

Table S1a: Measured length and area of the gullies in the Debre Mawi watershed obtained from Google image in 2005. The volume was calculated with equation Eq. (4) in the manuscript:  $V_p = 0.54 A^{1.226}$ , where  $V_p$  is predicted volume and A is area of a gully. The soil loss was calculated as  $V_p$  times average bulk density ( $1.2 \text{ g cm}^{-3}$ ).

No	Length (m)	Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Soil loss (ton)
1	46	3	2	2
2	27	54	72	86
3	36	72	103	124
4	35	83	122	146
5	41	94	141	169
6	50	130	211	253
7	33	148	247	297
8	38	152	256	307
9	66	181	317	381
10	67	189	334	400
11	163	205	368	442
12	48	227	417	501
13	94	228	420	504
14	65	267	511	613
15	100	297	581	698
16	85	298	583	699
17	98	390	812	974
18	197	419	884	1061
19	150	422	893	1072
20	243	454	978	1174
21	277	486	1062	1275
22	85	496	1090	1308
23	79	507	1120	1344
24	84	532	1186	1423
25	118	597	1368	1642
26	162	617	1422	1707
27	186	642	1494	1793
28	121	643	1498	1797
29	422	747	1799	2159
30	218	858	2132	2559
31	346	937	2375	2851
32	210	967	2470	2964
33	235	1057	2754	3305
34	269	1284	3496	4195
35	365	1356	3737	4484
36	390	1669	4819	5783
37	439	1961	5876	7051
38	465	2426	7624	9149
39	415	2883	9424	11309
40	241	3720	12881	15457
41	559	4254	15181	18217
42	504	4796	17584	21101
43	869	7349	29676	35611
<b>Sum</b>	<b>8743</b>	<b>45099</b>	<b>140321</b>	<b>168385</b>
<b>MIN</b>	<b>27</b>	<b>3</b>	<b>2</b>	<b>2</b>
<b>MAX</b>	<b>869</b>	<b>7349</b>	<b>29676</b>	<b>35611</b>
<b>AVE</b>	<b>203</b>	<b>1049</b>	<b>3263</b>	<b>3916</b>
<b>SD</b>	<b>153</b>	<b>1074</b>	<b>3855</b>	<b>4626</b>

Table S1b: Measured length and area of 245 gullies in the Debre Mawi watershed obtained from Google image in 2013, arranged in ascending order of their surface area in five columns. The total calculation in each column is given at the end of the table and the total magnitude of 245 gullies is presented at Table 1 in the manuscript. The volume was calculated with equation Eq. (4) in the manuscript:  $V_p = 0.54 A^{1.226}$ , where  $V_p$  is predicted volume and  $A$  is area of a gully which was obtained from the regression relation between measured volume and area of the 13 gullies (Figure S1a). The soil loss (SL) was calculated as  $V_p$  times average bulk density ( $1.2 \text{ g cm}^{-3}$ ).

No	Gully area ranged 10-90 m <sup>2</sup>				Gully area ranged 90-180 m <sup>2</sup>				Gully area ranged 180-400 m <sup>2</sup>				Gully area ranged 400-800 m <sup>2</sup>				Gully area >800 m <sup>2</sup>			
	Lengt h (m)	Area (m <sup>2</sup> )	V <sub>p</sub> (m <sup>3</sup> )	SL (ton)	Lengt h (m)	Area (m <sup>2</sup> )	V <sub>p</sub> (m <sup>3</sup> )	SL (ton)	Lengt h (m)	Area (m <sup>2</sup> )	V <sub>p</sub> (m <sup>3</sup> )	SL (ton)	Lengt h (m)	Area (m <sup>2</sup> )	V <sub>p</sub> (m <sup>3</sup> )	SL (ton)	Lengt h (m)	Area (m <sup>2</sup> )	V <sub>p</sub> (m <sup>3</sup> )	SL (ton)
1	73	12	11	13	157	97	146	176	90	183	322	386	97	402	841	1009	113	880	2201	2641
2	39	19	21	25	29	102	156	188	313	186	328	393	48	410	863	1035	307	888	2223	2668
3	315	22	24	29	254	103	159	190	189	192	341	409	44	412	868	1042	64	894	2242	2690
4	36	27	31	37	62	110	172	207	31	195	346	415	182	433	922	1107	120	982	2516	3019
5	47	28	32	38	506	110	173	207	239	200	357	429	22	441	942	1130	47	1033	2678	3214
6	96	29	33	39	447	111	173	207	218	202	363	436	40	457	986	1184	15	1053	2740	3288
7	286	33	39	47	40	113	177	213	130	204	367	441	21	463	1001	1201	14	1062	2770	3323
8	205	34	41	49	318	114	180	217	11	220	401	481	127	465	1006	1207	279	1069	2792	3351
9	221	34	41	49	30	116	183	220	35	221	404	485	115	475	1034	1241	161	1090	2861	3433
10	151	38	47	56	22	118	187	224	25	221	405	486	54	476	1035	1242	48	1103	2901	3481
11	27	39	48	58	113	119	190	228	90	223	408	489	54	483	1054	1265	110	1119	2952	3543
12	83	40	49	59	25	120	190	228	49	227	417	500	33	508	1121	1345	35	1124	2970	3564
13	119	41	51	61	99	120	192	230	119	233	432	518	8	508	1121	1346	79	1154	3067	3680
14	50	48	63	75	83	123	197	237	243	235	436	523	48	531	1184	1421	56	1208	3242	3890
15	74	50	65	78	90	123	198	238	14	236	439	526	113	531	1184	1421	53	1215	3266	3920
16	67	51	67	81	22	127	205	246	24	243	454	544	74	549	1233	1479	80	1252	3390	4069
17	130	52	68	82	67	127	206	247	97	245	458	550	135	550	1237	1485	162	1321	3619	4343
18	34	52	69	83	28	127	206	247	158	250	470	564	225	551	1239	1487	116	1367	3774	4529
19	42	52	69	83	60	128	207	249	372	251	472	566	89	556	1254	1505	71	1427	3979	4775
20	86	53	70	84	258	130	210	252	76	252	476	571	23	564	1276	1531	14	1615	4631	5557
21	88	57	77	92	173	131	213	256	81	260	494	593	59	580	1321	1585	144	1682	4867	5841
22	459	57	77	93	184	132	215	258	32	268	512	615	29	584	1331	1597	24	1688	4887	5864
23	456	61	83	100	68	132	216	259	44	269	514	617	51	602	1381	1657	160	1706	4951	5941
24	34	62	84	101	256	133	216	259	37	270	517	620	165	604	1388	1665	123	1843	5443	6531
25	32	62	86	103	267	135	221	266	65	274	526	631	56	606	1391	1670	39	2256	6974	8369
26	230	63	86	103	115	138	227	272	70	287	557	668	49	617	1423	1708	19	2264	7007	8408
27	24	68	95	114	199	142	235	282	251	297	581	697	292	620	1433	1720	38	2293	7116	8539
28	75	70	99	119	38	142	235	282	65	299	587	704	49	625	1447	1737	42	2458	7751	9301
29	98	70	99	119	32	144	239	286	57	304	598	718	45	641	1491	1789	317	2522	7996	9596
30	59	71	100	120	493	144	240	287	22	308	608	730	38	642	1493	1792	31	2583	8234	9881
31	45	73	104	125	176	147	246	295	379	314	622	747	489	677	1594	1913	179	2639	8454	10145
32	42	73	104	125	367	150	252	302	25	316	628	753	98	695	1647	1977	75	2818	9162	10994
33	20	74	105	126	160	151	253	304	20	324	646	775	15	714	1701	2041	38	2876	9393	11271
34	22	75	107	128	58	151	253	304	143	329	660	791	22	723	1729	2075	75	3255	10933	13120
35	25	75	108	129	21	151	254	304	544	331	664	796	35	734	1761	2114	16	3273	11010	13212

No	Gully area ranged 10-90 m <sup>2</sup>				Gully area ranged 90-180 m <sup>2</sup>				Gully area ranged 180-400 m <sup>2</sup>				Gully area ranged 400-800 m <sup>2</sup>				Gully area >800 m <sup>2</sup>			
	Lengt h (m)	Area (m <sup>2</sup> )	V <sub>p</sub> (m <sup>3</sup> )	SL (ton)	Lengt h (m)	Area (m <sup>2</sup> )	V <sub>p</sub> (m <sup>3</sup> )	SL (ton)	Lengt h (m)	Area (m <sup>2</sup> )	V <sub>p</sub> (m <sup>3</sup> )	SL (ton)	Lengt h (m)	Area (m <sup>2</sup> )	V <sub>p</sub> (m <sup>3</sup> )	SL (ton)	Lengt h (m)	Area (m <sup>2</sup> )	V <sub>p</sub> (m <sup>3</sup> )	SL (ton)
36	43	78	113	136	34	152	255	307	65	332	666	799	116	746	1796	2156	21	3656	12609	15131
37	43	79	114	137	55	157	266	319	76	336	675	810	151	769	1865	2238	119	3942	13827	16593
38	34	79	115	138	186	157	266	319	18	338	681	817	21	776	1884	2261	61	4360	15644	18773
39	87	80	116	139	29	159	271	325	698	348	706	847	45	777	1888	2266	27	4416	15895	19074
40	31	80	116	139	63	159	271	325	43	352	714	857	51	783	1906	2287	22	5089	18912	22694
41	32	84	123	147	67	162	276	332	86	352	716	859	225	785	1911	2293	23	5693	21697	26037
42	78	84	124	148	151	162	277	332	97	352	716	860	93	812	1994	2393	300	5768	22049	26458
43	100	84	124	149	52	164	280	335	107	356	725	870	40	825	2031	2437	35	5891	22630	27156
44	113	87	129	154	20	164	280	336	31	379	783	939	36	825	2034	2440	72	6051	23384	28060
45	72	89	133	160	63	170	294	353	39	381	787	945	37	827	2038	2446	40	6172	23959	28750
46	241	91	137	164	48	170	294	353	119	384	795	955	17	846	2094	2513	52	6386	24983	29979
47	66	91	137	165	102	175	304	364	47	385	798	958	76	852	2113	2536	40	7372	29786	35744
48	313	93	140	168	71	177	309	371	25	388	807	969	109	852	2114	2537	184	12577	57344	68813
49	32	96	145	174	35	180	315	378	271	391	815	977	90	859	2136	2564	43	13371	61811	74173
Sum	<b>5174</b>	<b>2960</b>	<b>4119</b>	<b>4943</b>	<b>6294</b>	<b>6773</b>	<b>11178</b>	<b>13414</b>	<b>6076</b>	<b>13946</b>	<b>27191</b>	<b>32629</b>	<b>4150</b>	<b>30764</b>	<b>71738</b>	<b>86085</b>	<b>4304</b>	<b>149755</b>	<b>539521</b>	<b>647425</b>
MIN	<b>20</b>	<b>12</b>	<b>11</b>	<b>13</b>	<b>20</b>	<b>97</b>	<b>146</b>	<b>176</b>	<b>11</b>	<b>183</b>	<b>322</b>	<b>386</b>	<b>8</b>	<b>402</b>	<b>841</b>	<b>1009</b>	<b>14</b>	<b>880</b>	<b>2201</b>	<b>2641</b>
MAX	<b>459</b>	<b>96</b>	<b>145</b>	<b>174</b>	<b>506</b>	<b>180</b>	<b>315</b>	<b>378</b>	<b>698</b>	<b>391</b>	<b>815</b>	<b>977</b>	<b>489</b>	<b>859</b>	<b>2136</b>	<b>2564</b>	<b>317</b>	<b>13371</b>	<b>61811</b>	<b>74173</b>
AVE	<b>106</b>	<b>60</b>	<b>84</b>	<b>101</b>	<b>128</b>	<b>138</b>	<b>228</b>	<b>274</b>	<b>124</b>	<b>285</b>	<b>555</b>	<b>666</b>	<b>85</b>	<b>628</b>	<b>1464</b>	<b>1757</b>	<b>88</b>	<b>3056</b>	<b>11011</b>	<b>13213</b>
SD	<b>107</b>	<b>22</b>	<b>36</b>	<b>44</b>	<b>125</b>	<b>22</b>	<b>44</b>	<b>53</b>	<b>140</b>	<b>63</b>	<b>150</b>	<b>180</b>	<b>85</b>	<b>142</b>	<b>403</b>	<b>483</b>	<b>80</b>	<b>2741</b>	<b>12577</b>	<b>15093</b>

