

**FACTORS COST EFFECTIVELY IMPROVED USING COMPUTER
SIMULATIONS OF MAIZE YIELDS IN SEMI-ARID SUB-SAHARAN AFRICA**

Masere, T. P.⁹ & Duffy, K. J.¹⁰

Corresponding author: Prof. K. J. Duffy, Institute of Systems Science, Durban University of Technology, P.O. Box 1334, Durban 4000, South Africa.; Email: kevind@dut.ac.za

ABSTRACT

Achieving food security is a challenge for the developed and developing world. These challenges are greater for developing nations such as in Africa because of the severity of the problems. An important aspect of this is poor agricultural productivity. Worldwide, technology is being developed to increase agricultural production. One aspect of this is the development of predictive computer models that enable farmers to optimise crops using management decision based on simulation scenarios. Most African farmers do not have the computer resources or expertise to implement these types of technology. Even extension offices in Africa, who provide much needed advice, can be under resourced in this way. We suggest here that simpler computer models that are cheaper and easier to use need to be developed. As a first step in this process we investigate here which factors are most cost effectively managed using computer simulations in semi-arid conditions pertinent to much of sub-Saharan Africa. Factors known to be important in crop farming are planting date, sowing density, variety, weeding, soils and fertiliser. We use qualitative arguments with simulations and conclude that interactions between rainfall, soil condition and fertiliser can benefit from simulations and thus should help in their management.

Keywords: modelling crop yields; small scale farming; food production

1. INTRODUCTION

Small scale farming systems are characterised by poor investment in farming inputs, low productivity and widespread persistent poverty (Shumba, 1993; Rohrbach & Okwach, 1997; Selvaraju, Meinke & Hansen, 2004). One of the primary reasons for the low or poor crop yields are found to be a lack of relevant and adequate information necessary for making informed crop management decisions (Prasad, Kesseba & Singh, 1996; Masere, 2011). These decisions include crop types and variety choices, planting dates, sowing densities, fertiliser investment, and weeding frequencies. Getting these management variables right is key for small scale farmers to obtain optimal crop yields thus ensuring their food security and livelihood is enhanced.

Crop modelling platforms can offer decision support information to help farmers optimise crop yields. Moreover the crop models offer farmers the opportunity to assess and quantify risks associated with their operational management decisions under climate variations (Struif-Bontkes & Wopereis, 2003). If computer resources and expertise to operate them are not

⁹ PhD Student at the University of KwaZulu Natal, Discipline of Agricultural Extension and Rural Resource Management. This article is part of the author's PhD Thesis. Institute of Systems Science, Durban University of Technology, P.O. Box 1334, Durban 4000, South Africa.

¹⁰ School of Mathematics, Statistics and Computer Science, University of KwaZulu-Natal, Private Bag X01, Scottsville, 3209, South Africa. Institute of Systems Science, Durban University of Technology, P.O. Box 1334, Durban 4000, South Africa.