	-3.36 (1.4970)	2.30** (2.7761)	-2.52 * (4.3933)	-8.76 ** (3.2601)	6.06 * (4.6975)	N.A	N.A	N.A
2000-01 to 2009-10	1.02 (0.6979)	1.24 *** (2.0955)	0.89 (0.7450)	2.82 * (4.50)	-0.19 (0.1968)	4.74 * (3.3804)	0.45 (0.6168)	3.36 * (3.5811)	-2.30 (0.8883)	4.99 (0.9391)	0.60 (0.3099)	7.35 * (3.6663)	13.75 * (13.4183)	8.68 * (7.1319)
2010-11 to 2014-15	-1.99 (0.6538)	3.69 (1.8073)	0.70 (0.3429)	2.80 *** (1.9685)	-7.20 * (3.9956)	8.31 * (3.5716)	-2.54 ** (2.2470)	4.57 * (4.0113)	-7.52 ** (3.1775)	5.64 (1.2145)	-0.6972 (0.3493)	6.65 (0.8648)	7.12 (1.2648)	3.75 (1.4830)
2010-11-2011-12@	1.14	-12..49	0.70	-7.61	0.33	3.23	0.57	-7.80	0.20	-45.24	1.18	-5.02	-0.26	-0.00
2010-11-2012-13@	0.77	-3.98	0.41	-2.13	0.09	45.29	0.30	-2.35	0.23	17.54	0.39	-6.20	0.55	-3.21
2010-11-2013-14@	0.16	-2.56	0.01	-1.60	0.51	-72.33	0.14	-4.20	0.24	-3.51	0.21	-5.02	0.05	-2.15
2010-11-2014-15@	0.25	-4.60	0.14	-3.19	0.49	39.28	0.23	-5.09	0.60	-6.35	0.13	-1.01	-0.83	-0.87

Note: For the periods 1980-90 (1st Period), 1990-2000(2nd period), 2000-10(3rd period) and 2010-15(4th period) growth rates are estimated on semi log trend and the figures in brackets are 't' values. @ Growth rates based on annual averages, * denotes 1% level of Significance, ** denotes 5% level of Significance, *** denotes 10% level of Significance

#: Since the data for the bifurcation Andhra Pradesh is not available for yield of Horticultural crops, Palm Oil area and yield, the growth rates are estimated for the data of un bifurcated Andhra Pradesh. N.A: Data not available for those periods.

Source: Various Statistical Abstracts of Andhra Pradesh, Directorate of Economics and statistics, government of Andhra Pradesh& Commissioner of Horticulture Department, Govt., of A.P

District wise cropping pattern in Andhra Pradesh

The District wise Area and Production of major crops for the year TE 2005-06 and TE 2014-15 are presented in Tables 3. Observing the two periods TE 2005-06 and TE 2014-15. The percentage of Area under rice in Gross cropped area is increased in TE 2014-15 while the percentage of area under Horticultural crops is increased in TE 2014-15, when compared to TE 2005-06. This inferences that the increase in area under Horticultural crops may be attributed to the increase in area under Oil Palm.

Table 3: Area and production of major crops at districts level in Andhra Pradesh (TE 2014-15) (Area in lakh hectares, production in lakh tones)

Name of the district	Rice		Coarse cereals		Pulses		Foodgrains		Oilseeds		Horticultural crops		Palm Oil		GCA
	Area	Prodn.	Area	Prodn.	Area	Prodn.	Area	Prodn.	Area	Prodn.	Area	Prodn.	Area	Prodn.	
Srikakulam	2.07 (4.95)	4.44	2.21 (5.28)	5.10	0.82 (1.97)	0.44	3.03 (7.24)	5.55	0.21 (0.49)	0.29	0.79 (1.88)	16.78	0.02 (0.044)	0.32	42
Vizianagaram	1.22 (3.33)	3.15	1.53 (4.16)	4.45	0.40 (1.09)	0.21	1.93 (5.25)	4.66	0.33 (0.90)	0.99	0.90 (2.46)	11.37	0.06 (0.165)	0.97	37
Visakhapatnam	1.05 (2.88)	1.71	1.50 (4.11)	2.21	0.27 (0.73)	0.21	1.76 (4.84)	2.43	0.19 (0.53)	0.50	1.18 (3.24)	22.87	0.05 (0.139)	0.76	36
East Godavari	4.00 (5.80)	12.92	4.13 (5.99)	13.83	0.45 (0.65)	0.16	4.58 (6.64)	14.00	0.11 (0.16)	2.15	1.59 (2.30)	23.89	0.10 (0.152)	1.66	69
West Godavari	4.17 (6.00)	14.19	4.72 (6.78)	17.76	0.16 (0.24)	0.14	4.88 (7.02)	17.89	0.40 (0.57)	7.61	1.40 (2.01)	17.76	0.49 (0.703)	9.20	70
Krishna	3.05 (4.35)	10.42	3.34 (4.76)	12.31	1.44 (2.05)	1.45	4.78 (6.81)	13.76	0.11 (0.15)	1.04	1.23 (1.75)	12.51	0.11 (0.160)	1.63	70
Guntur	2.66 (3.31)	9.49	3.67 (4.57)	17.23	0.98 (1.22)	1.24	4.65 (5.79)	18.46	0.13 (0.16)	0.23	1.59 (1.98)	12.28	0.00 (0.000)	0.00	80
Prakasam	0.99 (1.53)	3.76	1.58 (2.45)	5.92	1.59 (2.46)	2.11	3.17 (4.91)	7.95	0.37 (0.57)	0.39	0.78 (1.21)	8.66	0.00 (0.000)	0.00	65
S.P.S. Nellore	2.39 (6.01)	9.69	2.44 (6.13)	9.89	0.36 (0.91)	0.33	2.80 (7.04)	10.22	0.19 (0.47)	0.55	0.68 (1.72)	9.37	0.01 (0.031)	0.20	40
YSR. Cuddapah	0.46 (1.16)	1.42	0.69 (1.73)	1.97	1.13 (2.82)	0.75	1.82 (4.54)	2.72	0.93 (2.34)	0.73	1.37 (3.42)	18.97	0.00 (0.000)	0.00	40
Kurnool	1.10 (1.10)	4.13	2.47 (2.48)	8.20	2.45 (2.45)	2.67	4.92 (4.93)	10.87	2.08 (2.08)	1.75	1.32 (1.32)	24.43	0.00 (0.000)	0.00	100
Ananthapur	0.33 (0.31)	0.82	0.84 (0.81)	1.98	1.38 (1.32)	0.74	2.22 (2.13)	2.72	7.02 (6.73)	2.88	1.53 (1.47)	25.52	0.00 (0.00)	0.00	104
Chittoor	0.46 (1.16)	1.58	0.58 (1.46)	1.83	0.20 (0.49)	0.09	0.78 (1.95)	1.92	1.48 (3.70)	1.34	1.28 (3.22)	16.78	0.00 (0.000)	0.00	40
Andhra Pradesh	23.96 (3.02)	77.71	29.70 (3.75)	102.69	11.63 (1.47)	10.54	41.33 (5.21)	113.23	13.53 (1.71)	20.45	15.64 (1.97)	221.19	0.85 (0.107)	14.74	793

***Source*:** Various Statistical Abstracts of Andhra Pradesh, Directorate of Economics and statistics, government of Andhra Pradesh & Commissioner of Horticulture Department, Govt., of A.P, Note: figures in brackets are percentages to Gross Cropped Area

Observing across the districts the area under oilseeds in TE 2005-06 ranged from 0.15 lakh ha in Krishna districts to 8.82 lakh ha in Ananthapur district. On the other hand the area under Horticultural crops TE 2005-06 reported low in 0.52 lakh ha in Prakasam district and high of 1.58 lakh ha in East Godavari district. More over the area under Oil Palm reported a high of 0.17 lakh ha in West Godavari district, while The second place is occupied by East Godavari with an area of 0.11 lakh ha under Oil Palm.

Glancing over TE 2014-15 across the districts the area under Oil Seeds reported a high of 7.02 lakh ha in Ananthapur district and a low of 0.1 lakh ha in Krishna and East Godavari districts. The area under Horticultural crops reported a high of 1.59 lakh ha in East Godavari and low of 0.8 lakh ha in S.P.S Nellore district. More over the area under Oil Palm reported maintained its highest status as in case of TE 2005-06. To be specific the area under Oil Palm increased from 0.17 lakh ha in TE 2005-06 in West Godavari to 0.49 lakh ha in TE 2014-15. It means the increase is around 3 folds from TE 2005-06. The variations in area under other major crops between TE 2005-06 and TE 2014-15 across the districts can be observed from the tables presented below.

Growth and instability of rice production in the Andhra Pradesh

Compound Growth Rate of area, Production and Productivity of Total Paddy (Rice) in the State.

The changes that have been observed among the area, Production and Productivity of paddy over a period of 26 years are presented in the form of growth rates in Table 4. On the whole the growth rates of production and yield of paddy are found to be statistically significant, though there is no significant increase in area. Across the sub-periods, the yield of paddy showed a significant growth in the first and second sub-periods. While in the third sub period no significance is observed. The growth rates of Area in all the sub periods are found to be not significant but showed a negative growth in the second sub-period.

Observing the seasonal growth rates of yields across the sub-periods, positive significance of yields is observed in the two seasons of 1st sub period. While the yield rate in Rabi of second sub-period is only is reported as significant. No significant growth is reported in any case of both seasons during third-sub-period. As a whole it can be concluded that the reason for showing significance of yield rates may be due to the quality seed but not due to the changes in any of other variables.

Table 4: Compound Growth Rates of Area, Production and Productivity of total Paddy (Rice) in the State

Years	Kharif			Rabi			Total		
	A	P	Y	A	P	Y	A	P	Y
1984-85 to 1993-94	9.1373 (0.72)	3.8869** (2.36)	3.258* (4.10)	1.4342 (1.22)	3.9991** (2.70)	2.6484* (4.96)	1.0664 (1.02)	3.9331** (2.71)	2.8389* (3.97)
1994-95 to 2003-04	-1.8373 (-1.42)	-.1400 (-0.08)	9.7794 (0.56)	-3.0349 (-1.29)	-0.5816 (-0.21)	2.1606* (3.97)	-0.5671 (-0.39)	-0.2535 (-0.13)	1.5867** (2.54)
2004-05 to 2009-10	-0.1926 (-0.06)	1.7996 (0.49)	1.9940 (0.98)	7.4195 (1.75)	6.9368 (1.58)	-0.4822 (-1.41)	2.3900 (0.75)	3.7426 (1.14)	1.3558 (1.20)
1984-85 to 2014-15	-0.5.949*** (-1.98)	0.9389** (2.34)	1.3132 (0.52)	1.5160* (3.14)	3.4453* (6.67)	1.8964* (15.13)	0.1802 (0.62)	1.8211* (4.59)	1.6490* (10.83)

***Source*:** Directorate of Economics and Statistics, Government of Andhra Pradesh, Hyderabad.

Note: Parentheses refer to't' values.

* 1% level of Significance, ** 5% Level of Significance, *** 10 % level of significance

Table 5: Coefficient of Variation (CV) in Area, Production and Productivity of total Paddy (Rice) in the State

Years	Kharif			Rabi			Total		
	A	P	Y	A	P	Y	A	P	Y
1984-85 to 1993-94	10.94	17.63	11.66	11.13	17.60	9.30	9.52	16.70	10.34
1994-95 to 2003-04	12.11	14.93	35.34	20.32	22.92	8.01	11.46	16.42	7.22
2004-05 to 2009-10	11.24	14.43	8.36	18.26	18.35	1.55	12.21	14.00	4.91
1984-85 to 201-15	11.64	15.95	23.72	20.90	32.25	14.60	10.37	19.64	13.27

***Source*:** Directorate of Economics and Statistics, Government of Andhra Pradesh, Hyderabad.

Coefficient of variation (C.V) in area, production and productivity of total paddy (rice) in the state.

Observing the variations among area, production and productivity of total period (1984-85 to 2014-15), wide range of co-efficient is observed in the case of yields across the sub-periods than the co-efficient of area and production. Comparing the seasons, lesser variations are observed in the yields of Rabi season than in the Kharif season across the periods.

Growth and instability of rice production in the state

The growth rates of production and yield of paddy are found to be statistically significant, though there is no significant increase in area. Across the sub-periods, the yield of paddy showed a significant growth in the first and second sub-periods. While in the third sub period no significance is observed. The growth rates of Area in all the sub periods are found to be not significant but showed a negative growth in the second sub-period. Observing the seasonal growth rates of

yields across the sub-periods, positive significance of yields is observed in the two seasons of 1st sub period. While the yield rate in Rabi of second sub-period is only is reported as significant. No significant growth is reported in any case of both seasons during third-sub-period.

7. Suggestions

- Development of hybrid seed varieties that are suitable for the local area and comparable to the conventional HYVs is vital to win the confidence of the farmers for area expansion.
- Private companies' hybrid varieties did not attract the farmers due to poor grain, cooking quality and low market price.
- The government may consider giving Minimum Support Price for hybrid rice separately by procuring for central pool in PDS programme.
- Consumers in the state prefer long and thin variety of grain for home consumption. Present hybrid varieties do not fulfill this criterion. Seed developers need to focus more on this aspect to popularize their varieties.
- Tardy spread of hybrid rice varieties over the years show lack of efforts by the government agencies in its promotion.
- Though some demonstration programmes were held by the state agricultural department, the knowledge of the farmers with regards to hybrid rice cultivation is poor.

8. Conclusion

Though efforts are needed to raise productivity of any crop, excessive stress on rice crop needs to be reviewed in the back drop of huge buffer stocks being wasted due to improper storage and record exports of rice last year. Twice that value of edible oils is being imported. Policy makers may consider raising the production of edible oils and pulses which in fact need lesser irrigation. More support may be given to popularize minor millets that have more nutritional value. Broader policy initiatives may be undertaken to make availability of wide spectrum food grains in PDS programme. As a whole it can be concluded that the reason for showing significance of yield rates may be due to the quality seed but not due to the changes in any of other variables.

9. References

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