

**Evaluation of Operation Speed Effect on Center Pivot
Irrigation System Performance. A Case Study of El Waha and
El Zahra Project in Northern State (Sudan)**

تقويم أثر السرعة التشغيلية علي أداء نظام الري بالرش المحوري.
(دراسة حالة مشروع الواحة والزهران فى الولاية الشمالية (السودان)

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Dedication

To my Father,

Mother,

Brothers and Sister

To my Friends,

Wife and Son

**And all those who helped in away or an other to bring this
study to reality.**

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ABSTRACT

This study was conducted in Northern State, the field experiment was carried out during the period November 2008 to April 2009 at El Waha-Elzahra project, to evaluate using of center pivot irrigation system in wheat production.

The study was designed to determine the optimum speed to attain the best Christiansen's coefficient (CU) and Distribution uniformity (DU) and compare the productivity of wheat under center pivot and surface irrigation system (common system in the state).

The performance of the system was evaluated when running at four different speeds (60%, 70%, 80% and 100%) with complete randomized design (CRD). The respective values of uniformity coefficient (CU) for the four speeds were 70.5%, 79.6%, 72.4% and 80% and there was a significant different between these values at $p = (0.05)$. From the results obtained the general trend found was that the (CU) and (DU) values tend to increase with speed increase. These values are considered low when compared to the normally recommended value of 85% for center pivot irrigation system. For the distribution uniformity (DU) the system gave 55.9%, 75.6%, 61.9% and 68% at the different speeds respectively and there was a significant different between these value at $p = (0.05)$.

The center pivot has been better when evaluated for producing wheat and has improvement by 72% in productivity of the wheat under surface irrigation (3.48 ton/ha for center pivot compared to 2.02 ton/ha for surface irrigation method) under similar soil, fertilizing rate, seed rate and seed varieties conditions, (variety Wadi El Neele). In addition to increasing the productivity the center pivot made high water saving and it significantly better on yields than surface irrigation method

الخلاصة

تمت هذه الدراسة بالولاية الشمالية، حيث أجريت التجربة الحقلية في الفترة من نوفمبر 2008 إلى إبريل 2009، بمشروع الواحة والزهرء لتقييم استخدام نظام الري بالرش المحوري لإنتاج القمح.

أجريت التجربة لتحديد السرعة المثلى التي تعطي أفضل معامل انتظامية وانتظامية توزيع مع م مقارنة إنتاجية القمح بين نظام الري بالرش المحوري ونظام الري السطحي ((النظام السائد بالولاية الشمالية).

أجريت التجربة بأربعة سرعات مختلفة (60%، 70%، 80% و 100%) بنظام التصميم العشوائي الكامل، وكانت قيم معامل الانتظامية كالتى: 79.6%، 72.4% و 80% على التوالي. وعند تحليل النتائج وجدت فروق معنوية بين هذه القيم عند درجة معنوية (0.05) من النتائج التي حصلنا عليها وجد أن الاتجاه العام لمعامل الانتظامية وانتظامية التوزيع تزيد مع زيادة السرعة. هذه القيم تعتبر منخفضة عند م قارنتها بالقيم الموصى بها لنظام الري بالرش المحوري (85%). أما بالنسبة لانتظامية التوزيع أعطى النظام القيم التالية: (55.9%، 75.6%، 61.9% و 68%) للسرعات المختلفة (على التوالي وكانت هناك فروق معنوية بين هذه القيم عند درجة معنوية (0.05).

نظام الري بالرش المحوري يعتبر ملائم لإنتاج القمح عند م قارنته بنظام الري السطحي. استخدام نظام الري المحوري أدى إلي تحسين الإنتاجية بنسبة 72% عن إنتاجية الري السطحي (3.48 طن للهكتار لنظام الري المحوري م مقارنة ب 2.02 طن للهكتار لنظام الري السطحي) تحت نفس ظروف الم مقارنة من تربة ومعدل تسميد ومعدل بذر وصنف القمح (وادي النيل). بالإضافة إلي زيادة الإنتاجية فان نظام الري بالرش المحوري يعمل علي توفير كمية كبيرة من الماء و أعطي إنتاجية أفضل بدرجة معنوية عن نظام الري السطحي.

