

Evaluation Of Existing Small Scale Li Schemes By Techno – Economical Aspects

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ABSTRACT: Existing small Lift irrigation (LI) schemes which are executed and operated since last thirty to forty years have contributed the significant socio-economic integration in the life of farmers in western Maharashtra. After extending the services for many years, efficiency of these LI schemes is considerably reduced in performance due to various problems. Deterioration of existing pipes, weak pipe joints, wear and tear of machinery, obsolescence, improper management, modifications required in design etc; are the majority of the problems for poor performance of existing LI schemes. In this paper, it is proposed to recognize the problems and sort out them based on technical and economical aspects. Paper identifies the different factors which are relevant and causing poor performance of existing LI schemes. It will also suggest the guidelines to study the problems. Overall performance evaluation framework contains the identification of both strong and poor events of existing small LI schemes. This presentation will assist to prepare a evaluation report based on Techno – Economical aspects and to mitigate the constraints faced by existing small Lift Irrigation scheme

Keywords – Deterioration of Pipes, Distortion of joints, Poor Areas, Improper Management.

1. INTRODUCTION

Small scale lift irrigation (L.I.) is an important aspect of irrigation development in many countries. It involves individual or small group of farms organized and managed by farmers, usually independent of government resources. This type of development has often proved successful in areas where the large-scale, particularly government controlled projects have not succeeded. This is not meant that the large scale farming irrigation projects are bad but the small scale irrigation projects are simple to develop and operate. Development of lift irrigation Schemes requires careful design, execution and operation. The perfect management is the key to success of any LI project. In small scale system there are no tiers of management as in the large scale projects or Schemes. Farmers alone have to decide when to irrigate and how much water to supply, when to start and stop the pumps etc.

Now a days, L.I. Schemes which are framed before 30 to 40 years are to be evaluated on their performance basis. It is to be done by detecting the various causes such as deterioration of pipes, distortion of pipe joints, wear and tear of machinery, obsolescence, violation of cropping pattern and inefficient operational system etc which have reduced the performance efficiency of these existing Schemes.

2. PERFORMANCE EVALUATION

Performance evaluation is the formal determination of an contribution of individual component related to outcome of project within a particular setting or position. Objective of performance evaluation is to assess the extent to which the individual component has contributed to the outcome of project. It is also to measure the achievements above or below the standard norms. It is the process of formally judging the value or quality of a component in the project.

Based on the survey carried out on performance of existing LI Schemes in Maharashtra state, office of the co operative commissioner has published the data in the year 2011(Table No. 1). This data shows number of cooperative societies operating lift irrigation Schemes that met losses has increased from 62 in the year 1961 to 6065 in the year 2010. The amount of loss has increased from Rs. 2 lakhs to Rs. 2833 lakhs in the corresponding period. It is observed from the study of this loss making LI Schemes, following are the major elements responsible for their poor performance.

Table 1

Year	Total No. of L.I. societies	No. of Profit Societies in profit	No. of societies in loss
1961	119	02	62
1971	301	17	47
1981	1188	50	411
1991	3224	226	1760
2001	4796	800	2674
2009	9896	1084	5725
2010	10131	982	6065

(Source: <http://sahakarayuktalay.gov.co.>, Year 2011.)

As per the above TABLE published by office of co-operative commissioner, it is observed that there is considerable increase in the number of co-operative societies which are in loss.

3. FACTORS AFFECTING PERFORMANCE OF LI SCHEMES

It is observed from the field visit of authors that following are the main factors responsible poor performance of existing LI schemes,

1. Deterioration of Pipes
2. Distortion of Pipe Joints
3. Wear and Tear of Machinery
4. Violation of Cropping Pattern
5. Improper Management
6. Obsolescence
7. Focus on Areas for Special Repairs

Each of these elements is discussed below.

3.1 Deterioration of Pipes

In majority of the existing lift irrigations formed before 25 years, pre - stressed pipes and R.C.C. pipes are used for rising mains, gravity mains and distribution system. M.S. Specials and M.S. pipes are used at the initial stage of delivery system. These pipes laid below the ground level are in contact with the moisture containing chemicals in soil and fertilizers applied for the crops. The Chlorides and Sulphates of Sodium, Calcium and Magnesium are the constituents which affect the coating of these cement concrete pipes.

Chlorides and Sulphates of Sodium, Calcium, Magnesium in the presence of moisture, expedites the corrosion of M.S. pipes and M.S. specials leading to deteriorate the pipes. RCC pipe deterioration occurs in the layer form. Scaling which further leads to perforations is the well known effect in case of M.S. pipes and MS specials. This not only reduces the life and efficiency of pipes but also leads to the areas for leakages.

3.2 Distortion of Pipe Joints

Cement mortar used for collar joints, socket & spigot joints are attacked by the same reasons as discussed above. This causes the deterioration of pipe ends and collar, RCC pipe and M.S. components Fig. 1 and Overall effect of the above with the lateral thrust due to water hammer causes leakages at joints Fig. 2.



Fig 1. Leakage at RCC pipe and MS Special

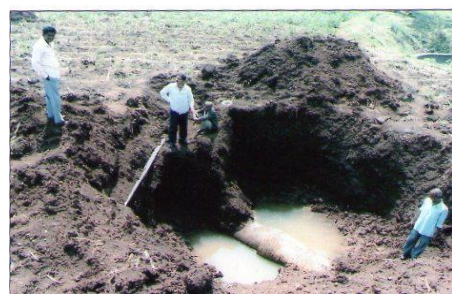


Fig 2. Leakage due to lateral thrust

3.3 Wear and Tear of Machinery

The pumping machinery of LI Schemes includes VT pumps, centrifugal pumps, electrical motors and installations. M.S. suction and delivery pipe connections and valves are also the parts of pumping machinery. These machineries and pipes deteriorate with internal and external scale formation.

These are affected with consistent operation causing natural wear and tear. If timely maintenance and overhauling through skilled person is not performed, it reduces the efficiency of machinery and increases the rate of wear & tear Fig. 3 and Fig. 4 Corrosion of the spares is also the reason. This leads to expensive maintenance and stoppages affecting increase in watering interval.



Fig. 3 and Fig. 4 Wear and tear due to lack of maintenance

3.4 Violation of Cropping Pattern

While estimating the water requirement for LI schemes certain cropping pattern is considered by planners. But in actual practice this cropping pattern is not followed due to various reasons. For example in old schemes, 15% sugarcane, 42.5% Kharif and 42.5% Rabbi cropping pattern was suggested, it was then revised to 20% sugarcane, 40% Kharif & 40% Rabbi with 10% overlapping of sugarcane crop.

The area under sugarcane was restricted to 15% to 20% of the total cultivatable area. But in practice planting of sugarcane crop was up to 35% to 50% which violated the previous cropping pattern. Such violation leads to increase in the watering interval and ultimately reduction in to number of watering. Consolidated effect of both the reasons is reduction in the crop-yield and increase in the production cost and suffering to priority list of watering etc. The beneficiaries are not satisfied with the outcome and blame the management. The revenue amount seems too large and recovery of the water charges becomes difficult and complicated.

3.5 Obsolescence

The latest technology is to be adopted to enhance the suitability and efficiency of the existing LI Schemes. Centrifugal pumps installed on the banks of river or reservoirs are heavy and require more manpower. Considering the motor pumps up to 25 lps discharge and 40 mtr. static head, these centrifugal pumps have become obsolete for above characteristics.

The vibrations generated due to centrifugal pumps and self weight of the pump assist the sliding of river bank. Hence there is a need to replace these old machinery by latest one.

3.6 Improper Management

The improper operation system, improper financial planning and deviation from principles of management lead many schemes to become inefficient and poor in condition. Not attending the leakages immediately results in huge wastage of water Fig. 5 and Fig. 6.



Fig. 5 Wastage of water due to leakage



Fig. 6 No Desilting Done

Improper methods used for machinery and valve maintenance not attended at right time also leads to heavy wastage of water Fig. 5. Partiality / deviation in the claim for watering, no control on operators and improper feedback for the constraints are some of the reasons for non-performance of L.I. Scheme.

Buildings where pumps and other machineries are housed should be maintained in good condition. In many existing LI schemes it observed that leakage from roofs and walls have damaged costly pumps and electrical installations Fig. 7 and Fig. 8. Such damages not only lead to heavy financial losses but also results in safety concerns. Proper maintenance of buildings is most important from leakages as well safety point of view. electrical installations, transformer structures etc. also require proper maintenance.

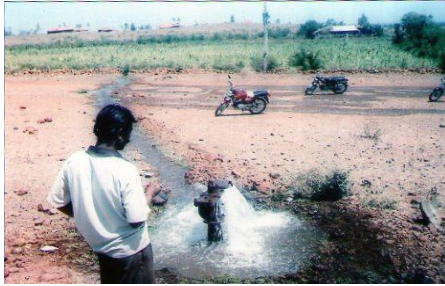


Fig 7. Leakage through air valve

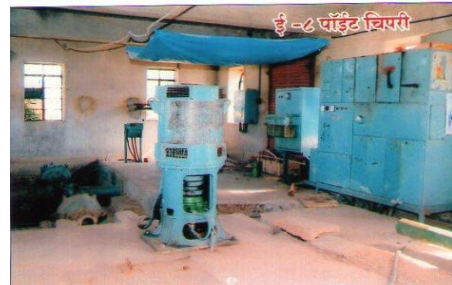


Fig 8. Pump house in hapless condition

4. REMEDIAL MEASURES TO IMPROVE PERFORMANCE OF LI SCHEMES

After detail observation of various factors responsible for poor performance of LI schemes, remedial measures and their suitability are suggested below

4.1 Deterioration of Pipes

R.C.C. pipes laid below the ground level deteriorate with chemical and moisture effect. In order to remove the leakage these pipes along with collars are to be replaced. This is time consuming and expensive also due to huge quantity of excavation. The transportation of material and machinery for such repairs is difficult and expensive due to standing crop and wet soil. The approaches are rather inaccessible. Considering these constraints it would be better to replace RCC pipes by PVC pipes. These PVC pipes are chemically inert and ease to transport, handle and repair.

Whenever designed diameter is more than 300 mm and required head is above 50 m, it would be better to use pre stressed pipes with prior planning. Pre stressed pipes proves to be economical in such conditions.

4.2 Distortion of Pipe Joints

RCC collar joints should be repaired with rich modified mortar using respective admixtures available in market. Chemical attack resistant and early setting time cement can be used.

Use of lead and wool joint to pre – stressed pipe leakages, MS step collars for RCC pipes depending upon site conditions are preferred. Anti – corrosive paint must be applied to MS components used in the scheme.

4.3 Wear and Tear of Machinery

Loss due to wear and tear could be reduced by the regular observations, periodical checking and maintenance. The maintenance and overhauling is to be executed through the skilled agency.

4.4 Violation of Cropping Pattern

If change in cropping pattern is essential, the changes must be made in planned manner considering duty, delta and base period of crops. If water allocation to a specific crop is increased, it has to be compensated by reducing requirement of another crop. For example 20 % + 40 % + 40 % permitted pattern can be revised by plantation of Sugar Cane up to 40 % from 20 %. Other cash crops like Tobacco, Banana and Vegetables are entertained.

4.5 Improper Management

List of claim for watering is intimated to the farmers and pasted on the office notice board. This must be mandatory on Patkari (employees) and farmers. Strict steps and immediate action towards the wastage of water and water theft are necessary. This can be done through written notice and penalty in the form of money.

Monetary savings in possible areas, yearly audit, provision of sinking fund etc. leads the LI Scheme to integrate the financial level. The training programs to operating staff is to made compulsory to increase the management level.

4.6 Obsolescence

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Wherever possible old machinery must be replaced by modern machinery as these are easy to handle and reduces required minimum manpower and energy. System control switches are to be used.

4.7 Focus on Areas for Special Repairs

Wherever possible the poor areas to integrate themselves are found out eg. Reduction in the static head by lowering down the invert level of rising main as in the case of ‘Ambap – Talsande LI Scheme’. This helps to reduce the head loss and to increase the discharge Fig 9 and Fig. 10.



Fig 9 and Fig 10 Lowering Down of Invert Level of Existing Psc Raising Main and Installation of the same

5. A CASE STUDY

- Nimshirgaon Parisar Upsa Jal Sinchan Yojana - 1984 established by Panchanganga Sugar Factory
- Command area - **10000 Acres** ,
- Cultivable land - **4000 Acres**.
- Number of beneficiaries - **758 Farmers**.
- Villages covered- **06** (Nimshirgaon, Kondgre, Tardal, Chipri, Jainapur and Tamdalage of Kolhapur district)
- Actual Cost of Project- **Rs.325 Lakhs**.
- Farmers Contribution - **Rs.10 lakhs** in the form of ‘Lok Vargani’.
- Borrowings - **Rs.264 lakhs** (District Land Development Bank).
- Contribution from Factory - **Rs. 51 lakh**.
- Rising main of length- **8000 m** in six stages.
- Distribution system length - **28000 m**.
- Designed with **16 hours** pumping.
- Sugar factory operated the scheme from **1984 to 2008**.
- In the year **2008** the scheme became sick and was not operating for full time the same condition was continued up to **2011**.
- Main reasons for the sick condition of project :
 - **Curtailment** of electric supply to 8 hours from 16 hours from MSEB.
 - Reduction in sugarcane plantation area due to **insufficient water supply**.
 - Lack of **financial support** from sugar factory.
 - **Improper coordination** from various personnel in operation the scheme.
 - Uncontrolled **water theft and wastage**.

- i. Curtailment of electric supply to 8 hours from 16 hours from MSEB.
- ii. Reduction in sugarcane plantation area due to insufficient water supply.
- iii. Lack of financial support from sugar factory
- iv. Improper coordination from various personnel in operation the scheme
- v. Uncontrolled water theft and wastage of water

Because of huge financial loss, the scheme was handed over to farmers by forming independent society in the year 2011 in order to restructure it. Society initiated the restructuring programme by taking support from government agencies. The high lights of restructuring programme are as below,

1) Total outstandings loan	Rs.1800 Lakhs
2) Debt waiver relief scheme by Govt. of India in 2007.	Rs.900 Lakhs
3) Balance outstanding loan	Rs.900 Lakhs
4) One time settlement scheme by District Co – Op. Agricultural & Rural Multipurpose Development Bank Ltd., Kolhapur.	Rs.396 Lakhs
5) Debt Waiver Relief Covering Scheme for interest reduction from 10 % to 6 %	Rs.77 Lakhs
6) Net amount reimbursed to District Co – Op. Agricultural & Rural Multipurpose	Rs.292 Lakhs

Details of operating cost required for the project are,

a) MSEB charges	Rs. 25 Lakhs
b) Staff payment	Rs. 15 Lakhs
c) Maintenance	Rs. 15 Lakhs
d) Dues installment	Rs.30 Lakhs
e) Miscellaneous	Rs. 5 lakhs

This required amount of Rs.90 lakhs was collected from the farmers in the form revenue at the rate of Rs.15,000 per acre.

Apart from above financial measures steps were taken to check the water theft and wastage through leakages. However author observed following points during his visit to the project,

- i. Existing Motor Pumps are in operating condition but are obsolete.
- ii. Pump House buildings at every stage requires special repairs.
- iii. Main delivery and other chambers are to be renovated.
- iv. More control valves are necessary for proper distribution of water.
- v. Desilting of Jack well and Delivery Chambers is very important.

6. CONCLUSIONS

LI Schemes has to take the prominent efforts to enhance the performance in both technical and financial aspects as follows,

- 6.1 There should not be wastage of water and leakages. If these are found should be attended and sealed immediately.
- 6.2 Reach mortar mix, use of admixtures and chemical resistant cement, make the joints stronger, water tight prolonging deterioration period.
- 6.3 To eliminate the manual error system controlled switches are to be installed.
- 6.4 Proper communication is required among the stake holders.
- 6.5 Efficient coordination between operators, Patkari persons, farmers and office management is essential.
- 6.6 Financial management emphasized by day to day accounting and book keeping, material purchasing with competitive rates and monetary saving wherever possible.
- 6.7 100 % revenue recovery is must.
- 6.8 Adoption of Latest Technology.

Consolidated effect of above factors will lead the existing LI Scheme in strong condition from technical and financial aspects by mitigating the problems faced.

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