Indian Journal of Agricultural Sciences 60 (9) : 609–11, September 1990

Consumptive use and irrigation requirement of arecanut palm (*Areca catechu*)

A MAHESHA[1], K B ABDUL KHADER[2] and G RANGANNA[3]

Regional Station, Central Plantation Crops Research Institute, Vittal, Karnataka 574 243

Received: 24 October 1989

ABSTRACT

The water requirements of arecanut palm (*Areca catechu* L.) in the coastal tracts of Karnataka were estimated based on the evaporative demand of the crop. The crop-water demand was evaluated by using the crop-coefficient and the potential evapo-transpiration values. The potential evapo-transpiration values for the region were computed by modified Penman method using a computer programme on monthly and weekly basis for 1971–85. The depth and quantity of water, the frequency of irrigation and the total number of irrigations required varied from month to month. The requirement of water was more during March–May in arecanut than during other months.

Arecanut or betelnut (*Areca catechu* L.) grows well within a temperature range of 14–36°C and is adversely affected by temperature beyond 10–40°C. In the tropical belt where it is grown (28°N and S of equator), though the rainfall is more, the distribution is very poor. Precipitation is confined during June–November, with heavy rainfall of 3 700–3 800 mm, resulting in floods. The monsoon is followed by a quite prolonged summer (January–May).

Arecanut is very sensitive to drought and shows severe reduction of growth and yield in the absence of proper irrigation during summer months. Sadanandan (1973) reported that irrigation of arecanut once in 3 days @ 189 litres water/palm resulted in maximum production of nuts at Peechi (central Kerala). Abdul Khader *et al.* (1982) recommended 200 litres water/palm once in 5 days by conventional method of irrigation in laterite soils of coastal Karnataka. Yadukumar *et al.* (1982) reported that irrigation of arecanut garden with an irrigation water : cumulative pan evaporation (IW:CPE) ratio of 1 with a 30 mm depth of water per irrigation is optimum. The present experiment was conducted to study the evapo-transpiration demand of arecanut to estimate its optimum water requirement, using climatic parameters.

[1]Research scholar, Department of Civil Engineering, Indian institute of Technology, Bombay, Maharashtra 400 076; [3]Professor, Applied Mechanics and Hydraulics, Karnataka Regional Engineering College, Surathkal, Karnataka 574 157

[2]Scientist

MATERIALS AND METHODS

The evapo-transpiration values for the region were computed by the modified Penman method (Doorenbos and Pruitt 1975), using a computer programme on monthly and weekly basis during 1971–85. The weather data required for the work were collected from the records maintained at Vittal, which has hot humid type of weather with rainfall mainly during June–November.

The values of evaporative demand of the crop for arecanut garden of 12–15 years old and evapo-transpiration values were estimated (Abdul Khader 1983). The crop-coefficient values for young arecanut palms were evaluated using the above data and an average value of 0.97 was considered.

The depth, frequency and the quantity

of water required/palm were computed (Doorenbos and Pruitt 1975). The total available soil water/m depth for the site was computed as 105 mm and the fraction of the total available soil water was as only 50%, to account for the sensitivity of the palm to moisture stress. The water-application efficiency depends on the efficacy of the irrigation method, and was assumed to be unity. The evapo-transpiration values of 75% dependability (1971–85) were considered for the computation of crop evapotranspiration for 12 months. Frequency of irrigation should conform to soil-water depletion requirements of the crop. Therefore, rather than fixed irrigation schedule considerable flexibility was accounted for to accommodate different crop evapotranspiration (Table 1). The depth of irrigation water did not vary throughout the irrigation period.

Table 1 Irrigation frequency for arecanut palms

Month	Crop evapo-transpiration (mm/day)	Irrigation interval (days)	No. of irrigations
Dec	4.60	6	6
Jan	4.65	6	5
Feb	5.31	5	5
Mar	5.86	4	8
Apr	6.25	4	8
May	5.78	4	7

Water-supply schedule was considered by drip-irrigation system. Four emmitters were recommended (Abdul Khader 1983) around the palm at a radius of 35 cm from the trunk, each with a flow rate of 2 litres/hr. The uniformity coefficient was 0.95. Considering the lateral spread of the roots (Murthy and Pillai 1982), the radius of a basin assumed was 75 cm, which worked out to be 24% of a hectare area by providing palm spacing of 2.7 m × 2.7 m. Daily water requirement/palm was determined considering the irrigation interval varying with the crop-water requirement.

RESULTS AND DISCUSSION

The crop-coefficient values for young arecanut palms were 0.95–0.99 during January–May in laterite soil. With the advancement of summer the temperature and the rate of evapo-transpiration increased, resulting in high water requirement during February–May compared with December–January. The optimum depth of water required/irrigation was 26 mm, based on an effective root-zone depth of 50 cm. The evapo-transpiration demand of the crop increased during December–April, resulting in corresponding increase in the number of irrigations required. Crop-water requirement showed a decreasing trend during May due to pre-monsoon showers. Depending upon the crop-evaporative demand, 8–12 litres water/palm/day was estimated by drip irrigation during December–May, which is equivalent to 1–1.30 hr of irrigation/day. The net supply needed for December–May was 2 583 m^3 because the amount of water needed/irrigation/ha worked out to be 66 240 litres. The water requirement of the arecanut based on IW : CPE ratio as per Abdul Khader (1983) gave similar results.

Using climatic parameters, the optimum depth of irrigation water needed per palm showed variation with the advancement of summer and the results obtained were similar to those by field methods.

REFERENCES

Abdul Khader K B. 1983. 'Effect of depth of irrigation based on cumulative pan evaporation, mulching and drip irrigation with fertilizer levels on growth and yield of arecanut.' Ph D thesis, University of Agricultural Sciences, Bangalore (unpublished).

Abdul Khader K B, Yadukumar N and Shama Bhat K. 1982. Irrigation requirements of arecanut. *Proceedings of the Symposium on Arecanut Research and Development*, held at Central Plantation Crops Research Institute, Vittal, during 13–14 December 1982, pp 27–33.

Doorenbos J and Pruitt W O. 1975. Guidelines for predicting crop water requirements. *Irrigation and Drainage Paper* 24, Food and Agriculture Organization, Rome.

Murthy K N and Pillai R S N. 1982. Botany of arecanut palm. *(in) The Arecanut palm*, Monograph 2, Central Plantation Crops Research Institute, Kasaragod, pp 11–46.

Sadanandan A K. 1973 Water requirement of arecanut. *Indian Journal of Agricultural Sciences* **43** (6) : 483–5.

Yadukumar N, Khader K B A and Shama Bhat K. 1982. Scheduling of irrigation for arecanut with pan evaporation. *(in) Proceedings of the Symposium on Arecanut Research and Development*, held at Central Plantation Crops Research Institute, Vittal, during 13–14 December 1982, pp 33–7.