

## Abstract

It is essential for planning purposes to be able to assess or predict the output of vital crops in order to develop strategies to cope with shortfalls or surpluses with sufficient lead time. This is usually done by developing yield prediction models based on well specified production factors. Crop yield results from the interaction among plant, physical and environmental factors. Radiation is a key environmental factor in this regard and the principal driver of the biological system. When all the other conditions are optimum, productivity is a function of the available energy and the size of the plant surface able to trap it. However, the distribution of radiation within the plant canopy is uncertain. The objectives of this study were to determine whether the light extinction coefficients of three maize hybrids of different morphological description are different; whether these coefficients change with time during the growing season; and attempt to establish the nature of the relationships between biomass accumulation and the observed morphological plant characters. The extinction coefficients of the three hybrids were not significantly different. They increased with vegetative growth to reach maxima at anthesis and decreased subsequently as the crops approached physiological maturity. These coefficients were used to fit Beer-Bougher type regressions for predicting light penetration into the various canopy levels. There were significant differences in light penetration, among the hybrids, during the growing season as well as within each day. The largest leaf area (index) and the highest light absorption occurred at the top layer of the canopies. Moreover, the highest light penetration into the canopies does not appear to take place at zenith but seems to occur when the solar elevation and leaf angles reach certain critical values. Leaf area index (LAI) had the greatest effect on light penetration during the growing season while the effect of leaf angle was secondary and more manifest after anthesis. Biomass and grain yields were not significantly different among the hybrids and a lower LAI seemed to favour a higher light use efficiency. No correlation was found between biomass and LAI. Consequently, no method was developed to predict biomass accumulation in the study. Growing conditions were sub-optimal in a few occasions during the season which, together with inadequate instrumentation, made it difficult to isolate the effects of extraneous factors from those of the main factors. Recommendations are given for conducting the experiment to insure better results.