Short Communications

1 Evaporation control

Mr. K. G. Dave*

1.0 Introduction :

1.1 To state very simply, 'evaporation' is just the opposite of precipitation. In evaporation, water is converted into vapour which escapes into atmosphere, while in precipitation, the water vapour in the atmosphere gets condensed in the shape of waterdrops and forms rain.

1.2 increasing fresh water demand and decreasing its availability has made it necessary to conserve water. Precipitating water which falls on high mountains or polar caps gets frozen. Rainwater that falls in the oceans becomes saline. Both these, the frozen and saline waters, are unutilisable. The water falling on land either flows to sea, gets stored – overground or underground or gets lost by evapotranspiration from land. Overground storages and land evaporation are the two major causes of loss of water through evaporation. Let us see a few facts.

2.0 Certain facts :

- 97.3 per cent of the abundant water on this earth in saline, contained in oceans. Only 2.7 per cent is fresh water.
- 1.4 billion cu.km. of water is available in the form of water. ice and vapour.
- Average precipitation on land is 74 cm/year while average evaporation from land is 49 cm/ year.
- Average precipiation on oceans is 107 cm/ year and average evaporation therefrom is 117 cm/ year.
- Global precipitation and evaporation are almost equal being 97 cm/year.
- Fresh water requirements on the earth, estimated for the years 1985, 2000 and 2025 A.D. are 540 cu.km., 750 cu.km. and 1050 cu.km. respectively.
- Loss of water due to evaporation by 2000 A.D. is estimated at 96 cu.km. (or about 80 per cent of the requirement).
- 10,000 ha. of land would lose 160 million cu.m. of water each year - enough to support a modern city of more than a million inhabitants. or to irrigate 10,000 to 15,000 ha. of crop land.
- Maximum evaporation in our country (i.e. India) is in the month of May (4 to 10 mm/ day) and minimum is in the month of January (1 to 6 mm/day).
- Highest annual evaporation is 300 to 350 cm over central part and lowerst is 100 to150 cm over the northem part of the country.

3.0 Factors affecting evaporation :

3.1 the major factors affecting evaporation can be enumerated as :

- ✓ Temperature of evaporating surface
- ✓ Water vapour in the air
- ✓ Wind speed
- ✓ Atmospheric pressure
- ✓ Nature size of the water body

3.2 Temperature of air and evaporating surface depend upon the source of heat energy i.e. the Sun. Higher the temperatures of air, higher is its vapour holding capacity. Similarly, higher the temperature of the evaporating body, higher will be the speed of evaporation. Thus evaporation is high in tropical areas. Water vapour holding capacity of the air is related to its temperature. Evaporation is higher in inland areas where air is drier as compared to coastal areas. Similarly evaporation is higher where air movement is faster compared to areas where air is relatively stagnant.

4.0 Estimation of evaporation :

4.1 on global basis, it is estimated that about 62,000 cu.km. of water evaporates annually from water bodies and land surfaces on earth. from oceans, the estimation is more than five times the evaporation from earth.

4.2 In the country, about 70 million ha. m. of water evaporates annually out of the total annual precipitation of 392 million ha. m. Total evaporation

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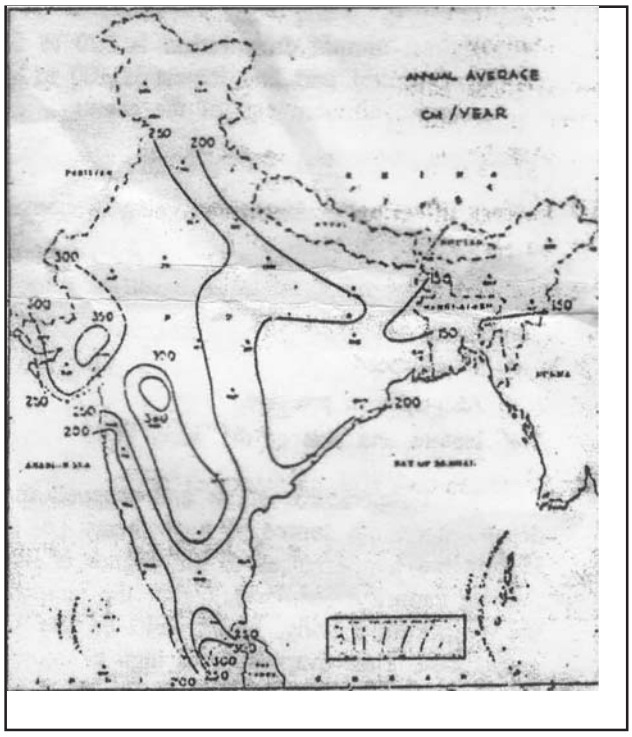
from water surfaces on land is about 5 million ha. m. (or 33 per cent) forms a total storage of 15 million ha. m. in tanks, reservoirs and lakes.

4.3 Studies suggest that the evaporation loss from shallow lakes and reservoirs and small tanks is of the order of 50 per cent of their capecity. Evaporation from the cropped area is about 25 per cent to 50 per cent of the total water applied.

4.4 Studies about monthly distribution of evaporation loss show that it is highest in the month of May and lowest in the month of January over most part of the country. Annual evaporation contours are shown in the map.

EVAPORATION



Ref. : Agroclimatic Atlas of India, I.M.D., 1978

5.0 Evaporation Control :

5.1 To reduce evaporation from water bodies, the approach and techniques are mainly based on following principles :

- Locate reservoirs at high altitudes.
- Keep area-volume ratio of a water body low.
- Minimise exposed surface by reservoir regulation.
- Construct artificial aquifers.
- Apply chemicals forming monomolecular films.
- Reduce energy available for evaporation.

5.2 To reduce evaporation from soil surface it is customary to use (a) plant residue, (b) gravel and (c) asphalt, oil mulches and chemicals. New crop is planted without removing the previous crop residue which keeps soil covered. Similarly gravel, paper, plastic and other mulches can be used to cover the soil.

6.0 Conclusion :

6.1 Loss of water due to evaporation is enormous and in future, this is going to be an area for intensive research as a measure to conserve scarce water. Designing of storage needs special consideration for evaporation allowance. In India, evaporation control by spraying or spreading evaporation retardant chemicals on water surfaces is practised during drought years only. Much more regular efforts are needed to prepare ourselves for the future.

6.2 Most of the information and statistical figures in this communication are drawn from a booklet 'Control Evaporation, Save Water' published by the National Institute of Hydrology, Roorkee and which is gratefully acknowledged.