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3.12 A water course has culturable commanded area of 2600 ha, out of which the intensities of irrigation for perennial sugar-cane & rice crops are 20% & 40%, respectively. The duty for these crops at the head of water course are 750 ha/cumec & 1800 ha/cumec, respectively. Find the discharge required at the head of water-course, if the peak demand is 120% of the average requirement.

(35)

Soln:- Given data:

$$C.C.A. = 2600 \text{ ha}$$
$$I.I._{\text{sugar-cane}} = 20\% = 0.2$$
$$I.I._{\text{rice}} = 40\% = 0.4$$

$$D_{\text{sugar-cane}} = 750 \text{ ha/cumec}$$
$$D_{\text{rice}} = 1800 \text{ ha/cumec}$$
$$\text{peak} = 120\% = 1.2$$
$$Q_{\text{total}} = ?$$

- we know that

$$I.I. = \frac{\text{Cultivated part on which crop grown or culturable/cultivated irrigated area}}{\text{Total cultivated part or C.C.A}}$$

So,

$$I.I. = \frac{\text{cultivated irrigated area}}{C.C.A.}$$

&

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

For Sugar-Cane

Cultivated irrigated area = I. I. × C.C.A.

= 0.2 × 2600

= 520 ha

&

Discharge (Q) = $\frac{\text{Area (A)}}{\text{Duty (D)}}$

= $\frac{520}{750}$

= 0.694 Cumec
= 694 lps (lit/sec)

For Rice

Cultivated irrigated area = I.I. × C.C.A.
= 0.4 × 2600
= 1040 ha

&

Discharge (Q) = $\frac{\text{Area (A)}}{\text{~~Discharge~~ Duty (D)}}$ = $\frac{1040}{1800}$ = 0.578
= 578

But Q_{peak} = 120 % = 1.2

So,

~~Q_{total} = Q_{peak} * Max. discharge crop~~
~~= 1.2 × 694 =~~

$Q_{total} = 694 + 578 = 1272$ lps

But

$Q_{peak} = 120\% = 1.2$

So,

$Q_{actual} = 1.2 \times 1272 = 1526$ lps $= 1.526$ c

3.13 The left branch canal carrying a discharge of 20 cumec has culturable commanded area of 20,000 ha. The intensity of crop is 80% & the base period is 120 days. The right branch canal carrying discharge of 8 cumecs has culturable commanded area of 12,000 ha, intensity of irrigation of Rabi crop is 50% & the base period is 120-days. Compute the efficiencies of the two canal system.

Garg (65)

Soln. Given data:

Left Canal	Right Canal
Discharge (Q) = 20 cumec	Discharge (Q) = 8 cume
C.C.A. (A) = 20,000 ha	C.C.A. (A) = 12,000 ha
I.I. = 80% = 0.8	I.I. = 50% = 0.5
Base period (B) = 120-days	Base period (B) = 120-da

– we know that the duty (D) is more then it is good hence the canal which has high duty which is more efficient

Left Canal

Cultivated irrigated area = I.I. × C.C.A

= 0.8 × 20,000

= 16,000 ha

~~Here~~ &

$$\text{Duty (D)} = \frac{\text{Area}}{\text{Discharge}}$$

$$= \frac{16,000}{20}$$

= 800 ha/cumec

Right Canal

Cultivated irrigated area = I.I. × C.C.A.

= 0.5 × 12,000

= 6000 ha

&

$$\text{Duty (D)} = \frac{6000}{8} = 750 \text{ ha/cumec}$$

Here,

Duty of left Canal > Right Canal

So, Left Canal system is more efficient

Definitions

* Net sown area

- The area which is sown once in a year is called ~~sow~~ net sown area

* Gross sown area

(ઉપરાંત) surplus - The total area which are sown once in a ye ~~&~~ the area which are sown more than once in a year ~~is~~ are called gross sown area

Gross sown area = Net sown area + Area sown more than once in a year

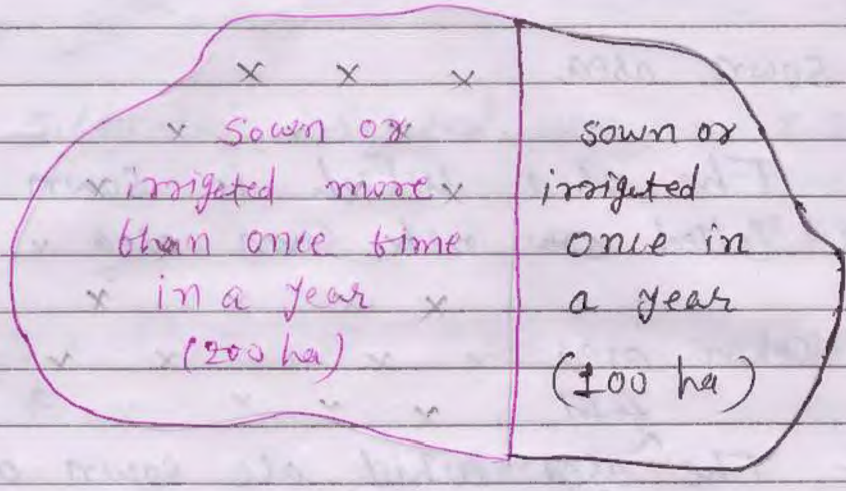
* Net irrigated area

- The area which are irrigated once a year is called net irrigated area

* Gross irrigated area

- The total area which are ~~sown~~ irrigated once a year surplus (ઉપરાંત) the area which are irrigated more than once in a year are called gross irrigated area

Gross irrigated area = Net irrigated area + Area irrigated more than once in a year



Net sown/irrigated area = 100 ha

Gross sown/irrigated area = 100 + 200 = 300 ha

* Cultivated irrigated area/ Area to be irrigated

– The area to be irrigated in any season or over any given year is called the cultivated irrigated area or area to be irrigated in that season or in that year

Cultivated irrigated area or Area to be irrigated = Irrigation Intensity × C.C.A

or

Irrigable area

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* Time factor

- Due to salinity & water-logging problem the distributary is not allowed to run/operate all days but its depends on design operator to how many days run the distributary

- It can be defined as the ratio of the actual operating period of a distributary to the crop period is called the time factor of the distributary

$$\text{Time factor} = \frac{\text{Distributary actually operated during base period}}{\text{Base period}}$$

Suppose, Three distributary operated 100-days for a base period of 120-days of rice

then time factor for rice

$$= \frac{100}{120} = 0.83$$

- Even if time factor is 0.9 & base period of maize is 120-days then,

$$\text{Actually operated time for distributary} = \text{Time factor} \times \text{Base period}$$

$$= 0.9 \times 120$$

$$= 108\text{-days}$$

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* Capacity factor

- It is based on the discharge capaci

- It is the ratio of mean supply (average supply) of the canal to the designe supply

Note:- Designed supply is always more than t mean supply to protect the canal from over-topping of water

* $$\text{Capacity factor} = \frac{\text{Mean supply}}{\text{Design supply}}$$

* Full supply Coefficient / Duty on Capacity

- It can be defined as the number of ~~hectare~~ irrigable hectare by 1 cumec of the canal at its head is known as the full supply coefficient or duty on capacity

$$\text{Full supply coefficient} = \frac{\text{Estimated area to be irrigat during base period}}{\text{Design full supply dischar at the canal head}}$$

* Nominal duty

— It is the ratio of the area actually irrigated by farmers to the mean supply (average supply or discharge) at the outlet of the distributary over the crop period

Suppose, 1 Cumec water is released from the outlet for 100-days in a total crop period of 125 d

$$\text{Mean supply} = \frac{1\ (\text{cumec}) \times 100\ (\text{days})}{125\ (\text{days})} = 0.8\ \text{cume}$$

Let, this mean supply (0.8 cumec) irrigated 100 ha then, the nominal duty

$$\text{Nominal duty} = \frac{100\ (\text{ha})}{0.8} = 125\ \text{ha/cum}$$

* Perennial crops

— The crops which requires water through the year (આખું વર્ષ પાણી ની જરૂર પડે તેવા પાકો) are called perennial crops

- Example :- Sugar-Cane & Garden crops

Example - 3.14 & 3.17 Perennial (3.24, 3.27) Same

- 3.2, 3.3, 3.4 (Home-work), 3.5