

having water requirement is less.

6.) Type of a soil

- In a high permeable (sandy) soil like sandy soil the percolation losses are more so, its duty will be less than the clay soil.

7.) Canal Condition

- An unlined canal results low duty (D) due to seepage & percolation losses whereas the lined canal results high duty because there will be no losses of such kind.

8.) Quality of water

- For the purpose of leaching in saline & alkaline soil, the requirement of water is high so duty (D) will be less.

- Due to presence of such kind of salt reduce the volume of water hence the duty will be reduced.

9.) Useful rainfall

- In case of effective rainfall, the requirement of crops by irrigation must be reduced therefore duty (D) will be increased.

* Discussed about to improve the duty of field & Canals

or

How to improve the duty of field & Canals

or

Enlist about to increase/improve the duty

Following different steps are listed below to improve the duty

- Use of suitable method to apply the water
- The land should be properly levelled.
- By frequently cultivation of land which reduce the evaporation losses due to capillary rise when the ground water is nearly to the root zone.
- The Canals must be lined which reduce the ~~evap~~ percolation (seepage) losses
- The Parallel Canals must be constructed
- The Canal must be straight which reduce the length of Canals & therefore evaporation losses
- The cultivated/culturable area must be nearest as possible as
- The crop rotation must be practiced
- The farmers must be aware to use of water by training them so they can use proper amount of water rather than wastage of water.
- Research stations must be established in various locations
- The Canal administrative staff should be efficient, responsible & honest.

Definitions

* Gross Command area (G.C.A.)

- It is the total area bounded within boundary by a irrigation project

- It includes culturable & un-culturable areas like Roads, ponds, residential areas, farm etc

* Culturable / cultivable Command area (C.C.A.)

- It is the area which is cultivated from/of gross Command area

- In other words, the area on which crops can be grown satisfactory is called culturable / cultivable Command area (C.C.A.)

$$C.C.A. = G.C.A. - \text{Uncultivated area}$$

or

$$G.C.A. = C.C.A. + \text{Uncultivated area}$$

- It is further divided into

1.) Culturable / cultivable Cultivated area

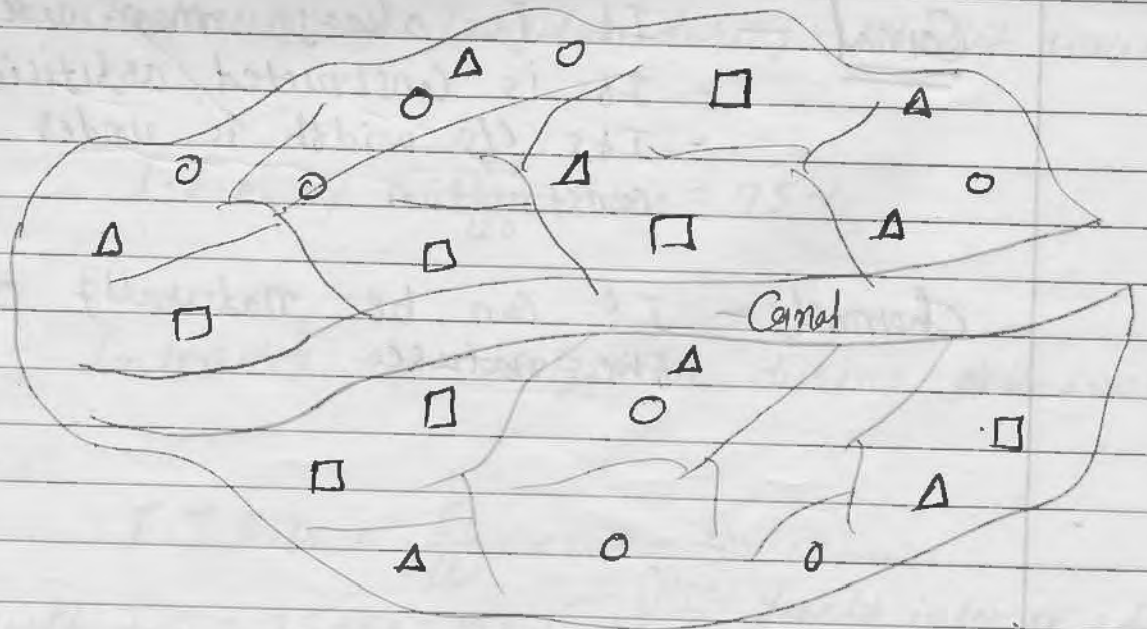
- The area in which crop is grown in particular season / time

2.) Culturable / cultivable un-cultivated area

- The area in which crop is not grow in a particular season (Pasture land is an example)

C.C.A. is assumed to be equal to 80% of G.C.A.

possible dangers of water-logging



Total Gross Area Represented by —

Let

$$G.C.A. = 2000 \text{ ha}$$

Uncultivated area represented by $O + \Delta + \square$

O - Pasture

Δ - Farmstead & farm

\square - Residential area

Let it will be = 50 ha

So,

$$\text{Culturable Command Area (C.C.A.)} = G.C.A. - \text{Uncultivated area}$$

$$= 2000 - 50 \text{ ha}$$

$$C.C.A. = 1950 \text{ ha}$$

Note

- Canal — It is always man-made
- It is constructed artificially
 - Its C/S width is under practical construction

Channel — It can be naturally exist in the nature.

* Intensity of irrigation (I.I.)

- The percentage of C.C.A. (Culturable Command Area) to be irrigated in a given season is called intensity of irrigation

$$I.I. = \frac{\text{Cultivated Part on which crop grows}}{\text{Total Cultivated Part}}$$

Let,

Total C.C.A. is 120 ha out of which 90 ha cultivated in Kharif & 60 ha cultivated in rabi season.

$$I.I. \text{ Kharif} = \frac{90}{120} \times 100 = 75\%$$

$$I.I. \text{ rabi} = \frac{60}{120} \times 100 = 50\%$$

$$\text{Yearly intensity} = 75 + 50 = 120\%$$

Also -----

$$I.I. = \frac{C.C.A.}{C.C.A.}$$

* Outlet factor

- The duty at the head of water-course or at the outlet point of minor is called the outlet factor (see-figure of canal network) → सभी क्षेत्रों में सरकारें operate करें हैं Canal में outlet में outlet factor स्थिति है.

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Q.1
Q.1
(178)

The gross command area for a distributary is 6000 ha, 80% of which is culturable irrigable. The intensity of irrigation for Rabi season is 50% & that for Kharif season is 25%. If the average duty at the head of the distributary is 2000 ha/cumec for Rabi season & 900 ha/cumec for Kharif season, find out the discharge required at the head of the distributary from average demand considerations.

Solⁿ:-

Given data:

$$G.C.A. = 6000 \text{ ha}$$

$$C.C.A. = 80\% \text{ of } 6000 \text{ ha}$$

$$I.I. \text{ Rabi} = 50\%$$

$$I.I. \text{ Kharif} = 25\%$$

$$D_{\text{Rabi}} = 2000 \text{ ha/cumec}$$

$$D_{\text{Kharif}} = 900 \text{ ha/cumec}$$

$$Q = ?$$

Here,

$$C.C.A. = 80\% \text{ of } 6000 \text{ ha}$$

$$= \frac{80}{100} \times 6000$$

$$= 4800 \text{ ha}$$

- we know that

$$I.I. = \frac{\text{Irrigable area or Cultivated Part on which crop grown}}{\text{Total Cultivated Part}}$$

So,

$$I.I. \text{ Rabi} = \frac{\text{Irrigable area or Cultivated Part on which crop grown}}{C.C.A.}$$

$$\frac{50}{100} = \frac{\text{Cultivated Part on which crop grown}}{4800}$$

$$\text{Cultivated Part on which crop grown in Rabi season} = 0.5 \times 4800$$

Area to be irrigated in Rabi season

$$\text{Irrigable area} = 2400 \text{ ha}$$

Similarly,

$$\text{Area to be irrigated in Kharif Season} = I.I. \text{ Kharif} \times C.C.A.$$

$$\text{Irrigable area} = \frac{25}{100} \times 4800$$

$$= 1200 \text{ ha}$$

NOW,

$$\text{Discharge (cumec)} = \frac{\text{Duty Area (ha)}}{\text{Duty (ha/cumec)}}$$

So,

$$\begin{aligned} \text{Discharge required} &= \frac{2400 \text{ (ha)}}{2000 \text{ (ha/cumec)}} \\ \text{in Rabi season} & \\ \text{(Q Rabi)} & \\ &= 1.200 \text{ Cumec} \end{aligned}$$

∴

$$\begin{aligned} \text{Discharge required} &= \frac{1200}{900} = 1.33 \text{ Cumec} \\ \text{in Kharif season} & \\ \text{(Q Kharif)} & \end{aligned}$$

Here, maximum discharge required in Kharif season (1.33 Cumec) so, the head regulators must be sufficient to carry 1.33 Cumec discharge.

Ex-3.11Panamia
(65)

An irrigation canal has gross command area of 80,000 ha out of which 80% is culturable irrigable. The intensity of irrigation for Kharif & Rabi seasons are 30% & 60%, respectively. Find the discharge required at the head of the canal, if the duty at its head is 800 ha/cumec & 1700 ha/cumec for Kharif & Rabi seasons, respectively.

Hint.....

Self-Assignment

$$C.C.A = \frac{80}{100} \times 80,000$$

$$\text{Discharge} = \frac{\text{Area}}{\text{Duty}}$$

$$\text{Irrigable area} = I.I \times C.C.A$$