

Assessing the performance of maize (*zea mays*)-cowpea (*vigna unguiculata*) intercrop under variable soil and climate conditions in the tropics

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Intercropping, which involves the growing of more than one crop simultaneously on the same field, is a common agricultural practice in many tropical and subtropical regions of the world. While the bulk of research indicates advantages of intercropping over the sole cropping systems, the many varied ways in which it is practised make the assessment of its performance by field experimentation rather difficult, especially under variable environmental conditions. In this poster, an intercrop model is presented which offers an approach to assessing the performance of a maize-cowpea intercrop under variable environmental conditions.

Methods

A maize-cowpea intercrop model was developed by linking AUSIM-Maize (1) to a cowpea model (developed by the authors) through competition sub-models for radiation interception, water and nitrogen uptake. It was assumed that throughout the growth period, the maize canopy was above the cowpea canopy so that radiation capture of the intercrop was modelled by applying Beer's Law to a two-layer canopy system. Competition for water was described by simulating water extraction of each crop in turn, with the order of extraction alternating each day (2). Nitrogen uptake was similarly simulated but with cowpea allowed to meet any shortfall through fixation.

Results and discussion

The cowpea and intercrop maize-cowpea models were calibrated and tested on data from field experiments in South-eastern Queensland involving the sole and mixed crops. Model predictions of the time-course of component crop leaf area indices and total biomass compared quite well with observed data for both sole and intercropping systems. For the sole cowpea, predicted and observed total biomass at maturity under non-limiting water and nutrient conditions were 7650 and 8220 kg/ha respectively. Further, the intercrop model correctly predicted a substantial reduction of cowpea biomass when grown under maize canopy: 4170 kg/ha was predicted compared to 2930 measured. In the case of maize, total biomass predicted were almost the same in both the sole crop (17010 kg/ha) and in the intercrop (16990 kg/ha). The corresponding observed data of the sole and intercrop maize were 17550 kg/ha and 16090 kg/ha respectively.

References

1. Carberry, P.S. and Abrecht, D.G. 1991. In: Climatic Risk in Crop Prod. (Eds R. Muchow and J.A. Bellany) CAB Int. 157 -182
2. Carberry, P.S., Keating, B.A and McCown, R.L. 1992. Proc. 6th Aust. Soc. Agron. Con. 206-209.