

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ



Sudan University of Science and Technology

College of Agricultural Studies



Department of Agricultural Engineering

Appreciation of Sugar cane Production Using Aqua Crop model in Aljunyed Scheme.

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Agricultural Engineering

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الآية

بسم الله الرحمن الرحيم

قال تعالى :

(وَفِي الْأَرْضِ قِطْعٌ مُتَجَاوِرَاتٌ وَجَنَّاتٌ مِنْ أَعْنَابٍ وَزَرْعٌ
وَنَخِيلٌ صِنَوَانٌ وَغَيْرُ صِنَوَانٍ يُسْقَى بِمَاءٍ وَاحِدٍ وَنُفِضَ لُبَّهَا
عَلَى بَعْضٍ فِي الْأُكُلِ إِنَّ فِي ذَلِكَ لَآيَاتٍ لِقَوْمٍ يَعْقِلُونَ)

صدق الله العظيم

سورة الرعد الآية (4)

Dedication

To my Family,

To my Teachers,

To my Friends,

Preface and Acknowledgments

The author wishes to express his sincere gratitude towards the following people The present thesis is submitted to Sudan University of science and Technology, of Agricultural Studies , Department of Agricultural Engineering , as a final report in fulfilling the requirements for the and institutions. BS.c Degree .

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Abstract

Founded Aljunyd project in 1960 and reached a total area of (27,500)

Feddans. The specific objective is to simulate crop water productivity in Aljunyed scheme for Sugar cane crop, using Aqua Crop model. Developed by FAO, considering the different aspects such as; the influence of sowing dates, the influence of water stresses, different levels of soil fertilities, irrigation options, effective rainfalls and two rainfed scenarios. Field data experiments have been retrieved from Hagu and Nasr area (during summer season (2012-2013)). For Aqua Crop model testing, the actual measured weights of biomass and yield produced by each farmer have been compared with the model predictions of biomass and yield considering; climatic daily measurements, soil moisture content measurements and the growth stages of Sugar cane. The Aqua Crop model has shown very good predictions of yield and biomass, respectively, compared to actually measured weights of yield and biomass obtained from the two field experiments. The Aqua Crop model has been applied using 16 scenarios together with other two rainfed scenarios to study the influence of water stresses, different levels of soil fertilities, irrigation options, different effective rainfalls and different levels of mulch on biomass and yield of Sugar cane crop. From the model applications, it has been concluded that; - Biomass and yield increased when soil fertility level increased.

Biomass and yield decreased when irrigation increased.

For 87% of the 16 scenarios, biomass and yield increased when actual effective rainfall increased, 75% when fertility level increased, 62% when mulch increased level and 50% when irrigation increased.

AquaCrop model can be used as a planning tool or to assist in management decisions for both irrigated and rainfed agriculture, management decisions to predict the maximum crop yield and biomass by selecting the appropriate irrigation option and soil fertility level.

الخلاصة

تأسس مشروع الجنيد في عام 1960 ووصلت مساحته الإجمالية إلى (27,500) فدان. الهدف العام من هذا البحث هو دراسة تحسين إدارة المياه لمشروع الجنيد بمنظور جديد والهدف المحدد هو نمذجة إنتاجية المياه في مشروع الجنيد لمحصول قصب السكر، وذلك باستخدام الذي طورته منظمة الأغذية والزراعة (فاو) مع الأخذ في الاعتبار الجوانب Aqua Crop نموذج المختلفة مثل: تأثير مواعيد الزراعة، تأثير نقصان أو زيادة رطوبة التربة على النبات ومستويات مختلفة مثل خصوبة التربة، خيارات الري، مستوى الأمطار واثنين من خيارات الري المطري. وقد تم استخدام بيانات تجارب حقلية في منطقة الدراسة (منطقة (Hagu and Nasr) خلال الموسم 2013 -2012) لاختبار النموذج، قد تمت مقارنة الأوزان الفعلية المقاسة من الكتلة الحيوية والإنتاجية المحصولية التي تم إنتاجها فعلياً مع تنبؤات النموذج للكتلة الحيوية والإنتاجية المحصولية. وقد أظهر النموذج تنبؤات جيدة جدا من الكتلة الحيوية و الإنتاجية المحصولية، على التوالي، مقارنة بالأوزان التي تحصل عليها المزارعين من الكتلة الحيوية والإنتاجية المحصولية.

تم تطبيق النموذج باستخدام 16 خياراً جنباً إلى جنب مع خيارين للري المطري لدراسة تأثير زيادة أو نقصان رطوبة التربة على النبات، ومستويات مختلفة من خصوبة التربة، خيارات الري والأمطار الفعلية على الكتلة الحيوية والإنتاجية لمحصول قصب السكر. ومن تطبيقات النموذج تم استخلاص الآتي:

- 75% من السيناريو الكتلة الحيوية والإنتاجية المحصولية تزيد كلما ارتفع مستوى خصوبة التربة.
- 87% من عدد 16 خياراً تزيد فيها الكتلة الحيوية والإنتاجية المحصولية كلما ارتفعت مستويات الأمطار.
- 50% من عدد 16 خياراً تزيد فيها الكتلة الحيوية والإنتاجية المحصولية تزيد كلما ارتفع مستوى (الري) - 62% من عدد 16 خياراً تزيد فيها الكتلة الحيوية والإنتاجية المحصولية تزيد كلما ارتفع مستوى (بقايا المحصول) - الحد الأدنى لتأثير نقصان أو زيادة رطوبة التربة على النبات والحد الأقصى لدورة محصول قصب السكري حدثان عندما تكون مستويات الري 50% من الري الفعلي.

يمكن استخدام النموذج كأداة للتخطيط أو للمساعدة في اتخاذ القرارات الإدارية في الزراعة المروية والمطرية لتحقيق أقصى قدر من الكتلة الحيوية والإنتاجية للمحاصيل المختلفة عن طريق اختيار الخيارات المناسبة للري و مستويات خصوبة التربة.