

AGRICULTURE DEVELOPMENT – FUTURE PRODUCTION AND PRODUCTION POSSIBILITIES IN ANDHRA PRADESH

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Agriculture in Andhra Pradesh has witnessed many changes since 1950 in terms of land use, cropping pattern, input use and productivity. These changes are the outcome of many government policies with emphasis on:

1. Self-sufficiency in foodgrains production
2. Reduction of hunger among the poor
3. Availability of foodgrains to the consumers at reasonable prices
4. Price stability
5. Stable and adequate returns to farmers

Though these objectives have remained the same since 1950 the emphasis varied on each of these objectives and strategies followed to achieve objectives from time to time depending on the output levels, prices, and cost of production. The main strategy followed during 1950s was institutional changes². These changes augmented the agriculture output by extensive cultivation of land. With the possibility of bringing more land under the plough declining during the 1960s, the strategy shifted from extensive cultivation to intensive cultivation. The green revolution is thus can be conceived as the product of such an effort. To speed up the adoption of new agriculture technology the agriculture policy, which was in favour of the consumer before the advent of green revolution period, tilted in favour of producers by setting up of Agriculture Prices Commission, (presently Commission for Agriculture Costs and Prices (CACP)³), which recommends the Government on the minimum support prices (MSP) to be implemented⁴.

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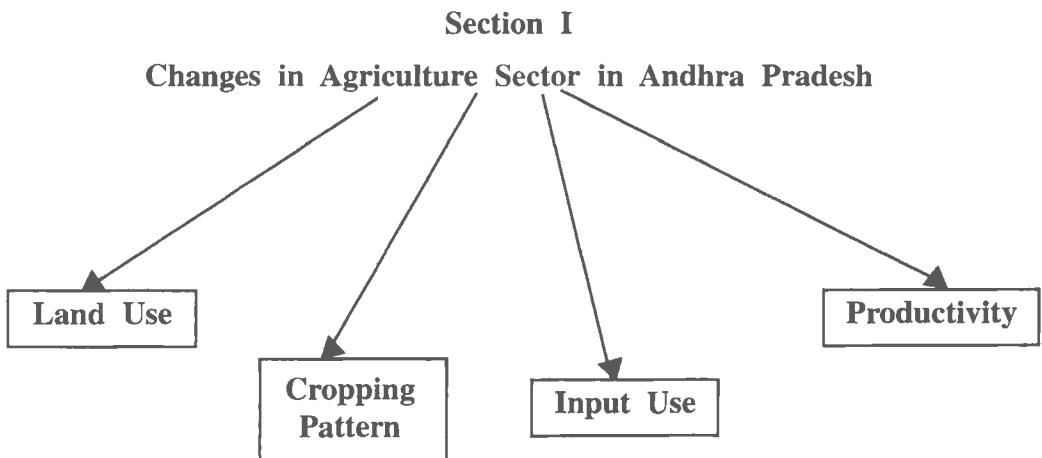
2 *Zamindari was abolished and tenancy regulated.*

3 *These measures are intended to provide accessed avenue to the farmers in the dispersed villages of the country through regulated markets. The FCI procures foodgrains and maintains buffer stocks with a view to protect the farmer and the consumer from price risks.*

4 *The minimum support price policy was adopted to ensure that the farmers got a reasonable return by the Government undertaking to purchase the product at this price if the market price falls below it. This policy sought to encourage farmers to adopt new technologies and to provide them signals on the likely returns on the crops since the MSP took into account many factors like cost of cultivation, the likely levels of output and internal supply situation.*

A major initiative during the 1970s was nationalization of banks for increasing the access to cheap credit to the farmers. Subsidies on inputs, viz., irrigation, power for lifting water and chemical fertilizers were given to the farmers to encourage them to adopt the high cost green-revolution technology. Since 1980s the positive effects of green revolution has been started slowing down. It is often criticized that the agriculture revolution had favoured large farmers, areas and crops covered by irrigation to the neglect of dry lands. Paddy, sugarcane and other irrigated crops benefited at the cost of dry crops like millets, pulses and oil seeds. While poverty is declining in irrigated areas, poverty persisted at high levels and among all occupational groups in dry areas. These factors coupled with increasing environmental degradation resulted in a shift of focus on dry lands and rural development. The 1990s have brought about rethinking on the importance of earlier stated objectives and strategies due to the changes in the international trading regimes (WTO) which led to removal of restrictions on exports of agricultural commodities especially foodgrains like rice.

Keeping this background in view this paper analyses the future production and production possibilities of important crops in Andhra Pradesh such as rice, sugarcane, oil seeds, and fruits. Before making any pronouncements on the production possibilities of these crops it would be important to examine the changes that occurred in Andhra Pradesh in terms of land use, cropping pattern, input use and productivity. Towards this purpose this paper is divided into three sections. Section I covers the changes in agriculture sector since 1950, Section II gives the methodology adopted to forecast the production of rice, sugarcane, oil seeds and fruits and Section III presents the results.



Land Use

The total geographical area of Andhra Pradesh is 27.5 million hectares. The land under forests, land put to non-agriculture use, barren and uncultivable land is generally considered as land not available for cultivation. This category of land was 10.25 million hectares (37 per cent of the geographical area) in 1950-51 and it increased to 10.81 million ha in 1997-98. The main increases were area under forests and land put to non-agriculture uses. The cultivable land⁵ was 3.1 million ha in 1950-51 (11 per cent) which declined to 1.8 million ha in 1997-98 (6.5 per cent). This decline was due to the decline in area under cultivable wastes, area under permanent pastures and other grazing lands. Fallow lands, which consist of current fallow and other fallow land was 3.69 million ha in 1950-51, which increased to 5.02 million ha in 1997-98. The net area sown in 1950-51 was 10.5 million ha (38 per cent of the total geographical area) which was declined in 1997-98 to 9.90 million ha (36.3 per cent). The decline in net sown area was also associated with an increase in fallow land. The gross cropped area in 1950-51 was 11.2 million ha and it increased to 13.4 million ha in 1997-98. The extent of land sown more than once increased from 0.91 million ha in 1950-51 to 2.58 million ha in 1997-98 (Tables 1 & 2).

TABLE - 1 : Land Utilization in Andhra Pradesh (Million Hectares)

Land Use	1950	1960	1970	1980	1990	1997
Forests	5.21	5.85	6.34	6.21	6.27	6.20
Barren Land	3.35	2.36	2.10	2.34	2.10	2.11
Land for non-agriculture use	1.69	1.83	2.12	2.17	2.31	2.50
Cultivable Waste	1.76	1.63	1.12	0.87	0.78	0.75
Fallow	3.69	3.35	2.65	3.91	3.86	5.02
Net Sown Area	10.50	10.8	11.7	10.7	11.0	9.90
Gross Cropped Area	11.20	11.8	13.4	12.3	13.2	13.4
Doubled Cropped Area	0.91	1.03	1.61	1.54	2.17	2.58
Total Geographical Area	27.4	27.5	27.4	27.4	27.4	27.4

Source: CMIE, various issues.

Land under permanent pastures, grazing, miscellaneous tree crops, groves and cultivable wastes are treated as cultivable but uncultivated land

TABLE - 2 Shares in Total Geographical Area (Percentage)

Year	Gross Cropped Area	Net Area Sown	Fallows	Cultivable Waste
1950	40.9	38.0	13.5	6.4
1960	43.1	39.5	12.3	6.0
1970	48.9	42.8	9.7	4.1
1980	44.7	39.2	14.3	3.2
1990	48.0	40.2	14.1	2.8
1997	48.9	36.3	18.0	2.7

Cropping Pattern

The growth in gross cropped area in the State was relatively poor compared to the national average. During 1997-98, the gross cropped area of the state was only 48.9 per cent and all-India average was 57.2 per cent (Table 2). Foodgrains accounted for about 70 per cent of the gross cropped area in the state up to 1980-81 and it declined to 50 per cent in 1997-98. Among the foodgrains rice occupy a pivotal position. The area under rice was increased from 2.2 million hectares in 1950-51 to 3.5 million hectares in 1997-98. It accounted for 19.7 per cent of gross cropped area which had gone up to 26 per cent during the same period. The area under this crop has recorded a positive growth till 1990. However, the late years of 1990 decade had witnessed a negative growth in area under rice (Tables 3 & 4).

Groundnut is the most prominent crop among oilseeds in Andhra Pradesh. It contributes more than 55 per cent in area under total oil seeds in the state. It accounted for 11 per cent of gross cropped area up to 1980 and increased to 18 per cent in 1990s. However, it could not retain this status for long and it fell down to 14 per cent in 1997-98. The area under other oil seeds viz., sesamum and castor was less than 5 per cent of the cropped area. The commercial crops like sugar and fruits contributed three and four per cent to gross cropped area in 1997 respectively. These two crops recorded significant positive growth rates and the rate of growth was much higher during 1980-81 to 1997-98 (Tables 3 & 4).

**TABLE – 3 : Harvested Area for Major Crops in Andhra Pradesh
(Million Hectares)**

Year	Rice	Groundnut	Oilseeds	Sugar	Fruits
1950	2.20	1.20	2.04	0.07	-
1960	2.96	0.80	1.42	0.09	0.35
1970	3.52	1.57	2.28	0.12	0.20
1980	3.60	1.30	1.86	0.17	0.23
1990	4.04	2.40	3.18	0.23	0.39
1997	3.50	1.83	2.70	0.37	0.53

**TABLE – 4 : Share of Harvested Area in Gross Cropped Area for
Major Crops in Andhra Pradesh (Per cent)**

Year	Rice	Groundnut	Oilseeds	Sugar	Fruits
1950	19.7	10.7	18.2	0.63	-
1960	25.0	6.8	12.0	0.76	2.96
1970	26.4	11.8	17.1	0.90	1.50
1980	29.3	10.6	15.2	1.38	1.87
1990	30.6	18.1	24.1	1.74	2.96
1997	26.1	13.7	20.1	2.68	3.95

Input Use

More than 60 per cent of the net sown area has no assured irrigation. The percentage of irrigated area to gross cropped area, which was 17.2 per cent, had increased to 37.5 per cent in the country as a whole. As against this in Andhra Pradesh, the irrigated area to gross cropped area has increased only from 23 per cent during 1950s to 38.5 per cent during 1997-98. The increase, therefore, is slow compared to the national average. Though a number of crops are grown in Andhra Pradesh only a few of them such as rice, sugarcane and groundnut are grown under irrigated conditions. These crops together accounted for 94 per cent of the irrigated area in 1950s, which fell down to 73 per cent in 1997-98. Among these, rice has a major share of more than 90 per cent in 1950s which has gradually fell down to 65 per cent (Table 6). The implication of this is that the increased irrigation facilities during the 1980s are used mainly for growing the crops other rice. This is due to the introduction of new yielding varieties in other crops also. The major sources of irrigation in the state are canals and tanks, which together contributed to 85 per cent of the irrigated area. The dominance of tanks however has disappeared after 1980s by giving its status to wells.

TABLE - 5 : Area Irrigated (Million Hectares)

Year	Net Area Irrigated	Gross Area Irrigated	% of Gross Area irrigated to Gross Cropped Area	Source Wise Irrigation (percent)		
				Canals	Tanks	Wells
1950	2.36	2.52	22.6	54.4	32.4	12.9
1960	2.91	3.47	29.4	45.8	39.6	11.3
1970	3.31	4.22	31.6	47.7	33.6	15.4
1980	3.46	4.34	35.4	48.9	26.0	22.4
1990	4.31	5.37	40.7	43.4	22.5	30.3
1997	3.95	5.16	38.5	39.9	14.3	42.5

TABLE – 6 : Crop-wise Shares of Irrigated Area in Total Irrigated Area (Percent)

Year	Rice	Groundnut	Sugarcane	Total Contribution by these Crops
1950	90.9	0.75	2.34	93.99
1960	89.1	1.58	2.51	93.19
1970	84.6	0.57	2.79	87.96
1980	77.8	0.48	3.94	82.22
1990	71.3	0.88	4.19	76.37
1997	65.4	0.70	6.51	72.61

Though fertilizer consumption in Andhra Pradesh is very low during the pre-green revolution period its use has been increasing drastically with the advent of green revolution. During 1970 to 1980 it has grown at the rate of 9 per cent per annum. However, it has slightly decreased during the second decade of green revolution (Table 7). The existing literature observed that there is an imbalance in the use of fertilizers in Andhra Pradesh where the optimal mix of N,P,K is 4:2:1.

TABLE – 7 : Growth Rates of Fertilizer Consumption (percent)

	1970 to 1980	1980 to 1995	1970 to 1995
Nitrogenous Fertilizer (N)	9.7	7.3	8.4
Phosphorus (P)	8.0	7.9	9.0
Potash (K)	8.6	5.4	8.0
N+P+K	9.1	7.3	8.5

(Hanumantha Rao et al, 1999)

Production and Productivity

Total foodgrain production recorded 3.6 per cent growth during the pre-green revolution period. However there was a slight fall in production growth during the post green revolution period mainly due to the fall in growth rate of area during this period. This fall is quite severe during post-green revolution period whose growth rate is less than the population growth rate. This is mainly due to the negative growth rates of pulses during this period. Among cereals rice is the major crop in A.P whose production is 8.5 million tones in 1997-98. Growth rate of rice though increased significantly from pre-green revolution period to post-green revolution period however it has fallen during the liberalization period mainly due to the fall in area under rice which is in turn due to the decline in irrigated area from canals and tanks.

Among oil seeds, groundnut dominated all other crops with a share of 88 per cent in total production in 1950-51 and 1.2 million tonnes of production. By 1980s and early 1990s its share had increased to more than 90 per cent. However, in 1994-95 as a result of increase in area under sunflower its share had fell down to roughly 85 per cent. Groundnut gained area from cereal crops during liberalization period as a result of the favourable policies of the Government. With regard to other oil seeds also, there was a reversal from negative growth rates in the liberalization period. As a result, the production of other oil seeds also has shown a substantial increase as compared to the pre and post green revolution periods.

Sugar cane is another important crop, which has witnessed a fall in the growth rates in the post-green period. This might be because of the relative importance of rice during the green revolution period as these are the competing crops. The liberalization period however witnessed an increase in area under sugar cane though the yield are continued to be negative (Table 8 & 9).

As far as productivity is concerned rice productivity was 2.47 tones per hectare. Compared to 0.92 tonnes in 1950. Yield of commercial crops like groundnut, other oil seeds and sugar increased at much slower rate when compare to rice (Table-9).

The growth in gross cropped area in the State is relatively poor compared to the national average. During 1996-97, the gross cropped area of the state was only 48.9 per cent. The percentage increase is only 3.6 per cent since 1956-57 when it was 45.3 per cent compared to this, the national average during 1956-57 was 45.4 per cent and it has gone upto 57.2 per cent by 1996-97. Similarly,

TABLE - 8 : Production (Million Tonnes)

Year	Rice	Groundnut	Oilseeds	Sugar	Fruits
1950	2.27	1.03	1.15	4.7	
1960	3.66	0.69	0.78	8.1	
1970	4.79	1.23	1.35	9.5	
1980	7.01	0.86	0.92	10.4	
1990	9.65	2.27	2.39	13.3	4.01
1997	8.51	1.16	1.21	13.5	5.47

the percentage of irrigated area to gross cropped area, which was 17.2 per cent, had increased to 37.5 per cent in the country as a whole. As against this in Andhra Pradesh, the irrigated area to gross cropped area has increased only from 27.2 per cent in 1956-57 to 43.1 per cent by 1996-97. The increase, therefore,

TABLE - 9 : Productivity (Ton/Hectare)

Year	Rice	Groundnut	Oilseeds	Sugar	Fruits
1950	0.92	0.77	1.10	6.06	
1960	1.24	0.87	1.23	8.89	
1970	1.36	0.79	1.20	7.92	
1980	1.99	0.66	0.93	7.86	
1990	2.44	0.95	1.40	7.28	12.8
1997	2.47	0.65	0.99	7.30	14.0

TABLE – 10 : Contribution of Area Growth and Yield Growth to

Production Growth (percent)	Rice	Sugarcane	Groundnut
Area Share			
1949-1968	45.2	74.8	16.9
1968-1980	39.4	36.9	-
1980-1995	-1.0	118.0	72.0
Yield Share			
1949-1968	54.8	25.2	83.1
1968-1980	60.6	63.1	
1980-1995	101.0	-18.0	28.0

is slow compared to the national average. Cropping intensity in the state is hardly 138 per cent and below national average.

As far as production is concerned, the state stands 2nd in groundnut, 3rd in rice and sunflower, 4th in case of cotton, jowar, maize and oilseeds. In case of pulses and sugarcane, it stands 5th. When it comes to productivity, its ranks 2nd in case of maize with 2857 Kgs. per ha despite being rice bowl of South India, the productivity level of rice is only 2494 Kgs. per hectare which is far below Punjab, Tamil Nadu and Haryana. In case of cotton and sugarcane, the productivity rank is only 4th in the country. Despite second in production, the productivity of groundnut is below national average of 1155 Kgs. per hectare and the State ranks 6th in productivity. The pulses' productivity of the state is much below national average with 477 Kgs. per hectare against 623 Kgs., per hectare of the country. In case of oilseeds as a whole, once again the State productivity is below national average and stands at 810 Kgs per hectare (10th rank) against 931 Kgs. national average. It is surprising to note the low productivity levels despite high consumption of fertilizers per hectare in the State. It is only second in consumption of fertilizers at 128.9 Kgs. per hectare in terms of NPK. During 1994-95 it consumed 16.44 lakh tonnes of NPK next only to Uttar Pradesh.

Section - II

Methodology for Supply Projections for 2010

The estimation of supply projection for 2010 is carried out for rice, groundnut, total oil seeds, sugar cane and fruits using the data on various variables for the period 1950-51 to 1997-98. The procedure followed for estimation of supply projections is as follows:

$$P = A * Y \text{ ————— } 1$$

Where

P = Production
A = Gross Cropped Area
Y = Yield per acre

- I. Projected gross cropped area by adding the net area sown and the area sown more than once
- II. The net sown area is projected using the exponential growth rates of net sown area for the period 1987-88 to 1997-98.
- III. Area sown more than once was projected on the basis of relationship between the irrigated area and the area sown more than once for the period 1950-51 to 1997-98 and the planned irrigation programme in future. Cropping intensity is projected based on the estimated relationship between cropping intensity and area irrigated. Using the impact variable which is derived by estimating the above relationship and future irrigation potential available in the state economy the cropping intensity is projected.

$$CI = a + b I^t + ut$$

Where	CI	=	Cropping Intensity
	I	=	Irrigated Area
	U	=	Random Error Term
	a, b	=	Parameters to be estimated
	t	=	Time

Yield per hectare is projected based on the following formulae:

$$Y^* = \left[\sum_{t=1}^m (Y_t - Y_{t-1}) / Y_{t-1} \right] / m$$

$$Y^* = \left[\sum_{j=1}^n (Y_{t-1} - Y_t) / Y_{t-1} \right] / n$$

Where,

Y^* = growth rate of the yield

Y_t = Yield of the respective crop in the t^{th} period

Y_{t-1} = Yield of the respective crop in the $t-1$ th period

$Y_t > Y_{t-1}$ in equation 1

$Y_{t-1} > Y_t$ in equation 2

m is years of positive increments in yield in the t^{th} period from $t-1$ period.

n is years of decrease in yield in the t^{th} period from $t-1$ period.

Data Sources

Secondary data has been collected from various sources such as Economic Survey of India, Season and Crop Reports of Andhra Pradesh, Statistical Abstract of Andhra Pradesh, and Bulletin on Food Statistics.

Section - III

Results

1. Net sown area is projected using the historical growth rates for the period 1950-51 to 1997-98. It is declined from 9.90 million hectares in 1997-98 to 9.65 million hectares in 2010. If the fallow and other cultivable waste lands are brought under cultivation NSA would be increased to more than 10 million hectares in 2010.
2. Though the cropping intensity has increased from two million hectares to more than three million hectares gross cropped area registered a fall from 13.4 million hectares to 13.3 million hectares.

3. Area under each crop is projected based on the growth rates of share of area in total gross cropped area by each individual crop. Area under all crops has increased with rice retaining its original position whose share is found to be increased from 26 per cent to 44 per cent. Area under groundnut has shown tremendous improvement in the projected period that increased from 13.7 per cent to 29 per cent. Sugar cane area share has more than doubled from 2.68 per cent to 5.40 percent. Area under fruits is also more than doubled from 3.95 per cent to 8.05 per cent.
4. However there is slight improvements in yields of these crops (Table 11).

TABLE – 11 : Projected Variables

Variable	1997	2010
Net Sown Area (NSA) (Million Ha)	9.90	9.654*
Cropping Intensity	2.58	3.62
Gross Cropped Area (GCA)(Million Ha)	13.4	13.279
Share of rice area to GCA (%)	26.1	44.24
Share of ground nut area to GCA (%)	13.7	29.91
Share of oil seeds to GCA (%)	20.1	33.70
Share of Sugar cane area to GCA (%)	2.68	5.39
Share of Area under fruits to GCA (%)	3.95	8.05
Yield of Rice (ton/ha.)	2.47	2.67
Yield of Groundnut (ton/ha.)	0.65	0.69
Yield of Oilseeds (ton/ha.)	0.99	1.03
Yield of Sugarcane (ton/ha.)	7.30	7.39
Yield of Fruits (ton/ha.)	14.0	14.86

Note: * Based on the exponential growth rate of NSA -0.22 per cent from 1987-88 to 1997-98

TABLE – 12 : Crop-Wise Projections of Supply by 2010 in Andhra Pradesh
(Million Tonnes)

Crop	1980	1990	1996	2010
Rice	7.01	9.65	10.68	15.69
Groundnut	0.86	2.27	2.05	2.73
Oilseeds	0.92	2.39	2.15	2.94
Sugarcane	1.04	1.33	1.48	2.65
Fruits		4.01	5.47	9.12

1. In the projected period production of rice has increased from 10.7 million tonnes to 15.7 million tonnes that is an increase of 40 per cent in fifteen years. Groundnut would increase by 33 per cent, oil seeds by 37 per cent. The maximum increase is found to be in sugarcane and fruits, which witnessed 79 and 67 per cent respectively (Table 12).
2. Though the future production in absolute terms is found out to be increasing the possibilities of increasing agriculture production is slowing down with closing down of land frontier for further cultivation and stagnating/declining growth rates of yields. Until the early 1970s yields were low and inputs used were minimal. Thanks to the advent of green revolution the use of high yielding varieties, fertilizers and pesticides had gone up. As a result yields improved tremendously in respect of those crops which came under the influence of green revolution. The 1970s and 1990s witnessed rapid commercialization of agriculture particularly sugarcane, groundnut and cotton as these crops gained area against the coarse cereals. As a result foodgrain production growth rates have declined. The benefits of green revolution reached a plateau. The affluent farmers ploughed back the profits generated by green revolution not in agriculture sector but as investment in hotels, cinema, and shares which resulted in decline in investments in agriculture and a slow down of production. This can be stopped by some extent
1. With an effective implementation of land reforms in the area of conferment of ownership rights on tenants as the possession of land provides a sense of psychological, social, and economic security.

2. Fallow lands are increasing largely in areas dependent on dry land agriculture. There is a need to introduce and integrate technologies suitable to tune the existing socio-economic realities for success of dry land agriculture. Efforts must be increased to disseminate the available dry land technologies.
3. The decline in real investment in irrigation should be checked up. Explore the possibilities for cost-effective expansion of irrigated area. Scaling down the subsidies provided for water, electricity and fertilizers.
4. Correct the imbalance in the use of plant nutrients.
5. Efficient dissemination of information and training in the use of modern technologies is the need of an hour. For this, an appropriate extension service both top down and bottom up forms of information between farmers, extension workers and research scientists to promote and adopt the location specific farm technology.