

.1.2

Neumann

" 1600 1954/55 - 1932/33 (1958)
(1977)

" 1080
" 80
" 30
" 80
" 260
" 80

(1977)

" 1150

200-

" 600- " 415- 1-

" 230- 370- " 350- 1.3- 1.6- 1.1

.2

.2.1

(Bentor, 1961) (1974) Begin et al.
(1961) Bentor (GIS , - ") " 40,900
" 40,000- (1974) Begin et al. - (1964) Ben Arieh

(1974) Begin et al. " 25
(1.1) " 73,000

.2.2

.2.2.1

(Hall, 1997) (DEM - Digital Elevation Model)
) 25
GRS 1980 (25 25
(ITM) , Transverse Mercator

.2.1

NASA (2004) NASA

30

(Shuttle Radar Tomography Mission) SRTM
(90)
(edcsgs9.cr.usgs.gov/pub/data/srtm)

14

Global Mapper 34-37 29-34

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UTM 25
GRS 1980 Transverse) SRTM .zone 36N WGS 1984
.ArcInfoGIS " (Mercator

(SRTM) .2.2

(2.2)

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GIS- (STRM- Hall, 1997)
) DEM- .(2.3)
 ,(3210.8 ,
 , 117- .Fill Sink
 .2.4 .(140)
 . 729

.2.2.2

.(Flow direction)
 ; (Flow accumulation)

)
 , 2.1 . ()
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() () -
 (2.5) (Sneh et al., 1998a-d) 1:200,000 "
 .(2.6) 1:50,000 " ()
) (2.5) (Bender and comp., 1968) 1:250,000 "
 .(2.6) 1:50,000 " ()
 (Ponikarov and comp., 1964) 1:200,000 "
 (1:200,000 - 1:250,000) " " .(36-XII, 36-VIw)
 (1:50,000) " ,

-) 1:200,000 "
 (2000) Rosensaft .(- ;
 ,(1988) Ben-Zvi .(Sneh et al., 1998a-d)
 - - (Sneh et al., 2001)
 ()
 ,(2000) Rosensaft

Bender and comp.,) 1:250,000 " -
) 1:500,000 " - ,(Ponikarov and comp., 1964) 1:200,000 " - ,(1968
 .(Dubertret, 1951, 1960a, 1960b) 1:50,000 " - (1980 ,
 () " ."

.2.7

.2.4

(2.8)

(500 500 -)

GIS-

Jordan Meteorological Department -)

38 .(www.jmd.gov.jo)

. " Kriging

- 1942-1976

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.(1986) National Atlas of Jordan

.(2.8)

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()

.2.5

Hashemite Kingdom of ,(1939) Ionides ,(1992) ,(1971) ,(

.(1997) Harza JRV Group ,(1964) Jordan

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(2004)

.3

" 43.5
(3.1) (1974) Begin et al.

(3.1 3.2)

(2%-) (1

(6%-) (2

() (3

(37%-)

(31%-) (4

(19%-) () (5

5%-) (/) (6

(

.3.1

(3.1)

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700 (90%-)

(3.1 3.3) 40%- 500

10- 50%~)

(3.1 3.4 ; 10- 20%- ,

.3.2

(2) , (1) :

(3.1 3.5) (5)- / (4) , / (3) ,

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.3.3

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37%-) " 15,881-

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26) " 10-

45

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213 ;

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.4.2

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/

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,4.5

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(21%)

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50%)

- (60%) / 10%

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.(27%-)

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- .4.4.1

" 1.5-

:(4.1 4.7)

" 18- .(, ,)
, 571 . " 106
()

49- , " 458) " 401-545

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() /
() " 11-

:(4.1 4.8)

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()

365- " 209 " 28- 830
" 104- " 500-) " 647
/ .() / .
10- 20%- () "
(4.9 4.1 ; " 66)

:(4.1 4.10)
)
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" 194 " 30- 789
" 82- " 421) " 325-514
() / .() /
() " 12.5- 20%

:(4.1 4.11)
" 163 " 20- 999
" 54- " 334) " 258-421
() / .() /
() " 5.5-
(4.12 4.1 ; " 47) '
:(4.1 4.13) ()

127 " 25- - "
1011

" 36- , " 281) " 207-452 .
/ .() /
19 - , " 69 - , " 11 - -) () " 35
(4.14 4.1 ; "
:(4.1 4.15)()
.()
" 7-
" 330 " 54-
1270
" 116- , " 353) " 150-639
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/ () " 1.5- .() /
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1231 . " 195 " 28
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.(" 64- ,
- .() / () " 11-
:(4.1 4.17)(')
" 29- , ' -
1390 " 260
" 72- , " 277) " 142-529
/ / .(
() " 5- .()
(4.18 4.1 ; " 25) -

:(4.1 4.19) (-)

" 115) " 117-574 " 37- 1390 " 41- " 353
.() / /
() " 10-
(4.18 4.1 ; " 21)

() :(4.1 4.20)()
.()
42- (,)
1290 " 147 "
" 58- , " 394) " 91-671
/ .() " 7-
4.21 4.1)(" 35) (" 43) -
(

.4.4.2

" 8-

:(4.1 4.22)

" 7247 " 177-
500 2039
" 301) " 139-1182 ,
.(" 2179- ,
/ / (~75%)
() " 5.5-

" 39- : (4.1 4.23)
. 1149 . " 282
" 127- , " 450) " 348-509
/ .()
() " 9.5- /
))
4.24 4.1 , " 58 - - , " 26 - , " 19 -
. ()
" 33- : (4.1 4.25)
" 323-581 . 1349 . " 117
.(" 59- , " 507)
/ /
() " 12-
, " 31 - , " 33 -)
4.26 4.1 ; " 20 - ' , " 21 - , " 27 -
. ()
" 26- : (4.1 4.27) (-)
. 1469 . " 130
.(13-)
" 70- , " 540) " 255-598
. ()
/ .
() " 15-
, " 22 - - , " 14 -)
(4.28 4.1 ; " 25 - - , 21 - '
. ')
" 27- : (4.1 4.29) '
. 1559 . " 113
" 57- , " 504) " 201-598
. / .()
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. ')
" 28- : (4.1 4.30) '
" 195-555 . 1560 . " 104

.(" 47- , " 450)
 / /
 () " 14.5-
 (4.31 4.1 ; " 37) -
 .
 .() - :(4.1 4.32) ()
 . " 4067 " 188-
 224) " 96-544 . 1939
 .(" 912- , ")
 . 25%- / /
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 (4.33 4.1 ; " 54)
 . -
 20- :(4.1 4.34) -
 . 1461 " 192 ")
 " 57- , " 296) " 138-456
 / .(/
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 . - :(4.1 4.36)
 . " 465 " 42-
 , " 379) " 93-504 . 1480
 .(" 176-
 1- / /
 () ")
 .
 " 33- :(4.1 4.37)
 " 87-472 . 1320 . " 106
 .(" 34- , " 325)
 / /
 () " 4.5-
 (- 4.38 4.1 ; " 61) -

.5

.5.1

(4.1 , 46%)

1932

(" ")

1964

1967

.5.2

5.1) 29

.5.1

.(5.1

.2000/01 1949/50
(1971 ,) 1967

(Excel) " _ "

.5.2 (")

.5.3

5.3 5.2

"

1999/00 1975/76
(1971 ,) 1967

(5.4)

(Excel) " _ "

,5.5 (")
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5.7 5.3

(Excel) " _ "
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.5.5

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(5.9) (,Excel , " _ "
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.5.6

.5.6.1

1978/79 ,1925/26-1945/46 .5.10
 1946/47-1977/78 "

(1) $V_n = V_j - C_j + V_y - C_y$
 C_j , V_j , V_n
 C_y , V_y ,

.5.6.2

,1962/63
) ,0.86
 : .(5.4

(2) $V_a = 1.30V_n - 135$
 V_n - V_a
 .1977/78 1926/27 2

.1977/78 - 1926/27

5.11

.(5.5)

: .(5.6) ,0.94
 (3) $V_s = 0.0002V_n^2 + 0.315V_n + 114$

$V_s - , V_n$

(4) $V_j = V_s + V_n$

(5) $V_j = 0.0002V_n^2 + 1.315V_n + 114$

.1978/79

5

, " 150-

5.6

. " 30

.5.12

.5.7

(1970)

" 160-

" 40-

.1967/68 - 1965/66

" 25- " 1-

.(5.11) " 40

.(5.9)

" (1970)

"

.1954/55 - 1932/33

(1977)

, " 143

, " 971

, " 1066

, " 103

.(" "

) " 151

1128

, " 964

) " 203

, "

.(" 20

(1964) Hashemite Kingdom of Jordan "

.(1997) Harza JRV Group "

" 40

" 58

- 1948/49

. " 100

1953/54

(") (Δh)

(1977)

: .(") (V_a)

(6) $\Delta h = 0.098(V_a - 1095)$

" 1100) ,5.12
 " 900- (1991/92
 (1979)
 " 5-8
 (1979) .5.12 " 5- ,
 285 (1992) Bilbeisi
 " 161 " "
 (1977) - "
 (" 167) 1994/95 - 1978/79
 ,(1977) - " 200-
 1990/91 - 1978/79 " 90- ,
 (1992) Bilbeisi ,
 " 210 (1997) Harza JRV Group ,
 (1995)
 .1993/94 - 1988/89 () ,
 .5.13
 (1995)
 2-3 5.13
 (1995)
 " "
 (1997) Harza JRV Group
 25 , " 10 , " 210 , " 475
 " 230 , "
 (1977) - .

20 , " 25 (1997) Harza JRV Group
 " 80 , " 660 , " , "
 ,5.9 " 55 " 380 , " 150 , "
) 1962/63 - 1958/59 " 25-
 ,1957/58 - 1956/57 , .(1992/93 - 1991/92
 ,1979/80 - 1965/66 ,
 " 40-80 1983/84 , " 15-

-(1997) Harza JRV Group
 " 74- " 130-
 1954/55 - 1932/33 (1977)

1340 (1997) Harza JRV Group
 " 75 " "

(1955) Neumann " ,
 " 1205 " 75 , " 60-
 ,(1977) -
 1100- " 100- .() " 1217
 ,(1977 , -) "

- 1988/89 (1995)
 Harza JRV " 45 , " 72 1993/94
 , " 20- (1997) Group
 " 50-

(2005) Holtzman et al.
 20-80% " 0.5-1.1 - 2000/01
 .1999-2001 (2004) Farber et al. .

20-50%

10%-

" (2005)

" 1385
 ,(1997) Harza JRV Group " 1340-
 ,() " 50
 " ,(1997) Harza JRV Group
 (1977) - " " 300- (2005)

.5.8

,1977/78

.1978/79

,(1979)
 ,(1995) " 5
 " ,(5.11)

" 10- ,(2004) Farber et al.

" 19- (1995)
 8- (2005) Holtzman et al.
 (2005) Holtzman et al. "

(1995) " 30- 2001
 " 40-50- 1990/91 - 1988/89
 (1995)
 (1997) Harza JRV Group (1995)
 " 70
 " 203
 ,1994/95 - 1978/79 " 167 1954/55 - 1932/33
 Harza JRV Group " 40
 " 80- (1997)
 " 70

151- (1977) - "
 (1997) Harza JRV Group (1995) .() "
 , " 8- (2005) Holtzman et al.
 " 8-
 " 100- " 100-
 "
 " 70-
 " " 5- ()
 " 100
 "

.5.9

.5.14 5.12 ,1999/00 - 1926/27
 1977/78 .5.7
 ,1978/79

" 330-

(1992/93 ,1991/92)

" 1000

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.(1998)

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	1:500,000 "	-	1980
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,6/96/ "									1996
	,9/96/ "								1996
,3/98/ "	1998 -								1998
	" ,HR/70/037 "								1970
,4 ' "	" ' - "		,61/79/01 ' "						1979
			1990						1992
			1994 - 1988						1995
									2005
			1967						1971

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