كما أن أظهرت النتائج على أن استخدام النسبة الثانية (1: 4) لحصد مياه الأمطار الدقيق واستخدام البيتومين الأثر الواضح على المحصول حيث كان لهما تأثير معنوى عالى على وبادة كل من وزن القش ووزن حبوب القمح وأطوال نباتات القمح.

وأظهرت النتائج على أن استخدام النسبة الثانية (1: 4) لحصد مياه الأمطار الدقيق مع استخدام البيتومين كان لهما الأثر الواضح على التركيز المتاح من العناصر المغذية (الحديد والمنجنيز والزنك) فى التربة حيث كان لهما تأثير معنوى عالى على زيادة تركيز تلك العناصر فى التربة وأيضاً كان لهما تأثير معنوى عالى على زيادة محتوى نباتات القمح من العناصر المغذية (حديد ومنجنيز وزنك).

5- التركيز المتاح من العناصر المغذية حديد ومنجنيز وزنك فى التربة:

زادت التركيزات المتاحة لعناصر الحديد والمنجنيز والزنك فى التربة تحت استخدام النسبة الثانية (1: 4) مقارنة بالنسبة الأولى (1: 2) ، النسبة الثالثة (1: 6).

حيث كانت هناك زيادة معنوية للتركيز المتاح للعناصر المغذية حديد ومنجنيز وزنك تحت استخدام النسبة الثانية مقارنة بالنسبة الأولى والثالثة وأيضاً كانت هناك زيادة معنوية لتلك العناصر المغذية تحت استخدام معاملة البيتومين مقارنة بمعاملة الكنترول ومعاملة سطح التربة.

5. SUMMARY

The present study was undertaken to evaluate the water harvesting systems at El-Qasr area in Wadi Washka West of Marsa Matrouh North- western coastal zone, Egypt. An assessment study was carried out on two water harvesting (water-catchment) set-ups made by farmers in the region one using earth embankment and the other using stone embankment. Besides, a field experiment was carried out.

The field experiment tested three ratio micro catchment size R_1, R_2 and R_3. They were 1: 2, 1: 4 and 1: 6 (area of cropped : area of non-cropped) respectively, and use three soil surface treatment. They were a control "non-treated soil surface"; "compacted with a load of 6.1 $kg.cm^{-2}$" and bituminous emulsion-treated surface "0.2 $L.m^{-2}$. The experiment was conducted for two wheat seasons "2002-2003 and 2003-2004".

1- Assessment of farmers systems of earth embankment versus stone embankment:

Highest of over all system efficiency occurred with stone embankment followed by earth-embankment. Volumes of water stored in root zone for non- embankment, earth embankment and stone embankment for all rain storms were 40.66, 57.44 and 61.52m^3 respectively in season 1; and 48.02, 67.85 and 72.8 m^3 respectively in season 2.

System efficiency for stone embankment was by 52%, while for earth embankment it was higher by 7% only, relative to non-embankment.

2- Assessment of results of the field experiment regarding water-harvesting effeciency.

a- Efficiency of run off :

Means values of runoff efficiency for R_1, R_2 and R_3 ratios for all storms were 76.6, 80.3 and 77.6% respectively in season 1, and 76.2, 83.1 and 79.5% in season 2.

b- Efficiency of runoff storage:

Mean values of storage efficiency for R_1, R_2 and R_3 were 84.0, 85.0 and 84.5% respectively in season 1, and 80.8, 84.2 and 81.5% respectively in season 2.

c- Overall efficiency of the water harvesting system:

Values of overall efficiency of system for the R_1, R_2 and R_3 well 66.1, 70.9 and 66.3% respectively in season 1, and 62.8, 70.9 and 65.8% respectively in season 2.

d- Efficiencies as affected by soil-surface treatment:

In all cases, the positive response to the R2 ratio was particularly considerable where the soil-surface was treated with Bitumen, followed by the compaction treatment.

3- Assessment of results of the field experiment regarding crop performance :

a- Height of wheat plant :

Mean values of plant height R_1, R_2 and R_3 were 33.0, 38.2 and 35.1 cm respectively in season 1, with R_2 giving an increase of 15.7 and 8.8% over R_1 and R_2 respectively in season 1. in season 2 values were 37.1, 44.2 and 40.6 cm for R_1, R_2 and R_3 respectively; with increasing plant height by 19.1 and 8.8% over R_1 and R_2 respectively.

The bitumen treatment was more effective than compaction. Main values for increases caused by bitumen over compaction and non-compaction was 10.3% and 30.3% respectively in season 1; and 7.6% and 27.5% respectively in season 2.

b- Yield of grains:

R2 gave the highest grain yield and R1 gave the lowest.

Yield increases by R2 and R3 over R1 were 47.5% and 13.7% respectively in season 1; and 64.6% and 20.1% in season 2.

The increase was particularly considerable where bitumen was used. The bitumen treatment increased yield by an average 39.9 as compared with 16.7% increase by compaction in season 1. Comparable values in season 2 were 50.0% and 20.8% respectively.

c- Yield of straw:

The R_2 gave higher straw yield than R_1 and R_3 by 38.4 and 15.9% respectively in season 1, and 50.0 and 13.2% respectively in season 2.

The bitumen treatment was more effective that compaction. It increased straw yield by 40.3 and the compaction treatment increased it by 20.6% in season 1; comparable increases in season 2 were 44.6 and 15.7% respectively.

d- Micro-nutrients in plant:

Response to water-catchment treatments regarding contents and uptake of Fe, Mn and Zn followed a patter rather similar to that regarding plant yield. R2 showed the most effective ratio, and bitumen proved the most effective soil-surface treatment, R2 surpassed R1 and R3 by the followings: Fe: 25.3% ad 11.0% (season 1); 34.7% and 13.8% (season 2); Mn: 25.0% and 14.1% (season 1); 36.1% and 17.6% (Season 2). Zn: 37.8% and 13.0% (season 1); 49.4% and 15.4% (season 2), Bitumen was more effective than compaction.

4- Assessment of results of the field experiment regarding contents of available micronutrients after crop harvest:

A pattern similar to that regarding yield and micronutrients in plant occurred in available Fe, Mn and Zn in soil in response to ratios of water-catchment and soil-surface treatment.