



Evaporation control from farm ponds

S. Deepika^{1*} and Mohammed Osman²

¹Senior Research Fellow,

²Principal Scientist, ICAR-CRIDA,
Santosh Nagar, Hyderabad-500059, Telangana.

*Corresponding Author - patideepika@gmail.com

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To overcome the drought or prolonged dry spells in rainfed agriculture, runoff water from the heavy rain events is diverted to farm pond and used for providing lifesaving irrigation. Water thus saved to meet the demand is lost due to evaporation and seepage. Seepage on the other hand cannot be treated as complete loss of harvested water as it percolate and adds to ground water. Now the present study deals with the evaporation control techniques. Evaporation issue can be dealt at two stages, which is prior to execution and for the existing structures. Measures can be advised before executing work for a storage structure like water surface area or depth of the pond as rate of evaporation increases with exposed surface area. Below flow chart shows evaporation control techniques over water reservoirs. Evaporation control measures for the existing ponds can be grouped broadly as mechanical, biological and chemical methods.

Mechanical barriers

Mechanical barriers for evaporation suppression are of two types floating and suspended sheet covers. Cover of made of permeable (allow rain water in to the storage structure) or impermeable polyethylene are made to float on water surface. Whereas suspended covers are mounted at the edges of the pond using cables which are also impermeable or permeable (shade cloth cover). Alternatively, thermocol sheets, plastic balls, HDPE and LDPE sheets are effective in controlling evaporation losses up to 80% but the only disadvantage is the cost incurred. Low budget experiment in the field is using water bottles by mounting in a bag and used as floating cover could able to control evaporation up to 40%.

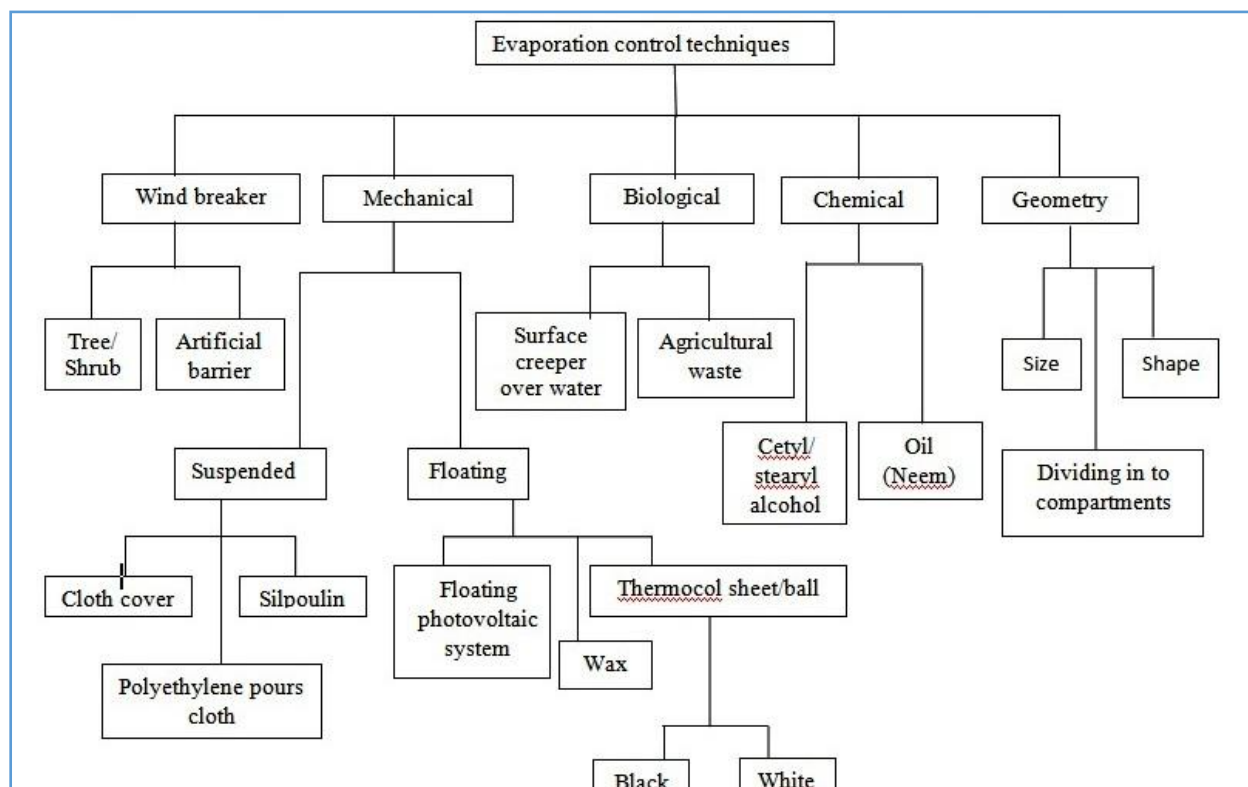


Fig. 1: Different methods of evaporation suppression

Latest research conducted using suspended/floating type solar panels in controlling evaporation along with additional benefit of power generation. Installation of solar panels over the farm pond saves the farm land, generate power which is used to operate pressurized irrigation system which alternatively increases water uses efficiency and yields and quality of agriculture produce therefore increasing the income. Thus covering with solar panel makes it viable as it compensates the high capital incurred.

Biological methods

Biological methods such as floating plants, agriculture waste such as palm fronds, maize cobs, wheat/paddy husk, wooden blocks, saw dust, vegetable oil etc. can be used to cover the water surface show reasonably good results with minimal investment. Palm fronds is easily available as it is widely distributed throughout the country, instead of disposing palm fronds and leaves as waste, can be used to cover the storage structure either one layer or two layers. Agricultural waste used to cover the water storage structures like farm pond can control up to 50% of evaporation losses. Simply suspending a cloth cover can control up to 80% of evaporation losses. Use of thin film of oil has been found to be the most effective method in checking the loss due to evaporation. If the film of oil remains without break, the evaporation loss can be fully curtailed. Vegetable oils like neem oil, mustard oil etc with lesser density than the water are also used in evaporation reduction. Combination of vegetable oils along with palm fronds cover can increase the efficiency of evaporation control.

Azolla a floating plant can be also grown in the pond to control evaporation though some water will be lost in the form of evapotranspiration there is an additional benefit as the azolla can be incorporated in to soil as nitrogen supplement or as the feed for the livestock.

Chemical method

Chemical monolayers form a thick oily layer on the surface of the water. These chemical layers are degradable, thus needs reapplication after every two to four days. Chemicals like long-chain fatty alcohols viz. cetyl alcohol and stearyl alcohol which attract molecules and form diffusion barriers are available in powder form having melting point at 49°C and 58°C, respectively. The chemical has some self-spreading ability so the chemical layer can be applied by hand from the bank. The chemical when applied over water surface form an interface barrier prevents escape of water vapor. The application of monolayer like cetyl and stearyl alcohol ranging from 0.3 kg/ha/day to 0.5 kg/ha/day resists evaporation by 16 - 30 %. Combination of cetyl and stearyl alcohol in 1:9 proportion increases the evaporation control up to 60%. This method of evaporation control will not interfere with other operations like boating, fishing, etc.

Other methods

Studies indicated that evaporation is positively correlated with wind direction, maximum and minimum temperatures, wind speed and sunshine hours. Therefore, evaporation of water from storage is due to wind speed and humidity gradient which can be regulated by wind breaks. Thus air flow is obstructed and humidifying the dry air flowing towards water storage and reducing the rate of evaporation. But height, density and number of tree rows as well as selection and composition of tree or shrub species impact percentage of wind break. Other mostly adopted method to control evaporation is by reducing the open surface area. Therefore, without altering the storage capacity, depth of the pond can be increased.

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