ABSTRACT

Differences in crop performance between hybrids, composites and local maize varieties were established and correlations between grain yield versus parameters of growth and development, yield indices and yield components at varying levels of significance established. Pioneer hybrids were consistently the highest yielders, but CIMMYT composites including a high lysine variety also produced high yields. Significant responses in grain and protein yields and grain protein content to N-supply were recorded, and yield responses to plant density occurred up to 100 x 10^3 plants/ha, but lodging in local varieties and infertility in hybrid and composite varieties at high plant density proved to be major yield constraints. Grain number per unit land area was the more limiting component of yield than mean grain weight, and cob prolificacy and reduced infertility were suggested as mechanisms for its increase at low and high plant densities respectively.

Harvest index and the newly defined grain index were more important sources of yield variability than total dry matter production and emerged, together with translocation efficiency, as important correlants of grain yield. Leaf area index and leaf angle at flowering were also found to be important yield determinants below and above respectively a critical LAI of 4.

Growth analysis showed that rapid cob development, long leaf area duration after flowering, high grain index, as well as low specific leaf area and leaf density were associated with high yield. Total and economic surplus assimilate emerged as valuable morphogenetic indices of

crop and yield performance which could lead to the quantification of the negative effect of tropical maize leafiness on yield.

The relative importance of potential total input of reduced N per plant compared with the intensity of nitrate reductase activity (NRA) in leaf tissue was demonstrated. Reduced nitrogen input at critical stages, e.g. after flowering, resulting from oscillatory variation in NRA during ontogeny was found to be a limiting factor in maize performance.