



## Trends in Different Sources of Irrigation in India: A Case of Srikakulam District of Andhra Pradesh

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**Abstract:** Growth of irrigation is stagnant in Srikakulam district over a period of time. Tanks are predominant source of irrigation. These are mainly rain-fed. The ayacut under tank irrigation in the district is very limited. Due to this in the district the extent of intensity of irrigation is very low. As far as cropping pattern under tank irrigation in the district is concerned, rice is the predominant crop under both tanks and canals. In the selected district, a higher proportion of paddy is grown in Kharif season. Because of the predominance of rain fed tanks in the district, adverse trends in rainfall is leading to decline in both the area under cultivation as well as crop yield in the study area. As a whole due to scarcity of water the cultivators under tank irrigation are facing frequent problems relating to loss of different crops.

**Keywords:** Irrigated Area, Irrigated Sources, Canals, Tanks, Wells

### 1. Introduction:

Irrigation plays an important role in agricultural development. It is one of the most important factors for assured crop production. It permits better utilization of all other productive factors and thus, leads not only to increased yields per unit of land and time, but also stability in economic conditions of the farmer. Adequate and timely supply of irrigation water is a pre-requisite in the agricultural production process, particularly in areas where the rainfall is scanty and irregular. It is an instrument with which rural transformation and agricultural development is possible. The supply of land being inelastic, accelerated growth in production is possible only through multiple cropping and realization of higher crop yields per unit of area, both of which are heavily dependent on irrigation.

In India, due to its geographical location, tropical and semi-arid climate prevails in the major part of the country. In these tropical and semi-arid tracts, rain fall is scanty and uncertain, and often

unpredictable. The rainfall in India is essentially monsoonal in character and rain occurs only in few months in a year, the frequency of failures of rainfall being very high.

Further, an unfavorable timing of rainfall within the crop season also leads to crop failure. Wide fluctuations from year to year have resulted in terrible famines in the Indian history. Significantly, the famine areas in India are not the driest parts, but those parts with an intermediate to low rain fall.

### 2. Types of Irrigation:

The classification of irrigation works by source goes back to first irrigation commission which laid down the basis of present system of classification of irrigation works.

Irrigation works in India are classified into three categories –

- (1) Minor Irrigation.
- (2) Medium Irrigation.
- (3) Major irrigation.



This classification was evolved during the British time and was linked to the quantum of resources required for executing the irrigation works of different sizes. When the resources required for the execution of an irrigation scheme are considerable, it was categorized as major irrigation work. Tanks division's schemes lift irrigation schemes are surface water related schemes which come under this category. Open or dug wells, tube wells filter points are the ground water related schemes included in this category.

The medium irrigation schemes come in between these two. The basis therefore, for this classification is in terms of investment norms. These investment norms have been revised from time to time to account for inflation. For example the investment norm for minor irrigation schemes was raised from Rs.15 lakhs to Rs. 25 lakhs in 1970 (rupees 30 lakhs for hilly areas). Finally this norm was abandoned by the Planning Commission in 1978.

The following Table-1 presents trends in Net Area Irrigated and Gross Area Irrigated in India during the period 1990-91 to 2011-12.

**Table-1: Trends in net and gross area irrigated in India**

Year	Net Area Irrigated Absolute (in lakh ha)	Index	Gross Area Irrigated Absolute (in lakh ha)	Index
1990-91	480.23	100.00	632.04	100.00
1991-92	498.67	103.84	656.8	103.92
1992-93	502.96	104.73	667.61	105.63
1993-94	513.39	106.91	682.54	107.99
1994-95	529.99	110.36	706.46	111.77
1995-96	534.02	111.20	713.52	112.89
1996-97	551.12	114.76	760.26	120.29
1997-98	552.10	114.97	756.70	119.72
1998-99	574.36	119.60	786.70	124.47
1999-00	575.31	119.80	792.16	125.33
2000-01	552.05	114.96	761.87	120.54
2001-02	569.36	118.56	783.71	124.00
2002-03	538.97	112.23	730.55	115.59
2003-04	570.57	118.81	780.42	123.48
2004-05	592.29	123.33	810.78	128.28
2005-06	608.37	126.68	842.80	133.35
2006-07	627.44	130.65	867.53	137.26
2007-08	631.89	131.58	880.58	139.32
2008-09	636.38	132.52	888.96	140.65
2009-10	619.36	128.97	850.85	134.62
2010-11	635.98	132.43	886.30	140.23
2011-12	652.63	135.90	915.3	144.82
Growth Rates	0.013* (13.63)		0.016* (13.75)	

Source: Government of Andhra Pradesh Statistical Abstract for the relevant years  
 GIA= NIA+AIMO (Area Irrigated More than Once) > \* Significant at 1 per cent level



Table 1 presents data relating to Net Irrigated Area (NIA) and Gross Irrigated Area (GIA) for the reference period .

The following table 2 presents the percentage of area irrigated under different sources of irrigation to total irrigated area in India during the period 1990-91 to 2011-12.

**Table-2: Percentage of source wise irrigated Area to total irrigated Area of India**

(Area in lakh hectares)

Year	Tanks	Per cent	Canals	Per cent	Other Wells	Per cent	Other Sources	Per cent	Total	Per cent
1990-91	2944	5.30	17453	31.43	24694	44.47	10438	18.80	55529	100.00
1991-92	2991	5.18	17791	30.84	26037	45.13	10869	18.84	57688	100.00
1992-93	3179	5.46	16986	29.19	26920	46.26	11105	19.08	58190	100.00
1993-94	3170	5.36	17138	28.99	27596	46.67	11220	18.98	59124	100.00
1994-95	3276	5.35	17279	28.24	28911	47.25	11722	19.16	61188	100.00
1995-96	3118	5.05	17120	27.74	29697	48.11	11787	19.10	61722	100.00
1996-97	2821	4.40	17109	26.66	31794	49.54	12457	19.41	64181	100.00
1997-98	2597	4.02	17397	26.96	32111	49.76	12431	19.26	64536	100.00
1998-99	2795	4.19	17311	25.95	34001	50.97	12606	18.90	66713	100.00
1999-00	2539	3.78	17440	25.95	34639	51.53	12597	18.74	67215	100.00
2000-01	2466	3.88	16012	25.20	33818	53.22	11252	17.71	63548	100.00
2001-02	2196	3.40	15202	23.55	35197	54.53	11952	18.52	64547	100.00
2002-03	1811	3.07	14073	23.87	34354	58.26	8727	14.80	58965	100.00
2003-04	1916	3.07	14458	23.15	36385	58.26	9693	15.52	62452	100.00
2004-05	1734	2.81	14766	23.95	35190	57.08	9956	16.15	61646	100.00
2005-06	2083	3.21	16718	25.75	36070	55.56	10044	15.47	64915	100.00
2006-07	2078	3.08	17027	25.25	37641	55.81	10698	15.86	67444	100.00
2007-08	1973	2.95	16748	25.02	38361	57.30	9864	14.73	66946	100.00
2008-09	1981	2.91	16881	24.82	38756	56.99	10389	15.28	68007	100.00
2009-10	1587	2.44	14978	23.07	38363	59.09	9992	15.39	64920	100.00
2010-11	2004	2.98	15667	23.30	39061	58.09	10509	15.63	67241	100.00
2011-12	1937	2.81	16017	23.24	40186	58.31	10779	15.64	68919	100.00

Source: Government of Andhra Pradesh Statistical Abstract for the relevant years

Table 2 presents the data relating to percentage of area irrigated under different sources of irrigation for the reference period. It can be seen that among different sources of irrigation the area under tanks is gradually decreasing between the years 1990-91 and 2011-12. On the other hand, there was an increase in the net area irrigated under wells from 44.47 per cent in 1990-91 to 58.31 per cent in 2011-12. This shows that some of the area lost under tanks was gained by wells and this inference gains strength from the fact that a fall in the area under tanks is accompanied by a corresponding rise in the area under wells for many years during the period 1990-91 to 2011-

12. It may be inferred that the decline in the area irrigated under tanks with a corresponding increase in the net area irrigated under wells in tank ayacut. Such an increase has partly contributed to the increase in the total net area irrigated.

**4. Growth of Irrigated Area in Andhra Pradesh:**

The growth of irrigation in Andhra Pradesh is analyzed by considering the broad indicators viz, NIA and GIA. Among the South Indian states, AP has the largest number of tanks. According to the State Government data, there are about 77472 tanks with a



command area of about 17.5 lakh hectares of farm lands, which includes area irrigated by tanks with less than 40 ha. command coming under the jurisdiction of Gram Panchayats. The region wise distributions of these tanks are presented in the following Table

**Table-3:Trends in net and gross area irrigated in Andhra Pradesh**

Year	Net Area Irrigated Absolute (in lakh ha)	Index	Gross Area Irrigated Absolute (in lakh ha)	Index
1990-91	43.05	100	53.70	100
1991-92	43.51	101.05	53.78	100.15
1992-93	40.29	93.58	50.85	94.70
1993-94	38.90	90.35	50.20	93.48
1994-95	39.59	91.96	51.85	96.56
1995-96	41.23	95.77	53.04	98.78
1996-97	43.95	102.08	57.82	107.68
1997-98	39.45	91.62	51.58	96.06
1998-99	45.38	105.41	60.92	113.45
1999-00	43.84	101.83	57.46	107.01
2000-01	45.28	105.16	59.16	110.18
2001-02	42.38	98.43	55.50	103.35
2002-03	36.14	83.93	53.62	84.48
2003-04	36.34	84.40	47.81	89.03
2004-05	38.81	90.13	49.87	92.87
2005-06	43.93	102.03	59.96	111.66
2006-07	44.52	103.40	60.69	113.02
2007-08	46.44	107.86	62.85	117.05
2008-09	48.21	111.97	67.41	125.54
2009-10	42.15	97.90	57.65	107.36
2010-11	50.34	116.92	71.53	133.21
2011-12	50.90	118.22	67.85	126.35
Growth rates	0.006** (2.186)		0.012*** (1.838)	

Source: Government of Andhra Pradesh Statistical Abstract for the relevant years

\*\* Significant at 5 per cent level .\*\*\* Significant at 10 per cent level

The data relating to Net Irrigated Area and Gross Irrigated Area is given in table-3. The net irrigated area has increased from 43.05 lakh hectares to 50.90 lakh hectares registering a trend growth rate 0.006. Considering the 22 years time period the registered trend growth rate is very insignificant. The gross irrigated area has increased from 53.70 lakh hectares in 1990-91 to 67.85 lakh hectares in 2011-12. The GIA has increased on an average growth rate of 0.012 per annum. Thus there is an increase in NIA and GIA in the state during the period under reference. The computed growth rates reveal that comparatively the annual growth rate of GIA is more than that of NIA.



**Table-4: Log linear Growth Rates of Net Irrigated Area and Gross Irrigated Area in Andhra Pradesh during 1990-91 to 2011-12**

Irrigated area	1990-91 to 2011-12	1990-91 to 2000-01	2001-02 to 2011-12
Net Irrigated Area	0.006 (2.186) **	0.007 (1.339)	0.029 (4.019) *
Gross Irrigated Area	0.012 (1.838) ***	0.013 (2.575)**	-0.003 (-0.110)

\* Significant at 1 per cent level      \*\* Significant at 5 per cent level      \*\*\* Significant at 10 per cent level

Table 4 presents growth rates of NIA and GIA for sub periods and for the total period. The data do not reveal any encouraging trend pattern in both periods. That the log linear growth rates of both net irrigated and gross irrigated area show that while gross irrigated area growth rate is positive and 5 per cent significant level (2.575) for the first sub period.1990-91 to 2000-01and for the total period. The trend growth rate of net irrigated area is very discouraging for the total period and both the sub periods. The information relating to percentage of area irrigated under different sources of irrigation to total irrigated area in the state of Andhra Pradesh is presented in the following

Table 5 Growth of source wise irrigated area in analyzed by considering data for the reference period. Table 5

gives these details, to find out the relative importance of alternative sources of irrigation and changes in source wise irrigation over the period, proportion of irrigated area under different sources is calculated. There is marked change in the relative importance of various sources of irrigation as is evident from the data given in Table 4 and 5.The data reveal that both in the initial and end period, canal irrigation forms an important source of irrigation. However, by the year 2011-12 well irrigation has emerged as the predominant source. In fact in the year 1990-91 about 30 per cent irrigated area in the State was under wells, this percentage has increased to around 50 per cent by 2011-12. This change is very significant.



**Table-5: Percentage of Area Irrigated under Different Sources of irrigation to total Irrigated Area in Andhra Pradesh**

(Area in '000 ha.)

Year	Tanks	Per cent	Canals	Per cent	Other Wells	Per cent	Other Sources	Per cent
1990-91	967844	22.48	1868867	43.41	1303221	30.27	165546	3.85
1991-92	947994	21.79	1825435	41.96	1402997	32.25	174369	4.01
1992-93	728499	18.08	1726964	42.86	1411237	35.03	162176	4.03
1993-94	632595	16.26	1659016	42.65	1441959	37.07	156379	4.02
1994-95	692021	17.48	1606107	40.57	1478692	37.35	182405	4.61
1995-96	746631	18.11	1538613	37.31	1656814	40.18	181167	4.39
1996-97	843890	19.20	1628606	37.06	1728437	39.33	193986	4.41
1997-98	562730	14.27	1537708	38.98	1676460	42.50	167704	4.25
1998-99	810487	17.86	1634729	36.02	1896571	41.79	197148	4.34
1999-00	651427	14.86	1634252	37.28	1899929	43.34	198516	4.53
2000-01	726809	16.05	1649387	36.43	1954301	43.16	197232	4.36
2001-02	567519	13.39	1562413	36.87	1927438	45.48	180498	4.26
2002-03	425677	11.78	1208538	33.44	1842285	50.98	137164	3.80
2003-04	489560	13.47	1136696	31.28	1886519	51.91	138094	3.80
2004-05	477100	12.29	1345979	34.68	1903636	49.06	153875	3.97
2005-06	661626	15.06	1572222	35.79	1986228	45.21	177227	4.03
2006-07	602227	13.53	1622754	36.45	2073540	46.58	154370	3.47
2007-08	584965	12.60	1609418	34.66	2287184	49.25	162583	3.50
2008-09	647809	13.44	1669447	34.63	2323168	48.19	179827	3.73
2009-10	331803	7.87	1445446	34.29	2283792	54.18	153297	3.64
2010-11	650124	12.91	1746510	34.69	2461439	48.90	175639	3.49
2011-12	550000	10.80	1818000	35.71	2545000	49.99	17800	3.50
Growth rates	-0.025 (-3.710)*		-0.005 (-1.071)		0.029 (17.034)*		-0.003 (-0.758)	

Source: Government of Andhra Pradesh Statistical Abstract for the relevant years

\* Significant at 1 per cent level

Tank irrigation is on decline, with substantial reduction in both absolute area and as percentage as to total irrigated area. Thus in the state of Andhra Pradesh well irrigation is becoming increasingly important as can be seen from the substantial addition in area under this source. At the same time, tank irrigation has losing its significance in the state of Andhra Pradesh as is evident from a marked decline in the area under tanks.

Log linear growth rates for each one of the sources of irrigation are

presented in the above Table 3.10 shows that the rate of growth of area irrigated under tanks is negative and significant at one per cent level for the total period, and it is negative and not significant for the first sub-period. On the other hand the rate of growth of irrigation under canals is negative and significant at one per cent in the first sub-period, and positive and significant at one per cent level in the second sub-period. The growth rates of well irrigation are positive and one per cent significant level for both sub periods and for total period. The rate of growth of irrigation other source is positive and



significant and one per cent level for the first sub-period.

### 5. Irrigation Development in Srikakulam District:

Srikakulam district as pointed out earlier is the district selected for the study. In view of this, development of irrigation is analyzed with the help of the broad indicators as already stated in beginning of this chapter. The data relating to NIA and GIA are given in Table -6.

The following Table-6 provides the broad trends in net area irrigated and gross area irrigated in Srikakulam District for period 1990-91 to 2011-12. From the above Table it can be noticed that the trends in net area irrigated and gross irrigated area in Srikakulam. In 1990-91 the net irrigated area is 1.87 lakh hectares increased 1.92 lakh hectares in 2011-12, gross irrigated area in 1990-91 is 2.04 lakh hectares to increased 2.20 lakh hectares in 2011-12. Both net irrigated area and gross irrigated area have increased during the reference period. To know the trend log linear growth rates are also computed. For computing growth rates the total period was divided into two periods viz., 1990-91 to 2000-01 and 2001-02 to 2011-12, these details in the following Table.

The trend growth rates show very distressing results. The growth rate of NIA is negative for both the total period and for the sub period 1990-91 to 2000-01. In case of GIA the trend growth rate is positive for the total period and also for

**6. Conclusion:** Growth of irrigation is stagnant in Srikakulam district over a period of time. Tanks are predominant source of irrigation. These are mainly

the period 2001-02 to 2011-12. The indices of NIA and GIA also reveal very insignificant changes during period under reference

About 0.77 lakh hectares of irrigated areas is under tanks in 1990-91. This has decreased to 0.66 lakh hectares by 2011-12. Irrigated area under canals and wells shows an increase during the study period. Thus whatever the increase that is observed in the case of NIA is largely due to an increase in the area under canals and wells. In 1990-91 about 55 per cent of NIA is under canals which have increased to 59 per cent. Percentage of irrigated area under tanks has shown a decline by 7 percentage point during the reference period. Irrigated area under well has increased by 3 percentage points. Thus, it is a fact that tank irrigation in this district is declining consistently. the rate of growth of area irrigated under tanks is declining for the total period and also in the both sub periods. On the other hand the rate of growth of irrigation under canals is positive and significant at one per cent level for the total period, and positive and significant at one per cent level for the second sub-period. The rate of growth of irrigation under other sources is negative and significant and 10 per cent level for the total period. The rate of growth of irrigation under well source is positive and significant and 10 per cent level for the first sub-period period. From the above discussion it is clear that though tank irrigation is declining in the district, yet it is a predominant source of irrigation. rain-fed. The ayacut under tank irrigation in the district is very limited. Due to this in the district the extent of intensity of irrigation is very low.



**Table-6: Trends in Net Irrigated Area and Gross Irrigated Area  
 in Srikakulam District**

Year	Net Irrigated Area Absolute (in ha)	Index	Gross Irrigated Area Absolute (in ha)	Index
1	2	3	4	5
1990-91	186601	100.00	204913	100.00
1991-92	191223	102.48	207369	101.20
1992-93	195792	104.93	213183	104.04
1993-94	174876	93.72	186498	91.01
1994-95	187877	100.68	198067	96.66
1995-96	193437	103.66	209730	102.35
1996-97	166721	89.35	180679	88.17
1997-98	176432	94.55	184762	90.17
1998-99	181638	97.34	194579	94.96
1999-00	181538	97.29	191076	93.25
2000-01	193174	103.52	200956	98.07
2001-02	167036	89.52	177247	86.50
2002-03	150433	80.62	159413	77.80
2003-04	175834	94.23	189093	92.28
2004-05	182557	97.83	197612	96.44
2005-06	156741	84.00	180333	88.00
2006-07	196679	105.40	211880	103.40
2007-08	199628	106.98	217294	106.04
2008-09	197223	105.69	211504	103.22
2009-10	161998	86.82	190067	92.75
2010-11	184390	98.82	219231	106.99
2011-12	191662	102.71	219891	107.31

Source: Government of Andhra Pradesh Statistical Abstract for the relevant years

As far as cropping pattern under tank irrigation in the district is concerned, rice is the predominant crop under both tanks and canals. In the selected district, a higher proportion of paddy is grown in Kharif season. Because of the predominance of rain fed tanks in the district, adverse trends in rainfall is leading to decline in both the area under cultivation as well as crop yield in the study area. As a whole due to scarcity of water the cultivators under tank irrigation are facing frequent problems relating to loss of different crops.

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