STUDY OF EFFECT OF SOIL MOISTURE HOLDING CAPACITY, RATIO OF ACTUAL TO MAXIMUM EVAPOTRANSPIRATION AND FARMING STRATEGIES ON YIELD OF TOMATO GROWN IN VADODARA DISTRICT, GUJARAT, INDIA

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CONCEPT

To study the effect of

- soil moisture holding capacity on yield response.
- ratio of actual to maximum evapotranspiration on the relative yield response.
- different farming strategies on yield response, if any.

METHODOLOGY

- The study area for the present analysis is Vadodara district of Gujarat, India, lying between latitudes 72.859 N and 74.283 N and between longitudes 21.828 E and 22.818 E.

- Daily climateological data of Vadodara district for 16 years (i.e. 1991 – 2006) are considered for analysis.

- The available data is used for calculating average daily reference evapotranspiration, ETo based on FAO Penman-Monteith equation.
- ETo is calculated with the help of DSS ET software.
- ETo is multiplied by Single Crop Coefficient (Kc) for Tomato from FAO 56 to obtain values of crop evapotranspiration, ETm.

- Irrigation scheduling for Tomato, considering rainfed irrigation, two irrigation and full irrigation farming is carried out by considering two soil moisture holding capacities of 90 mm/m and 150 mm/m.

- Total values of ETa and ETm for entire crop period are calculated.

- Maximum potential yield, Ymp i.e. Ym is calculated using the Agro-Ecological Zone Method of FAO 33.

- Obtained values are used to quantify the effect of soil moisture holding capacity and ratio of actual to maximum evapotranspiration on the relative yield response.

- The relationship given by FAO 33 between relative yield decrease and relative evapotranspiration deficit is calculated.

- $(1 - Y_a/Y_m) = k_y (1 - ET_a/ET_m)$

where

Y_a = actual harvested yield, kg/ha/crop period

Y_m = maximum harvested yield, kg/ha/ crop period

k_y = yield response factor (Table 24, FAO 33)

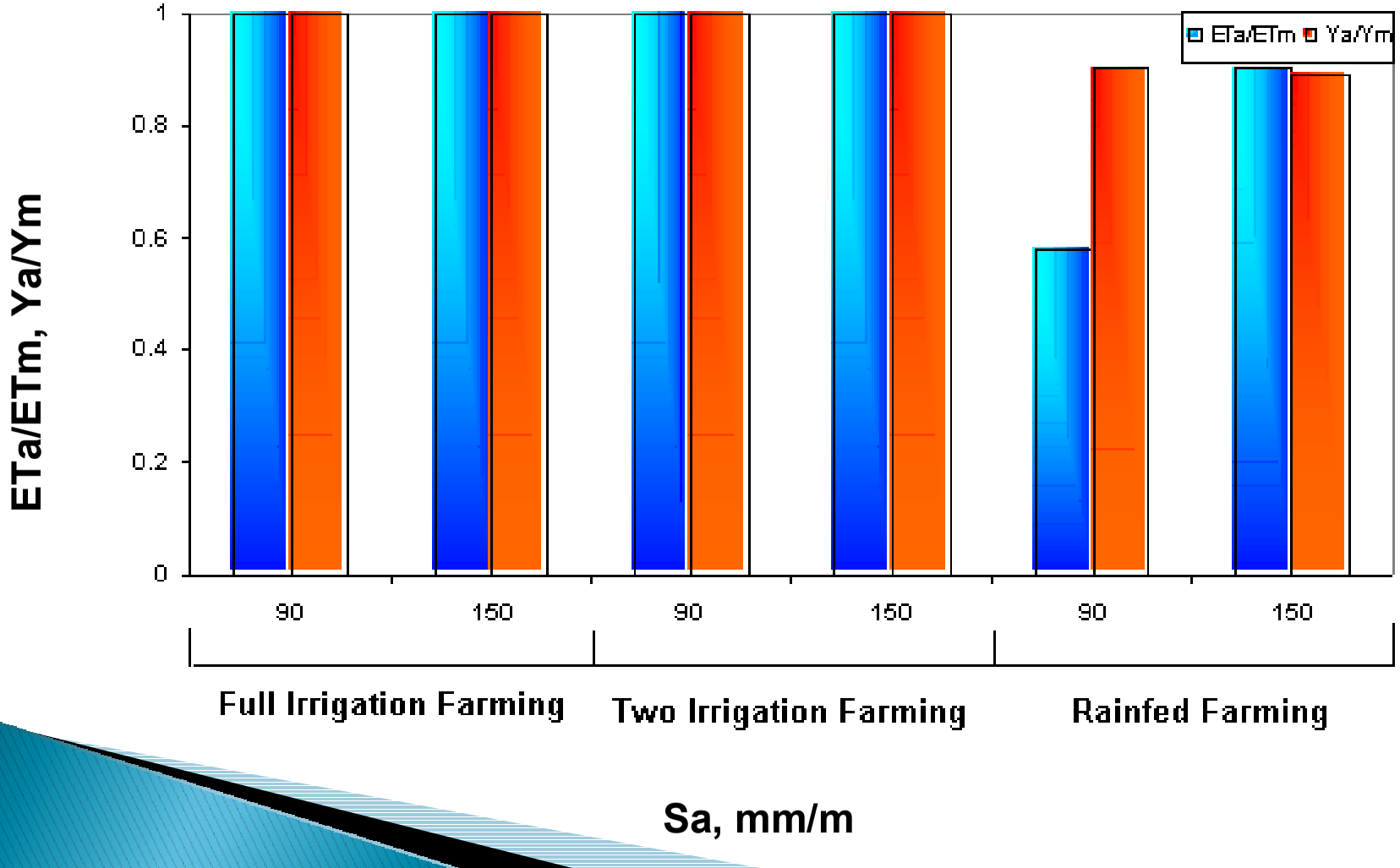
ET_a = actual evapotranspiration, mm/day or mm/crop period

ET_m = maximum evapotranspiration, mm/day or mm/crop period

RESULTS AND ANALYSIS

- When rainfed farming is practiced with an increase of 67% in soil moisture holding capacity i.e. from 90 mm/m to 150 mm/m ratios of ETa/ETm and Ya/Ym enhance by 32% and 33% respectively.
- When two irrigation and full irrigation farming are practiced for an increase of 67% in soil moisture holding capacity there is no additional increase in ETa/ETm and Ya/Ym because both the ratios are 100% for given soil moisture holding capacity.

Figure 1: ETa/ETm and Ya/Ym in Vs Soil Moisture Holding Capacity, Sa Considering Full Irrigation Farming, Two Irrigation Farming and Rainfed Farming



CONCLUSIONS

- From the results it can be concluded that if full irrigation farming is practiced in the study area then for the soil moisture holding capacity between 90 mm/m and 150 mm/m actual yield of Tomato is going to be 100% of the maximum potential yield.

- But when two irrigation farming is adopted then about 100 mm of water can be saved.

THANK YOU