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Irrigation Development and Agricultural perspectives in Andhra Pradesh

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Agriculture and irrigation are back bone of the Economic development of the country. The state has 5a heritage of irrigated agriculture dating back to several centuries. In the past during the periods of Kakatiya and Vijayanagara kingdoms , several tanks , canals and diversion systems were constructed and dug wells which are still operating and productive increase in agricultural production and productivity depends to a large extension the availability of water . he main objectives of the study of the paper (i) to analyze the major , medium and minor irrigation source and district wise irrigation (ii) analyze Agriculture and irrigated crops and (iii) o Examine the importance of irrigation and limitations and to suggest the remedies .

The above the study the paper analyze the Rain fall pattern source wise availability of surface and ground water , irrigation development , major medium and minor irrigation schemes , Irrigation potential and source of irrigation are canals , tanks , wells and other sources, land use and cropping pattern crop wise irrigation and importance of irrigation and agriculture of the study area

Key Words : Agriculture , Irrigation , Development, command Area etc .

Introduction

. It is an established fact that agriculture is the main source of livelihood for human beings; hence the increase in the standard of living is associated with the growth and development of agriculture. Agriculture and Irrigation are backbone of the economic development of the Country. Irrigation is the application of water for the cultivation of crops, trees, grasses and so on. The agriculture sector is the primary consumer of water. Almost 70% of all available freshwater is used for agriculture across the world. In India more than 80 % of the renewable water resources are spent for agriculture alone. Andhra Pradesh is one of water potential and endowed with very rich water resources and is appropriately called a river state in the Country. Waters flow in the large rivers Krishna, Godavari, and Pennar and in several minor rivers...The state has a heritage of irrigated agriculture dating back to several centuries. In the past, during the periods of Kakatiya and Vijayanagar Kingdoms, several tanks, canals and diversion systems were constructed and dug wells which are still operating and productive. Increase in agricultural production and productivity depends, to a large extent on the availability of water. The development of water resource is critical agriculture and drinking

water to several aspects of welfare of the people and thereby the development of the society is linked with water resources. In the development discourse irrigation has been identified as the leading input for the growth of agriculture (Ishikawa, 1967). Increased and assured irrigation facilities will surely lead to greater investments in inputs by the farmers, and there by raises the growth of agricultural output The availability of irrigation facilities are still inadequate in Andhra Pradesh. The State is predominantly a resource poor small farm agricultural economy... It may have implications for the living conditions of rural masses and rural poverty. In this paper an attempt has been made to examine the and Irrigation and Agriculture in Andhra Pradesh in general and the agricultural economy in particular the paper focusing the aspects of irrigation and cropping pattern.

Objectives:

The main objectives of the paper are

(i) To analyze the Major, medium and minor irrigation, Source and district wise Irrigation.

(ii) To analyze Agriculture and irrigated crops and

(iii) To examine the importance of irrigation and limitations and to suggest the remedies.

The method and source of data

This study is mainly based on the secondary sources of information obtained from the various issues of Statistical Abstract of Andhra Pradesh, published by Bureau of Economics and Statistics, Government of Andhra Pradesh. The study covers the period from 1956-57 to 2013-14. Ten years Irrigated area data has been used to The study of the changes in the agricultural sector with respect to Land use irrigation and cropping pattern for the period from 2009-10 to 2013 -14 . To analyze the pattern of these shifts, changes of the areas under the various crops at the periods 2009-10 to 2013-14 are considered and the analysis is carried out in terms of the changes in the proportion of area under the different crops to the total gross cropped area.

Study Area:

Andhra Pradesh is situated in the central stretch of the eastern seaboard of the Indian Peninsula. .It is bounded on the Northeast by Orissa and on the Northwest by Telangana, on the East by Bay of Bengal, on the South by Tamilnadu and on the South West by Karnataka state. Andhra Pradesh has a total geographical area of 16297 square kilometres area it is the 9th largest State in the Indian Union in terms of area and accounts for 4.87 percent of Country. With a coastline of 974 kms running from Ichapuram in the north to Srikakulam District to Pulicat Lake in the south in Nellore district. The state comprises two regions, coastal Andhra, and Rayalaseema Andhra Pradesh with a population of about 49 million and 4.08 percent as per 2011 population censes. About 70.5 percent of the population lives in rural areas. About 70% of the population of Andhra Pradesh depends upon agriculture. The labour force constitutes about 40.6 percent of the total population and about 59.06 per cent of it is engaged in agriculture, 50.7 percent gross cropped area of (81.27 lakh hectares) total geographical area is under cultivation and the net area shown is about 65.61lakh hectares (30.13 lakh hectares irrigated). The majority of land ownership in Andhra Pradesh is small private farms with an average of 1.56 hectares per holding. Irrigated holdings have an average of 0.88 hectares and about 30 percent of the state economy is contributed by agriculture. As the state is spread over the regions located at different altitudes, there are variations in climate rainfall and soils. The

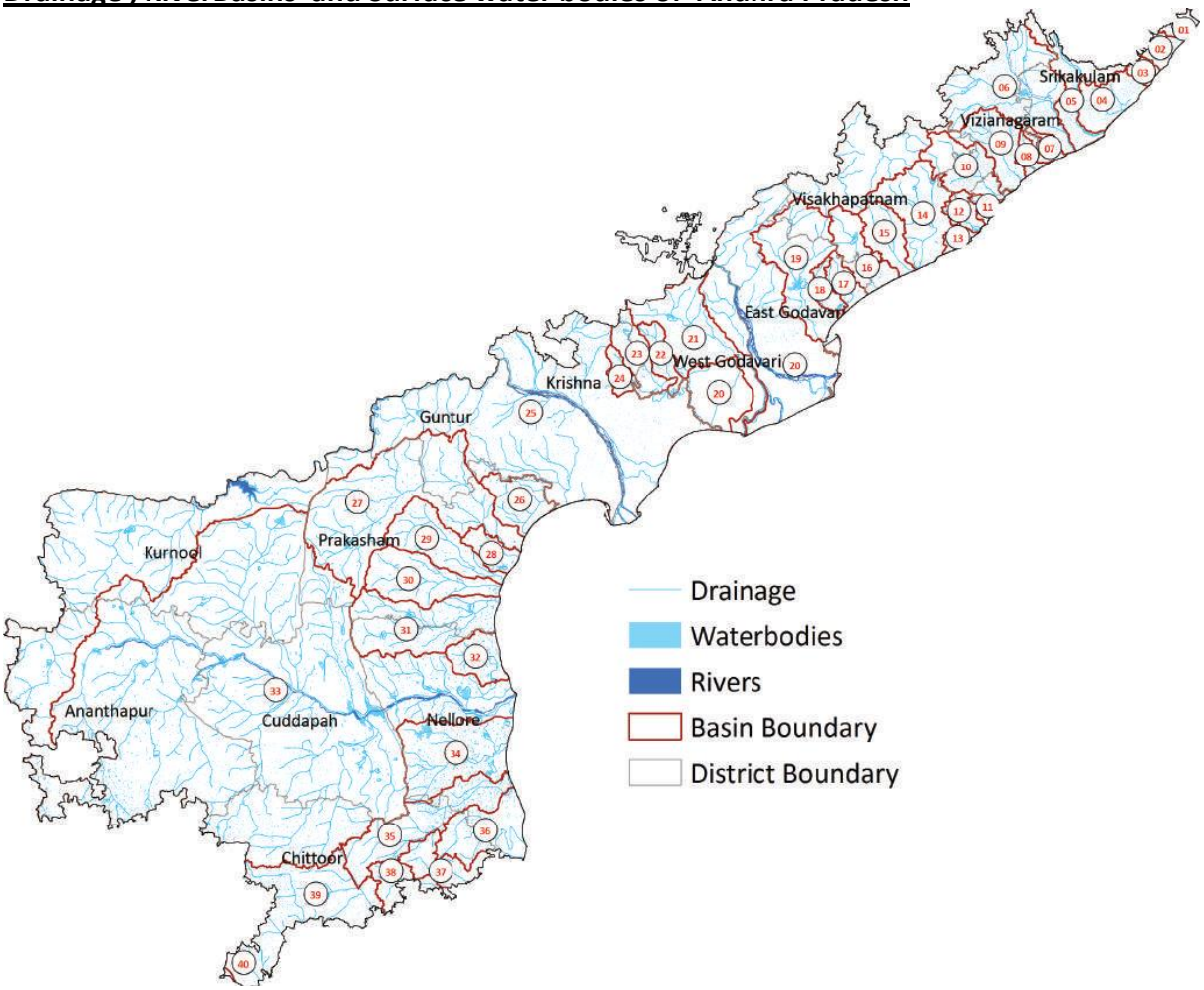
diversity makes the state conducive for growing a variety of crops and rearing different types of livestock. The state is endowed with good water bodies like rivers, lakes and canals. They not only enrich the scenic beauty of the state, but also provide water for irrigation and other purposes, and facilitate transportation.

Rainfall

The state gets rainfall both from southwest and northeast monsoons. The average annual rainfall in the state is 898 mm and ranges from 750 mm in semi-arid belt to about 1250 mm in the north eastern region of the state. The coastal area receives an average of 1100 mm of rainfall. About two thirds of annual monsoon rainfall in the coastal area. The north eastern monsoon is most effective in Nellore and Chittoor districts. The some extent of Kadapa and Anantapur. The north eastern districts of Srikakulam and Visakhapatnam receive heavy rain as a result of cyclones, mostly during north east monsoon period. The mean annual rainfall is observed to be 858 mm, of which about 670 mm (i.e. 78 per cent) is contributed by the south-west monsoon and the rest is by north-east monsoon (ibid). There are, in fact, wide variations in water resources and rainfall within the state across different agro-climatic regions.

Andhra Pradesh is blessed with many major rivers flowing through the state, the most important being Godavari, Krishna, Pennar and Vamsadhara. Andhra Pradesh is a riverine state with forty major, medium and minor rivers. Godavari, Krishna and Pennar are three major inter-state rivers which flow through the heart of the state. Besides these, there are five interstate rivers north of Godavari which flow through Orissa and Andhra Pradesh and four rivers south of Pennar that flow through Andhra Pradesh. Apart from the above twelve rivers, twenty eight medium and minor rivers flow within Andhra Pradesh. They are practically perennial. Besides these two large rivers they are many other rivers such as Vamsadhara, Nagavali and Sarada. Godavari and Krishna flow mainly through the districts of Coastal Andhra. Pennar flows through Rayalaseema. While Vamsadhara, Nagavali and Sarada flow through north Coastal Andhra region. The major lakes in the state are Pulicat Lake covering an area of 327.33 sq.kms and Kolleru Lake with an area of 245 sq.kms. Andhra Pradesh, therefore, has the advantage of having most of the east flowing rivers in the heart of the state bringing in copious supplies from the Western and Eastern Ghats and the Deccan Plateau up to Bay of Bengal. These water bodies along with estuaries on the coast make the State conducive for taking up aqua culture and piscine culture. The state, share of dependable flows water flowing at 75 percent dependability from all the rivers and streams and Ground Water is estimated at 2195.45 TMC. And only 1753 TMC has been utilized so far. The total cultivable area of the state is 81.27 lakh Hectares and at present 40.95 lakh Hectares is being irrigated and cultivated from all sources.

Drainage , RiverBasins and Surface water bodies of Andhra Pradesh



. Source: Andhra Pradesh State Remote Sensing Application Centre (APSRAC)

Table- 1. Source wise Availability of Surface and Ground Water in Andhra Pradesh(in T.MCs).

S.No	Surface Water Availability			Total Ground Water Availability	Total Ground water Utility	Surface And Ground Water Availability
	Previous Andhra Pradesh		PresentAndhra Pradesh		Irrigation, Domestic and Industrial	
	Name of the River	Volume of WaterTMC	Volume of Water	Volume of WaterTMC	Volume of WaterTMC	Volume of WaterTMC
1	Godavari	1480	600	679.55	618.45	2195.45
2	Krishna	811	522	---	---	
3	Penner	98	98	---	---	
4	Other basins	357	357	---	----	
	Total	2746	1577	679.55	618.45	

Source: Dynamic Ground Waterresources Of India,Central Ground Water Board,Ministry of Water ResourcesGovernment of India2011

Irrigation Development :

. The history of irrigation in the state goes back to ancient kings and rulers who have built many artificial lakes and reservoirs for irrigation and drinking water. Big lakes like Laknavaram are still remembered. Cumbhum Tank,Kanigiri Reservoir, AnantapurTank, SinganamalaTank , Bukkapatnam Tank, Porumamilla Tank, Mopad Tank, Nandyal Tank and anicuts across Tungabhadra River such as Koregal, Vallabhapur, Raya and Basavanna are some of the major irrigation works inherited by the state from the Vijayanagar kings. Andhra Pradesh has a heritage of cultivation and irrigation dating back to several centuries. Earlier rulers paid a good deal of attention to the development of irrigation in their kingdoms for the benefit of their subjects In the past, during the periods of Kakatiya and Vijayanagar Kingdoms, several tanks and diversion systems were constructed and wells dug which are still operating and productive During the pre-independence period the Godavari Delta, the Krishna Delta, the Pennar Delta, The anicut across river Godavari at Dowlaiswaram, across Krishna at Vijayawada, across Pennar at Nellore Sangam, K.C Canal irrigation System were constructed by the then rulers and others are the legacy of British engineers like Sir Arthur Cotton, Sir Charles Alexander Orr and Col. J John Penny, who transformed lakhs of hectare of barren lands in coastal Andhra into a big rice bowl during the 19th Century.

After Independence Government have given highest priority for irrigation sector which is the key force behind the green revolution. Many gigantic projects have been taken up in addition to many medium and minor schemes, thus creating a total irrigation potential of 134 lakh acres. The goal is to reach the ultimate IP of 217 lakh acres. After independence, high priority was given to irrigation development. The principal projects providing irrigation are the new barrages to replace the old anicuts on the rivers Godavari, Krishna, Tungabhadra and the Penna, and the new dams/reservoirs and canal systems of Nagarjunasagar, Tungabhadra High and Low Level Canals, Somasila, Vamsadhara and Yeleru. On the Godavari, the original anicut built between 1844 and 1851 in four sections has been replaced by barrages at the same places, Dowlaiswaram, Ralli, Maddur and Vijjeswaram providing a potential of 5.02 lakh ha in East and West Godavari and Krishna districts. Godavari and Prakasam Barrages have been constructed in place of the old anicuts across rivers Godavari and Krishna.

The Prakasam barrage at Vijayawada was the first project taken up after the Andhra State came into being in 1953; this replaced the hundred year old anicut and serves 4.96 lakh ha in Krishna, Guntur, Prakasam and West Godavari districts. The Kurnool Cuddapah Canal (KC Canal) carrying the Tungabhadra water from the anicut at Sunkesula to fields in Kurnool and Cuddapah districts since 1866 has been improved and strengthened to provide water to 1.21 lakh ha. The Nellore and Sangam anicuts also of the last century irrigate 0.79 lakh ha in Nellore district. The Tungabhadra project, (High and Low Level Canals) taken up after to Independence carries water to 1.05 lakh ha in drought prone Anantapur, Cuddapah and Kurnool districts. Vamsadhara and Yeleru serve 1.18 lakh ha in Srikakulam and East Godavari districts. The largest of the works nearly completed is Nagarjunasagar, with a potential of 8.95 lakh ha, most of which is already created, and currently provides water to 8.10 lakh ha. The Tungabhadra High level Canal Stage-II and the Pulivendula Branch canal initiated in 1967 and 1973 respectively to add a potential of 1.14 lakh ha, have generated a capacity of 0.64 lakh ha and have been irrigating 55,000 ha in the last few years. Projects like Polavaram Tadipudi, Pushkaram, and several other medium projects are proposed for utilization of Godavari water.

Somasila reservoir across the Penna upstream of the Nellore and Sangam anicuts was started in 1975 to stabilise the flow to 1.04 lakh ha and to create a fresh potential of 38,000 ha. It has stabilized supply to about one lakh ha and covered an additional area of 6,000 ha, in the Nellore delta. Telugu Ganga Project was started in 1983 with a commitment to supply 15 TMC of water to Chennai city for drinking and to provide irrigation to 5.75 lakh acres in the drought affected areas of Kurnool, Cuddapah, Chittoor and Nellore districts. The project is in advance stage of implementation. Construction of the Srisailam Right Branch Canal in Kurnool district, the Tungabhadra High Level Canal Stage-II in Anantapur district, the Somasila Stage-II in Nellore district.

Major and Medium Irrigation

Andhra Pradesh stands at a high pedestal in the irrigation with its rich water resources with major rivers like Godavari, Krishna, Pennar and Tungabhadra and many other medium and minor rivers altogether around 37 in number (GOAP, 2005b:p.61). The state economy is mainly agriculture dependent especially in terms of employment and livelihood. There have been efforts towards enhancing irrigation infrastructure5 while utilizing these natural water resources which are handy to the state.

In A.P under Major Irrigation about 27.22 lakh hectares is created ayacut and 18.79 lakh hectares of Utilizing Ayacut area Irrigated. Major irrigation is highest in 5.30 lakh hectares Created and Utilizing Ayacut in Krishna district and Lowest irrigated area of 13060 hectors crated ayacut in Vishakapatnam district and while only 817 hectares is utilizing Ayacut in the Kadapa district in the state .

Medium Irrigation 2.24 lakh hectares created ayacut 1.45 lakh hectars is utilizing Ayacut under medium irrigation Schemes in State. among the District highest about 43 thousands hectors created ayacut in Vizianagaram district and 28 thousand hectors utilizing ayacut in Srikakulam district . Lowest area irrigated 8 thousands hectares created ayacut and 4153 hectors utilizing ayacut in Nellore district irrigated under medium Irrigation .

There are 30 ongoing projects in the state, of which 12 are in major sector and 18 are in medium sector, In addition to the completed projects of 12 are in major and 83 in medium sector (GOAP, 2005a). Some of these ongoing projects have been grounded recently with the assistance of NABARD, JBIC, and World Bank This shows a sign of good progress in the irrigation infrastructure.

Ongoing Projects of Andhra Pradesh are Vamsadhara , Thotapalli , Peddagadda Reservior , Tarakarama Thertha sagaram , Janjavathi project , Polavaram ,Right main Canal (pattiseema),Polavaram Headworks (ISP) Polavaram Left Main Canal , Venkatanagaram Pumping Station , Musara malli , , Puskaram LI Scheme , Tadsipudi LI Scheme , Bhupati palem Head works , Pulichintala , Gundla Kamma reservoir , Pula Subbaiah Veligonda Project , Ramatheertham B.R , Teluguganga project , Somasila , and Swarnamukhi Projects . Rayalaseem region , Teluguganga Project , Kadapa , Chitravati Balancing Reservoir , Teluguganga Project , GNSS, Kadapa , FFC , Mylavaram Modernization Owk Reservoir , Sri Narasimharaya Sagar (Gorukallu Balancing Reservoir) Guru Raghavendra , PABR Stage II Veligallu Reservoir and HNSS.

Major Irrigation Projects Existing Ongoing and Contemplated Projects in State: . Existing Major Irrigation Projects , District wise Major irrigation Projects are TBP HLC Stage I and II in Anantapur district K.C Canal , Pulivendula Branch Canal , Mylavaram Reservoir in Kadapa , K.C Canal , TBP LLC , Rajolibanda Divertion Scheme in Kurnool , Penner River Canal system In Nellore , Nagarjuna sagar Canal , Krishna Western Delta in Prakasam District .Krishna western Delta and N.S.P in Guntur District , Prakasam Barrage in Krishna District , Gadavari Delta System , Krishna Delta System , in West Godavari District , Godavari Eastern (Including Pitapuram Branch Canal) Godavari Central , Godavari western Canal East Godavari District Tandava reservoir in Vishakapatnam District of Andhra Pradesh .

On going Major Irrigation projects among the Districts are namely Teluguganga in Chittoor ,Teluguganga ,GNSS in Kadapa , Telugu Ganga , SRBC , TBP HLC Stage II in Kurnool District Somasila , Telugu Ganga , in Nellore District , Gundlakamma in Prakasam , Pulichintala in Guntur District , Tarakarama Lift Irrigation Scheme in Krishna , Chagalnadu L.I Scheme , Puskaram LIScheme in East Godavari , Janjhavathi Resrvoir in Vizianagaram , Vamsadhara Project Stage IL MC in Srikakulam District .

Contemplated Major Irrigation Projects are Somasila , Suvarnamukhi Link Canal , GNSS , HNSS in Chittoor , SRBC Scheme in Kadapa , GNSS , GuruRaghavendra L.I Scheme ,Veligonda Project in Kurnool , Somasila , Suvarnamukhi Link Canal Scheme and Valigonda in Nellore District Valigonda In Prakasam District , Pulichintal in Guntur Pulichintala , Dammugudem , Polavaram In Krishna district , Polavaram Project in West Godavari , East Godavari, VishakaPatnam District , Thotapalli Barrage , Peddagedda , TharakaramaThirthaSagaram reservoir scheme in Vizianagaram , Vamsadhara Project in Srikakulam District .

Medium Irrigation :

Existing , Ongoing Contemplated projects in Andhra Pradesh Among the districts existing Medium Irrigation projects are Bhairavani Thippa , Upper Pennar , Chennaraya SwamiGudi , Pennar Kumuvathi and Y.V.R Projects in Anantapuram District . Araniar Reservoir , SuvarnaMukhi Anicut , Kalangi Reservoir , Mallimadugu reservoir , Krishnapuram Reservoir , Bahuda Reservoir , Pedderu reservoir , and Siddalagandi Project in Chittor District . Lower sagileru , Upper Sagileru , Pincha , Buggavanka , Annamayya Project in Kadapa . Zurreru , Sanjevaiah sagar (GDP) Varada Raja swamy Gudi (VRSP) Project in Kurnool . Gandi palem project in Nellore . Mopadu Reservoir System , Paleru , Bitragunta Anicut System , V.R. Kota Anicut System . L.V Anicut system , Rollapadu project and Cumbam Tank in Prakasam District . Guntur , Channel Scheme in Guntur District

Miniyeru , Tammileru Reservoir Project in Krishna district , Jalleru , yerra Kalva Tammileru reservoir in West Godavari , Pampa reservoir , Maddigadda reservoir , Torrigedda Pumping Schme , Tarakarama Ramavarapu Avo LI schme , Subbareddy Sagra in East Godavari District raiwada reservoir , Konam reservoir , Kalyanapulova reservoir , Gambrigedda reservoir , Mchadrigedda reservoir , in vishapatnam district . Denkada Anicut , Thotipudi , andra Vegavathi Anicut , seethanagaram Anicut , Pendakkalam Anicut , Vattigadda reservoir , Thotapalle regulator , Vengala Raya sagaram Project in Vizianagaram District Narayanapuram Anicut , Thota pally Regulator and Pydigam Project in Srikakulam District.

On Going Medium Irrigation Projects in state are district wise Projects are Veligallu ,, Buggavanka , Annamayya , Pincha , Lower sagileru and Upper Sagileru projects in Kadapa District . Kanupur Canal schem in Nellore district. Yarrakalva Project , Kovvadakalva Reservoir ,

Vijayarai Anicut , Tadipudi L.I Scheme in West Godavari District Surapalem , Pampa, Maddigadda, Bhupatipalem Reservoir In East Godavari District .Pedderu , modernization of Kalyanapulova Reservoir in VishakaPatnam district and Maddivalasa reservoir in srikakulam District.

Contampleted Medium Irrigation Projects District Wise Projects are Jerikona , Chittor and Kadapa Districts , Barrage –Cum –Bridge on Swarnamukhi river project in Nellore district , Paleru reservoir in Prakasam district ,and Linking of N.S Lift Canal with Tammileru reservoir link Channel In West Godavari District .

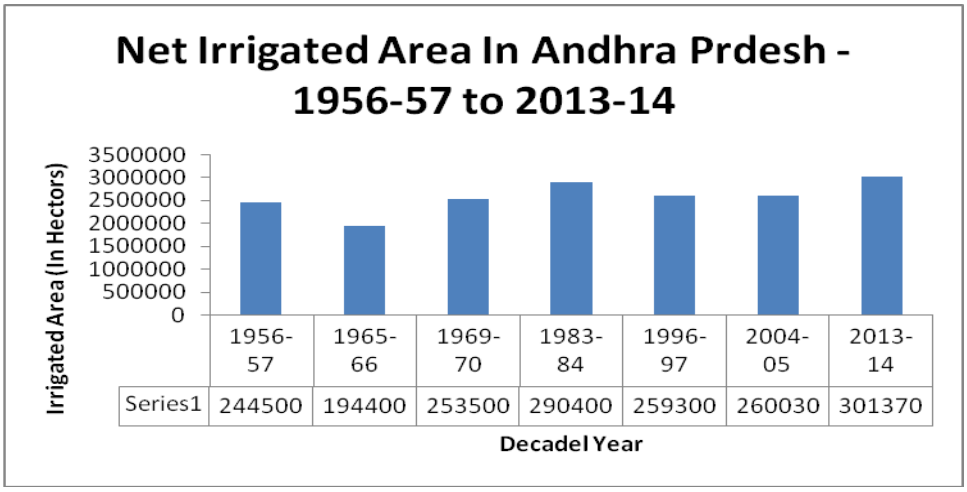
Minor Irrigation

Minor irrigation system has played a vital role in ushering the growth and development of agricultural output and enhanced the food security in drought prone areas and in areas outside the command/catchment area of the major and medium irrigation projects. It is, therefore, given high priority to the completion of on-going minor irrigation schemes in the State. Minor irrigation, under Irrigation and Command Area Development (I&CAD) Department mainly deals with the surface flow irrigation and supply of water through (a) system fed tanks; (b) non – system tanks or isolated tanks; and (c) direct irrigation under the control of Panchayathraj Department. About eleven thousands (exactly 11,277) minor irrigation cannels which irrigate an ayacut About 6.35 lakh hectars of land Under minor Irrigation schemes. Among The district , highest registerd 1.06 lakh hectars is Nellore district and Lowest registered in 28 thousands hectares in Kurnool District in the State .

Table -2 Extent of area under Major , Medium and Minor Irrigation in Andhra Pradesh (Area in Hectors)

S.no	Name of The District	Major Irrigation Ayacut Created InHectors 0	Ayacut Utilizing 0	Medium Irrigation Ayacut Created InAcars 0	Ayacut Utilizing 0	Minor Irrigation Ayacut Irrigatedin Hectors 0	Total Irrigated Area In Hectors Major+Medium		Minor Irrigation Ayacut Irrigatedin Hectors Minor Irrigation
1	Anantapuram	451330	31194	17139	12331	0	468469	43525	0
2	Chittoor	0	0	15309	13974	56490	71799	13974	56490
3	Kadapa	86924	817	23786	11127	34248	144958	11945	34248
4	Kurnool	131815	131815	15092	11822	28106	175013	143637	28106
5	Nellore	99960	99960	0	4153	106329	206289	104113	106329
6	Prakasam	172128	4210	17474	6111	46481	236083	10321	46481
7	Guntur	473546	451909	10927	10927	9949	494422	462836	9949
8	Krishna	529684	529684	8641	8641	41879	580204	538325	41879
9	West Godavari	234188	200333	15406	5059	57953	307547	205391	57953
10	East Godavari	410021	410021	16463	19454	53414	479898	429474	53414
11	Vishaka Patnam	13060	11747	13220	12742	72389	98669	24488	72389
12	Vizianagaram	45860	6693	42661	0	60109	148631	6693	60109
13	Srikakulam	73531	0	28075	28075	67193	168798	28075	67193
	Total	2722045	1878381	224193	144415	634541	3580779	2022796	634541

Source: http://irrigation.cgg.gov.in/html/demoFuncs.html



.Andhra Pradesh net area irrigated 4.76 percent 8 place after Uttara Pradesh Madhya Pradesh , Rajasthan , Gujarat , Punjab , Karnataka , Maharastra of the country during period 2013-14, 40.95 lakh hectares gross irrigated area of the State In Andhra Pradesh during the year in 1956-57 , irrigated area 24.45 lakh hectors to 2013-14 ,30.13 lakh hectors irrigated area increased are 5.68 lakh hectares of the land is irrigated . Within the state in terms of district wise irrigation during the year 1956 – 57 highest irrigated area 14.93 percent in west Godavari followed by Krishna East Godavari , Nellore , Guntur , Chittoor , VishakaPatnam , Anantapuram , Kadapa , Kurnool and Srikakulam and in 2013 -14 Highest 14.53 percent in Guntur followed by West Godavari , Krishna , East Godavari , Nellore , , Srikakulam ,Kadapa , Chittoor , Vizianagaram Anantapuram and Vishakapatnam District

Canal Irrigation Second most important source of irrigation in the State approximately 14.93 lakh Hectares 9.23 percent 3rd place after U.P , Rajasthan of the irrigated area in the Country . During the period 2009- 10 to 2013-14 0f the state is decreased from 48.06 percent to 47.43 percent of area.

Table -3 Extent of Irrigated Area improved In Andhra Pradesh During !956-57 to 2013 to 2014.

S.no	Name of the District	1956-57	1965-66	1967-70	1983 -84	1996-97	**2004-05**	2013-14
1	Srikakulam	0.88	12.55	10.02	6.30	6.17	7.02	6.03
2	Vizianagaram	0.00	0.00	0.00	4.34	5.17	5.47	4.58
3	Visakapatnam	8.14	7.15	6.75	3.51	4.78	3.84	3.71
4	East Godavari	12.23	12.29	9.35	14.81	15.46	10.11	9.47
5	West Godavari	14.93	14.09	11.36	18.04	16.39	13.80	12.70
6	Krishna	13.62	15.64	15.35	15.36	15.43	11.59	10.44
7	Guntur	8.51	13.48	14.36	12.26	11.96	12.69	14.53
8	Prakasam	0.00	0.00	3.35	4.48	5.01	5.85	8.04
9	SPS Nellore	12.07	11.57	8.99	8.54	7.52	9.08	8.56
10	Kadapa	5.19	3.14	3.31	2.44	1.89	4.77	5.05
11	Kurnool	2.82	4.48	5.17	4.55	4.17	6.60	7.69
12	Anantapuram	5.28	3.50	3.39	2.41	2.28	4.31	4.33
13	Chittoor	8.38	4.68	4.46	2.96	3.78	4.87	4.87

Source: Directorate of Economic and Statistics of Andhra Pradesh.

Table -3.1. Extent of Irrigated Area improved In Andhra Pradesh During !956-57 to 2013 to 2014.

S.no	Name of the District	1956-57 to 1965-66	1965-66 to 1969-1970	1969-70 to 1983-84	1983-84 to 1996-97	1996-97 to 2004-05	2004-05 t0 2013 -2014	1965 -66 to 2013 -14
1	Srikakulam	11.67	2.53	3.72	0.13	0.85	0.99	5.15
2	Vizianagaram	0.00	0.00	4.34	0.83	0.30	0.89	4.58
3	Visakapatnam	0.99	0.40	3.23	1.27	0.94	0.13	4.43
4	East Godavari	0.07	2.95	5.46	0.66	5.36	0.64	2.76
5	West Godavari	0.83	2.73	6.68	1.65	2.59	1.10	2.23
6	Krishna	2.02	0.29	0.01	0.07	3.83	1.15	3.18
7	Guntur	4.97	0.88	2.10	0.30	0.74	1.84	6.03
8	Prakasam	0.00	3.35	1.12	0.54	0.83	2.19	8.04
9	SPS Nellore	0.49	2.58	0.45	1.02	1.55	0.52	3.51
10	Kadapa	2.06	0.18	0.87	0.56	2.88	0.28	0.14
11	Kurnool	1.65	0.69	0.62	0.38	2.44	1.09	4.87
12	Anantapuram	1.78	0.11	0.98	0.14	2.04	0.02	0.95
13	Chittoor	3.70	0.22	1.50	0.82	1.09	0.00	3.52

Source: Directorate of Economic and Statistics of Andhra Pradesh.

Out of 3013700 hectors Net irrigated area 45.93 percent of the area of total net area was shown in the state of the Land irrigated net sown area. among the districts is as follows proportionately net sown areas with 14.53 percent in Guntur accounts first followed by , 12.70 percent in West Godavari , 10.44 percent in Krishna , 9.47 percent in East Godavari , 8.56 percent in Nellore 8.04 percent in Prakasam , 7.69 Percent in Kurnool , 6.03 percent in Srikakulam 4,87 percent in Chittoor , 4.58 percent in Vizianagaram, 4.33 percent in Anantapuram and 3.71 percent in Vishakhapatnam District respectively.

Irrigation Potential and Sources of Irrigation:

Principal Source of Irrigation in Andhra Pradesh can be divided into four major sources are namely (i) Canals (ii) Tanks (ii) Wells (IV) other sources.

(i)Canals:

Canal irrigation was Increased from 41.43 percent in the year 2009 -10 to 45.93 percent in 2013 -14. in Andhra Pradesh State Area Irrigated under Different sources in claiming by canals is 47.43 percent 2013-14 Among the districts Proportionately the highest Canal irrigation 23.18 percent is in Guntur followed by 15.25 percent in Krishna , 12.96 in east Godavari , 12.29 percent in west Godavari , 7.88 percent in Kurnool , 7.74 percent in Srikakulam , 6.03 percent In Nellore , 5.80 percent in Prakasam , 3.15 percent in Vishakapatnam district , 2.68 percent Vijayanagaram , 1.45 percent Anantapuram and 0.29 percent in Chittoor district respectively .

(ii) **Tanks:** Out of 3,40 lakh hectors about 11.29 percent in 2013 – 14 brought under irrigation which it was only 10.11 percent in 2009 -10. Among the District Proportionately Irrigation through tanks was 20.63 percent in Vizianagaram followed by 17.68 percent SPS Nellore , 17.27 percent in Srikakulam , .22 percent in Krishna , 8.18 percent in Vishakhapatnam 7.89

percent East Godavari , 4.49 percent West Godavari , 3.73 percent in Prakasam 2.52 percent in Kurnool 2.04 percent in Kadapa and 1.01 percent Anantapuram District .

(iii) Wells :

Dug wells and Tub wells 37.27 percent of the area Irrigated in 2013 -14 and 37.64 percent in 2009-10 . Among the districts Proportinetely irrigation Through Dugwells was 23.61 percent in Kurnool Followed by 20.61 percent in Chittoor , 15.78 percent Nellore , 6.83 percent in Krishna 6.82 percent vizianagaram 6.36 percent Srikakulam 5.96 percent in Vishakapatnam 4.41 percent in Guntur , 2.68 percent in prakasam 2.62 percent in Kadapa 2.17 percent in West Godavari 1.66 percent in Anan tapuram and 0.01 percent in East Godavari district respectively .

Tube well Irrigation among the Districts Proportionetly 17.53 percent was in west Godavari , followed by 12.46 percent in Prakasam 11.65 percent in Kadapa 10.67 percent in Chittoor 9.98 percent in Anantapur am 8.80 percent in Nellore , 7.44 pewrcent in Guntur , 7.27 percent in Kurnool 5.86 percent in East Godavari , 5.02 percent in Krishna 1.89 percent in Vizia nagaram 1,14 percent in Vishaka patnam and 0.31 percent in Srikakulam district .

(iv) Other Sources:

Other Sources of irrigation in Andhra Pradesh 4.06 percent Among the district Proportionetly 18.17 percent was in Vishakapatnam followed by 15.65 percent in Guntur , 13.27 percent in Kurnool , 11.68 percent in prakasam 9.82 percent in East Godavari , 8.88 percent in Krishna , 6.20 percent in Nellore 5.77 percent in West Godavari , 3.82 percent in Vizianagaram , 3.44 percent in Srikakulam 2.54 percent in Kadapa , 0.70 percent in Anantapuram and 0.07 percent in Chittoor District .

Area Irrigated by Source District wise In Andhra Pradesh 2013 -14

S.no	Name of the District	% Tanks	% of Canals	%Tubewells	%Dugwells	%)ther Sources	Net Irrigated Area	Gross Area Irrigated
1	Srikakulam	17.27	7.74	0.31	6.38	3.44	6.03	5.14
2	Vizianagaram	20.63	2.68	1.88	6.82	3.82	4.58	4.31
3	Visakapatnam	8.18	3.15	1.14	5.96	18.17	3.71	3.69
4	East Godavari	7.89	12.96	5.86	0.01	9.82	9.47	12.34
5	West Godavari	4.49	12.29	17.53	2.17	5.77	12.70	15.70
6	Krishna	8.22	15.25	5.02	6.83	8.88	10.44	11.36
7	Guntur	1.82	23.18	7.44	4.41	15.65	14.53	13.95
8	Prakasam	3.73	5.80	12.46	2.68	11.68	8.04	6.43
9	SPS Nellore	17.68	6.03	8.80	15.78	6.20	8.56	7.21
10	Kadapa	2.04	1.29	11.65	2.62	2.54	5.05	4.49
11	Kurnool	2.52	7.88	7.27	23.95	13.27	7.69	6.77
12	Anantapuram	1.01	1.45	9.98	1.66	0.70	4.33	3.95
13	Chittor	4.50	0.29	10.67	20.61	0.07	4.87	4.65

Source : Statistical Abstract 2013-14 , Directorate of Economics and Statistics Govt of Andhra Pradesh

Net Area Irrigated by Different Sources In Andhra Pradesh(Area in Hectares)

S.no	Source of Irrigation	2009-10	2010-11	2011-12	2012-13	2013-2014
1	Tanks	10.11	13.60	12.45	12.34	11.29
2	Canals	48.06	47.22	48.06	41.95	47.43
3	Wells (Tube wells & Dug Wells	37.64	35.18	36.11	41.34	37.18
4	Other Sources	4.19	3.99	4.00	4.36	4.01
5	Total	41.43	44.58	47.32	43.34	45.93

Source : Statistical Abstract 2013-14 , Directorate of Economics and Statistics Govt of Andhra Pradesh

Land Use patteren :

Land Use Pattern of the Andhra Pradesh as per Agricultural censes 2013 -14 net area sown in major land use type it accounts for 40.95 percent of the geographical area of the state followed by Forest area of land with for 21.83 percent , land put to non- agricultural used area of land with 12.37 percent , current fallow 6.79 percent , other fallows 4.94 percent , permanent , pastures and other grazing lands 1.32 percent and land under miscelenous tree crops 1.0 percent respectively .

The cultivable land is about 89.91 lakh hectors or 56.12 percent of the total geographical area of the state . The cropped area is about 81.27 lakh hectors or 50. 73 percent of the Geographical area of the state. Because of the increasing pressure on land for urbanization, Industrialization and development works there will be little or no scope for expansion of the cropped area. Hence, increase in the agricultural production has to be achieved by improving the productivity through various inputs like provision of irrigation, use of better seeds and fertilizers, better agricultural practices etc.

Cropping pattern :

The State has widely diversified farming base with large varity of crops , which include food grains condiments and Spices , Oilseeds horticulture crops . About 67.57 percent of the cultivated area is under food crops viz. . Paddy is about 31.79 percent , while Other important food crops are Maize , Jower , Bajra , Ragi and Minor millets for about 7.29 percent, Pulses (Bengal gram , Blockgram , Redgram , green gram and Others gram) are grown over about 13.64 percent , Oilseeds ,like ground water , seasamum , sunflower , safflower , castor , 17.89 percent , Cotton 8.32 percent , Fruit or plants are mangoes , banans , lime , Sapotas Graps and Cashewnut ,and other fruit crops 6.35 percent crops Drugs and Narcoties like tobacco 2.02 percent crops and sugarcane 1.88 percent and chillies 1.62 percent of the cultivated area of total gross crpped area.

Cropwise Irrigation In Andhra Pradesh

Andhra Pradesh being one of those Indian states having relatively better irrigation infrastructure, of the Country. During the period 2013-14 Out of 81.27 lakh hectores or 50. 73 percent gross cropped area of the total geographical area, 40.95 lakh hectors or 50.38 percent of gross irrigated of the total cropped area, 30.13 lakh hectors 73.58 percent of the total gross irrigated area of the state. The State Area under irrigation cultivated food crops 88.15 percent of the total gross irrigated area , Among the food crops paddy most predominant food crop and is sown over about 97.32 percent of the area under irrigation of the total Paddy cultivated Area. During the period 2009-10 to 2013-14 food grains 68.91 percent and 69.58

percent of net area irrigated . Among the crop wise irrigated 61.39 and 62,32 percent paddy followed by Maize , Jower , Bajra , and Small millets 0.30 and 0.52 percent pulses (Blackgram , Redgram , Bengalgram , horsegram and Other Pulses . 0il seeds with 8.75 and 6.62 percent Among the oil seeds Ground nut 3.86 percent and 2.26 percent folloed by other oilseeds . (Castor , Sunflower , safflower and gengelly or sesamum). Cash Crops Sugarcane 6.12 percent and 6.31 percent , chillies 2.57 percent and 6.31 percent cotton 1.72 percent and 3.21 and 2.97 percent coconut 1.25 percent 1.10 percent onions o.62 percent and 0.50 percent and Nonfood crops 12.67 percent and 11.85 percent gross ara irrigated crops of the state .

In this Interesting points that crop wise irrigated areas during the period 2009-10 to 2013 - 14 Among the food crops and Non food crops area under crops are Maize , Jower , Chillies , Sugarcane , Cotton , Fodder crops has increased and Miscelenience crops has decreased some was ordering Rice , ragi , Small millets Onions Ground nut , gengelly , coconut , Oilseeds , and Tobbaco , crops have decreased may be due to uncertain Rainfall pattern , and marketing less marketing prices .

Irrigated Area in Crop Wise Area in Andhra Pradesh -2009-10 to 2013-14(Area in Hectores)

S.no	Name of Crop	2009-10	2010-11	2011-12	2012-13	2013-2014	2009-10 to 2010-11	2010-11 to 2011 to 2012	2011 - 12to 2012-2013	2012-13 to 2013-2014	2009-10 to 2013 - 2014
1	Rice	62.32	64.89	57.92	57.71	61.39	+2.57	-6,97	-0.21	+3.68	-0.95
2	Jower	0.77	0.59	1.08	1.33	0.84	-0.10	+0.49	+0.25	-0.49	+0.07
3	Bajra	0.26	0.37	0.27	0.31	0.26	+0.05	-0.04	+0.04	-0.05	-0.00
4	Maize	4.76	4.46	5.37	6.31	6.58	-0.30	+0.91	+0.94	+0.27	+1.82
5	Ragi	0.25	0.18	0.18	0.16	0.18	-0.07	0.00	-0.02	+0.02	-0.07
6	Small Millets	0.006	0.01	0.02	0.01	0.005	-0.004	+0.01	-0.01	-0.005	-0.001
7	Pulses	0.52	0.53	1.15	0.53	0.30	+0.01	+0.62	-0.62	-0.03	-0.22
8	Total Food Grains	68.91	71.00	66.02	66.37	69.58					
9	Chillies	2.57	2.39	3.77	2.85	2.97	-0.18	+1.38	-0.92	+0.12	+0.40
10	Termeric	0.31	0.31	0.61	0.40	0.35	-.0.00	+0.30	-0.21	-0.05	+0.04
11	T. Condiments	2.94	2.83	4.44	3.35	3.39	-0.11	+1.61	-1.09	+0.04	+0.45
12	SugarCane	6.12	6.43	6.82	7.10	6.31	+0.31	+0.39	+0.28	-0.79	+0.19
13	Onions	0.62	0.60	0.76	0.55	0.50	-0.02	+0.16	-0.21	-0.05	-0.12
14	Groundnut	3.86	3.13	3.48	4.08	3.26	-0.63	+0.25	+0.60	-0.82	-0.60
15	Gengelly	0.26	0.21	0.16	0.18	0.22	0.05	-0.05	+0.02	+0.04	-0.04
16	Castor										
17	Coconut	1.25	1.08	1.16	1.26	1.10	-0.17	+0.08	+0.10	-0.16	-0.15
18	O.oil seeds	3.36	2.52	2.21	2.09	1.34	+0.84	-0.31	+0.28	-1.45	-0.002
19	T.Oilseeds	8.75	7.02	7.12	8.06	6.62	-1.73	+0.10	+0.94	-1.44	-1.13
20	Tobacco	1.06	0.96	0.94	0.99	0.91	-0.10	-0.02	+0.05	-0.08	-0.15
21	Cotton	1.72	2.18	3.70	3.06	3.21	+0.46	+1.52	-0.64	+0.15	+1.49
22	Fodder Crops	0.25	0.23	0.34	0.34	0.30	-0.02	+0.11	-0.00	-0.04	+0.03
23	Micelenious Crops	0.59	0.69	0.84	0.85	0.79	+0.05	+0.15	-0.01	-0.06	+0.20
24	Total Non-Food Crops	12.67	11.01	13.07	13.36	11.85	-1.62	+2.06	-0.29	-1.51	0.78

Importance of Irrigation and Agriculture :

The importance of irrigation in the economic development may be seen in terms of stabilization of the agricultural production, increased cropping intensity, productivity of land and labour, and production thereby leading to the growth of agriculture (see Boyce, 1987). Also, it increases the employment generation and thereby well-being of the people. In Indian context, while recognising the value of irrigation for agriculture there has been efforts in developing irrigation infrastructure since and prior to independence. Over the period, there has been tremendous improvement in the cultivable area brought under the different irrigation sources. It is suggested that may need to put some more attention The state towards the issues especially in the case of irrigation.

1. In sufficient, uncertain and irregular rain causes uncertainty in agriculture.:

The period of rain is restricted to only Four months in a year June to September when monsoon arrives. The remaining eight months are dry. There is some rainfall during the months of December and January in some parts of the country. Even during monsoon, the Rainfall is scanty and undependable in many parts of the state. Sometimes the monsoon delayed considerably. While sometimes they cense prematurely. These pusses' large areas of the country into drought conditions with the Lack of irrigation, droughts and famines can be effectively controlled. . Rain gauges may be of some help in drought affected areas.

2. Higher Productivity on Irrigation Land.

Productivity on irrigated land is considerably more than the productivity on un –irrigated land

3. Multiple cropping possible: .

Since The state has a tropical and subtropical climate it has potentialities to grow crops on a year round basis . However since 80 % of the annual rainfall is received in less than four months , multiple cropping is generally not possible but provision of irrigation facilities can make possible the growing of two or three crops in a year in most areas of the state . This will considerably enhance agricultural production and productivity .

4. Role in new agricultural Strategy :

The Successful implementation of the High yielding programme enhances agricultural production to a great extent.

5. Reducing Instability in output levels:

Irrigation helps in stabilizing the output and yield levels. It also plays a protective role during drought years Since both income and employment are positively and closely related to output , prevention of fall in output during drought is an important instrument for achieving stability of income and employment in the countryside . Irrigation has enabled many areas to acquire partial immunity from drought.

6. Indirect benifits of Irrigation:

Irrigation confers indirect benefits through increased agricultural production , Employment potential of irrigated lands increased production , helps in developing allied activities , means of water transport etc . One improved income of government from agriculture . Availability of regular water supply will increase the income of farmers imparting a sense of security and stability in agriculture .

Limitation of Irrigation on account of certain problems related irrigation :

Despite large – scale investment and expansion of irrigation facilities It is a matter of serious concern that about 60 percent of the total cropped area is still dependent on rain .there area number of problems related to irrigation and they have to be solved .

Inter state water Disputes :

Irrigation is a state Subject in India , Development of Water resource is there is therefore being planned by states individually taking into account their own needs and requirement However , all major rivers are inter – state in character . As a result difference with regard to storage priorities and use of water arise between different states, Narrow regional outlook brings Inter – State rivalries over distribution of water supply .

Increasing cost of Irrigation :

The cost of providing irrigation has been increasing over the years from the First five year plan to tenth Five year plan .

Decline in Water Table:

There has been a steady decline in water table in the recent period in served parts of the country, especially in the western dry region on account over exploitation of ground water and in sufficient recharge from rain water.

The conclusion of the present paper discussed with the Rainfall pattern , surface and ground water availability , irrigation Development , major , medium and minor irrigation , Existing , ongoing completed irrigation schemes , potential and source wise Irrigation , Land use cropping patterns crop wise irrigation in various years Importance of irrigation and Agriculture of Study Area .

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