

IRRIGATION SEASON FOR ARECANUT PALMS (*ARECA CATECHU L.*)

1. Arecanut (*Areca catechu L.*) is the major cash crop in the coastal belt of Karnataka. The palm flourishes well within a temperature range of 14° C to 36° C and in areas of heavy rainfall (Murthy and Pillai 1973). Deep well drained soils are most ideal for the palms (Aiyer 1966). Since the palm is sensitive to moisture stress, it requires frequent irrigation during the absence of rainfall (Bavappa and Annaji Rao 1970). The water requirement of the crop (ET_{crop}) as defined by Doorenbos and Pruitt (1977) is met by rainfall, stored soil moisture and groundwater sources. The remaining part, if any is to be met by irrigation which is known as Net Irrigation Requirement (NIR).

The study area receives an average annual rainfall of more than 3500 mm and with a temperature range of 20° C to 36° C. Moreover the soils, including laterite soil which covers most of the area, are deep and well drained (Badrinath 1984). Intense rainfall is experienced during southwest monsoon which is followed by relatively weaker northeast monsoon. Dry period follows the northeast monsoon which intensifies as summer advances. Proper irrigation during this period is essential to maintain the water stress on the palm within the limits. Lit irrigation from tubewells is the common source of water for irrigation as most of the shallow wells, ponds and streams dry up before peak summer. Hence optimising the available water resources during this period is necessary. This objective can be achieved with the knowledge of period and quantity of irrigation actually needed by the crop. The present study estimates irrigation season for the crop based on weekly net irrigation requirements.

2. *Material and methods* — Weather data needed for the study was collected from Central Plantation Crops Research Institute, Regional Station, Vittal for the period 1972-1986. Potential evapotranspiration (ET_0) values were computed by modified Penman method on weekly average basis for the above years. 75%

dependable ET_0 values and an average crop coefficient value of 0.97 as per Mahesha *et al.* (1990) were considered to estimate crop evapotranspiration (ET_{crop}) for 52 weeks. Effective rainfall values were evaluated as per Doorenbos and Pruitt (1977) from average fortnightly ET_{crop} and rainfall. Effective rainfall is the amount of water available in the root zone after the losses including surface run-off, deep percolation and evaporation. The excess of effective rainfall after meeting ET_{crop} was added to the soil storage up to the field capacity. This back storage was utilised during the need of the palm. The field capacity of laterite soil of the area as determined by Abdul Khader (1983) is 200 mm per metre depth and 50% of which was considered as freely available water with the consideration of wilting point. Contribution from groundwater storage is dependent on the depth of water table, soil type and root zone depth of the crop (Dastane 1975). He established a relationship between depth of groundwater table below the root zone and rates of upward flow of groundwater (mm/day) for various types of soils. In the present investigation such a study was not undertaken and groundwater contribution was not accounted. Weekly values of NIR were evaluated as follows :

$$NIR (mm) = ET_{crop} (mm) - \text{Effective rainfall (mm)} \\ - \text{Stored soil moisture (mm)}$$

3. *Results and discussion* — Table 1 shows weekly NIR values for arecanut palms in laterite soils of coastal Karnataka. As the southwest monsoon breaks during the first week of June the land receives copious amount of water. Within a couple of weeks the soil gets saturated up to the field capacity. Water requirement of the crop reduces to a minimum of 3.16 mm/day during July on account of reduction in evaporation losses. The saturated status of the soil continues till mid October due to significant rainfall during northeast monsoon also. Scanty rainfall during November-December is not enough to meet the crop water requirement and soil moisture stored earlier gets utilized. The situation becomes critical when the ET_{crop} is to be met solely by irrigation. The net depth of irrigation water needed by the palm is 26 mm per irrigation (Mahesha *et al.* 1990) and hence irrigation becomes essential from first of December as the moisture level falls below 50% of the field capacity (wilting point). Also, the palms are

TABLE I
Weekly net irrigation requirements of arecanut palms

Std. week	75% ET _o (mm/d)	ET _{crop} (mm)	Effective rainfall (mm)	Soil Storage (mm)	NIR (mm)
1	4.82	32.7	—	—	32.7
2	4.72	32.1	—	—	32.1
3	4.75	32.3	—	—	32.3
4	4.88	33.1	—	—	33.1
5	4.81	32.7	—	—	32.7
6	5.31	36.1	—	—	36.1
7	5.39	36.6	—	—	36.6
8	5.58	37.9	—	—	37.9
9	5.60	38.0	—	—	38.0
10	6.05	41.1	—	—	41.1
11	6.02	40.9	—	—	40.9
12	6.03	41.0	—	—	41.0
13	6.05	41.1	—	—	41.1
14	6.21	42.1	—	—	42.1
15	6.24	42.4	9.3	—	33.1
16	6.31	42.8	7.6	—	35.2
17	6.25	42.4	14.4	—	28.0
18	6.26	42.5	15.3	—	27.2
19	6.04	41.0	15.4	—	25.6
20	5.77	39.2	32.4	—	6.8
21	5.90	40.0	8.5	—	31.5
22	5.39	36.6	40.4	3.8	—
23	5.04	34.2	87.7	57.3	—
24	4.26	28.9	142.6	171.0	—
25	3.42	23.2	227.6	260.0	—
26	3.67	24.9	167.1	200.0	—
27	3.68	25.1	168.1	200	—
28	3.26	22.1	167.5	200	—
29	3.45	23.5	153.4	200	—
30	3.61	24.5	168.3	200	—
31	3.34	22.7	176.9	200	—
32	3.64	24.7	146.6	200	—
33	3.94	26.7	135.1	200	—
34	4.08	27.7	95.9	200	—
35	4.27	29.0	59.5	200	—
36	4.56	30.9	40.5	200	—
37	4.56	30.9	37.4	200	—
38	4.41	30.0	31.0	200	—
39	4.69	31.9	52.5	200	—
40	4.51	30.6	33.1	200	—
41	4.76	32.3	33.2	200	—
42	4.76	32.3	21.0	188.7	—
43	4.64	31.5	23.9	181.1	—
44	5.01	34.0	33.9	181.0	—
45	4.63	31.4	22.4	172.0	—
46	4.79	32.6	13.0	152.4	—
47	4.78	32.5	10.5	130.4	—
48	4.81	32.7	6.0	103.7	—
49	4.70	31.9	2.3	74.1	—
50	4.79	32.6	2.3	43.8	—
51	4.69	31.9	—	11.9	—
52	4.77	37.0	3.0	—	22.1

very sensitive to water stress and any damage due to water stress has long term effects on their growth and yield (Bavappa and Annaji Rao 1970). However, irrigation may be delayed or avoided for low lying areas where groundwater table is within the root zone depth. But such cases are very rare as areca palms have relatively shallow root zone depths (Murthy and Pillai 1982) compared to other perennial crops. Increased frequencies of irrigation are needed (Mahesha *et al.* 1990) as the summer advances. Crop water requirement reaches to maximum of 6.11 mm/day during April. Pre-monsoon showers during April-May reduce NIR partially and in such cases irrigation frequency may be altered from the original schedule accordingly. Irrigation need to be continued till the onset of southwest monsoon which is usually during last week of May or first week of June.

4. *Conclusion* — A reliable estimate of irrigation season for areca palms was achieved by comparing its water requirements with contributing sources of water which in turn will indicate the irrigational requirement and thus optimal utilisation of available resources without affecting the growth.

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