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ENHANCEMENT OF IRRIGATION METHODS IN COMMAND AREA OF ANNAMAYYA PROJECT, RAJAMPET, KADAPA, A.P., INDIA.

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Abstract: Agricultural country like India, where day by day irrigation of lands is reduced due to scarcity of water and old irrigation techniques. In line with technology may advance irrigation techniques are available which reduces man power, usage of water & weed control. One among such techniques. Especially in AP, Kadapa region is rocky area where very little availability of water is expected. Due to this farmers are backward to irrigate this land. In such a scenario going to optional irrigation methods leads advantage. Hence micro irrigation is adopted. Micro irrigation is the application water at low volume and frequent interval under low pressure to plant root zone and it is conserved as a very economic and efficient plan. Micro irrigation is targeted irrigation method surface water and fertilizer using controlled delivery method by allowing water to drip slowly of the roots of individual plants either on the soil surface or directly on to the root zone through the net work of tubes, pipes, valves and emisses. The main objective of Government of Andhra Pradesh in conceiving the project is not only for saving water but also saving energy and labour, improved weed management en- chanced productivity etc... In the present work, the pipe net work is designed by field surveying like checking the reduced levels of ground, soil condition for100 acres of ayacut under Annamaya project, because of scarcity of water in Rajampet we are implementing the micro irrigation method .The main advantage of micro irrigation is more crop for every drop, early maturity, better quality and higher yield. It saves 70% of water
Key words: Micro irrigation, surface water, root zone, rocky area

I. INTRODUCTION:Irrigation may be defined as the course of artificial supply of water to soil for growing crops. It is a science of planning anddesigning an efficient, low-cost, economic irrigation scheme tailored to fit natural conditions. It is the engineering of controlling and connecting the various naturalbasesofwater,bythe constructionofdamsand reservoirs, canals and head works and finally distributing the water to the agricultural fields. Irrigation engineering comprises the study and design of works in linking with river control, drainage of water-logged areas, and generation of hydroelectric power.

2. **NECESSITY:** India is basically an agricultural country, and all its resources depend on theagricultural output. Water is evidently the most vital element in the plant life. Water is normally supplied to the plants by nature through rains. However, the total rainfall in a particular area may be either insufficient, or ill-timed. In order to get the maximum yield, it is essential to supply the optimum quantity of water, and to maintain correct timing of water. This is Possible only through a systematic irrigation system- by collecting water during the periods of excess. Rainfall and releasing it to the crop as and when itis needed.

3. **MICRO IRRIGATION METHOD:Drip**: Irrigation is also known as Micro irrigation & it is an advanced method of application of water to the crops. This micro irrigation system has found greater acceptability not only world over but also in our country among the progressive farmers in recent years, especially in water scarcity areas like arid lands and deserts. As the name suggest, in this system water is applied directly through nozzles at the roots of the plants at a very slow rate drop-by –drop or in trickles. Therefore, it is also called trickle irrigation.

4. LITERATURE SURVEY:

Arif and Abbas (2015) developed an Arduino-based greenhouse control system. It was reported that soil moisture, relative humidity, temperature, CO2, and light measurements can be made successfully. By using a wireless sensor network, they automatically controlled the irrigation system required for the greenhouse. They reported that with the developed system, the workforce was reduced and remote control and monitoring were provided.

Kopdra and Martin (2016) carried out the design and application of a smart irrigation system with the help of an Arduino microcontroller. In the design, Arduino Yun, real-time clock DS1302, two humidity sensors, relay, and solenoid valve were used. A mobile application interface was developed for the control of the irrigation system. Java programming language was used for mobile application technology for remote control of irrigation. In this way, it was able to control from both phones and tablets.

Karaca et al. (2017) investigated moisture sensors, which were widely used in agricultural irrigation and were used to determine the amount of moisture in the soil. The importance of these sensors in terms of sustainable agriculture was determined. As a result of their research and examination, the researchers were seen that FDR-type soil moisture sensors were more widely used because of their low cost, but they have some disadvantages. They emphasized that farmers should be informed about the disadvantages of these sensors.

Suman et al. (2017) stated that the soil moisture level was critical for crop growth. For this purpose, the researchers conducted the necessary research to keep the soil moisture level under control. The researchers, created a development-ready automatic irrigation system, supported the system with rainwater collection technology, and smart wireless humidity sensors. Solar panels were used to improve the system's efficiency.

Kumar et al. (2017) designed an automatic irrigation system using a microcontroller, temperature, and humidity sensor. A system was created that allows the temperature and humidity changes of the environment to be detected with the help of sensors and the pump to operate by sending a signal by the microcontroller. It was stated that the designed system was less costly than other systems. By using the developed system, it was stated that the farmers could irrigate overnight and there was no need for them to be physically present while irrigating.

M. Alamelu et al. (2019) it was aimed that automatic water irrigation system approach for smart home agriculture, irrigation plays an important role. Normally, we have many issues in irrigating the plants. Over irrigation of plants leads to decay of plants and low irrigation of plants leads to retardation of crop growth, late flowering. To overcome from this issues the proposed system define a method called Automatic Irrigation system for Smart Homes (AI-SH). The proposed model build an automatic irrigation system approach using Arduino in which moisture sensor senses the moisture content present in the soil. According to the moisture content level water will be pumped to the soil by the DC motor.

5. GOVERNMENTSCHEMESAVALIABLE

FOR MICRO IRRIGATION: Government of India has announced micro-irrigation in 1992 and familiar as a thrust area in numerous Centrally Sponsored Schemes (CSS) since 2006. This was later raised by National Mission on Micro Irrigation (NMMI) during the period 2010 to 2014 and National Mission for Sustainable Agriculture (NMSA) in the year 2014-15. NMMI had a clear visualization to endorsemicro-irrigationasathrustareaandhencethearea under this technology was augmented from 3.09 Mha in 1992 to 6.14 Mha in 2012. Under NMMI,some of the States Bihar, Karnataka, Orissa, Rajasthan and Sikkim attained more than 90 % of the set targets (physical and financial) whereas Andhra Pradesh, Chhattisgarh, Gujarat, Haryana, Maharashtra andTamil Nadu reached more than 70% of the target. The key strengths of the scheme were emphasis on micro- irrigation, endurance for a sustained period of time, better efficiency due to single execution agency,quality standards and necessities for after sales service and Government funding for demonstration.

The confines of this scheme were insufficient subsidy, inefficient fund disbursement, land ceiling to 5 Ha and no uniform implementation. National Mission for Sustainable Agriculture (NMSA) instigated in the year 2014-15 had four components;

(i) Rainfedareadevelopment,
(ii) On-farmwatermanagement,
(iii) Soilhealthmanagement, and
(iv)Climatechangeandsustainableagriculture.

On-farm water management Micro-Irrigation: An EfficientTechnology... K. Priyan& R. A. Panchal 400 promotescompetent technologiesandequipment'sand the keyfocusisonwateruse efficiency.Hence, micro- irrigation is measured as a module of on-farm water management. A total amount of 1111.82 crores had been allocated to on-farm water management under NMSA where Gujarat's share was 142 crores.

Themajorstrengthsofthisschemewere

(i) to promote a bearable agricultural system considering climate change facets and
(ii) to promote location specific agronomic activities. In this scheme also some deficiencies were noticed at the planning and implementation stages. These were

(i) lackoffocusasasingleidea,
(ii) incompleteguidelinesand
(iii) inadequacyin implementing the scheme. Pradhan Mantri Krishi SinchayeeYojna (PMKSY)", a flagship scheme launched by Honourable Prime Minister in the year 2015 with two idiosyncratic slogans for water management

(i) "HarKhetkoPani"-ExtensionofIrrigationCover
(ii) "Per Drop More Crop" - Improving Water Use Efficiency.

This Yojna focuses on all aspects of waterdevelopment and management with micro-irrigationas an essential component. Micro-irrigation was granted an allocation of approximately Rs. 1075 crores to all 640 districts in India. Some of the State Governments have taken intense initiative for the execution of micro irrigation and Gujarat Green Revolution Company Ltd (GGRC), a Public Private Partnership (PPP) model is one such initiative by Gujarat Government. GGRCwas formed during vibrant Gujarat 2005 with equity shares by Gujarat State Fertilizers & chemicals Ltd (GSFC), Gujarat Narmada Valley Fertilizer Company Ltd (GNFC) and Gujarat Agro Industries Corporation Ltd. (GAIC).

6. **Survey nos:**

121,122,123,124,125,126,127129,130,131,132,133,136,137,138,140,141,142,143,147,149,150,151,152, 153,154,155,156,158,159,160,161,162,163,164,165,166,167,168,169,170,171.,128.

7.CALCULATINGRL'S for 100ACRES of LAND

	B.S	I.S	FS	H.I	R.L	REMARKS
TBM	1.15			101.15	100.000	B.M
A1		1.135			100.015	
B1		1.135			100.015	
B2		1.135			100.015	
C1		1.155			99.995	
D1		1.190			99.960	
D2		0.980			100.170	
C2		1.24			99.910	
A2		1.76			99.390	
B3		1.38			99.770	
A3		1.395			99.750	

C3		1.360			99.790	
D3		1.60			99.550	
D4		1.260			99.890	
C4		1.560			99.590	
B4		1.360			99.790	
A4		2.236			98.910	
A5		1.980			99.170	
B5		1.280			99.870	
C5		1.280			99.870	
D5		1.510			99.640	
D6		1.520			99.630	
	1.91		1.335	101.725		C.P
C6		1.590			100.135	
B6		1.880			99.845	
A6		2.370			99.355	
D7		1.295			100.430	
C7		1.650			100.075	
B7		2.065			99.660	
A7		2.850			98.875	
A8		2.720			99.005	
B8		2.195			99.530	
C8		1.835			99.890	
D8		1.485			100.240	
D9		1.495			100.230	
C9		1.725			100.000	
B9		2.235			99.490	
A9		3.135			98.590	
A10		1.135			100.590	
B10		2.210			99.515	
C10		1.850			99.875	
D10		1.500			100.225	
D11		1.480			100.245	
C11		1.740			99.985	
B11		2.420			99.305	
A11		2.800			98.925	
A12		2.620			99.105	
B12		2.430			99.295	
C12		2.250			99.475	
D12		2.120			99.605	
D13		1.660			100.065	
C13		1.910			99.815	
B13		2.190			98.815	
A13		2.220			99.505	
A14		1.190			99.815	
B14		2.080			99.645	
C14		1.880			99.845	
D14		1.590			100.135	
D15		1.550			100.175	

C15		1.790			99.935	
B15		1.820			99.905	
A15		1.620			100.105	
B16		1.720			100.005	
C16		1.680			100.045	
D16		1.730			99.935	
	1.600		1.28	102.045	100.445	C.P
E16		1.970			100.075	
F16		1.800			100.245	
G16		2.000			100.045	
H16		1.110			100.935	
G15		0.860			101.185	
F15		1.580			100.466	
E15		1.90			100.135	
E14		2.100			99.945	
G14		0.850			100.195	
F14		1.690			100.355	
G13		1.260			100.785	
F13		1.940			100.105	
E13		2.170			99.875	
E12		2.400			99.645	
F12		2.030			100.015	
G12		1.475			100.57	
G11		1.690			100.365	
E10		2.200			99.845	
F10		1.820			100.225	
G10		1.660			100.385	
G9		1.580			100.465	
F9		1.540			100.505	
E9		2.120			99.925	
E8		1.960			100.085	
F8		1.450			100.595	
G8		1.520			100.525	
G7		1.500			100.545	
F7		1.180		102.045	100.865	
E7		1.780			100.265	
E6		1.950			100.095	
F6		1.430			100.615	
G6		1.540			100.505	
G5		1.660			100.385	
F5		1.580			100.465	
E5		1.980			100.065	
F4		1.670			100.045	
G4		1.490			100.555	
G3		1.550			100.495	
F3		2.125			99.92	
E3		2.090			99.955	
	1.94		1.49	102.495	100.555	C.P

J16		1.56			100.935	
J16		1.46			100.035	
K16		1.04			101.455	
J15		1.21			101.285	
K15		0.90			101.595	
I15		1.46			101.035	
H15		1.49			101.005	
H14		1.49			101.005	
J14		1.57			100.925	
K14		1.00			101.495	
K13		0.990			101.505	
J13		1.390			101.505	
I13		1.585			100.910	
H13		1.660			100.835	
H12		1.740			100.755	
I12		1.56			100.935	
I12		1.09			101.405	
K12		1.35			101.145	
K11		1.52			100.975	
J11		1.26			101.235	
I11		1.50			100.995	
H11		1.72			100.775	
H10		1.70			101.325	
I10		1.46			101.035	
J10		1.13			101.365	
K9		1.26			101.235	
J9		1.16			101.335	
I9		1.27			101.225	
H9		1.72			100.775	
H8		1.69			100.805	
	0.320		0.365	102.45	102.13	
K8		1.31			101.14	
J8		1.21			101.24	
I8		1.17			101.28	
H7		1.59			101.86	
I7		1.31			101.14	
J7		1.46			100.99	
K7		1.57			100.88	
K6		2.01			100.44	
J6		1.34			101.11	
I6		1.415			101.035	
H6		1.64			100.81	
H5		1.77			100.68	
I5		1.50			100.95	
J5		1.37			101.08	
K5		1.98			100.47	
K4		2.57			102.2	
J4		2.25			100.2	

I4		1.57			100.88	
H4		1.55			100.9	
H3		1.43			100.82	
I3		1.58			100.87	
J3		2.32			100.13	
K3		2.12			100.33	
	2.34		1.29	103.495	101.155	C.P
L3		2.16			100.635	
M3		2.24			101.255	
N3		1.57			101.905	
L4		2.74			100.755	
N4		1.99			101.505	
L5		2.49			10.005	
M5		2.04			101.405	
N5		1.395			102.100	
N6		1.450			102.045	
L6		2.395			101.100	
M6		1.195			102.300	
L7		2.410			101.085	
M7		1.820			101.65	
N7		1.450			102.445	
L8		1.580			101.915	
N8		1.730			101.765	
M8		1.350			102.145	
L9		1.780			101.715	
M9		1.540			101.955	
N9		1.150			102.325	
	1.13		1.060	103.565	102.435	
O7		0.850			102.785	
O6		0.600			102.965	
P6		0.130			102.735	
P7		0.550			103.025	
Q6		0.490			103.075	
Q7		0.450			103.115	
O8		0.500			10.045	
P8		0.500			103.065	
Q8		0.330			103.235	
P9		0.700			102.865	
O9		0.600			102.965	
			0.7800		102.785	

8. **BLOCK DESIGN FOR 100 ACRES OF LAND DESIGN OF SQUARE SUMP**

Capacity=7.905m^3 L*b*h=1.99*1.99*2.15

Thicknessofbase slab=H/12=2150/12=200mm

Height of stem h= (2.15-0.2) =1.95m

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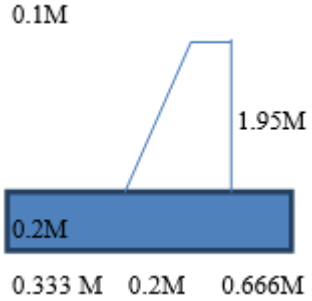

Widthofbaseslab=0.5H-0.6H
0.5H=0.5*2.15=1.075
0.6H=0.6*2.15=1.29Adopt b=1.2M

TABLE:STABILITYCALCULATIONS

Stability calculations	Magnitude	Distance	Moment
W1=(0.1*1.95*25)+0.5(0.5*0.1*1.95*25)	4.875 1.218	0.710 0.743	3.460 0.905
W2=1.2*0.2*25	6	0.6	3.6
W3=1.95*0.66*18	23.16	0.33	7.643
Moment of earth pressure Ka*wh^3/6 =1/3*18*1.95^3/6			7.414
Total	∑W=35.253		∑M=23.022

Distance Z=∑M/∑W=23.022/35.253=0.653m Eccentricity e=Z-b/2=0.653-1.2/2=0.053m
emin=b/6=1.2/6=0.2; e<b/6

⇨ ∑W/b(1+6*e/b)=35.253/1.2 {1+6*(0.053)/1.2}

⇨ 37.162KN/m^2

⇨ ∑W/b(1-6*e/b)=35.253/1.2{1-6*(0.053)/1.2}

⇨ 21.592KN/m^2

Soilpressure=K*wh^3/6=1/3*23.022*1.95^3/6
=90483 KN/m^2
WaterPressure=w*h*h/3=10*1.95*1.95/3=12.675KN/m^2

Mix design for M20 grade:

1. fck'=fck+1.65s

*Standard deviation s=4
=20+1.65*4=26.6N/mm^2

2. W/C=0.43

Cement content = water content /water cement ratio
=177/0.143=411.62kg
Water content=177/1000=0.177 m^3 Cement =411.62/3.15*1000=0.13m^3 CA+FA=1-{0.177+0.13} =0.69m^3 CA=0.69*0.62*2.75*1000=1176.45kg
FA=0.69*0.38*2.65*1000=694.83kg
For 1m^3
Cement=411.62kg FA=694.83 kg CA=1176.45 kg
Water=177kg
Forsize 1.99*1.99*2.15=8.51m^3

Cement=3502.8kg FA=5913.0 kg CA=10011.5 kg
Water=1506.27kg

8. ESTIMATING THE COST FOR ALL QUANTATIES

1. Earth work excavation=8.15m^3*Rs.50=Rs.450
2. Concrete

1. M15=6000/m^3
2. M20=7000/m^3
3. Walls1*2=1.99*1.99*0.45=1.8*7000 Walls 1*2=1.99*1.99*0.45=1.8*7000

Totalcost=Rs.30000

9. Installation of drip system : Various steps involved in installation are the following:

1) From a source of water lay a PVC pipe line of appropriate size to the irrigation area.

2) Locate a back flow prevention assembly immediately below the source on the pipe line to stop back flow of chemically laden water into the source. Irrigation water in drip system contains chemical fertilizers, weedicides and pesticides which areharmful to human beings.

3) Take the pipe line to valve box or pump house. Valve box includes valves, filter and pressure regulator. It may be above or burried underground as per site conditions.
If the pump is to pump water into a storage tank for creating head, from an elevated tank water is taken through fertilizer mixer assembly. Thereafter water is taken through fertilizer to eliminate suspended impurities from water to avoid clogging of emitters.

4) Along the already decided alignment dig trenches starting from valve box as required after taking soil type and slope of land into consideration. The trenches may be 10cm deep unless soil is sandy. Backfill the trenches to give protective cover to pipes and tubings and electrical wiring. However, it is necessary to keep emitters above the so that chances of getting them clogged by minute soil particles is avoided.

5) PVC pipes (1/2 inch or 1.3cm dia), polyethylene tubings and laterals may be laid above ground or burriedas considered necessary.

6) Attach irrigation clock on the main or bury it in the valve box. The wires from irrigation clock to valves can run along with the sub-mains in the trenches. The valves are provided on the sub-mains to control discharge of water into lateral tubings or on the mainas requirement.

10. OPERATIONANDMAINTANCEOFDRIP ASSEMBLY

The operation of drip assembly is governed by watering schedule of a crop. Numberof days drip system has to work at a stretch and the frequency thereofdepends on the type of soil and the crops to be watered .The number of nozzles(emitters) to be placed on each valve depends upon the rate of flow of watering system.

During operation if the plants seem to be drooping,subsoil moisture has to be checked.The flow of water then accordingly increased.On the other hand if soil appears to be wet then the plants may have received over watering. In such situation flow through nozzles need adjustment.

QUOTATION FOR DRIP IRRIGATION SYSTEM FOR 100 ACRE AREA						
Client :Model for 100 acre						
System type:Drip Irrigation System						
Crop: Banana		Area:100Acre				
s.no	Itemcode	Itemdescription	Qty	Unit	Rate,Rs	Amount,Rs
1	PRPA2500041GS00600	SKTPVCPIPE250MMX04KG	1356	M	998.80	1354372.80
2	PRPA2250041GS	SKTPVCPIPE225MMX	504	M	818.10	412322.40

	00600	04KG					
3	PRPA2000041GS00600	SKTPVCPIPE200MMX04KG	708	M	641.30	454040.40
4	PRPA1800041GS00600	SKTPVCPIPE180MMX04KG	504	M	521.00	262584.00
5	PRPA1600041GS00600	SKTPVCPIPE160MMX04KG	300	M	406.40	121920.00
6	PRPA1400041GS00600	SKTPVCPIPE140MMX04KG	504	M	307.20	154828.80
7	PRPA1100041GS00600	SKTPVCPIPE110MMX04KG	300	M	185.70	55710.00
8	PRPA0900041GS00600	SKTPVCPIPE90MMX04 KG	300	M	128.40	38520.00
9	PRPA0750041GS00600	SKTPVCPIPE75MMX04 KG	300	M	91.60	27480.00
10	PRPA0630041GS00600	SKTPVCPIPE63MMX04KG	3264	M	64.00	208896.00
		Sub total				3090674.0
B		Filter&Fertigation Equipment				
1	CM050SM	JCM50M3/HR-3”SINWITHM.MF	5	NOS	30392.00	151960.00
2	JPSFP50SW	JAINSUPERFLOWFILTER 50M^3/HR3”PLUS	5	NOS	5121.00	25605.00
3	FT160	160 LITERFERTIGATIONEQUIPMENT	1	NOS	12645.00	12645.00
		Sub total				190210.0
C		Drippers&Accessories				
1	T0162250	TUBEOD16MMCL2X250MTR	2000	M	10.05	20100.00
2	A16400502H400N	AQURA16MM4.0LPH50CMCL2HD400MTRNPC	236400	M	11.9	2813160.00
3	GT001613	POLYGROMMETTAKEOFF 16 X 13 MM	800	No	3.70	2960.00
4	ES0816	LATERALENDSTOP“8”SHAPE 16 MM	800	No	2.05	1640.00
5	TU16	J-TURBOAQUR/LINEJOINER 16 MM	800	No	2.06	2080.00

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		Sub total				2839940.0
D		Valves&Accessories				
1		BUTTERFIYVALVE250MMPN1	8	NO.	28518.00	228144
2	BV63HSW	CONTROLVALVE63MMMOULDEDSEALPLAIN	128	NO.	527.00	67456.00
3	SFV63	FLUSHVALVE63MM	128	NO.	69.00	8832.00
4	CINRV250BS10CL	C.I.NON RETUVAL 250MM–BS10D10KG/CM^2-CL	1	NO.	39670	39670.00
5	ARVC100	DBLACTAIR/VACRELEVLV1”+D3750	5	NOS	483.00	2415.00
6	PRVP20T	PR RELIEF VALVEPLASTIC2” THREADED	1	NOS	20512.00	20512.00
		Sub Total				367029.00
			TotalofA+B+C+D			6487853.4
		Fittingsandaccessories			5.00%	
		VAT			5.00%	
		Installationcharges	100AC		1500	
Grandtotal,RS.						7302859.0

11. COSTANALYSIS:

Comparison with micro-irrigation and conventional irrigation

Microirrigation

Per acre of banana crop upto1000 plants has to be planted

For each plant it will cost around = Rs 80 (including sump, motor, and labour cost etc.,)

Initial investment per acre=Rs80000 Total income per acre=Rs 150000 **Conventional irrigation**

Per acre of banana crop upto1000 plants has to be planted Initial investment per acre=Rs40000

Total income per acre=Rs 80000

12. CONCLUSION

- Micro irrigation is implemented 100 acres of ayacut area in kothapalli village near rajampet.
- Reduced levels are calculating by using an instrument Auto level.
- For square sump cantilever wall is designed and stability calculations for cantilever wall.
- Estimating cost analysis for square sump and drip installation system.
- Costanalysis

✓ Initial cost for drip irrigation method=Rs 80000
✓ Total income for drip irrigation method=Rs 150000
✓ Initial cost forconventional irrigation=Rs 40000
✓ Total income for conventional irrigation=Rs 80000

- ✓ Compare with conventional irrigation micro irrigation is more preferable
- ✓ Water required for drip irrigation =1/4 (water required for conventional irrigation)

We can irrigate more land with less quantity of water in micro irrigation method.

13. Disclaimer

The opinions and information included in this research paper are those of the authors and may not accurately reflect those of the organizations to which they belong.

14. Data Availability

The article contains the data that were considered in the investigation.

15. Conflicting Interests

There are no conflicts of interest, accordingto the authors.

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