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# Lining Project Viability and Economic Reliability through N.P.V

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***Abstract:***
*The purpose of this study is to produce a comparative study between Tile lining or Cement concrete lining work. This study reveals how irrigation canals lining project viability and economic reliability through Net present value. Comparative study between Tile lining or Cement concrete lining work depend on hole life return against initial investment. lining should be supported with water conservation, lower operation and maintenance, structural safety, long life, and improve duty and crop or benefit of cost returns .*

***Keyword:*** *lining, crops , efficiency of water, delta and duty, CCA , NPV.*

## I. Introduction

Irrigation planning either in an individual project or in a basin as a whole should take into account The irritability of land, cost-effective irrigation options possible from all available sources of water and Appropriate irrigation techniques for optimizing water use efficiency. Irrigation intensity should be such as to extend the benefits of irrigation to as large a number of farm families as possible, keeping in view the need to maximize production. Water allocation in an irrigation system should be done with due regard to equity and social justice. Disparities in the availability of water between head-reach and tail-end farms and between large and small farms should be obviated by adoption of a rotational water distribution system and supply of water on a volumetric basis subject to certain ceilings and rational pricing. Concerted efforts should be made to ensure that the irrigation potential created is fully utilized. For this purpose, the command area development approach should be adopted in all irrigation projects. Irrigation being the largest consumer of fresh water, the aim should be to get optimal productivity per unit of water. It should be adopted wherever feasible. Reclamation of water logged / saline affected land by scientific and cost-effective methods should form a part of command area development. Major irrigation projects: Projects which have a cultivable command area (CCA) of more than 10,000 ha hut more than 2,000 ha utilize mostly surface water resources. Medium irrigation projects: Projects which have CCA less than 10,000 ha. But more than 2,000 ha utilizes mostly surface water resources. Minor irrigation projects: Projects with CCA less than or equal to 2,000 ha. Utilizes both ground water and local surface water resources.

The efficiency of the conveyance and distribution system, that is the transport of water at minimum cost and with minimum water loss, essentially affects the total economy of an irrigation project. Seepage losses may be and have been satisfactorily reduced through the installation of relatively impervious linings or by special treatment of canal sections. Determination of the need of lining should be based on an analysis of benefit such as water conservation, reduced water logging of lower drainage requirements, reduced excavation and right of way cost, lower operation and maintenance costs and structural safety .It is very important to store, transport and use the available water without under loss through evaporation or leakage. Lining irrigation canals to prevent seepage losses, which average 40 percent of the water transported in unlined canals, is justified on a purely economic basis [1]. Therefore the loss of this valuable water cannot be tolerated. Lining of an irrigation canal is justified economically when its cost can be repaid in terms of Benefits derived during the life of the lining. Some of the most important tangible benefits resulting from lining irrigation canals those that can be evaluated with some accuracy are saving of water that would otherwise be lost though seepage, reclamation of water logged lands, lower maintenance and economies of canal lining operation cost, and right of way requirements, etc. Some additional benefits from lining canals, such as prevention of bank erosion and better control and more uniform distribution of water, are difficult to evaluate from a monetary standpoint, but should be given consideration when the value of lining is being appraised.

The importance of including canal lining (or provision for future lining) in the original Construction plans and designs of an irrigation project, provided studies have demonstrated its economic feasibility, It is only during the planning and designing stages that full advantage can be taken of the many benefits of the installation of a canal lining. When lining is included in the original plans and designs, the cost of the lining might be justified in consideration of reduced storage and diversion requirements, smaller canal sections, smaller and possibly fewer canal structures, reduction of pumping costs where pumping is necessary, and a possible reduction in the right-of-way requirements. Seepage losses from canals and laterals represent a loss to the intended user not only of value able irrigation water, but also a considerable loss in the costs of additional construction from which no return is received on the investment. Storage reservoirs and dams must be constructed of sufficient size to impound not only the useful water but also the water that will be diverted in transit by seepage from the canals. Reduction of the loss of water from a canal may be economically important when the water supply available at the head of the canal is limited or when all of the water has to be pumped. Since the amount of leakage and the unit value of the lost water are of primary importance, a measurement estimate of the amount of leakage must be made before the need for lining can be definitely as certainness. The cost of constructing, operating, and maintaining a large or lengthy drainage system for the sole purpose of The lining, therefore, determines some of the factors which may be considered in the economic analysis. One of the largest items of recurring maintenance costs on many canal systems is weed control and the removal of weeds and water-loving plants from the canal section.

It is possible to obtain rather accurately the construction cost of a canal lining. The annual savings or benefits to be derived from lining, however, are more difficult to evaluate and must include an estimate of the difference in annual maintenance cost between a lined and an unlined canal. Unfortunately, maintenance cost data frequently are inconclusive and incomplete so far as being explicit as to just what the costs include. On water-user-operated projects (including most projects constructed by the Bureau), time and personnel are seldom available for making a careful breakdown of individual maintenance cost items. The costs may be for lining repair only, or they may include the cost of cleaning silt, sand, and other debris from the canal perimeter, etc. Separation of costs for these various maintenance activities is difficult, from most records received. Good maintenance cost data should include the expense necessary to keep the channels in the condition they were in when transferred from a construction to an operation and maintenance status.. Weed control expense should preferably include only that expense incurred for control of aquatic and land type weeds", the canal or lateral prism. However, it is difficult to segregate the cost for control of land type weeds on right-of-way, roads, and outside banks, the total cost for land type weeds is usually included in the maintenance data. This latter cost, although common to all lined or unlined canals, may vary considerably because of seepage through the banks of unlined or ineffectively lined canals, which may stimulate the growth of weeds outside of the canal prism.
Net present value is used for evaluating investment proposals that accounts the time value of money in calculating the return on investment .as per project planning and management by R.R.Hermon.
Steps for calculating NPV:

- Set a rate of interest (discount rate) or the required rate of return. This is generally the prevailing rate of interest on long-term loans or it is the opportunity cost of capital of the investor.
- Compute the present value of the total investment outlay
- Compute the present value of the total cash inflows
- Calculate the NPV of each project
- If NPV is greater than or equal to zero, project can be accepted. To select from multiple mutually exclusive projects, the project with the highest positive NPV is considered.
  Following are the calculations:

$$\text{NPV} = \frac{Ct}{(1+R)^t}$$

Where, NPV = Net Present Value $C_t$ is the Cash flow at time period t and t varies from 1 to T
R is the discount rate and $C_0$ is the initial investment or outflow
Criteria for project selection:

- NPV is $\geq 0$
- For multiple projects, choose one with highest positive NPV

## II. Case study

Datia is the district of M.P. forming eastern part of Gwalior Commissionery. It's surrounded by the portion of Shivpuri district and bordering Jhansi district of U.P. The main body of the district extends between the N-

latitude $25^0$, 28' and $26^0$, 20' and E-Longitude $78^0$, 10 and $78^0$, 45'. The Datia district forms a part of Bundelkhand region covering an area 2959 Sq.km

The district is divided into three tehsils and three blocks of the same name i.e., Datia, Seondh and Bhander. The district is predominantly a rural district there are 4 towns and 583 villages. The district includes three tehsils and three blocks. The total population of the district of as per 2001 census is 628240. The total area of the district shown that development of agricultural activities in the district and also represents the potential of cultivation of the area. The area under different land use and their percentage to the reported area of the district is given in table -1.

The year divided in to four Seasons. Cold season, December to February is followed by hot season. From March to about first week of June is the summer season. May is the hottest month of the year with temperature of 42.10 C. The coldest days during the month of January. The average normal annual wind velocity of Datia district is 6.8 km/hr. The Datia district soil property is alluvial soil, this soil is loamy and fertile. Admixture of sand, in varying proportions And of various sizes of grains produces a number of soil types. The Datia district mostly areas is flat with very poor drainage density where feasibility of percolation tanks is almost remote. In this area where phreatic aquifer has gone dried up and the clay bed do not allow to percolate the water in deeper recharge. Feasibility of project it is very important for any kind of project .project feasibility or exception of project depend on that net value profit in whole life. In long term projects holistic approach N.P.V. is best calculation. In this project thesis shown long term planning and returns, that's by we go for Net Present Value of this project. Net Present Value (N.P.V.) Net present value is a best way to evaluating investment. Time value money is calculating the return on investment. In Datia irrigation canal have two investment ways to find the best result and economics.

In this thesis study project type -1 are tile lining and type -2 are C.C. lining project and project -3 earthen lining represent in table :-

**Table. 6.1 Project initial data**

| | **Project -1** | **Project -2** | **Project -3** |
|---|---|---|---|
| Initial investment | 17927297 | 19111039.75 | 7615965 |
| Estimated life | 50 | 30 | 5 |
| Scrape value | 4481824.25 | 2866655.96 | - |

**Present value calculation for project type -1**

| **Year** | **Cash flow ( per hat)** | **Present value of Re.1@4% using present value tables** | **Present value of cash flow** |
|---|---|---|---|
| | | | **PV=FV/(1+I)^n** |
| 1 | 844503.24 | 1.04 | 812022.3462 |
| 2 | 844503.24 | 1.0816 | 780790.7175 |
| 3 | 844503.24 | 1.124864 | 750760.3052 |
| 4 | 844503.24 | 1.16985856 | 721884.9089 |
| 5 | 844503.24 | 1.216652902 | 694120.1047 |
| 6 | 844503.24 | 1.265319018 | 667423.1776 |
| 7 | 844503.24 | 1.315931779 | 641753.0554 |
| 8 | 844503.24 | 1.36856905 | 617070.2456 |
| 9 | 844503.24 | 1.423311812 | 593336.7746 |
| 10 | 844503.24 | 1.480244285 | 570516.1294 |
| 11 | 844503.24 | 1.539454056 | 548573.2013 |
| 12 | 844503.24 | 1.601032219 | 527474.2321 |
| 13 | 844503.24 | 1.665073507 | 507186.7616 |
| 14 | 844503.24 | 1.731676448 | 487679.5785 |
| 15 | 844503.24 | 1.800943506 | 468922.6716 |
| 16 | 844503.24 | 1.872981246 | 450887.1842 |
| 17 | 844503.24 | 1.947900496 | 433545.3695 |
| 18 | 844503.24 | 2.025816515 | 416870.5475 |
| 19 | 844503.24 | 2.106849176 | 400837.065 |
| 20 | 844503.24 | 2.191123143 | 385420.2548 |
| 21 | 844503.24 | 2.278768069 | 370596.3988 |
| 22 | 844503.24 | 2.369918792 | 356342.6912 |
| 23 | 844503.24 | 2.464715543 | 342637.203 |
| 24 | 844503.24 | 2.563304165 | 329458.8491 |

| | | | |
|---|---|---|---|
| 25 | 844503.24 | 2.665836331 | 316787.3549 |
| 26 | 844503.24 | 2.772469785 | 304603.2258 |
| 27 | 844503.24 | 2.883368576 | 292887.7172 |
| 28 | 844503.24 | 2.998703319 | 281622.805 |
| 29 | 844503.24 | 3.118651452 | 270791.1586 |
| 30 | 844503.24 | 3.24339751 | 260376.1141 |
| 31 | 844503.24 | 3.37313341 | 250361.6481 |
| 32 | 844503.24 | 3.508058747 | 240732.354 |
| 33 | 844503.24 | 3.648381097 | 231473.4173 |
| 34 | 844503.24 | 3.794316341 | 222570.5935 |
| 35 | 844503.24 | 3.946088994 | 214010.1861 |
| 36 | 844503.24 | 4.103932554 | 205779.0251 |
| 37 | 844503.24 | 4.268089856 | 197864.4472 |
| 38 | 844503.24 | 4.43881345 | 190254.2762 |
| 39 | 844503.24 | 4.616365988 | 182936.804 |
| 40 | 844503.24 | 4.801020628 | 175900.7731 |
| 41 | 844503.24 | 4.993061453 | 169135.3587 |
| 42 | 844503.24 | 5.192783911 | 162630.1526 |
| 43 | 844503.24 | 5.400495268 | 156375.1468 |
| 44 | 844503.24 | 5.616515078 | 150360.718 |
| 45 | 844503.24 | 5.841175681 | 144577.6135 |
| 46 | 844503.24 | 6.074822709 | 139016.936 |
| 47 | 844503.24 | 6.317815617 | 133670.1308 |
| 48 | 844503.24 | 6.570528242 | 128528.9719 |
| 49 | 844503.24 | 6.833349371 | 123585.5499 |
| 50 | 844503.24 | 7.106683346 | 118832.2596 |
| Scrap | 4481824.25 | 7.106683346 | 630649.2117 |
| | | | |
| | | total present value | 18772423.72 |
| | | less present value of initial investment | 17927297 |
| | | Net present value | 845126.72 |

**Table. 6.3 Present value calculation for project type -2**

| Year | Cash flow ( per hat 434.34) | Present value of Re.1@4% using present value tables | Present value of cash flow PV=FV/(1+I)^n |
|---|---|---|---|
| 1 | 844503.24 | 1.04 | 812022.3462 |
| 2 | 844503.24 | 1.0816 | 780790.7175 |
| 3 | 844503.24 | 1.124864 | 750760.3052 |
| 4 | 844503.24 | 1.16985856 | 721884.9089 |
| 5 | 844503.24 | 1.216652902 | 694120.1047 |
| 6 | 844503.24 | 1.265319018 | 667423.1776 |
| 7 | 844503.24 | 1.315931779 | 641753.0554 |
| 8 | 844503.24 | 1.36856905 | 617070.2456 |
| 9 | 844503.24 | 1.423311812 | 593336.7746 |
| 10 | 844503.24 | 1.480244285 | 570516.1294 |
| 11 | 844503.24 | 1.539454056 | 548573.2013 |
| 12 | 844503.24 | 1.601032219 | 527474.2321 |
| 13 | 844503.24 | 1.665073507 | 507186.7616 |
| 14 | 844503.24 | 1.731676448 | 487679.5785 |
| 15 | 844503.24 | 1.800943506 | 468922.6716 |
| 16 | 844503.24 | 1.872981246 | 450887.1842 |
| 17 | 844503.24 | 1.947900496 | 433545.3695 |
| 18 | 844503.24 | 2.025816515 | 416870.5475 |
| 19 | 844503.24 | 2.106849176 | 400837.065 |
| 20 | 844503.24 | 2.191123143 | 385420.2548 |
| 21 | 844503.24 | 2.278768069 | 370596.3988 |
| 22 | 844503.24 | 2.369918792 | 356342.6912 |
| 23 | 844503.24 | 2.464715543 | 342637.203 |
| 24 | 844503.24 | 2.563304165 | 329458.8491 |
| 25 | 844503.24 | 2.665836331 | 316787.3549 |
| 26 | 844503.24 | 2.772469785 | 304603.2258 |
| 27 | 844503.24 | 2.883368576 | 292887.7172 |
| 28 | 844503.24 | 2.998703319 | 281622.805 |

| | | | |
|---|---|---|---|
| 29 | 844503.24 | 3.118651452 | 270791.1586 |
| 30 | 844503.24 | 3.24339751 | 260376.1141 |
| Scrap | 2866655.963 | 3.24339751 | 883843.5481 |
| | | total present value | 15487021.7 |
| | | less present value of initial investment | 19111039.75 |
| | | Net present value | -3624018.05 |

**Table. 6.3 Present value calculation for project type -3**

| Year | Cash flow ( per hat) | Present value of Re.1@4% using present value tables | Present value of cash flow PV=FV/(1+I)^n |
|---|---|---|---|
| 1 | 844503.24 | 1.04 | 812022.3462 |
| 2 | 844503.24 | 1.0816 | 780790.7175 |
| 3 | 844503.24 | 1.124864 | 750760.3052 |
| 4 | 844503.24 | 1.16985856 | 721884.9089 |
| 5 | 844503.24 | 1.216652902 | 694120.1047 |
| | | total present value | 3759578.382 |
| | | less present value of initial investment | 7615965.00 |
| | | Net present value | -3856386.6 |

Hence we know that……..

NPV is > 0

For multiple projects, choose one with highest positive NPV

Project type -1 is positive NPV and Project type-2 &3 is negative NPV. So project type -2 is better than project-1. Cement concrete lining providing batted result in whole life calculation.

## III. Conclusion

Planning and management of water resource and its optimal, economical and equitable use has become a matter of the utmost urgency. In this. According to analysis of thesis topic "**Efficiency of Canal & Lining preference" In** Indian scenario and resultant of the study shows that we can save the water and evolve canals lining. Cement concrete lining providing batted result in whole life calculation.

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