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# Performance Analysis for Lift Irrigation Schemes- A Case Study

**Anirudha S.Jadhav[1], Prf. Dr. Y.M. Patil[2]**

*[1]M Tech, Dept. of Civil Engineering, RIT, Maharashtra, India*
*[2]Assistant Professor, Dept. of Civil Engineering, RIT, Maharashtra, India*

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**Abstract -** *Lift irrigation is a method of irrigation in which water is not transported by natural flow (as in gravity-fed canal systems) but is lifted with pumps or other means. Analysis the performance of the Lift Irrigation Schemes for their proper functioning has become very important. In this research work, performance analysis of the existing Lift Irrigation Scheme was performed to assess the conveyance efficiency of the existing LIS scheme and to check the current cropping pattern in the scheme area. The cropping patterns greatly affect the efficiency of the LIS, so that comparison between designed cropping pattern and actual cropping pattern plays very important role in this analysis work. The performance analysis of the existing LIS indicated that the crop pattern taken by the farmers is different from designed cropping pattern. During analysis it is observed that the conveyance efficiency of the existing scheme is near about 84%. The existing scheme is efficient by means of water conveyance but not efficient by means of water use.*

***Key Words***: *Lift Irrigation Scheme, Efficiency, Cropping Pattern*

## 1. INTRODUCTION

Irrigation is defined as the science of artificial application of water to the land, in accordance with the crop water requirement throughout the crop period for full- fledged nourishment of crops.

Water is one of the important resources required for everything in the globe from agriculture to human survival. The optimized use of water is necessary in all the fields of its application. Of the total available water resources, around 70% in India are consumed for irrigation of which, if optimized, can save up up to 50% of it.

The performance analysis of the scheme must be required to evaluate the performance of any LIS. The analysis of the LIS scheme can be carried out on the basis of many parameters such as water use efficiency, conveyance efficiency and the most important is the estimation of the irrigation cycle time.

For above performance analysis work 'Bhairavnath cooperative Lift Irrigation Scheme' which is sponsored and run by 'Rajarambapu patil cooperative sugar factory, Maharashtra, India, was selected.

In order to understand the scope, water requirement and available discharge, the scheme has been plotted using GIS and discharges at random outlets are calculated. Data related to cropping pattern also has been collected and its found that, about 80% of farmers cultivate sugarcane which requires huge amount of water. Some other crops as Wheat, Soya bean, Gram are also cultivated and require very less amount of water.

Data analysed also shows that, the entire scheme has furrow irrigation method applied for irrigation where in huge amount of water is wasted.

Through this performance analysis the entire LIS scheme has been analysed sincerely. Analysis data are important for future modifications in the scheme to work better.

## 2. Case Study and Data Collection

For current study, 'Bhairavnath Cooperative lift irrigation scheme' (Taluka: Walwa, Dist: Sangli, India) is selected which is operated and maintained by 'Rajarambapu patil cooperative sugar factory ltd., rajaramnagar, walwa, India.

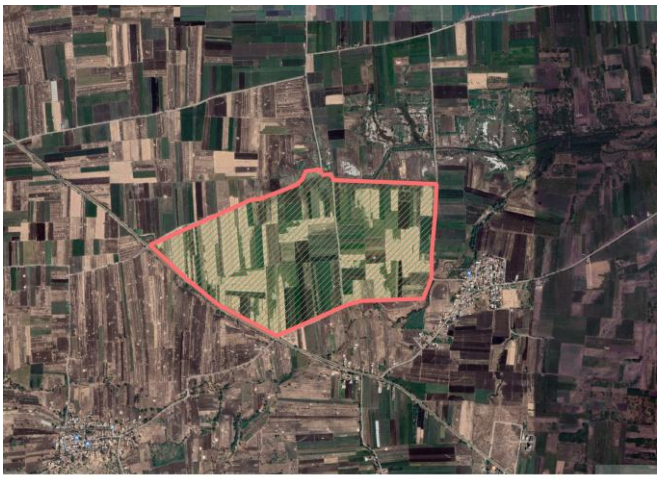

**Fig -1**: Study Area Map

### 2.1 Description of the case study

Data of Scheme-

Information about the name of Branches, number of water outlets on each branch, number of beneficiaries on each branch and area of irrigation under each branch is from irrigation office of the scheme.

The mapping of all the details of the scheme has been done by using Q.GIS Software. The scheme map consists of water outlet locations in the scheme area and boundary of the scheme.

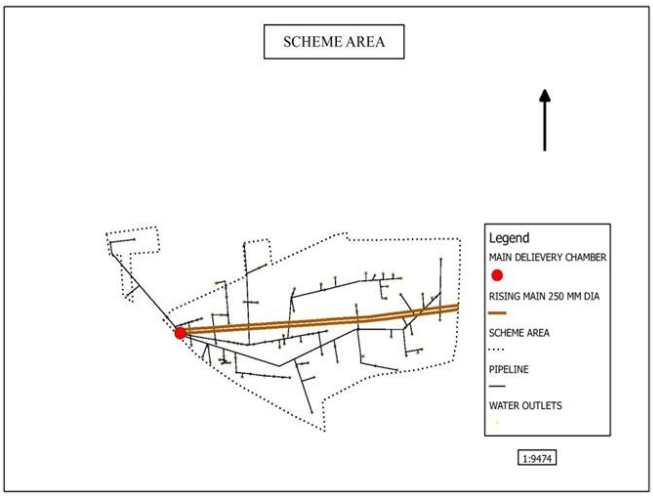


**Fig -1**: Study Area Map

**Table1**. Division of outlets among all branches

| Sr.no. | Name of branch | Water outlets | Total beneficiaries | Area under irrigation ( Ha) |
|---|---|---|---|---|
| 1 | Banduk-tatya branch | 9 | 15 | 4.01 |
| 2 | Bajarang annabranch | 21 | 40 | 10.32 |
| 3 | Appa anna branch | 18 | 36 | 10.04 |
| 4 | Wal khinde branch | 29 | 34 | 12.63 |
| 5 | Sarju-bhau branch | 12 | 19 | 4.97 |
| 6 | Chairmen brac | 1 | 30 | 9.77 |
| 7 | Narale branch | 8 | 15 | 4.69 |
| Total | | 114 | 189 | 56.43 |

Rotation period-

In the scheme there are total 104 water outlets, distributed along 7 different branches. Amongst all these, 8-9 water outlets are operated simultaneously. The rotation period for each branch & number of active chambers on each branch are tabulated below.

**Table2**. Active outlets and rotation period

| Sr.no | Branch name | Active outlets | Rotation period days |
|---|---|---|---|
| 1 | Banduk-tatya branch | 0 | 21 |
| 2 | Bajarang anna branch | 2 | 22 |
| 3 | Appa anna branch | 1 | 20 |
| 4 | Wal khinde branch | 2 | 21 |
| 5 | Sarju-bhau branch | 2 | 22 |
| 6 | Chairmen branch | 2 | 21 |
| 7 | Narale branch | 1 | 20 |
| Average rotation period=21 Days | | | |

The rotation period is the time gap between two subsequent watering events. From above table it is observed that the rotation period in existing system is about 21 days.

Data regarding to the cropping pattern-

The required data is collected from the irrigation office of the scheme using the records. The abbreviations used during data collection for crops taken, are as follows.

**Table3**. Abbreviations used for data collection

| Symbol | Meaning |
|---|---|
| S | Sugarcane growing |
| S1 | Sugarcane grown |
| B | Banana |
| W | Wheat |
| J | Jowar |

The collected data includes number & names of beneficiaries of every single water outlet, individual farm area and crop taken individual farm. It is tabulated in following format.

**Table4**. Format for data collection of crops

| | | | |
|---|---|---|---|
| Chamber no | 1 | | |
| Name of owner | Madhukar shankar virkar | | |
| Survey number | 14 (2) | | |
| Area (guntha) | 20 | | |
| Crop pattern | 1 | 2 | 3 |
| | S1 | - | - |

(Only part of table has been given here for only illustration purpose).

From this cropping pattern analysis it is observed that 80% of scheme beneficiaries have been taken sugarcane crop and around 20% of farmers taken other crops.

Comparison between designed and actual cropping pattern-

Designed cropping pattern-

1. Sugarcane – 15%
2. Kharip- 85%

3. Rabbi – 42.5%

Actual cropping pattern derived from data collection-

1. Sugarcane – 80%
2. Wheate, jowar and soyabean – 20%

## 3. Reasons of long rotation period

According to detailed study of scheme area reasons of long rotation period find out. They are as follow-

- Farmers in the scheme area do not follow the designed cropping pattern.
- Farmers use lot of water than actual requirement.
- 80% of scheme area is under sugarcane cultivation which requires large amount of water. That leads to long rotation period.

## 4. Research Methodology

For calculation of the Efficiency of scheme the following methodology has been adopted.

The efficiency calculation of the scheme is calculated by using input and output discharge values. The input discharge is calculated at main delivery chamber and output discharge is calculated at openings in the scheme area. From division of input and output discharge of scheme, the efficiency of the scheme has been known.

1. Calculation of Discharge through water outlets in the scheme-

The water quantity available in the scheme for irrigation should be calculated for calculating the irrigation capacity of the scheme.

| OutletNo. | Bucket Capacity (ltr) | Time (Sec (for one Outlet) | Discharge (lps) |
|---|---|---|---|
| 1 | 10 | 1.43 | 7.00 |
| 3 | 10 | 0.70 | 12.00 |
| 4 | 10 | 1.00 | 7.00 |
| 6 | 10 | 0.55 | 15.00 |
| 7 | 10 | 0.55 | 12.00 |
| 18 | 10 | 1.35 | 7.00 |
| Average discharge=10.00 lps | | | |

**Table5**. Discharge calculation

As this discharge (i.e., 10.00 lps) is the output discharge in the scheme, it is considered for calculation of the efficiency of the scheme.

2. Efficiency calculation-

Efficiency of the scheme has been calculated by comparing total water pumped in the scheme at jack well to the total water discharge at active openings.

1. Total pump discharge at lifting point=72 lps = 0.072 Cu.m
2. Daily water quantity pumped at the jack well (for 10 work hours)

   = 0.072*3600*10= 2592 Cu.m
3. Discharge from single outlet = 10 lps = 0.01 Cu.m
4. Total active chambers in the scheme at a time = 6
5. Daily water discharge in the entire scheme ( for 10 hours)

   = 0.01*3600*10*6 = 2160.00 Cu.m
6. Efficiency of scheme= output discharge/ input discharge

   = 2160/2592 = 83.33%

## 5. RESULT

According to the analysis of the Lift Irrigation Scheme following results are obtained-

1. Conveyance efficiency of the scheme- 83.33 %~84%

2. Rotation period – 21 days

## 6. CONCLUSIONS

Here the conveyance efficiency of the Lift Irrigation Scheme is very good but Rotation period of watering events found not so good. It is due wrong cropping pattern followed by the beneficiaries

## REFERENCES

[1] A. A. Bishop and A. K. Long, (1983), "Irrigation water delivery for equity in users". "Journal of Irrigation and Drainage Engineering," Vol. 1, December 1983, 349-356

[2] Bharatkumar L., M.A. Mohammed-Aslam, (2015), "Crop pattern mapping of Tumkur taluka using NDVI Technique: A remote sensing and GIS approach", International conference on Water Resources, Coastal and ocean Engineering (ICWRCOE 2015), 1397-1404.

[3] D.Rey, I.P. Holman, A.Daccache, J.Morris, E.K. Weatherland, J.W. Knox, (2016), "Modelling and mapping the economic value of supplemental irrigation in a humid climate." Agricultural Water Management, 13.-22.

[4] M. Ayub Hossain, M. Shoeb Hassan, M. Abdul Mottalib, Sultan Ahmed, (2015), "Technical and economic feasibility of solar pump irrigations for eco-friendly environment", 6th BSME International Conference on Thermal Engineering (ICTE 2014), 670-678