



.1.2

Neumann

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

" 1080  
" 80  
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" 80  
" 260  
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" 1150

200-

" 600- " 415- 1-

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

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.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

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

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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

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

.2.2.2

(Flow direction)  
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) ,( )  
, 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](http://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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(3.1 ) (1974) Begin et al.

(3.1 3.2 )

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( 6%- ) (2

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( 31%- ) (4

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5%- ) ( / ) (6

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( " 100 ) 20

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" 18- .( , , )  
, 571 . " 106  
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49- , " 458 ) " 401-545

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" 209 " 28- 830  
 365- , ,  
 " 104- , " 500- ) " 647  
 / .( ) / .( .  
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 (4.9 4.1 ; " 66)  
 :(4.1 4.10 )  
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 .( , , ,  
 " 194 " 30- 789  
 " 82- , " 421 ) " 325-514  
 .( ) / .( ) /  
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 :(4.1 4.11 )  
 " 163 " 20-  
 " 54- , " 334 ) " 258-421 999  
 ( ) / .( ) /  
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 (4.12 4.1 ; " 47)  
 :(4.1 4.13 ) ( )  
 127 " 25-  
 1011 "

" 36- , " 281 ) " 207-452 .  
/ .( ) /  
19 - , " 69 - , " 11 - - ) ( ) " 35  
( 4.14 4.1 ; "  
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" 330 " 54-  
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" 116- , " 353 ) " 150-639  
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- : (4.1 4.16 ) -  
1231 . " 195 " 28  
" 326 ) " 148-518 .( 11- )  
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- .( ) / ( ) " 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  
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(4.18 4.1 ; " 21)

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.( )  
42- ( , )  
1290 " 147 "  
" 58- , " 394 ) " 91-671  
/ .( ) " 7-  
4.21 4.1 )( " 35) ( " 43) -  
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**.4.4.2**

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" 7247 " 177-  
500 2039  
" 301 ) " 139-1182 ,  
.( " 2179- ,  
/ / (~75%)  
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" 39- . : (4.1 4.23 )  
. 1149 . " 282  
" 127- , " 450 ) " 348-509  
/ .( )  
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) )  
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 )  
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 ( ) " 14.5-  
 (4.31 4.1 ; " 37) -  
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 " 4067 " 188-  
 224 ) " 96-544 . 1939  
 .( " 912- , " )  
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 . 1461 " 192 " )  
 " 57- , " 296 ) " 138-456  
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 ; " 13) (4.35 4.1  
 . - :(4.1 4.36 )  
 " 465 " 42-  
 , " 379 ) " 93-504 . 1480  
 .( " 176-  
 1- / /  
 ( ) " )  
 " 33- :(4.1 4.37 )  
 " 87-472 . 1320 " 106  
 .( " 34- , " 325 )  
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 ( - 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  
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(5.4 )

(Excel ) " \_ "

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.5.4

5.7 5.3

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(5.8 )

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.5.5

)  
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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

( " ) ( $\Delta h$ )

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

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

1340 " 75 " (1997) Harza JRV Group

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

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

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

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

.5.9

" 330-

(1992/93 ,1991/92 )

" 1000

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,(1988) Ben-Zvi

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,(1996)

	1:500,000 "	-	1980	..	..	..	..	..	..
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	(1999/2000 )								
			(2000/2001 )						
,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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