



WORKING OF MICRO-IRRIGATION TECHNOLOGY FOR SUSTAINABLE FARMING SYSTEMS IN THE DROUGHT PRONE AREAS : A CASE STUDY OF ANANTHAPURAMU DISTRICT IN ANDHRA PRADESH, INDIA

Dr. G. Ramalingappa

ICSSR, Post Doctoral Fellow, Department of Rural Development ,
Sri Krishnadevaraya University, Ananthapuramu.
Email - ramgadaputichowdari@gmail.com

Abstract: Ananthapuramu District of Andhra Pradesh has varied Physical and Climatic conditions and the district population is mainly depending on agriculture and its related activities. But, the district is far behind in irrigation sources which is the back bone of agriculture. The district soils and weather phenomenon are very much favourable for agricultural operations. But the district is located in low rain fall receiving and drought prone area and it is vulnerable for discontinues, un reliable, onset failure of monsoons. Once, the district is known for some agriculture surface wells and yearlong water flowing streams. Surface wells are totally replaced by tube wells and water flowing streams became dry and encroached. In later stage majority tube wells of the district became dry even 1400-1500 feet wells. In want of irrigation water, several farmers constructed more than one tube well. Some farmers failed in obtaining water even from five to six tube wells constructed which has been leading for 'Farmer Suicides' noticed in several parts of low rainfall receiving areas of Andhra Pradesh state. In this circumstances Andhra Pradesh Micro Irrigation Project (APMIP) was launched in united Andhra Pradesh in the month of November 2003 with an objective of enhancing the crop productivity by improving the water use efficiency through Micro Irrigation Techniques, improving the economic conditions of the farmers by conserving water, bringing additional area into cultivation with the available water resources, enhancing the crop productivity and production, quality, facilitating judicious usage of underground water, saving in power consumption and cost of cultivation. APMIP is being implemented with the assistance from Government of India, State Government and farmer contribution. The APMIP did a sea change in agriculture by bringing major fallow land under cultivation and creating the awareness about various benefits of micro-irrigation techniques in the farming community to achieve the slogan 'more crops per drop'. In this circumstance emergence of micro-irrigation system has very much needed in drought prone area like Ananthapuramu District of Andhra Pradesh with an aim of enhancing the crop productivity by improving the water use efficiency through micro irrigation systems for sustainable agriculture. The present study is based on both empirical observations and secondary information sources to analyze the achievement of micro irrigation in drought prone Ananthapuramu District of Andhra Pradesh.

Key Words: Ananthapuramu District, groundwater resources, micro irrigation systems, rainfall.

1. INTRODUCTION :

The Southern part of Andhra Pradesh which comprises five districts is one of the most climate-vulnerable regions in India. Rainfall is low and unreliable, with frequent droughts. Irrigation is limited – there is a modest surface water source and groundwater resources have been over-exploited with many tube wells drilling regularly failing to strike water and /or tube wells are running dry. The farmers are vulnerable to wells running dry, resulting in considerable distress, and some have committed suicide.



Andhra Pradesh Micro Irrigation Project (APMIP) is unique and first comprehensive project being implemented in a big way in the state. APMIP was launched in United Andhra Pradesh in the month of November 2003 with an objective of enhancing the crop productivity by improving the water use efficiency through micro irrigation techniques, improving the economic conditions of the farmers by conserving water, bringing additional area into cultivation with the available water resources, enhancing the crop productivity and production, quality, facilitating judicious usage of underground water, saving in power consumption and cost of cultivation. APMIP is being implemented with the assistance from Government of India, State Government and farmer contribution.

In view of the deficit rainfall, rain shadow regions, unpredictable rains and considerable depletion of ground water, the farming community realized the need to adopt the technologies of Micro Irrigation to achieve the concept of "More crop per Drop". Government of Andhra Pradesh has set a goal to cover the entire potential area available in all the 13 districts of Andhra Pradesh under Micro Irrigation, within the next five years for sustainable agriculture.

The Ananthapuramu District comes under varied agro-climatic and physical conditions. Mainly Tanks, Canals and Tube wells have been utilizing for irrigation in the district. With the existing prolonged dry and drought prone conditions in the district, the cropping pattern has tremendously shifted from principle crops to horticulture crops and leading for remarkable decrease in net area sown. Once the district use to cultivate predominant crops like groundnut, Maize, Red gram, Paddy etc., has lost its important in the form of area and number of farmers.

After a gruelling field work since 2003, the Andhra Pradesh Micro Irrigation Project (APMIP) has bagged the National Records for being number of farmers involving 10,990 and number of Area in hectares covering 13576.84 under its purview in the drought prone Ananthapuramu District latest by 2022-23.

In this circumstance emergence of Micro Irrigation System has very much needed in drought prone area like Ananthapuramu district of Andhra Pradesh with an aim of enhancing the crop productivity by improving the water use efficiency through micro irrigation systems for sustainable agriculture. The present study is based on both empirical observations and secondary information sources.

2. Objectives : The present study has the following objectives :

- 1) To find out irrigation water sources and rain fall scenario in the study area.
- 2) To assess Micro Irrigation adaptation and as emerging technology.

3. Data and Methodology :

The study was designed to assess profile characteristics of emerging Micro Irrigation Technology for sustainable farming systems in drought prone in Ananthapuramu District of Andhra Pradesh which was purposively selected. The study area is predominantly depended on monsoon rains and no perennial rivers are found. Hence the farming system is depending on emerging Micro Irrigation Systems, adaptation, impact of micro irrigation and farmer's opinion are taken into consideration for analysis. Both empirical observations and secondary data was collected the office of the Director, APMIP. Analysis is made by using simple averages for drawing meaningful interpretations.

4. Study Area :

Ananthapuramu District, the present study area lies in the Southern most part of Andhra Pradesh state. It forms a part of the semi arid as well as backward Rayalaseema region. Geographically, it is located between the 13°-40' and 15°-15' Northern Latitude and between the 76°-50' and 78°-30' Eastern Longitude.

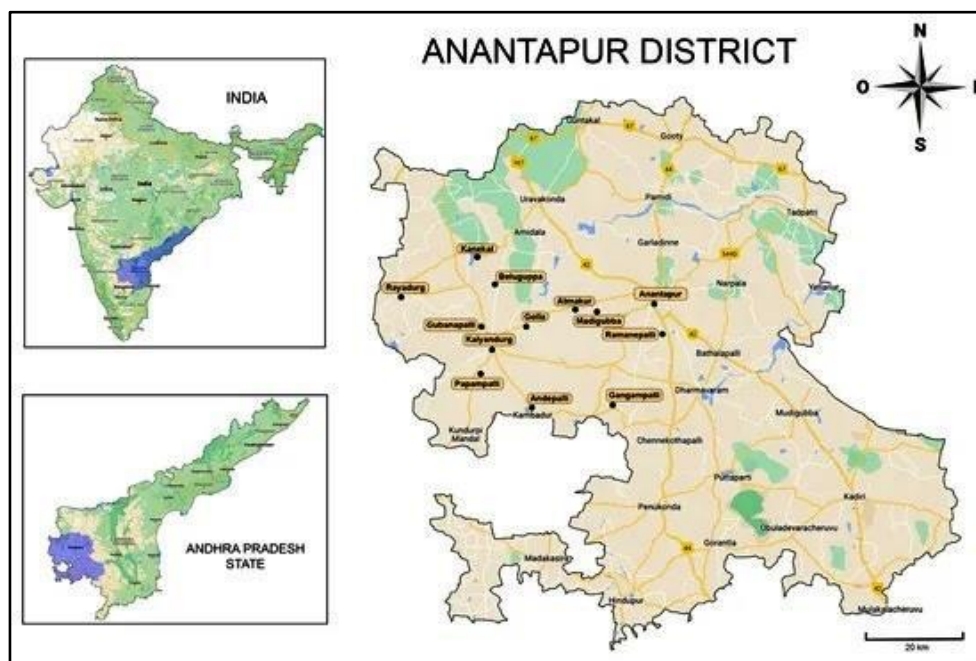


Fig.1 - Study Map Area

5. Analysis :

In the present study the available region wise irrigation sources were narrated by comparing gross cropped area, dynamics in irrigated land and emerging of micro Irrigation technology as sustainable source for agriculture in drought prone Rayalaseema region of Andhra Pradesh state with secondary data sources. A field investigation is also conducted to find out the position of micro irrigation implementation and analyzed field data to find out conclusions.

Ananthapuramu District is basically depends on monsoon rains for its agricultural operations. The district has neither perennial nor major irrigation project. Only a few Eastern mandals have irrigation sources under canals which ultimately depend on monsoon rains. Moreover the district lies in drought prone Rayalaseema Region which is identified as one of the drought prone region.

Table-1 : Ananthapuramu District Rainfall Particulars

(In mms.)

Sl. No.	Year	Rainfall		
		Actual	Normal	Percentage of Deviation
1	2008-09	714	553	29
2	2009-10	616	553	11
3	2010-11	722	553	31
4	2011-12	496	553	-10
5	2012-13	455	553	-18
6	2013-14	539	553	-03
7	2014-15	401	553	-27
8	2015-16	608	553	10
9	2016-17	334	552	-39
10	2017-18	647	552	17

Source : Chief Planning Office, Ananthapuramu



From the above table can clearly observe that, rail fall from monsoons is very uncertain, uneven, unpredictable and discontinuous. It is very worst condition that district has receive less rain fall than normal in 5 years out of 10 years period. This resembles how bad the district continuous in doldrums of monsoons. Further it is understood within 5 negative rain fall. Which is indication for frequent drought prone phenomenon in the district.

In the study area, most of the agricultural operations have been depending on monsoon rains, if monsoon failure is happened and total agriculture would be in mess. Area irrigated under different sources presented in the table 1.2. It is observed from the table predominately source in irrigated tube wells 2013-14 to 2017-18 year in 1,58,470 hectares, irrigated in tube wells 2017-18 followed by Canales 2017-18 year in 10,997 hectares. Net area irrigated in the year of 2017-18, 1,36,490 hectares respectively. It point out that, the district has neither major rivers nor major irrigation projects and majority of the farmers directly depending on underground water resources through digging of tube wells by investing huge amount which is not affordable for majority farmers. There are notable incidents causing for farmers suicide wherever tube wells got failure when farmer tried for more than one tube well in continuation of searching for underground water resources. The problem associated with the tube well construction by the farmers is depleting of underground water table and in some areas farmers went up to even 1600 feet depth which also resulted failures. The development and over-exploitation of groundwater resources in certain parts of the district have raised the concern and need for judicious and scientific resource management and conservation of water.

In observation of the existing status of water resources and ever increasing demands of water for meeting the requirements of the speedily growing population, agricultural requirements of the speedily growing population, agricultural requirements as well as the problems that are likely to arise in future, a holistic, well intended long-term strategy is needed for sustainable water resource management in drought prone areas. Presently decision support systems are being developed for providing the necessary inputs to the decision makers for water resource judicious utilization.

The Government of Andhra Pradesh considered scientific utilization of the scarce water resources to the growing needs of agricultural sector. As a result, the micro irrigation technology came into existence under the specialized organization known as Andhra Pradesh Micro Irrigation Project (APMIP) which is part and partial of Pradhana Mantri Krishi Sinchayee Yojana (PMKSY) in financial and technology aspects.

Micro Irrigation Technology has two types of implementation – Drip and Sprinkler Techniques. Both of them save conveyance losses and improve water use efficiency by supplying water near the/root zone of the plant to achieve the APMIP target ‘More Crops per Drop’. In recent days even Rain Gun Technology has been implementing in midway water scarcity areas.

Initially, in the study area, micro irrigation technique use to adopt for plantation crops but currently the technique has been implementing even for principle crops like Groundnut and Maize. Moreover, emergence of micro irrigation technology brought a tremendous shift in cropping pattern. Previously the study area was known for principle crops like Paddy, Maize and groundnut. But, over a period of time cropping pattern shifted to fruits, vegetable and other commercial crops.

Emergence of APMIP and Launching of PMKSY are boon to the agriculture sector in general and to the farmers of drought prone areas in particular. Under the APMIP, farmer is highly encouraged to convert their land under micro irrigation technique by providing high percentage of subsidy for being equipped micro irrigation facility. The following tables present detailed structure of subsidy pattern and financial implication.

Table-2 : Area Irrigated under different sources

(In Hectare)

Sl. No.	Source of Irrigation	Year				
		2013-14	2014-15	2015-16	2016-17	2017-18
1	Canals	21348	22610	14606	9131	10997
2	Tanks	3891	994	3677	932	3316
3	Tube Wells	133146	126363	154153	146280	158470
4	Dug Wells	1657	1070	331	255	202
5	Lift Irrigation	115	91	82	81	89
6	Other Sources	1518	1204	1192	993	1101



7	Gross Area Irrigated	161675	152332	174041	157591	174086
8	Area Irrigated more than one	31187	26372	35389	25447	37596
9	Net Area Irrigated	130488	125960	138652	132144	136490

Source : Chief Planning Office, Ananthapuramu

**Table-3 : APMIP – Subsidy Pattern and Financial Implication
– Drip Irrigation**

Sl. No.	Category of Farmer	GoI Assistance (%)	State Share			Total % of Subsidy (3+6)	Farmer Contribution (%)	Ceiling Limit	
			Match - ing Share (%)	Addi- tional Share (%)	Total Share (%) (4+5)			Area in Acres	Sub- sidiy in Lakhs
1	SC/ST (under SF/MF Category)	33	22	45	67	100	0	5	2.00
2	SF/MF (Other SC/ST)	33	22	35	57	90	10	5	2.00
3	Medium Farmers of Coastal Districts (5 to 10 Acres)	27	18	25	43	70	30	10	2.80
4	Medium Farmers of Rayalaseema Districts & Prakasam (5 to 10 acres)	27	18	45	63	90	10	10	2.00
5	Others	27	18	5	23	50	50	--	4.00

Source : Compiled from the Reports of P.D. Office of the APMIP, Ananthapuramu

**Table-4 : APMIP – Subsidy Pattern and Financial Implication
– Sprinkler Irrigation**

Sl. No.	Category of Farmer	Assistance GoI (%)	State Share			Total % of Subsidy (3+6)	Farmer Contribution (%)	Ceiling Limit	
			Match - ing Share (%)	Addi- tional Share (%)	Total Share (%) (4+5)			Area in Acres	Sub- sidiy in Lakhs
1	Small and Marginal Farmers of all Categories	33	17	0	17	50	50	5	
2	Other Farmers	27	18	5	23	50	50	5	

Source : Compiled from the Reports of P.D. Office of the APMIP, Ananthapuramu

As stated in the above tables, subsidy is ranging from 100 percent to 50 percent in Drip Irrigation and maximum subsidy is being given to SC/ST farmers who come under marginal and small farmers. Government of India under PMKSY is providing subsidy ranging from 33 percent to for small and marginal farmers to 27 percent to the rest of farmers. However, the subsidy percent is same (50%) for all the farmers in Sprinkler Irrigation and no change in the share of Government of India assistance.



As per PMKSY guidelines, beneficiaries who have already availed the subsidy for micro irrigation cannot avail further assistance for the same land for next 7 years. The farmers who have availed subsidy for Sprinkler Irrigation are eligible to avail balance eligible subsidy for Drip Irrigation within the ceiling limit i.e., Rs. 2.00 Lakhs (-) subsidy already availed by SC and ST farmers under SF/MF, Small and Marginal other than SC/ST and Medium Farmers of Rayalaseema Districts and Rs. 2.80 Lakhs (-) subsidy already availed by Medium Farmers and Rs.4.00 Lakhs (-) subsidy already availed by other farmers. The farmer who have availed subsidy for Drip Irrigation are eligible to avail balance eligible subsidy for Sprinkler Irrigation in same land within the ceiling limit as stated above as per the field / crop requirement. The farmers who have availed subsidy for Sprinkler Irrigation are not eligible to avail subsidy again for Sprinkler for the same land.

State Level APMIP Achievement :

APMIP has covered an area 6,43,885.05 Hectares of land and 4,69,097 farmers over a period of five years i.e., from 2014-15 to 2018-19. It is very interesting to note that, in five years of period 122 times growth in farmers and more than 18 times growth in area extension is achieved.

Table-5 : Area and Farmers covered under Micro Irrigation – Andhra Pradesh

Sl. No.	Year	No. of Farmers Covered	Area Covered in Hectares
1	2014-15	3841	35317.26
2	2015-16	11532	90726.03
3	2016-17	121319	135228.53
4	2017-18	161041	182612.00
5	2018-19	171364	200001.21
TOTAL		4,69,097	6.43.885.05

Source : Compiled from the Reports of P.D. Office of the APMIP

Andhra Pradesh Micro Irrigation Project (APMIP) was started during November, 2003 in combined Ananthapuramu District under this project. The department is providing Drip (Inline, Online) and Sprinklers to the farmers on Government subsidy. Area and farmers covered under Micro Irrigation, Ananthapuramu presented in the table-6. It is observed from the table predominately 2017-18 year 18,677 farmers, and 22,717.04 area hecters were covered.

2003-04 to 2019-20 in combined Ananthapuramu District, a total extent of 2.19 lakh hecters has been covered under Micro Irrigation by covering 1,87,538 farmers, since inception i.e., from 2003-04 to 2022-23.

Table-6 : Area and Farmers covered under Micro Irrigation – Ananthapuramu

Sl. No.	Year	No. of Farmers Covered	Area Covered in Hectares
1	2003-04	5001	8787.12
2	2004-05	5490	6925.14
3	2005-06	9015	11596.77
4	2006-07	9892	12612.79
5	2007-08	11940	15868.25
6	2008-09	12454	13224.68
7	2009-10	15230	13360.36
8	2010-11	11786	11935.19
9	2011-12	6665	6214.64
10	2012-13	3698	3464.59
11	2013-14	4175	4516.83
12	2014-15	4957	5428.53



13	2015-16	13894	14543.56
14	2016-17	13771	15918.16
15	2017-18	18677	22717.04
16	2018-19	17404	22173.84
17	2019-20	12499	16209.78
18	2020-21	APMIP Scheme not Implemented	
19	2021-22	APMIP Scheme not Implemented	
20	2022-23	10990	13576.84
TOTAL		187538	219074.11

Source : Compiled from the Reports of P.D. Office of the APMIP, Ananthapuramu

6. CONCLUSION :

It is traced that, due to monsoon rain dependency is at maximum level, frequent crop failures and drought phenomenon conditions are common and have lead for tremendous change in cropping pattern and shifting from open irrigation to micro irrigation. For installation at micro irrigation technology Government encouragement is also very appreciable and encouraging by providing up to 100% subsidy to farmers based on their social category. Finally it is concluded that the APMIP is a fortunate thing to improve the economic conditions of farming in general and farmers at drought prone areas like Rayalaseema region in the journey at sustainable agriculture.

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