Letters to the Editor

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EFFECT OF WEATHER VARIABLES ON ARECA-NUT PALMS (ARECA CATECHU L.)

1. Areca nut (Areca catechu L.) is a tropical palm and is grown in a variety of soils and climatic conditions within this region. It grows well from almost sea level up to an altitude of 1000 m with an adequate rainfall or under irrigation within a temperature range of 14°C to 36°C (Anonymous 1982). But as the altitude increases the lower temperatures affect badly on the kernel hardening which may result in poor quality of nuts (Murthy and Pillai 1973). As the palm is very sensitive to water stress, it requires frequent irrigation during summer months in the areas where distribution of rainfall is poor (Abdul Khader et al. 1982). Thus the weather variables play an important role on the palm and its yield. The dependability of the palm on weather variables is studied and a functional relationship is established between them.

2. Material and methods — Weather data were collected from Central Plantation Crops Research Institute, Vittal for the period 1968-1979 and the variables except climatological normals, were computed. Potential evapotranspiration as defined by Doorenbos and Pruitt (1977) was computed by modified Penman method on weekly average basis for the above period. Moisture adequacy index, which is the ratio of actual evapotranspiration to potential evapotranspiration and soil moisture storage values were evaluated on monthly average basis by water balance computations for the region using Thornthwaite and Smith’s revised book-keeping procedure. Considering uniformity in weather conditions in a year, four seasons were defined as: (1) December-February, (2) March-May, (3) June-August, & (4) September-November. Seasonal average values of weather variables were used for the analysis. The variables along with symbols are:

- Total rainfall (mm) (TRF)
- Total rainy days (>2.5 mm/day) (NRD)
- Average daily maximum temperature (°C) (MXT)
- Average sunshine (hours/day) (SSH)
- Average evaporation (mm/day) (EVP)
- Mean daily relative humidity (%) (MRH)
- Total evapotranspiration (mm) (PET)
- Average monthly moisture adequacy index (%) (MAI)
- Total soil moisture (mm) (TSM)

Data on annual yield (wet weight of ripe nuts) were collected from the gardens of Central Plantation Crops Research Institute, Vittal for the available period of eleven years (1969-79). Harvesting season for the palm starts by November and lasts till March with 3-4 harvests at an interval of 1-11 months. One hundred areca palms of uniform age, cultural practice, manural treatment and grown under identical conditions were selected for the study.

The method adopted here involves two steps. In the first step the variables were correlated with the yield and tested for significance (at 5% level). As the developmental process of nuts is of long term, variables of the year of harvest (zero lag) and previous year (one year lag) were correlated with the yield. The second step involves multiple regression analysis. Variables with significant correlation coefficients were selected for regression analysis. A software package developed by Statistics Division of Central Plantation Crops Research Institute, Vittal was used for the above purpose.

3. Results and discussion — The weather variables with significant (>60%) correlation coefficients in one or more seasons are given in Table 1.

Average evaporation during Dec-Feb showed positive correlation with the yield in the second year indicating palms’ preference for dry weather. Sunshine hours during summer had negative correlation with following year’s yield. Since majority of spadix initiate during this period (Bavappa and Annaji Rao 1970) any water stress may cause abortion of the spadix. Even sunshine hours and temperatures during Sep-Nov found detrimental on successive year’s yield. As this is the period when inflorescences open and bloom, the palms may not favour hot climate. Humid climate during winter (Dec-Feb) is also not favoured by the palms. In the regression analysis only two variables were found to influence the yield significantly. The linear model developed showed 78% predictability.

\[ Y = 6.46 \text{ EVP}_{16} - 2.85 \text{ MXT}_{14} + 65.47 \]

where, \( Y \) is average annual yield/palm. Subscripts indicate lag year and season number respectively.

As the variables of previous year only involve in the model, the yield can be predicted in advance.
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TABLE 1
Correlation coefficients of weather variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sep-Nov</th>
<th>Jan-Aug</th>
<th>Mar-May</th>
<th>Dec-Feb</th>
<th>Sep-Nov</th>
<th>Jan-Aug</th>
<th>Mar-May</th>
<th>Dec-Feb</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVP</td>
<td>0.54</td>
<td>0.04</td>
<td>0.32</td>
<td>0.22</td>
<td>-0.10</td>
<td>-0.10</td>
<td>0.49</td>
<td>0.77</td>
</tr>
<tr>
<td>SSH</td>
<td>0.04</td>
<td>0.06</td>
<td>-0.30</td>
<td>-0.29</td>
<td>-0.70</td>
<td>-0.12</td>
<td>-0.64</td>
<td>-0.14</td>
</tr>
<tr>
<td>MRH</td>
<td>-0.26</td>
<td>-0.12</td>
<td>-0.02</td>
<td>-0.64</td>
<td>-0.23</td>
<td>-0.13</td>
<td>-0.16</td>
<td>0.43</td>
</tr>
<tr>
<td>MXT</td>
<td>-0.11</td>
<td>-0.06</td>
<td>-0.50</td>
<td>-0.06</td>
<td>-0.64</td>
<td>-0.25</td>
<td>-0.4</td>
<td>0.32</td>
</tr>
</tbody>
</table>

4. Conclusion — Areca nut palms showed considerable dependency on weather variables maintaining other factors uniform and at satisfactory levels. The model developed to predict the yield was found sufficiently accurate to indicate the yield trend. The present work can be considered as an initiative towards developing a crop weather modelling.

References


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THE RADAR FIXES OF TROPICAL CYCLONIC STORMS

1. A study of the position difference in two radar fixes of two cyclonic storms is made. Two severe cyclonic storms of November 1989 and May 1990 over Bay of Bengal are chosen for the study where, the eye was clearly seen on the radar scopes in both the cases and more than two radars could track them simultaneously.

2. The tracking of a tropical cyclone by a Cyclone Detection Radar (CDR) is possible whenever the eye or the spiral band pattern is seen on the radar scope. The S-Band (10 cm wavelength) radars which are used by the India Meteorological Department to track the cyclonic storms by monitoring the position of the eye or using the spiral overlay technique, have an useful range of 400 km.

3. Generally, whenever the eye is identifiable the centre can be fixed to an accuracy of 10 km (Raghavan 1985). But the fast changing characteristics of the eye pose problems in fixing the centre at any time of observation. Also, in viewing the storm by the radars located at different ranges and at different azimuths lead to some uncertainty in fixing the storm centre. In a previous investigation with the data of the three CDRs at Karaikal, Madras and Machilipatnam, Raghavan et al. (1985) found that the cyclone centres determined by Karaikal and Machilipatnam radar differed by 15 to 52 km from that of Madras radars, for Srilankota cyclone of 1982.

4. The eye, sometimes seen partially takes various shapes and sizes. Each storm is unique in its characteristics. The eye, sometimes with its irregular shapes poses problems in identifying the centre (Meighen 1985). But whenever the system is approaching the station even small precipitation echoes become prominent and the eye appears distinct. Besides this, the radiowave propagation characteristics, observational and gridding errors add to the uncertainty in locating the storm centre. Thus, various errors exist in identifying the centre of the storm from a single radar observation itself. So there would be differences in locating the centres by two different radars. Hence attempt is made in the present paper to study the maximum