Notes by-

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Lift Irrigation →

water-supply is at too low level to run by gravitation on to the land. In such circumstances water is lifted up by mechanical means.
The well irrigation is best example of lift irrigation system. In some cases the irrigation water may also be required to be lifted up from a canal or any other source of water when level of water is lower than that of land to be irrigated.

#1) Well/Tubewell irrigation:-

In well irrigation from well sub-soil water is lifted up to the surface & is then conveyed (used) to the agricultural fields.

Comparison between tube well & Canal irrigation →

Tube well irrigation	Canal irrigation
1. Lowers water table	Raises water table
2. Independent source of irrigation, supplies can be drawn whenever needed.	Dependent on the supplies in the canals & that too in turn on rain water.
3. Entire system need not be constructed in one single stage Wells can be sunk (dug) as irrigation develops.	Entire system of dam, headworks, canal system need to be constructed before yield can be expected.
4. Silt-free water devoid of manure value.	Silt in canal water has manure value.
5. Supplies assured & fairly constant.	Supplies fluctuating & in rotation.
6. Volumetric assessment possible, resulting in optimum utilisation of water	Volumetric assessment not in vouge as yet.
7. Low water losses since the channels are of shorter lengths & normally lined.	High losses in transit.
8. Difficulty in maintainence, repair & replacement of mechanical & electrical parts	Canal department maintains supply & collective responsibility to maintain watercourse.

10.	Limited supplies since discharges is restricted.	Supplies commensurate with area.
11.	High initial cost & subsequent running expenses.	Cheapest source of irrigation.
12.	Life of tube well limited	Canal system once constructed is a permanent source.
13.	Reduction in yield by progressive deterioration.	Improvement in supplies, as absorption losses go down with constant running of canal.
14.	Construction of bridges, cross-drainage works & head regulation etc. is not needed.	Construction of storage dam, head regulators & hydraulic structures on canal system is invitable.
15.	Possibilities of break downs are there	Breaches, cuts, weed & aquatic growth are one of the problem of canal system.
16.	Isolated land can be irrigated	Isolated lands can not be irrigated.

* Suitability of area of tube well irrigation —

Tube wells are necessary in areas with.

1. low ground waters, where open wells are not feasible.
2. Deficient Rainfall.
3. Inadequate flow in the rivers in the post monsoon period.
4. Necessity of irrigation to raise cash crops.

* Site location of a tube well —

The following factors determine the site for location of a tube well.

1. Highest point in the chak to provide good command for the whole area of chak.
2. It should be centrally located.
3. It should be so located that no structure falls within its radius of influence.
4. Good aquifer, full of ground water storage should be available.
5. The site should not be near to a canal or another tube well.

Types of tube-Wells :-

1. Strainer tube-wells.
2. Cavity tube walls.
3. Slotted tube wells
4. Artesian tube wells or flowing tube wells; &
5. Tube-wells in hard rock formation with fissures.

Component of tubewell irrigation :-

1. Motor :- It imparts energy to the pump for operation.
2. Pump :- It is device installed to lift the water. When pump works, it creates a strong vacuum head under which water from various water bearing strata rushes with a great velocity through the strainer into the tube well pipe & moves up this pipe into delivery pipe.
3. Delivery pipe :- Delivery pipe from the pump delivers the water in a water course which in turn carries water to the field.
4. Tube well pipe :- It is the water conductor pipe conveying water from the underground reservoir to the pump for lifting. plain pipe is put in impermeable strata & strainer pipe throughout the depth of each permeable strata to allow sand-free water to enter into the well freely & to support the loose formation material.
5. Strainer pipe :- It is a perforated pipe with openings so designed that only water is admitted with the least possible friction into the tube well.
6. Blind or blank pipe :- It covers impervious layers of the formations
7. Well casing :- The casing pipe supports the hole during drilling or installed afterwards to complete the well assembly.
8. Housing pipe :- This pipe is necessary for housing the pump or its suction pipe.
9. Depth Gauge :- Instrument for indicating water level It may be direct or indirect reading type.

(12) Lift Canal Irrigation —:.

Lift canal irrigation means lifting of water from its normal flow level to irrigate lands at higher elevation to which water can not be brought by gravity flow.

The lift or static head is determined only by cost consideration & not by mechanical or power consideration.

Design Consideration —:.

Along with design criteria for lined & unlined canal following spec consideration are apply to lift canals.

1. In general lift canals are lined to economise in adsorption losses also to permit adoption of flatter water surface slopes, because steeper the slope higher shall be the lift & greater pumping cost.
2. Lacey's silt factor 'f'- The value of Lacey's 'f' is kept lower than th adopted in the existing channel from where the water is to be lifted because lift canal in general recarries the silt in suspension in th pumped water, Because of lined section, it cannot pick up silt.

Component of lift canal irrigation —:.

Pumps —:. Types of pumps used for lifting water
1) Centrifugal 2) Reciprocating & 3) Vertical turbine

Selection of pumps —:.

The various consideration governing the selection of type, size & number Pumping unit are as under.

1. Total head
2. Maximum authorised discharged to be lifted.
3. Pump speed.
4. Permissible total suction lift.
5. Monthly demand pattern or capacity factors of the canal.
6. Intake & discharge water surface elevation.
7. Power costs
8. Maximum temp^{r} sediment content & chemical quality of water.

Electric motor →:

The pump is powered by electric motor. Double circuit is necessarily provided so that if circuit fails the other circuit is there to fall back upon. Depending on the standards of current of the electricity authority concerned & characteristic starting torques, slipring motors are adopted for large size instead of squirred cage.

Pumping station →:

The layout of pumping station includes the approach channel or conduits pumps & valves, the discharges line & exit channel.

Operation of pumping station is dependent on suitable inlet conditions & layout of sump pits.

Economics

Discharge measurment →:

A meter flume is provided in the canal suitably removed from the pump station to measure discharge corresponding to gauge depth. The measurment of pump output is obtained by the application of efficiency obtained from shop motor test results to pump input in field.

Intake well →:

It is a well constructed in the bed of the river at a suitable site to tap the water. It should have its upper portion construted above the minimum water level; expected at any times & the bottom portion embedded well below the bed of the river.

Intake pipe line →:

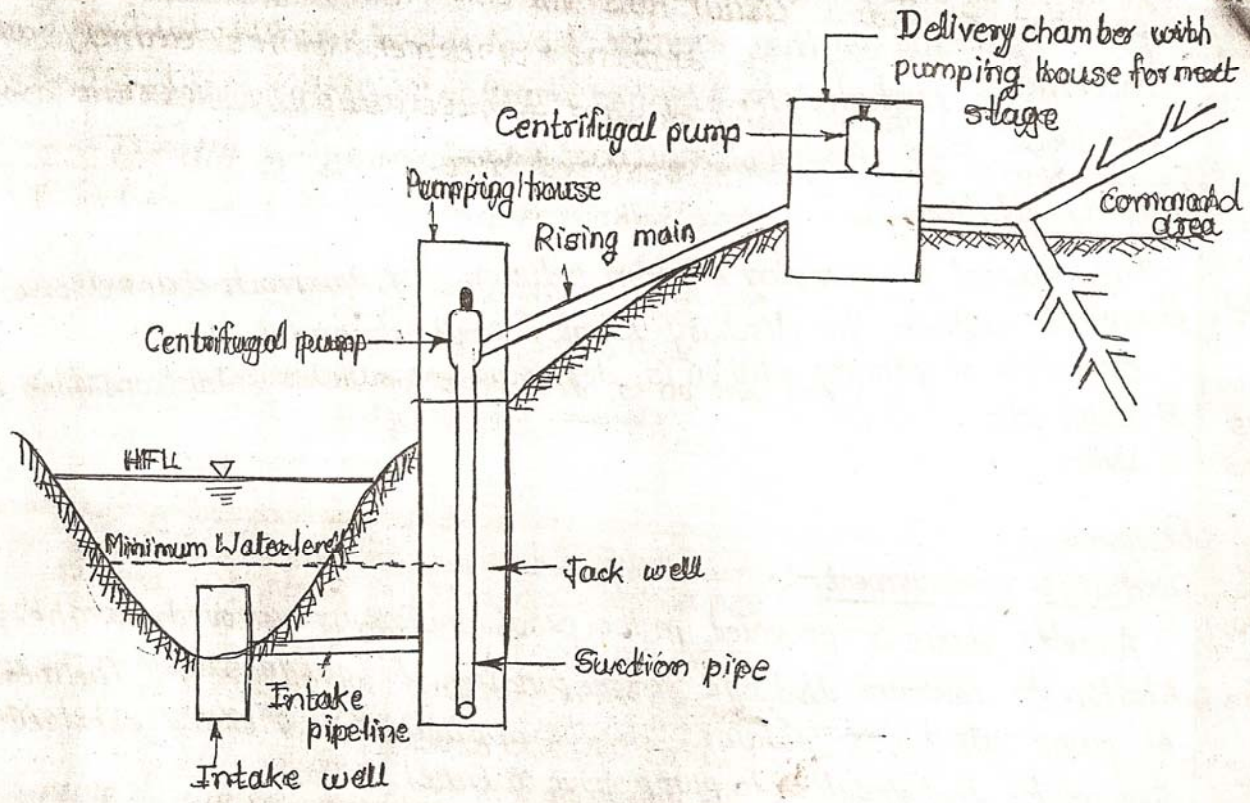
The purpose of intake pipe is to convey the water collected into the intake well to the jack well which is constructed to lift the water to the rising main.

Jack well →:

The water from the intake well is carried to the jack well.

Distribution system →:

The water may be conveyed to the command area either by irrigation canals or by suitable underground distribution system depending upon the site conditions etc.



SECTION OF A SCHEMATIC DIAGRAM OF LIFT IRR^{n}

WARABANDI ***

INTRODUCTION :- In term Warabandi Wara means 'turn' & bandi means fixation. It is a type of distribution system. It is the rotation of water supply according to fix schedule.

DEFINATION :- It is a distribution system whose main objective is obtain high efficiency of water by supply of water on specified days between fixed time interval.

PRINCIPLES INVOLVED :- The specification of the day & time involved when a farmer will receive water and duration of water supply determined on the basis of the size of land holding in the outlet command.

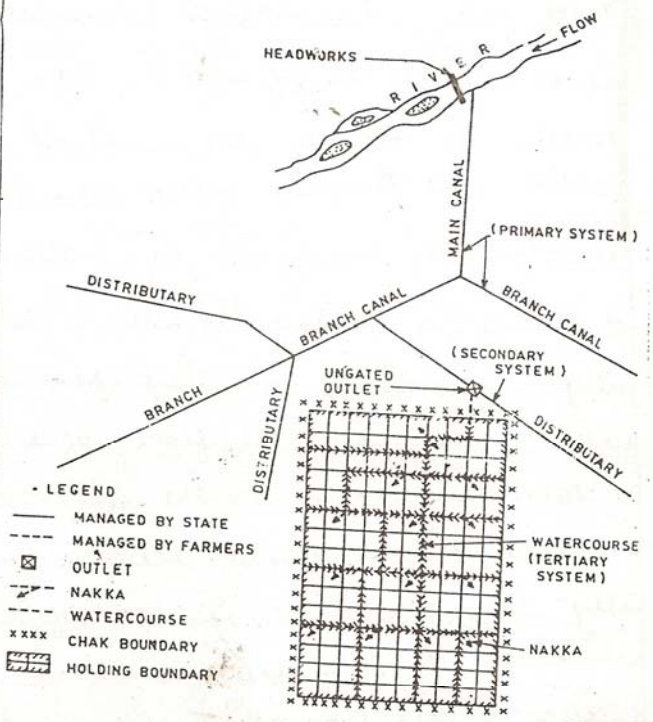


Fig. 5.10 Typical *Warabandi* Distribution system (4)

SIGNIFICANCE :- are as follows :-

Equity :- everybody utilited to recive water in the proportion.

Dependability :- The farmer is inform in advance about the time when he can withdraw water.

Adequacy :- water is supplied according to crop duties & standards by specialists.

Coverage :- The total area to be irrigated is specified & fulfilled.

Discipline :- One turns on time and the water supply is adequate there is no need to intrude on others rights.

Common destiny :- Here every body interest are bound this is a common interest in preserving the system &

(vii) ECONOMY :- since the time period when water is available is fixed farmers get encourage to economise water by irrigating as much area as they can.

***LIMITATIONS :-** are as follows :-

(i) Technical :- The canal design & existing canal capabilities and control structure upto outlet are not suitable to supply water in a adequate quantity at the required time.

(ii) Administrative :- There is a penalty for using water to irigate an additional area within the time allocated. This effect need for water is subjected to penalty.

(iii) Social :- The bigger farmers are those located at the head reach who get more