DETERMINING THE RAINFED ARABLE PRODUCTION POTENTIAL OF CLIMATICALLY MARGINAL LAND IN THE NORTHWEST PROVINCE USING THE CYSLAMB LAND EVALUATION MODEL

by

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Declaration

I declare that this mini-dissertation describes my original work, except where specific acknowledgement is made to the work of others, and has not previously in its entirety or in part been submitted for a degree to any other university.

B.N Mbatani

Signature ..... Date..08 FEB 2001

ABSTRACT

This study consisted of two stages: First the validation of the Crop Yield Simulation and Land Assessment Model For Botswana (CYSLAMB) against the recorded maize yields in some parts of the Northwest Province (Potchefstroom, Setlagole and Ottosdal). The model was also calibrated to simulate maize yield under specific management systems of low plant density and conditions of acute water deficit prevailing in the study area. Statistical methods including D-index (index of agreement), RMSEs (root mean square error systematic), RMSEu (root mean square error unsystematic) and RMSE (root mean square error) recommended by Willmott (1982) for model evaluation were used to evaluate CYSLAMB. Results indicated that the model simulates yield with an acceptable level of accuracy under local conditions.

Secondly the CYSLAMB model was used as a quantitative method for screening the impact of existing and potential management systems on production in the study area. The model was used to predict maize yields for different planting dates. The ideal planting date being the one with a high probability of receiving planting rains and most importantly, a high probability of receiving a fair amount of rainfall (>20 mm) at silking (70 days after planting for mid-season cultivars). The model simulations were also run to investigate the effect of planting density on maize yield in Potchefstroom and Mmabatho over periods of 57 and 12 years respectively. Results indicated that maize yields were increased with reduced plant density during seasons with insufficient water supply. In Mmabatho simulations showed that 14000 plants.ha^{-1} gave a reasonable yield for good seasons (more than 4 tons.ha^{-1}) and during bad seasons low input farmers would be able to reach a break-even point (more than 1.5 ton.ha^{-1}). In Potchefstroom 14000 plants.ha^{-1} gave a reasonable yield (more than 1.8 ton.ha^{-1}) during below average seasons but during seasons of sufficient water supply higher yields are obtained at densities of more than 18000 plants.ha^{-1}.

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