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Study of Irrigation Efficiency of Kaddam Project, Nirmal District, Telangana.

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ABSTRACT:
Irrigation efficiency (IE) is the ratio of the amount of water consumed by the crop to the amount of water supplied through irrigation (surface, sprinkler or drip irrigation). It can be expressed as the ratio of water output to the water input. Input minus output is nothing but losses and hence if losses are more output is less therefore efficiency is less. Hence, efficiency is inversely proportional to the losses. This research work has been carried out at TheKaddamNarayana Reddy project,Peddur (Vill), Kaddam (Mdl), Nirmal (Dist). The dam contains two canals left canal and right canal. The left main canal traverses through a length of 73.6 kms. The right canal traverses through a length of 8.0kms. The irrigation efficiency of kaddam project is measured using conventional or traditional methods.They are many irrigation techniques have been using in thiscommand area namely surface irrigation, sprinkler irrigation. The water efficiency in the Kaddam project is less due to more loss of water in the canal due to evaporation, percolation and condition of canals. In this paper an attempt has been made to present and discuss such of the losses along with suggested practices that can improve efficiency.

Key words: Irrigation efficiency, surface irrigation, drip irrigation, sprinkler irrigation, Water Conveyance Efficiency

1. INTRODUCTION:

Irrigation is the artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall.Irrigation in India includes a network of major and minor canals from Indian rivers groundwater well based systems, tanks, and other rainwater harvesting projects for agricultural activities. In 2010, only about 35% of total agricultural land in India was reliably irrigated. About 2/3rd cultivated land in India is dependent on monsoons.

The present study has been carried out at Kaddam Project. This Project Constructed across river KADDAM at Peddur Village, KaddamMandal, NirmalDistrict. This dam is on the river kaddam. This river is tributary to famous Godavari River. This project mainly supports for irrigation in the Nirmal district for many Mandals. There are two canals from this project. left and right canals

1.1 NECESSITY:

India is basically an agricultural country, and all its resources depend on the agricultural output. 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 realizing it to the crop as and when it is needed.

1.2 OBJECTIVE:

The objective of the project work is to study the Irrigation Efficiency of the KaddamNarayana Reddy project for five years. i.e. from 2010 to 2015.

2. STUDY AREA:

The KaddamNarayana Reddy Project Constructed across river KADDAM at Peddur Village, KaddamMandal, Adilabad District. The latitude and

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longitude of the dam is N 19-07' and E 78-47' respectively. The ayacut of the project is 68,150 acres, The MandalsKaddam, Jannarum, Dandepally, Luxettipet and Mancherial are benefited due to kaddam project. The designed discharge of the dam is 3.82 lakh cusecs, dependable yield is 18.65 TMC. The water utilization of the dam is 10.00 TMC.

Fig1: Kaddam Dam

There are two numbers of canals taking off from the dam, namely Left main canal and Right canal. The Left main canal traverses through a length of 73.6 Kms. The works on left main canal were completed 47 years back with 35 numbers distributaries (D1 to D42) with an irrigation potential of 66,428 Acres. The crapping pattern under Left main canal is completely wet. The average area irrigated under Left main canal and its distributaries is 43.700 acres as against 66.428 acres irrigation potential created. The villages benefited due to left canal are 93 villages. The right canal traverses through a length of 8.0 Kms. The works on Right canal were completed 47 years back with 4 numbers minors with an irrigation potential of 1700 acres. The cropping pattern under right channel is completely wet. The average area irrigated under right channel and its minors is 1250 acres as against 1,700 Acres irrigation potential created. The villages benefited due to right canal are 5 villages.

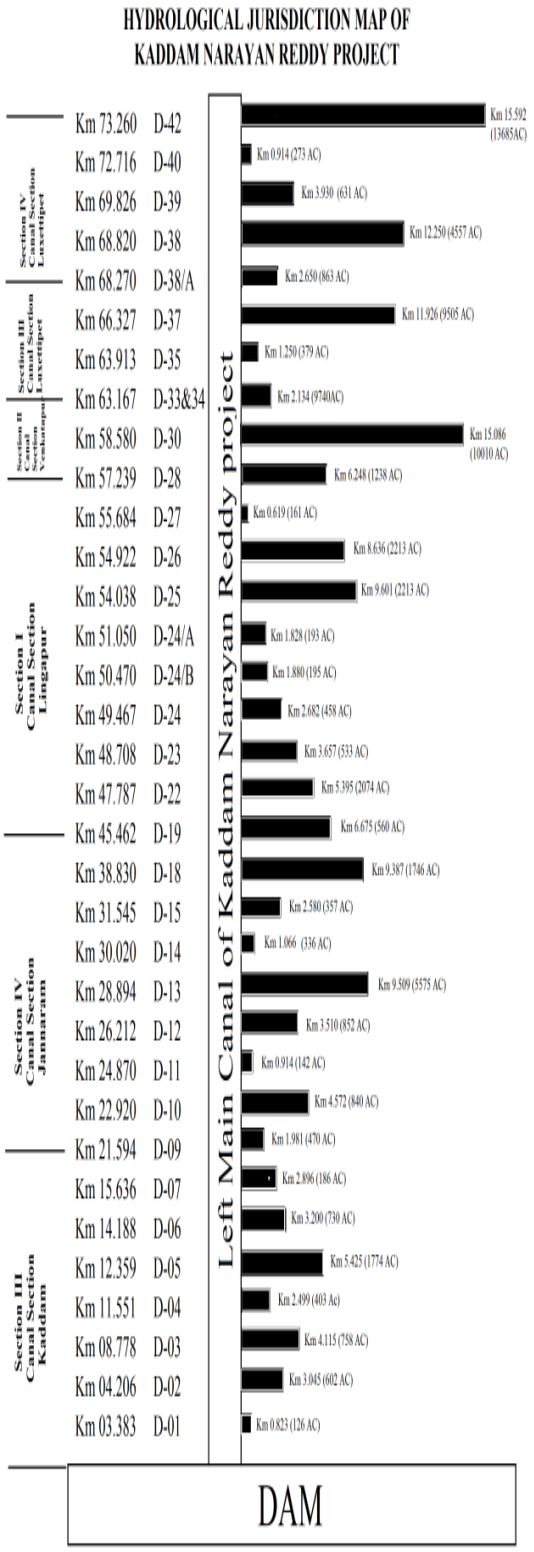

Fig2: Hydrological Jurisdiction Map of Kaddam Project

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3. IRRIGATION EFFICIENCY:

The efficiency is the ratio of water output to the water input. Input minus output is nothing but losses and hence if losses are more output is less therefore efficiency is less. Hence, efficiency is inversely proportional to the losses.

It can express as the percentage of water delivered to the field that is used beneficially.

$$Ei = \frac{Wb}{Wf} * 100$$

Wb= Water used beneficially

Wf = Water delivered to field

3.1 TYPES OF IRRIGATION EFFICIENCY

a)Water Conveyance Efficiency (Ec):

It is the percentage of source water that reaches the field.

$$Ec = \frac{Wf}{Ws} * 100$$

Wf = Water delivered to field

Ws = Water diverted from source

b) Water Application Efficiency (Ea):

The percentage of water delivered to the field is used by the crop.

$$Ea = \frac{Wc}{Wf} * 100$$

Wc= Water available for use by the crop

Wf = Water delivered to field

c)Water Distribution Efficiency (Ed):

The percentage of the average application depth delivered to the least-watered part of the field.

$$Ed = [1-\frac{y}{d}] * 100$$

y = Average absolute numerical deviation in depth of water stored from average depth stored during the irrigation

d = Average depth of water stored during irrigation

d)Water Storage Efficiency (Es):

The percentage of water delivered to the field is used by the crop.

$$Es = -\frac{Ws}{Wf} * 100$$

Ws= Water stored in the root zone of the plants

Wf= Water delivered to field

3.2 FACTORS INFLUENCING IRRIGATION EFFICIENCY

The following factors influence the efficiency of Irrigation Project

- Design of irrigation system
- The degree of land preparation
- Skill and care of irrigator

4. PROCEDURE:

4.1REQUIRED DATA:

To determine the irrigation efficiency of the kaddam project the following data is required

- Rain fall data
- Irrigated land
- Ayacut of the project
- Length of the canal
- Water released in TMC
- Amount water reached at the irrigated land

The data was collected from the respective authorities and tabulated below.

i) Irrigated Land:

S.No	YEAR	WATER RELEASED (TMS)		AYACUT IRRIGATED (acres)	
		Kharif	Rabi	Kharif	Rabi
1	2008-09	7.795	----	31964	----
2	2009-10	3.619	----	35320	----
3	2010-11	4.942	3.785	56314	23604
4	2011-12	6.061	----	45560	----
5	2012-13	7.405	----	35379	----
6	2013-14	7.491	4.133	41309	17786

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ii) Rain fall data:

S.No	YEAR	RAIN FALL(mm)
1	2010	870.00
2	2011	1508.60
3	2012	722.20
4	2013	1091.20
5	2014	1625.80
6	2015	653.40

iii) Water delivered to the field:

S.No	Year	Water released from source (TMC)	Water delivered to field (TMC)
1	2010	4.942	2.276
2	2011	6.061	3.265
3	2012	7.405	3.785
4	2013	7.491	3.613
5	2014	4.405	1.945
6	2015	6.09	2.612

4.2 CALCULATION WATER CONVEYANCE EFFICIENCY (Ec):

Water input to a field or an agricultural system is not the same as the water used or depleted for crop production. However, we may work out water use efficiency as output per unit of irrigation supply. Water productivity is estimated from the amount of water directly consumed by the agricultural system (evaporation and transpiration) and not the amount of irrigation water applied or rainfall received (Molden et al., 2003, Molden and Oweis, 2007; Kassam et al., 2007, Molden et. al., 2010). This distinction is increasingly important as we move upscale from field to farm to basin because water that is taken into the system, but not consumed, is available downstream and hence is excluded from calculation.

This conveyance efficiency is calculated by using the formula.

$$Ec = \frac{Wf}{Ws} * 100$$

For the year 2010:

Water released from source (TMC) =

Ws = 4.942

Water delivered to field

Wf = 2.27

So, the water conveyance efficiency is

Ec = (2.27/4.942)*100

Ec =55.63%

Similarly, for remaining years also it has been calculated and presented in the next table

IRRIGATION EFFICIENCY:

S.No	YEAR	IRRIGATION EFFICIENCY (%)
1	2010-11	55.63
2	2011-12	53.92
3	2012-13	51.08
4	2013-14	48.32
5	2014-15	44.19
6	2015-16	42.98

5. CONCLUSIONS:

The following conclusions have been derived from this study on the KaddamNarayanaReddy project

- Dam is working in good condition but the conditions of the canals are not fair.
- Almost half of the line canal of the both left canal and line canal are collapsed. Considering the last five years the efficiency is reduced due to percolation of water into the soil and also evaporation.
- The maximum efficiency occurred in the year 2010 is 55.63%& the minimum efficiency occurred in the year 2015 is 42.98%
- The average efficiency of the project in the last five years is 49.35%
- The average evaporation losses in the total loss of efficiency is 40%

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Further it can be concluded that the project is yielding satisfactory results and the efficiency is can be improved by renovation of the both left & right canals.

6. LIMITATION:

Due to lack of sufficient data Water Application Efficiency (Ea), Water Distribution Efficiency (Ed), Water Storage Efficiency (Es) has not been calculated. The overall irrigation efficiency may vary if the aforesaid efficiencies are considered.

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