The Islamic University of Gaza- Civil Engineering Department
Irrigation and Drainage- ECIV 5327

Lecture 1: Importance of Irrigation and Drainage

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Introduction

Importance of Irrigation

- Definition “the supply of water to crops and landscaping plants by artificial means”
- world-wide: 544 million acres
- (17% of land → 1/3 of food production)

Purpose

- Raise a crop where nothing would grow otherwise (e.g., desert areas)
- Grow a more profitable crop (e.g., alfalfa vs. wheat)
- Increase the yield and/or quality of a given crop (e.g., fruit)
- Increase the aesthetic value (القيمة الجمالية) of a landscape (e.g., turf, ornamentalsنباتات الزينة)

Reasons for yield/quality increase

- Reduced water stress
- Better germination and stands
- Higher plant populations
- More efficient use of fertilizer
- Improved varieties
- Leaching of salts
- Frost protection
- Plant/soil cooling
- Chemical application
- Wind erosion control

Arid to semiarid sites: calcareous soils general characteristics

(e.g. Mediterranean region, India, N. China...)

- **little weathering of minerals**
- **low development of soils**
- **low organic matter (N) content**

  low leaching
- **accumulation of salts**
- **inhibited root growth because of drought and salt**
- **risk of erosion (wind, water)**

nutritional status/nutrient deficiencies

- **water deficiency**
  →inhabit root growth →inhibited nutrient acquisition
- **poor water use efficiency because of nutrient deficiency**
- **P-deficiency (fixation)**
- **Fe-, Zn- (Mn-, Cu-) deficiency**
- **B-deficiency**
- **<u>toxicity</u> (salt, boron)**

drought stress

Soil water content (SWC)

Historical Perspective

- Nile River Basin (Egypt) - 6000 B.C.
- Tigris-Euphrates River Basin (Iraq, Iran, Syria) - 4000 B.C.
- Yellow River Basin (China) - 3000 B.C.
- Indus River Basin (India) - 2500 B.C.
- Maya and Inca civilizations (Mexico, South America) - 500 B.C.
- Salt River Basin (Arizona) - 100 B.C.
- Western U. S. - 1800’s

Irrigation Techniques

Surface irrigation	**Furrow**	Water flows through furrows over the field.
	Border-strip	Water flows over a strip of land.
	Basin	Water is hold in a small basin until irrigator decides to make water run off through breaking bank or spillway arrangement
Piped systems	**Sprinkler**	Spraying water over the soil surface
	Trickle / drip	Emitting water to top soil at low flow rates
Subsurface irrigation		Control of groundwater table

Types of Irrigation Systems

1. Sprinkler: pressurized irrigation through devices called sprinklers (water is discharged into the air and infiltrates near where it lands). Used on agricultural and horticultural crops, turf, landscape plants

2. Surface Irrigation: Irrigation water flows across the field to the point of infiltration. primarily used on agricultural crops and orchards

3. Micro (drip, trickle): frequent, slow application of irrigation water using pressurized systems. Used in landscape and nursery applications, and on high-value agricultural and horticultural crops.

Why do we need to irrigate in the Gaza Strip?

Rainfall in Gaza Strip

- The average annual rainfall varies from 470 mm/year in the North to 242 mm/year in the South.
- Rainfall occurs only in the winter months (October - March).
- Half of the Rainfall occurs during December to January.
- The number of rainy days along Gaza strip is 41 days.

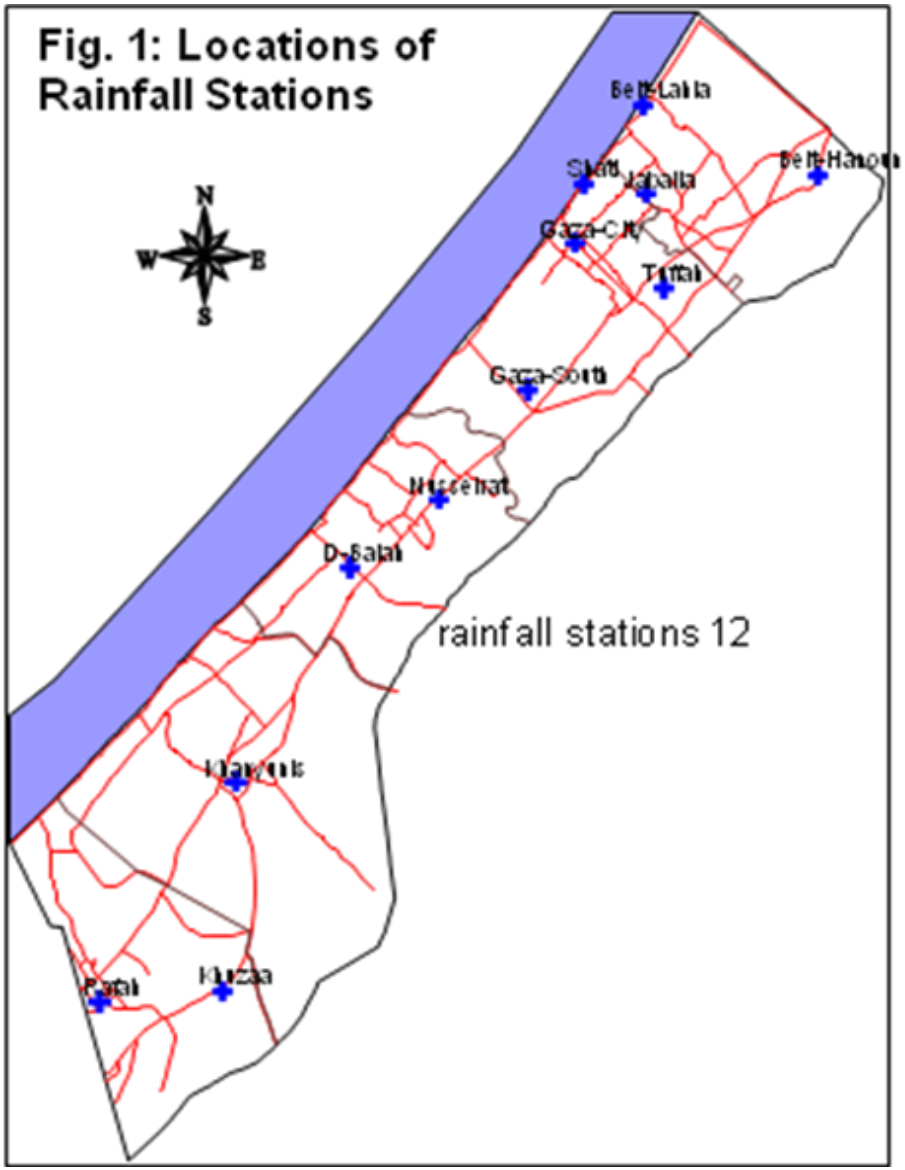


Fig. 1: Locations of Rainfall Stations
N
W
E
S
Beit-Lahia
Sheik Jaballia
Beit-Hanoun
Gaza-City
Tuffah
Gaza-South
Nuseirat
D-Balah
rainfall stations 12
Khan-Yunis
Rafah
Khuzaa

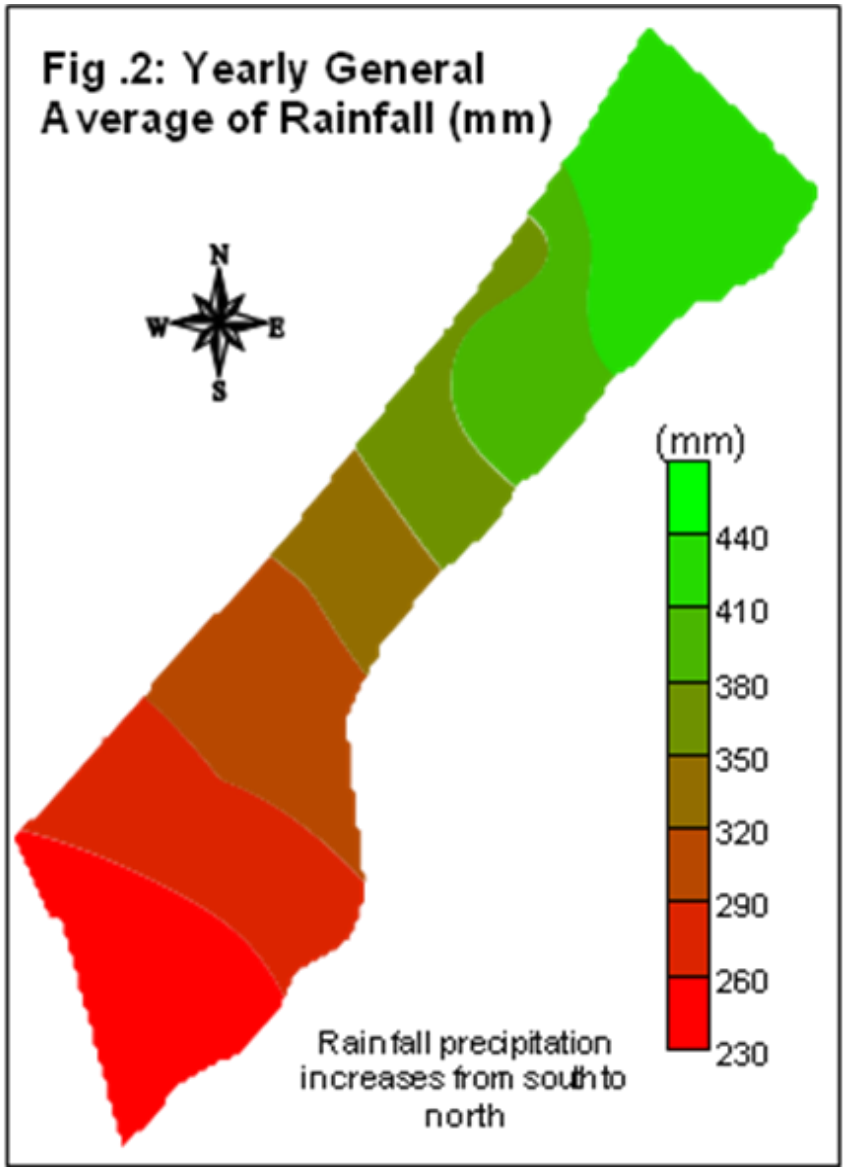
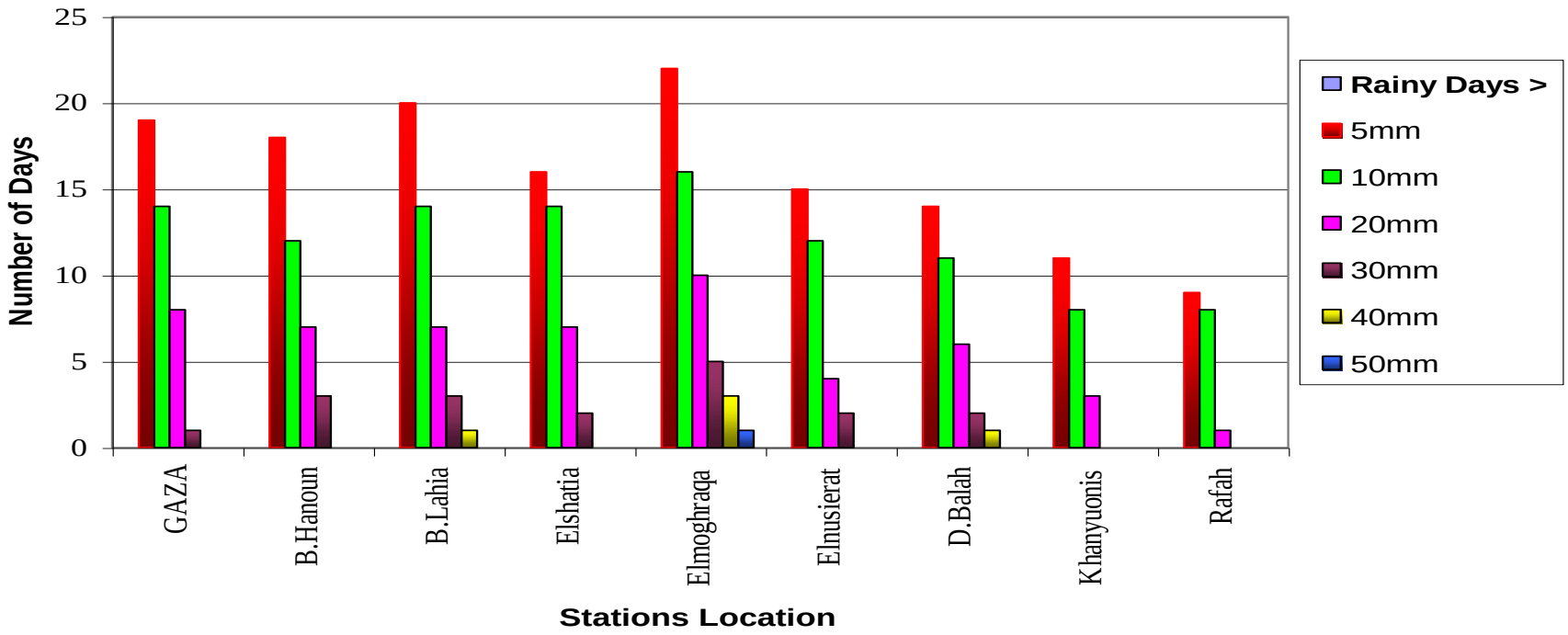


Fig .2: Yearly General Average of Rainfall (mm)
N
W
E
S
(mm)
440
410
380
350
320
290
260
230
Rainfall precipitation increases from south to north

Metrological Stations in the Gaza Strip

No	Meteorological Station	Elevation (m)	x	y	Longitude East	Latitude North
1	Beit Hanoun	48	106420	105740	35°13E	32°56N
2	BeitLahia	55	99750	18280	35°21E	31°37N
3	Shati	36	97500	105320	35°16E	32°21N
4	Gaza City	13	97140	103300	34°27E	31°30N
5	Gaza South	43	95380	98000	35°23E	31°76N
6	Deir El-Balah	56	88550	91600	35°27E	31°51N
7	Khanyounis	32	84240	83880	35°18E	32°28N
8	Rafah	98	79060	75940	34°16E	31°14N

Number of Rainy Days According to the Quantity in (mm) for Nine Weather Stations in Gaza strip for the Year 2004 (MOT, 2004)



Example of Metrological data for Gaza City

Month	Temperature		Humidity (%)	Wind Spd (km/d)	Sun shine (hrs/d)
	Max	Min			
Jan.	17.8	10.7	64.0	280.8	4.8
Feb.	18.1	11.2	67.0	278.4	6.2
March	19.8	13.2	68.0	261.6	7.6
April	22.5	16.7	67.0	249.6	8.2
May	24.4	19.2	71.0	230.4	9.8
June	27.0	21.7	74.0	237.6	9.8
July	29.4	23.9	74.0	232.8	10.5
Aug.	29.4	24.6	71.0	237.6	10.5
Sept.	28.7	23.1	69.0	249.6	9.6
Oct.	26.3	20.4	68.0	256.8	8.2
Nov.	23.0	16.1	61.0	261.6	6.0
Dec.	19.2	12.6	65.0	261.6	3.9
Average	23.8	17.8	68.3	253.2	7.9

Irrigation water requirements according to the metrological data

No	Meteorological Station	Citrus	Almonds	Date Palm	Grapes	Vegetables	Winter wheat
1	Beit Hanoun	790	731	1129	623	298	318
2	BeitLahia	825	778	1155	644	314	323
3	Shati	835	808	1166	661	323	417
4	Gaza City	853	812	1179	675	341	429
5	Gaza South	860	843	1183	680	355	436
6	Deir El-Balah	897	874	1261	738	361	453
7	Khanyounis	906	888	1274	742	376	477
8	Rafah	948	930	1317	753	378	483

Assignment No. 1

Write a brief report (not more that 2 Pages. 14 Times New Roman, 1.5 spacing) about Gaza Strip Metrological stations showing the following:

- Location
- What types of measurements (Rainfall, temperature, Evaporation, Humidity, Wind Speed and direction, Sunshine hours and Sunshine Intensity…….etc.)
- Compare one year- rainfall data from metrological station in the north and the other in the south of Gaza Strip.