
PHYSIOGRAPHIC CHARACTERIZATION OF SMALL HILLSIDE SEMIARID CATCHMENTS OF TUNISIA

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The small hillside reservoirs are very crucial for the sustainability of the water resources in the semiarid area of Tunisia. The Tunisian government has initiated a policy of small dams construction since 1990. However, flash floods and severe soil loss are jeopardizing the lifetime of those small hydraulic structures. The geomorphology has fundamental effects on the hydrologic response. In this paper, we studied the geomorphological characteristics of small hillside catchments in the semiarid region of Tunisia. Twenty-four catchments were selected. Their areas vary from a few hectares to 100 km². They have relief ranging from a minimum altitude of 70 m to a maximum altitude of 1309 m. They are representative of rainfall gradient of the semiarid region of Tunisia, which is 250 to 550 mm of annual rainfall (see Table 1). The hypsometric curve and topographic index were used as geomorphological parameters. GIS software and self-developed tools were used to calculate the hypsometric curves and the topographic index distributions. Statistical moments were computed to quantitatively describe the topographic structure of the basins. Other statistics were used to compare the topographic index distributions (see Table 2). The results have shown two classifications of those catchments depending on the scale of the geomorphological characterization. At the global scale, the watersheds were classified into five groups by comparing the hypsometrical attributes (Fig.1). The hypsometrical analysis revealed the impact of the erosion process on the studied watersheds. At the local scale, the topographic index distributions were divided into three classes (Fig.2). We noticed a shift effect of the topographic index distributions to larger values, which is due to the advanced erosion impact in some watersheds.

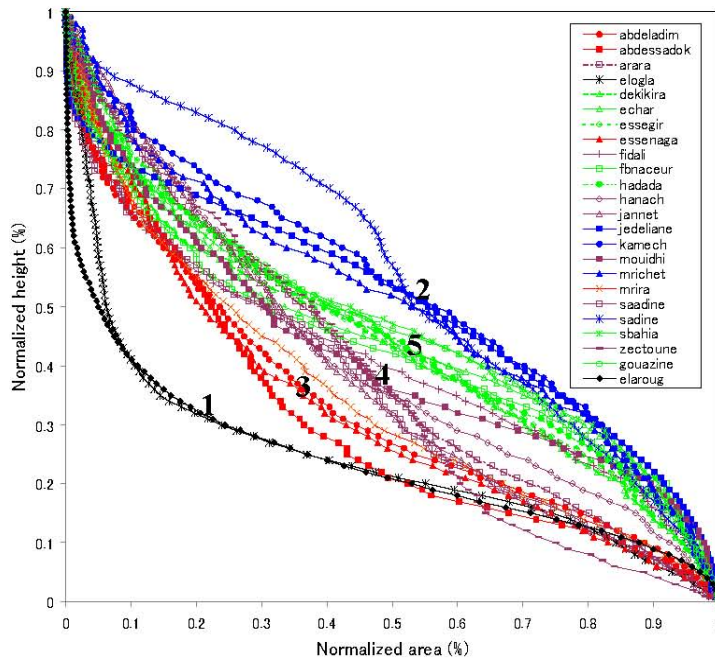


Fig.1 Hypsometric curves of the 24 studied catchments.

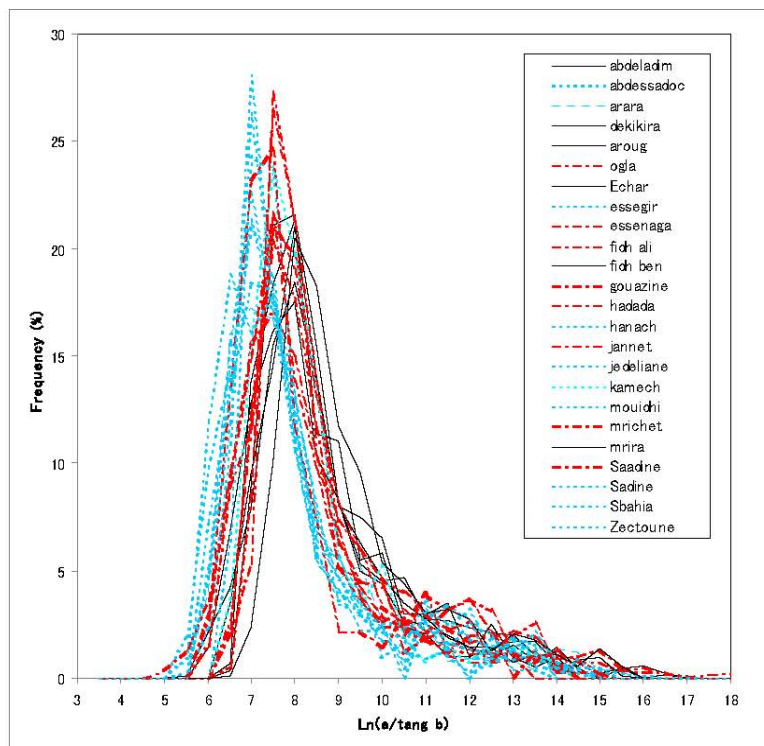


Fig.2 The topographic index distributions for the 24 studied watersheds.

Table 1 Characteristics of the studied catchments and their reservoirs.

No	Catchments (Km2)	Area Annual Rainfall Average (mm)	Altitude Min (m)	Altitude Max (m)	Storage Capacity (m3)	Construction Year	
1	Abdeladim	6.42	268	1030	1224	164080	1992
2	Abdessadok	3.07	336	815	1189	92530	1990
3	Arara	7.08	247	910	1352	91150	1993
4	Dekikira	3.07	366	380	479	219100	1991
5	El Aroug	40.25	NA	872	1309	2334920	1994
6	El Ogla	80.10	333	145	880	5887080	1989
7	Echar	9.17	338	970	1190	186840	1993
8	Es Segir	4.31	524	70	232	192450	1992
9	Es Senaga	3.63	287	618	883	86420	1991
10	Fidh Ali	4.12	264	335	444	134710	1991
11	Fidh Ben naceur	1.69	239	350	462	47110	1990
12	Gouazine	18.10	338	376	575	237030	1990
13	Hadada	4.69	344	900	1246	84970	1992
14	Hanach	3.95	351	447	834	77220	1992
15	Jannet	5.21	412	820	1191	94280	1992
16	Jedeliane	47.00	NA	740	1206	1550660	1992
17	Kamech	2.45	603	95	203	142560	1993
18	Mouidhi	2.66	252	235	363	142770	1991
19	Mrichet	1.58	329	590	730	41780	1991
20	Mrira	6.13	313	770	940	126350	1991
21	Saadine	2.72	390	245	552	35620	1992
22	Sadine	6.53	459	825	1267	82400	1990
23	Sbahia	3.24	436	300	473	135100	1993
24	Zectoune	2.05	199	195	569	72903	1998

Table 2 Hypsometric attributes and topographic index statistics for the 24 catchments.

No	Hypsometric attributes			TI statistics						
	Catchments	HI	Skewness	Kurtosis	Min TI	Max TI	Mod TI	Peak Freq	Mean TI	SD TI
1	Abdeladim	0.333	0.78	2.27	5.88	16.36	8.00	17.53	8.53	1.81
2	Abdessadok	0.306	1.03	2.93	5.58	13.67	7.00	21.38	7.75	1.69
3	Arara	0.398	0.43	1.98	5.76	15.64	7.00	17.23	8.21	1.86
4	Dekikira	0.434	0.21	1.48	6.67	13.97	8.00	21.38	8.62	1.55
5	El Aroug	0.234	1.27	3.10	5.31	17.40	8.00	18.45	8.70	1.91
6	El Ogla	0.242	1.26	2.99	4.87	19.27	7.50	17.02	8.19	2.08
7	Echar	0.450	0.23	1.41	6.64	15.39	8.00	21.61	8.75	1.72
8	Es Segir	0.444	0.23	1.54	6.30	14.72	7.00	24.31	8.28	1.80
9	Es Senaga	0.324	0.86	2.44	5.98	14.90	7.50	20.30	8.45	1.74
10	Fidh Ali	0.409	0.38	1.54	6.59	13.98	7.50	27.24	8.57	1.58
11	Fidh Ben naceur	0.434	0.31	1.44	6.46	14.03	8.00	21.00	8.81	1.57
12	Gouazine	0.461	0.10	1.43	6.31	17.23	7.50	20.90	8.60	1.93
13	Hadada	0.453	0.21	1.50	6.37	14.41	7.50	21.53	8.79	1.77
14	Hanach	0.411	0.50	1.90	6.01	13.92	7.00	26.30	8.16	1.72
15	Jannet	0.383	0.58	2.24	6.05	14.76	7.50	24.64	7.94	1.73
16	Jedeliane	0.505	-0.12	1.46	5.60	17.24	7.00	21.05	8.03	1.91
17	Kamech	0.525	-0.16	1.54	6.40	13.78	7.50	23.79	8.35	1.51
18	Mouidhi	0.420	0.46	1.66	5.96	15.20	7.00	18.46	7.94	1.72
19	Mrichet	0.504	-0.02	1.46	6.70	13.12	7.50	26.46	8.53	1.53
20	Mrira	0.348	0.73	2.22	6.67	15.49	8.00	20.47	9.19	1.80
21	Saadine	0.354	0.51	1.97	6.04	14.08	7.50	21.64	8.46	1.80
22	Sadine	0.550	-0.26	1.96	5.87	14.63	7.00	22.54	7.91	1.81
23	Sbahia	0.471	0.13	1.38	5.72	14.62	7.00	28.07	7.94	1.64

24 Zectoune

0.380

0.36

2.20 |

5.67

14.35

6.50

18.75

7.75

1.77

NPO21