



IMPACT OF IRRIGATION ON AGRICULTURAL SECTOR IN ANDHRA PRADESH-AN EMPIRICAL ANALYSIS

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ABSTRACT

Agriculture and irrigation are back bone of the economic development of the country. 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. This study delves into the consequences of these investments, shedding light on their effects on the livelihoods of the rural population, agricultural productivity, income distribution and overall socio-economic development. It considers the extent to which these projects have contributed to narrowing socio-economic disparities among different sections of the population, including marginalized communities. The findings of this research not only contribute to a comprehensive understanding of the socio-economic impacts of irrigation projects in Andhra Pradesh but also offer valuable insights for policymakers, development practitioners, and agricultural stakeholders.

Key Words:- Agriculture, Irrigation, Socio-Economic Impacts, Andhra Pradesh.

Irrigation stands as a cornerstone in the development of agriculture, significantly influencing both the socio-economic fabric and environmental landscape of rural areas. The introduction of irrigation projects has historically been a game-changer in many parts of the world, particularly in regions plagued by water scarcity and unreliable rainfall patterns. 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 per cent of all available freshwater is used for agriculture across the world. In India more than 80 per cent 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. 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.

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 per cent 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 per cent as per 2011 population censuses. About 70.5 per cent 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 per cent of the total population and about 59.06 per cent of it is engaged in agriculture, 50.7 per cent gross cropped area of (81.27 lakh hectares) total geographical area is under cultivation and the net area shown is about 65.61 lakh 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 per cent 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.

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 per cent 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.

Irrigation Development in Andhra Pradesh

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, Anantapur Tank, Singanamala Tank, 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, Kadapa 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 Srisailem 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 in Andhra Pradesh

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. 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 Andhra Pradesh 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 hecters crated ayacut in Vishakhapatnam 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 hectares is utilizing Ayacut under medium irrigation Schemes in State. Among the District highest about 43 thousands hecters created ayacut in Vizianagaram district and 28 thousand hecters utilizing ayacut in Srikakulam district. Lowest area irrigated 8 thousands hectares created ayacut and 4153 hecters 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. Some of these on-going 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. On-going Projects of Andhra Pradesh are Vamsadhara, Thotapalli, Peddagadda Reservoir, Tarakarama Therttha 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 On-going and Contemplated Projects in Andhra Pradesh

The 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 Diversion 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, Godavari 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 Vishakhapatnam 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 LI Scheme in East Godavari, Janjhavathi Reservoir 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, Guru Raghavendra L.I Scheme, Veligonda Project in Kurnool, Somasila, Suvarnamukhi Link Canal Scheme and Valigonda in Nellore District Valigonda In Prakasam District , Pulichintala in Guntur Pulichintala , Dammugudem, Polavaram In Krishna district, Polavaram Project in West Godavari, East Godavari, Vishakhapatnam District, Thotapalli Barrage, Peddagedda, Tharakarama Thirtha Sagaram reservoir scheme in Vizianagaram, Vamsadhara Project in Srikakulam District.

Medium Irrigation

Existing On-going 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 Chittoor 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 Scheme, Tarakarama Ramavarapu Avo LI scheme, 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. Contemplated Medium Irrigation Projects District Wise Projects are Jerikona, Chittoor 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 system fed tanks; non-system tanks or isolated tanks; and direct irrigation under the control of Panchayathraj Department. About eleven thousands (exactly 11,277) minor irrigation canals which irrigate an ayacut About 6.35 lakh hectares of land under minor Irrigation schemes. Among The district, highest registered 1.06 lakh hectares is Nellore district and Lowest registered in 28 thousands hectares in Kurnool District in the State.

Socio-Economic Impacts of Irrigation

The socio-economic impacts of advancements in agricultural productivity are multifaceted, encompassing various dimensions such as increased crop yields, crop diversification, and the resultant economic effects including alterations in income levels of farmers and employment opportunities in rural areas.

- **Increase in Crop Yields:-** The escalation of crop yields, often a consequence of improved agricultural techniques, high-yield variety seeds, and enhanced irrigation and fertilization methods, significantly influences the socio-economic landscape. From an economic standpoint, increased yields can lead to a surplus in agricultural production, which in turn may reduce food prices and enhance food security. Socio-economically, this phenomenon can alleviate hunger and malnutrition in impoverished regions, thereby improving overall public health and stability. However, it is

imperative to acknowledge that the increased use of chemical fertilizers and pesticides, often associated with higher yields, can have deleterious environmental impacts, necessitating a careful balance between yield enhancement and ecological sustainability.

- **Crop Diversification:-** The introduction of a variety of crops within agricultural practices is another pivotal factor. Diversification can mitigate risks associated with mono-cropping, such as vulnerability to pests, diseases, and market fluctuations. Economically, it can lead to the stabilization of income for farmers by providing a safeguard against crop failure and enabling them to tap into different markets. Socially, crop diversification can enhance dietary diversity and nutritional status within communities. Furthermore, it fosters resilience against climate change impacts, a critical consideration in contemporary agricultural strategies.
- **Economic Impacts on Farmers:-** The economic ramifications of advancements in agriculture are particularly pronounced for farmers. Enhanced productivity can lead to increased income levels, enabling farmers to invest in better agricultural technologies, education, and health, thereby initiating a positive cycle of growth and development. However, this scenario often varies based on the scale of farming and the accessibility of resources and technology, with smallholders sometimes facing challenges in adapting to new technologies.
- **Employment Opportunities in Rural Areas:-** Improved agricultural productivity can be a catalyst for job creation in rural areas. It not only necessitates labor for farming activities but also stimulates allied sectors such as agro-processing, marketing, and logistics. This can lead to a reduction in rural-urban migration, helping to stabilize rural communities and cultures. Moreover, agricultural advancements often necessitate a workforce with diverse skills, including technical know-how, thus potentially transforming the rural job market and skill set requirements. In conclusion, the socio-economic impacts of enhanced agricultural productivity are profound, with implications for food security, economic stability, and social well-being. While the benefits are substantial, they must be weighed against potential environmental impacts and the need for equitable distribution of technology and resources to ensure sustainable and inclusive growth.

Social Impacts of Irrigation

The socio-economic impacts of irrigation projects in Andhra Pradesh, particularly from a social perspective, are profound and multifaceted. These impacts can be observed in changes in rural community structures, impacts on education and health, and shifts in gender dynamics, including the role of women in agriculture and changes in gender-based labor division.

- **Changes in Rural Community Structures:** The implementation of irrigation projects in Andhra Pradesh has significantly altered the rural community structures. Enhanced water availability for agriculture often leads to increased agricultural productivity, which can transform the socio-economic fabric of rural communities. This transformation may include the emergence of new social hierarchies based on land ownership and access to irrigation resources. Additionally, the influx of resources and increased agricultural output can lead to the growth of ancillary businesses and services, further reshaping the rural socio-economic landscape.
- **Impact on Education and Health:-** The economic benefits derived from successful irrigation projects can have a direct positive impact on education and health in rural areas. With increased income, families are more likely to invest in education, leading to higher literacy rates and educational attainment. Improved agricultural productivity can also lead to better nutritional outcomes, thereby enhancing overall health standards. However, it is essential to consider that the increased labor demands of intensified agriculture might sometimes negatively impact education, especially if children are involved in farm work.
- **Gender Dynamics and Role of Women in Agriculture Post-Irrigation:-** The introduction of irrigation can significantly alter gender dynamics in rural Andhra Pradesh. Traditionally, women in rural areas have played a crucial role in agriculture, primarily in tasks that are labour-intensive but low in economic recognition. With irrigation, the nature of agricultural work can change, potentially opening up opportunities for women to engage in more varied and economically rewarding aspects of farming. However, this shift is contingent upon social norms and the extent to which women are allowed access to new resources and technologies.
- **Changes in Gender-Based Labour Division:-** The traditional gender-based division of labour in agriculture might undergo changes post-irrigation. The increased productivity and potential diversification of crops can lead to new types of agricultural activities. This shift can provide opportunities for women to take on roles that were traditionally male-dominated, thus

challenging and potentially changing existing gender roles and norms. However, it is also possible that technological advancements in irrigation could lead to the marginalization of women if these technologies are more accessible to men, thereby reinforcing gender inequalities.

In conclusion, irrigation projects in Andhra Pradesh have significant social implications that extend beyond mere agricultural productivity. These projects have the potential to reshape rural community structures, enhance education and health outcomes, and transform gender dynamics in profound ways. It is crucial, however, to approach these changes with an understanding of the local socio-cultural context to ensure that the benefits of irrigation are equitably distributed and contribute to the overall empowerment of rural communities, including both men and women. The socio-economic impacts of irrigation projects in Andhra Pradesh are extensive and multifaceted, reflecting the intricate interplay between water resource management, agricultural productivity, and rural community dynamics. This analysis aims to provide a comprehensive overview of these impacts, culminating in a conclusion that synthesizes the findings, offers policy recommendations, and suggests avenues for future research.

