SUMMARY

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This study was conducted during (1995-1997) in three experimental sites. The first one , was in Bustan (sandy soil) at Nobaria area (new reclaimed lands). The second site, was in experimental farm of faculty of Agric. at Moshtohor , Zagazig University (clay soil) , and the third site , was in the experimental farm of faculty of Agric. Ain-Shams Univ. at Shalaqan (clay loam soil).

Portable sprinkler irrigation laterals, with traditional (standard) and alternate sets management, were used to irrigate the experimental sites.

The aims of this investigation were: -

1- Studying the effect of alternate sets management on water distribution uniformity and water application efficiency

2- Determining the effect of alternate sets on soil characteristics (soil aggregates break down and compaction).

3- Investigating the effect of alternate sets management on crop production, water use efficiency and irrigation cost.

The results obtained could be summarized as follows : -

Effect of engineering factors of the alternate set management:

1-The highest values of water distribution uniformity (CU) was 88% with 9×9m spacing under operating pressure of 0.3 Mpa, while the lowest value was 55% with 18×18m spacing at operating pressure of 0.15 MPa. The optimum (CU) was 85% for 12×12m spacing under 0.25 MPa.

2-Soil breakdown was influenced by both alternate and traditional sets management. Data indicated that alternate set management reduced the soil aggregates break down (soil detachment) which improve the soil intake rate while the traditional set increased soil detachment. Soil aggregates breakdown (soil detachment) after 2 hours of irrigation amounted to 4.14% and 5.51% under 6.2 mm/h and 6.5 mm/h water application rate for alternate and traditional sets respectively.

3-Soil Moisture content increased by 2% to 4 % near and around the sprinkler compared with the overlap area in traditional set system, while the soil moisture content increased by 1% to 2% near and around the sprinklers compared with the overlap area. On the other hand, soil salinity decreased by 14.2% and 11.4% for alternate and traditional sets respectively. This means that the alternate sets have higher water distribution uniformity and more effective for salinity leaching.

4. Soil compaction measurements using Recording dynamometer indicated that less soil compaction was observed with the alternate set (0.85 N/cm^2) while it was 0.98 N/cm^2 under traditional set. Surface irrigation was the highest soil compaction since it was 1.25 N/cm^2.

Effects of economic factors of the alternate set management:

1. Alternate set increased both wheat and Faba - bean yield by 19.5 and 12% more than under traditional set .

2. Water use efficiency (kg/m^3) increased under alternate sets by (19.5 and 11.7%)   for both wheat and Faba - bean crops more than under traditional sets.

3-Irrigation cost for crop production unit (LE/kg) was decreased under alternate sets by (17.5 and 6%) for both wheat and Faba-bean crops respectively comparing with traditional sets.

The scientific results could be summarized in the following:

Using alternate   sprinkler irrigation set management improve water distribution uniformity and soil condition as well as increasing crop yield.