

REPORT ON PLANT SPECIES DIVERSITY AND ABUNDANCE FOUND ALONG THE PROPOSED LENGWE NATIONAL PARK IRRIGATION CANAL CORRIDOR

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INTRODUCTION AND BACKGROUND

Canals are created to drain water from wetlands or river courses for urban and agricultural use, to store and provide water to areas of development. Additionally, they provide flood control measures. Through construction of water canals, those objectives have been met, but, in the process, have transformed the landscape and ecology of the area where they pass through. The Lengwe agriculture water canal is designed to be constructed in Lengwe National park for agriculture purposes. The canal will run at a stretch of approximately 11 to 12 km distance with a waterbed width of 8.1m from the bottom, while the top will be 13.5m and fully fenced with bridges to allow the movement of animals.

Lengwe National Park was gazetted in 1970; located in Chikwawa district in the rift valley escarpment zone comprising of hills and low-lying vegetation types. It is 887 square km in area and lies to the south of Majete Wildlife Reserve which is 80km from Blantyre in the Malawi's Lower Shire Valley. The National Park extends between 16°15'28''S to 34°45'05''E in terms of geographical location. The soils are lithosols (Shallow and stony on steep slopes). The vegetation is open canopy savanna woodlands in hills and escarpments dominated by *Brachystegia* species especially *B. boehmii* and *Jubernadia globiflora*. The Eastern side of the park is dominated with low lying woodlands dominated by *Senegalia*(*Acacia*) *nigrescens* , *Vachellia* (*Acacia*) *nilotica* and *Ziziphus mucronata* are the dominant species.

The vegetation is thicket, with some deciduous woodland and more-dense tree growth along the stream courses. The eastern area is quite flat, allowing for a good and well-marked network of drivable tracks. To the west the level rises and low hills, outcrops of sandstone, break the skyline. The construction of the water canal in Lengwe National park will slough plant flora, an important component of biodiversity in the national park, hence this study.

3.0 RESULTS AND DISCUSSION

3.1 General vegetation description

Field observations of the canal passage vegetation comprise largely of open deciduous forests and some dense thickets of dry savanna woodlands. Within the open deciduous forest woodlands, two classes of vegetation compositions were distinct specifically along the canal passage corridor. These comprise of;

A= low-lying deciduous savanna forest with isolated islands of forest patches that are dominated by *Senegalia nigrescens* and *Ziziphus mucronata* (Plot No. 1,3,5,7,9,11 and 13). Grasses and herbs cover approximately 50-60% of the open areas between the forest patches (Figure 1). **B**=Low-lying open savanna woodland dominated by *Colophospermum mopane* mixed with *Vachellia (Acacia) nilotica* (Plot 13, 15, 17). Grasses and herbs cover approximately 30 to 40% of the open areas.

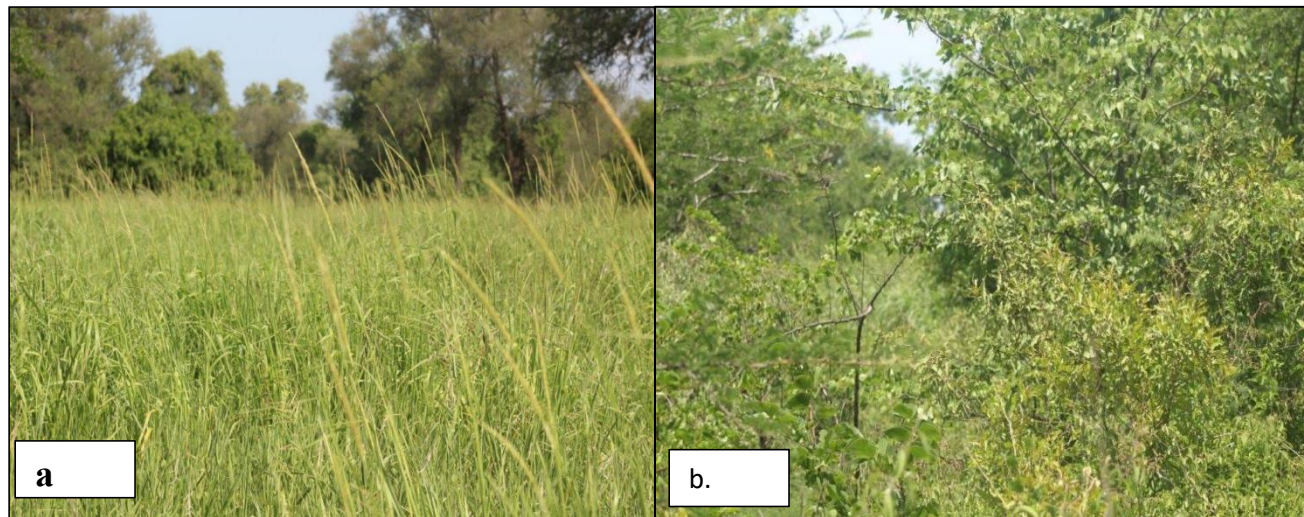


Figure 1: Vegetation type compositions along the proposed Lengwe agriculture canal as A= low lying sparse deciduous forest dominated by *Senegalia nigrescens* and *Ziziphus mucronata*; B= Low deciduous woodlands dominated by *Colophospermum mopane* and *Vachellia nilotica*

Table 1: Summary of plant groups and the corresponding number of species found

Plant species Life form	Number of plant families	Number of species found
Climber/creepers	6	18
Herbs	16	33
Trees and shrubs	23	58

3.2 Diversity and richness of plants found

Appendix table 1 shows the plant recorded in the entire survey sites. From a total of 41 plant families, one hundred and six (105) plant species were recorded within the corridor of the proposed canal (Table 1). The most dominant plant families observed were Fabaceae (13.8%), followed by Convolvulaceae(6.4%), Poaceae, (6.4%), Tiliaceae (5.5%), Acanthaceae, (4.6%) and Capparaceae (4.6%) respectively.

Within the study sites, plant species richness ranged between 13 and 34 plants (Table 2). Species richness (34) was the highest in areas dominated by *Colophosperm mopane* (Plot no.13 and 15) while the low richness (13) was observed in areas dominated by *Vachellia (Acacia) nilotica* and *Ziziphus mucronata*. Furthermore, Shannon Wiener diversity index (H) ranged from 2.57 to 3.52. High species diversity index was recorded in plot 15 (H=3.52) followed by Plot 7 (H=3.37), while low diversity of plants (H=2.57) was recorded in plot no.1 (Table 2). The observed differences could perhaps be ascribed to variances in soil/edaphic factors.

Table 2: Plant species richness and diversity recorded in study sites of the proposed agriculture canal, Lengwe National Park

PLOT ID	Mean	St.Dev	RICHNESS (S)	PLANT SPECIES DIVERSTY		
				E	H	D'
Plot 1	0.118	0.324	13	1	2.565	0.9231
Plot 3	0.164	0.440	16	0.976	2.707	0.9259
Plot 5	0.191	0.395	21	1	3.045	0.9524
Plot 7	0.264	0.443	29	1	3.367	0.9655
Plot 9	0.164	0.396	17	0.993	2.813	0.9383
Plot 11	0.164	0.372	18	1	2.89	0.9444
Plot 13	0.382	1.292	30	0.866	2.944	0.8878
Plot 15	0.318	0.487	34	0.997	3.516	0.9698
Plot 17	0.182	0.387	20	1	2.996	0.95
Plot 19	0.136	0.345	15	1	2.708	0.9333

AVERAGE	0.1893	0.4436	19	4 0.894	2.686	0.8537
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3.3 Diversity, richness and abundance of plants recorded in subgroups

3.3.1 Herbs and grasses

Thirty-three (33) plant species in the category of herbs and grasses were recorded from 17 plant families (Table 1). The dominant families in the sub-group were Poaceae (22%), Acanthaceae (12%) and Commelinaceae (9%) respectively. *Urochloa mosambicensis*, *Panicum simplex*, *Echinochloa colona*, *Setaria sphacelata*, and *Sporobolus pyramidalis* from the family Poaceae were the dominant species respectively. The grass species approximately covered 50 to 60% of the survey areas along the canal. *Commelina benghalensis* and *C. diffusa* were the second dominant species found in Commelinaceae family.

3.3.2 Climber/creepers

The survey recorded 17 plant species in the category of creepers and climbers from 6 plant families (Table 1). Convolvulaceae and Cucubitaceae dominated the creepers and climbers plant group (Figure 4). The preponderant species recorded was *Cucumis hirsutus*, and *Momordia foetida* which are part of the species are identified as crop wild relatives.

The wild crop relatives identified in the canal floral represented (15%) percent of the total flora found (Appendix table 3). The relative abundance show the top five dominant wild relative crops as *Cucumis hirsutus* (28.9%), *M. foetida* (19.3%), *Ipomoea crassipes* (14.3%), *Vigna unguiculata* (11.8%) and *Coccinia mildbraedii* (5.7%) respectively.

3.3.3 Trees and shrubs species

Fifty-eight (58) trees and shrub species recorded from 23 plant families were found in the survey (Table 1). DCA analysis revealed that the most preponderant family of the trees and shrubs were Fabaceae, Tiliaceae, Capparaceae, Ebenaceae and Olacaceae (Figure 2).

Seventy-eight (78) trees per hectare was the average density of mature trees (diameters greater than 5cm) found in the canal passage area. This low density of trees observed is a result of empty pockets of the woodland which are largely covered by herbs and grasses. However, the top six dominant trees recorded were *Ziziphus mucronata*, *Senegalia(Acacia) nigrescens*, *Lepidotrichilia volkensii*, *Colophospermum mopane*, *Vachellia (Acacia) nilotica*, and *Dalbergia melanoxylon* with a relative density ranging from 7 to 17% (Tables 2 and Appendix Table 1).

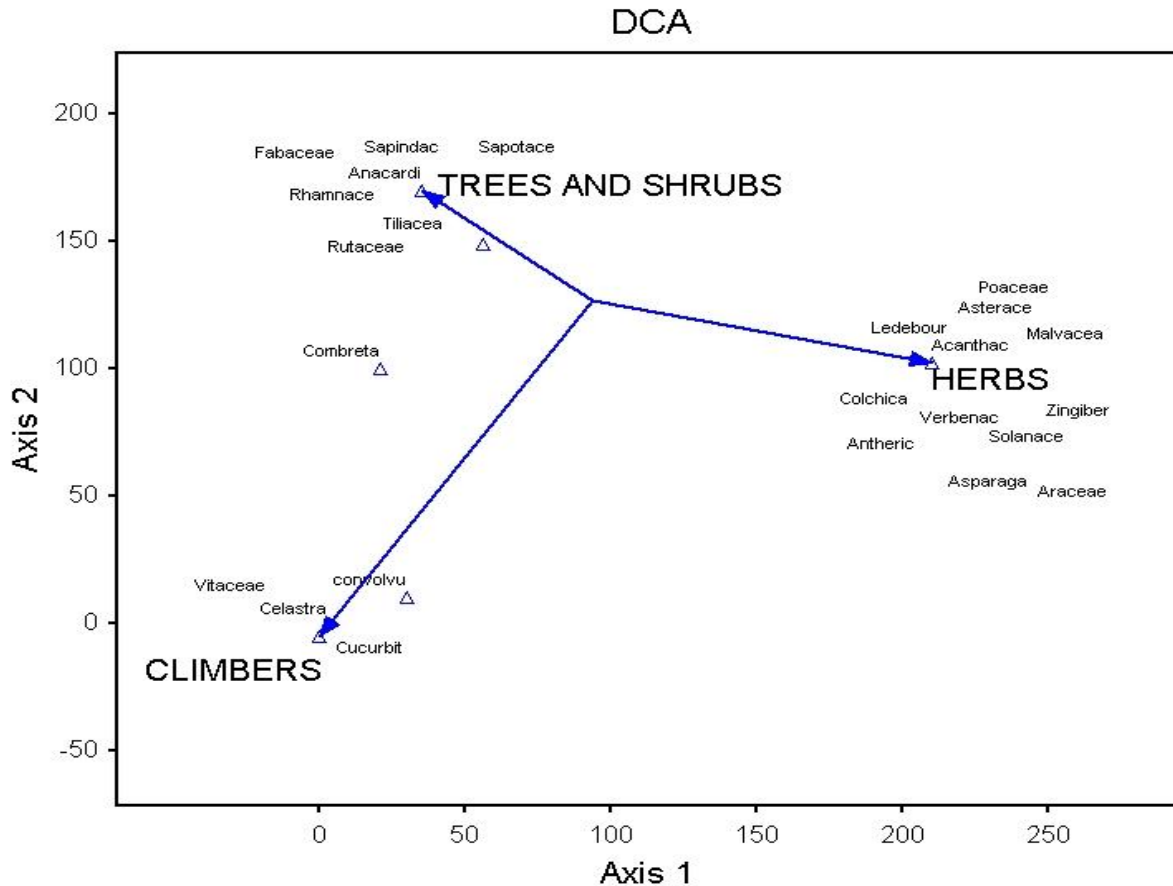


Figure 1: Detrended Canonical Analysis of the plant families in the Lengwe agriculture canal

3.4 Diameter distribution of mature trees

Diameter distribution of the woody plants found in the Lengwe canal project influence area displayed an inverse J shape of the mature trees (Figure 2). In such a pattern, there are many young trees and saplings that could be recruited into successive growth stages and therefore enhance the sustainable conservation of woody plant species in the area. The observed presence of trees with diameter sizes greater than 35cm is an indication of a healthy forest with mature seed-bearing trees which implies that regeneration outplays disturbances. Juvenile trees in the range of 5 to 9.9cm were the highest followed by the 10 to 14.9cm (Figure 2; Appendix Table 2).

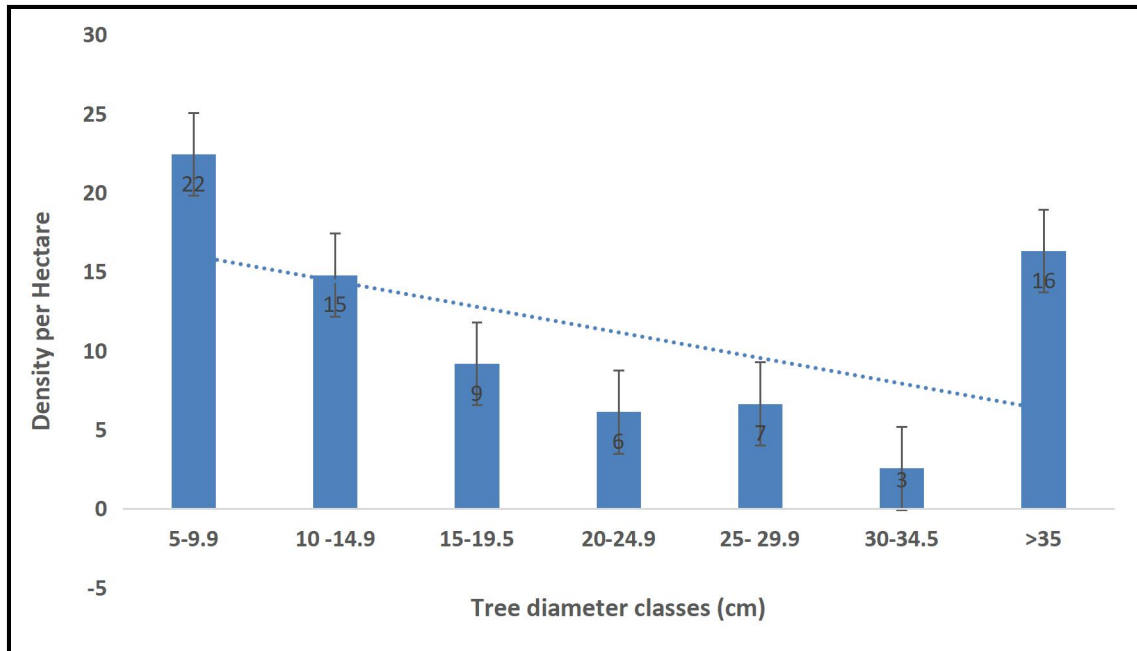


Figure 2: Density of woody tree species inventoried in diameter classes

4.0 CONSERVATION STATUS OF SPECIES FOUND AND USES

Appendix Table 2 shows the composition of species recorded along the proposed canal. Out of the 105 recorded species only one species, *Afzelia quanzensis* Welw has been listed as Vulnerable(VU) at National level (Msekandiana & Mlangeni (2002). *Afzelia quanzensis* Welw. The species is widely used in Malawi and it is used for timber, wood curving and charcoal. Globally it is listed as Least Concern (LC), The rest of the species are either categorized as Not Evaluated (NE) or as Least Concern (LC). Apart from *Afzelia quanzensis*, Lengwe has stands of *Colophospermum mopane* (Kirk ex Benth.) Kirk ex J.Léonard, a tree species which is highly targeted for its durable timber and charcoal. Lots of stumps were observed during fieldwork but since the area is protected, there has been a lot of natural regeneration going on and this will in the long term ensure the survival of the species.

5.0 CONCLUSION AND RECOMMENDATION

5.1 PROJECT IMPACT ON THE VEGETATION

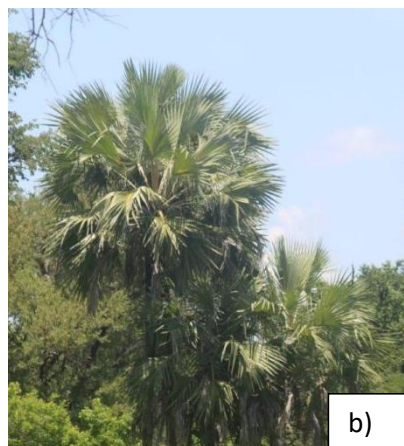
Based on the findings from the Rapid Botanical Survey, the impacts of the project on the plant diversity along the irrigation canal will be minimal but there will be a need for developers to avoid unnecessary cutting down of trees especially where the canal will pass through the *C. mopane* stand as the area has a lot of regeneration going on at the moment although the major threat to the species recorded during the present investigation was charcoal making business. Constant monitoring will be necessary to avoid unnecessary clearing of the vegetation along the proposed canal.

Additionally, since there will be cutting of trees to allow for the passage of the canal, it is recommended that to counteract the effects of loss of wood volumes; planting of indigenous trees especially the *Colophospermum mopane*, *Senegalia nigrescens*, *Grewia bicolor*, *Azelia quanzensis* amongst other tree species near but outside the corridor of the canal to compensate for the loss from this disturbance should be encouraged.

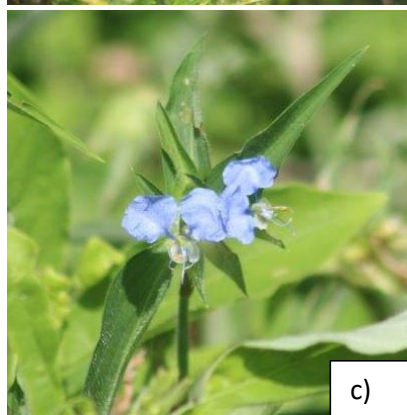
For important tree and herbaceous plants, the project should support seeds collection and conservation efforts through the Forestry Research Institute of Malawi and the National Herbarium and Botanic Gardens to ensure seeds or other associated plant species are conserved ex-situ and long-term at the Malawi Plant Genetic Resources Centre.



a)



b)



c)



d)



e)



f)

Figure 4: Some plant species recorded (a= *Senegalia nigrescens*; b= *Borassus aethiopum* ; c= *Commelina benghalensis* L.; d= *Gonatopus boivinii* (Decne.) Engl.; e= *Colophospermum mopane*; f= *Siphonochilus kirkii* .

Appendix Table 1: Tree diameter classes recorded in the 10 surveyed plots

Tree species name	Tree diameter classes (cm)							Frequency	Density+ /Ha	Relative abundance (%)
	5-9.9	10 -14.9	15-19.5	20-24.9	25- 29.9	30-34.5	>35			
<i>Ziziphus mucronata</i>	7	6	3	2	5	0	3	26	13.27	16.99
<i>Vachellia (Acacia) nilotica</i>	0	1	0	0	1	3	15	20	10.20	13.07
<i>Lepidotrachia volkensii</i>	6	5	3	4	1	0	0	19	9.69	12.42
<i>Colophospermum mopane</i>	7	2	2	0	1	0	4	16	8.16	10.46
<i>Vachellia (Acacia) nilotica</i>	5	4	3	0	0	1	0	13	6.63	8.50
<i>Dalbergia melanoxylon</i>	7	2	2	1	0	0	0	12	6.12	7.84
<i>Grewia bicolor</i>	10	1	1	0	0	0	0	12	6.12	7.84
<i>Xanthocercis zambesiaca</i>	0	3	2	1	0	0	2	8	4.08	5.23
<i>Combretum imberbe</i>	0	2	1	0	1	0	3	7	3.57	4.58
<i>Borassus aethiopum</i>	0	1	0	4	0	0	0	5	2.55	3.27
<i>Strychnos potatorum</i>	0	0	0	0	1	1	2	4	2.04	2.61
<i>Cleistochlamys kirkii</i>	1	1	1	0	0	0	0	3	1.53	1.96
<i>Lannea stuhlmannii</i>	0	0	0	0	3	0	0	3	1.53	1.96
<i>Combretum mossambicense</i>	1	0	0	0	0	0	1	2	1.02	1.31
<i>Combretum adenogonium</i>	0	1	0	0	0	0	0	1	0.51	0.65
<i>Dichrostachys cinerea</i>	0	0	0	0	0	0	1	1	0.51	0.65
<i>Sterculia appendiculata</i>	0	0	0	0	0	0	1	1	0.51	0.65
Frequencies	44	29	18	12	13	5	32	153		
Mean density per hectare	22	15	9	6	7	3	16			
Density per hectare	78/ha									

Appendix Table 2: Plant species recorded in the Lengwe agriculture canal corridor and their conservation status (LC-Least Concern; NE-Not Evaluated; VU-Vulnerable, NT-Near Threatened)

No.	Species Name	Family	Frequency of occurrence	Life form		
					Global	National
1	<i>Senegalia ataxacantha</i> (DC.) Kyal. & Boatwr.	Fabaceae	1	Shrubby climber	LC	NE
2	<i>Senegalia nigrescens</i> (Oliv.) P.J.H. Hurter	Fabaceae	8	Tree	NE	NE
3	<i>Vachellia nilotica</i> (L.) P.J.H.Hurter & Mabb	Fabaceae	2	Tree	LC	NE
4	<i>Acalypha chirindica</i> S. Moore	Euphorbiaceae	1	Shrub	NE	NE
5	<i>Acalypha ornata</i> Hochst. ex A. Rich.	Euphorbiaceae	1	Shrub	NE	NE
6	<i>Afzelia quanzensis</i> Welw.	Fabaceae	1	Tree	LC	VU
7	<i>Ampelocissus africana</i> (Lour.) Merr.	Vitaceae	1	Climber	LC	NE
8	<i>Asparagus africanus</i> Lam.	Asparagaceae	3	Herb	NE	NE
9	<i>Borassus aethiopum</i> Mart.	Palmae	1	Tree	LC	NE
10	<i>Boscia salicifolia</i> Oliv.	Capparaceae	1	Tree	LC	NE
11	<i>Cadaba kirkii</i> Oliv.	Capparaceae	4	Shrub	NE	NE
12	<i>Canthium glaucum</i> Hiern	Rubiaceae	2	Shrub	LC	NE
13	<i>Capparis tomentosa</i> Lam.	Capparaceae	4	Shrub	NE	NE
14	<i>Chlorophytum cameronii</i> (Baker) Kativu	Anthericaceae	1	Herb	LC	NE
15	<i>Cissus cornifolia</i> (Baker) Planch.	Vitaceae	1	Climber /Creeper	NE	NE
16	<i>Cissus rubiginosa</i> (Welw. ex Baker) Planch.	Vitaceae	1	Climber /Creeper	NE	NE
17	<i>Cleistochlamys kirkii</i> (Benth.)	Annonaceae	3	Tree	LC	NE

	<i>Oliv.</i>					
18	<i>Coccinia mildbraedii</i> Gilg ex Harms	Cucurbitaceae	1	Climber / Creeper	NE	NE
19	<i>Coffea mufindiensis</i> Hutch. ex Bridson	Rubiaceae	1	Tree/Shrub	LC	NE
20	<i>Colophospermum mopane</i> (J.Kirk ex Benth.) J.Léonard	Fabaceae	2	Tree	LC	NE
21	<i>Combretum adenogonium</i> Steud. ex A. Rich.	Combretaceae	1	Tree	LC	NE
22	<i>Combretum imberbe</i> Wawra	Combretaceae	4	Tree	LC	NE
23	<i>Combretum microphyllum</i> Klotzsch	Combretaceae	7	Climber	NE	NE
24	<i>Combretum mossambicense</i> (Klotzsch) Engl.	Combretaceae	3	Climber	LC	NE
25	<i>Combretum psidioides</i> Welw.	Combretaceae	1	Tree	LC	NE
26	<i>Commelina benghalensis</i> L.	Commelinaceae	4	Herb	LC	NE
27	<i>Commelina diffusa</i> Burm.f.	Commelinaceae	1	Herb	LC	NE
28	<i>Commiphora edulis</i> (Klotzsch) Engl.	Burseraceae	2	Tree	LC	NE
29	<i>Commiphora marlothii</i> Engl.	Burseraceae	1	Tree	LC	NE
30	<i>Convolvulus sagittatus</i> Sessé & Moc.	Convolvulaceae	1	Climber / Creeper	NE	NE
31	<i>Cordyla africana</i> Lour.	Fabaceae	1	Tree	LC	NE
32	<i>Crossandra fruticulosa</i> Lindau	Acanthaceae	1	Herb	NE	NE
33	<i>Crotalaria cleomifolia</i> Welw. ex Baker	Fabaceae	1	Herb	NE	NE
34	<i>Cucumis hirsutus</i> Sond.	Cucurbitaceae	1	Climber / Creeper	NE	NE
35	<i>Dalbergia melanoxydon</i> Guill. & Perr.	Fabaceae	2	Tree	NT	VU
36	<i>Dalbergiella nyasae</i> Baker f.	Fabaceae	1	Tree	NE	NE
37	<i>Dichrostachys cinerea</i> Wight et Arn.	Fabaceae	3	Tree	LC	NE
38	<i>Diospyros natalensis</i> (Harv.) Brenan	Ebenaceae	4	Tree	LC	NE
39	<i>Diospyros zombensis</i> (B.L. Burtt) F. White	Ebenaceae	6	Tree	LC	NE
40	<i>Dolichos kilimandscharicus</i> Harms ex Taub.	Fabaceae	1	Herb	NE	NE

41	<i>Echinochloa colona</i> (L.) Link	Poaceae	1	Herb	NE	NE
42	<i>Echinochloa crus-galli</i> (L.) P.Beauv.	Poaceae	1	Herb	NE	NE
43	<i>Euclea crispa</i> (Thunb.) Gürke	Ebenaceae	1	Tree	LC	NE
44	<i>Euclea natalensis</i> A.DC.	Ebenaceae	1	Tree	LC	NE
45	<i>Gloriosa superba</i> L.	Colchicaceae	1	Herb	LC	NE
46	<i>Gonatopus boivinii</i> (Decne.) Engl.	Araceae	1	Herb	NE	NE
47	<i>Grewia bicolor</i> Juss.	Tiliaceae	5	Tree/Shrub	NE	NE
48	<i>Grewia forbesii</i> Harv. ex Mast.	Tiliaceae	11	Tree	NE	NE
49	<i>Grewia microthyrsa</i> K.Schum. ex Burret	Tiliaceae	1	Tree	NE	NE
50	<i>Grewia mollis</i> Juss.	Tiliaceae	1	Tree	LC	NE
51	<i>Grewia villosa</i> Willd.	Tiliaceae	3	Tree	LC	NE
52	<i>Hewittia malabarica</i> (L.) Suresh	Convolvulaceae	3	Herb	NE	NE
53	<i>Hibiscus diversifolius</i> Jacq.	Malvaceae	1	Herb	NE	NE
54	<i>Hibiscus physaloides</i> Guill. & Perr.	Malvaceae	1	Herb	NE	NE
55	<i>Hippocratea goetzei</i> Loes.	Celastraceae	1	Climber	NE	NE
56	<i>Hugonia orientalis</i> Engl.	Linaceae	1	Tree	LC	NE
57	<i>Ipomoea cairica</i> (L.) Sweet	Convolvulaceae	1	Climber / Creeper	LC	NE
58	<i>Ipomoea crassipes</i> Hook.	Convolvulaceae	1	Climber / Creeper	NE	NE
59	<i>Ipomoea pes-caprae</i> (L.) R.Br.	Convolvulaceae	1	Climber / Creeper	LC	NE
60	<i>Ipomoea sinensis</i> (Desr.) Choisy	Convolvulaceae	1	Climber / Creeper	NE	NE
61	<i>Jasminum fluminense</i> Vell.	Oleaceae	2	Shrub	NE	NE
62	<i>Siphonochilus kirkii</i> (Hook. f.)	Zingiberaceae	2	Herb	NE	NE

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63	<i>Lannea schweinfurthii</i> var. <i>stuhlmannii</i> (Engl.) Kokwaro	Anacardiaceae	1	Tree	NE	NE
64	<i>Ledebouria apertiflora</i> (Baker) Jessop	Hyacinthaceae	2	Herb	NE	NE
65	<i>Lepidotrichilia volkensii</i> (Gürke) Leroy	Meliaceae	4	Tree	NE	NE
66	<i>Leucas martinicensis</i> R. Br.	Lamiaceae	1	Herb	NE	NE
67	<i>Lippia javanica</i> (Burm.f.) Spreng	Verbenaceae	2	Herb/Shrub	NE	NE
68	<i>Luffa aegyptiaca</i> Mill.	Cucurbitaceae	1	Climber / Creeper	NE	NE
69	<i>Maerua angolensis</i> DC.	Capparaceae	1	Tree	LC	NE
70	<i>Maerua kirkii</i> F. White	Capparaceae	1	Tree	NE	NE
71	<i>Markhamia zanzibarica</i> (Bojer ex DC.) K.Schum	Bignoniaceae	1	Tree	LC	NE
72	<i>Mellera submutica</i> C.B. Clarke	Acanthaceae	1	Herb	NE	NE
73	<i>Merremia tridentata</i> (L.) Hallier f.	Convolvulaceae	1	Climber	NE	NE
74	<i>Momordica foetida</i> Schumacher.	Cucurbitaceae	3	Climber	NE	NE
75	<i>Ocimum americanum</i> L.	Lamiaceae	2	Herb	NE	NE
76	<i>Panicum monticola</i> Hook. f.	Poaceae	4	Herb	NE	NE
77	<i>Panicum simplex</i> Rottler ex Trin.	Poaceae	9	Herb	NE	NE
78	<i>Pavonia urens</i> Cav.	Malvaceae	2	Herb	NE	NE
79	<i>Phyllanthus ovalifolius</i> Forssk.	Euphorbiaceae	0	Shrub	LC	NE
80	<i>Searsia longipes</i> (Engl.) Moffett	Anacardiaceae	2	Tree	LC	NE
81	<i>Ruellia cordata</i> Thunb.	Acanthaceae	2	Herb	NE	NE
82	<i>Ruspolia hypocrateriformis</i> (Vahl) Milne-Redh.	Acanthaceae	4	Herb	NE	NE
83	<i>Salvadora persica</i> L.	Salvadoraceae	2	Shrub	LC	NE
84	<i>Sclerocarya birrea</i> (A. Rich.) Hochst	Anacardiaceae	4	Tree	NE	NE

85	<i>Sesbania sesban</i> (L.) Merr.	Fabaceae	3	Shrub	LC	NE
86	<i>Setaria sphacelata</i> (Schumach.) Stapf & C.E. Hubb.	Poaceae	4	Herb	LC	NE
87	<i>Solanum incanum</i> L.	Solanaceae	3	Herb	LC	NE
88	<i>Solanum panduriforme</i> E.Mey.	Solanaceae	6	Herb	NE	NE
89	<i>Sporobolus pyramidalis</i> Beauv.	Poaceae	1	Herb	NE	NE
90	<i>Sterculia appendiculata</i> K. Schum.	Sterculiaceae	1	Tree	NE	NE
91	<i>Strombosia scheffleri</i> Engl.	Olacaceae	1	Tree	LC	NE
92	<i>Strychnos potatorum</i> L.f.	Logoniaceae	2	Tree	NE	NE
93	<i>Synsepalum brevipes</i> (Baker) T.D.Penn	Sapotaceae	1	Tree	LC	NE
94	<i>Teclea gerrardii</i> I.Verd.	Rutaceae	1	Tree	LC	NE
95	<i>Urochloa mosambicensis</i> (Hack.) Dandy	Poaceae	9	Herb	NE	NE
96	<i>Vepris lanceolata</i> (Lam.) G.Don	Rutaceae	1	Shrub	NE	NE
97	<i>Vernonia adoensis</i> Sch. Bip. ex Walp.	Asteraceae	8	Herb	NE	NE
98	<i>Vigna unguiculata</i> (L.) Walp.	Fabaceae	1	Climber	Cultivated	
99	<i>Xanthocercis zambesiaca</i> (Baker) Dumaz-le-Grand	Fabaceae	1	Tree	LC	NE
100	<i>Xeroderris stuhlmannii</i> (Taub.) Mendonça & E.P. Sousa	Fabaceae	1	Tree/Shrub	NE	NE
101	<i>Ximenia americana</i> L.	Olacaceae	4	Tree/Shrub	LC	NE
102	<i>Ximenia caffra</i> Sond.	Olacaceae	3	Tree/Shrub	LC	NE
103	<i>Zanha golungensis</i> Hiern	Sapindaceae	2	Tree	LC	NE
104	<i>Ziziphus abyssinica</i> Hochst. ex A. Rich	Rhamnaceae	3	Tree	LC	NE
105	<i>Ziziphus mucronata</i> Willd.	Rhamnaceae	5	Tree	LC	NE

Appendix table 3: Crop wild relatives found during the canal biodiversity survey

NO.	NAME OF SPECIES	FAMILY	FREQUENCY	RELATIVE ABUNDANCES (%)
1	<i>Cucumis hirsutus</i> Sond.	Cucurbitaceae	81	28.9
2	<i>Momordica foetida</i> Schumach.	Cucurbitaceae	54	19.3
3	<i>Ipomoea crassipes</i> Hook.	Convolvulaceae	40	14.3
4	<i>Vigna unguiculata</i> (L.) Walp.	Fabaceae	33	11.8
5	<i>Coccinia mildbraedii</i> Gilg ex Harms	Cucurbitaceae	16	5.7
6	<i>Hibiscus physaloides</i> Guill. & Perr.	Malvaceae	12	4.3
7	<i>Ipomoea cairica</i> (L.) Sweet	Convolvulaceae	11	3.9
8	<i>Hibiscus diversifolius</i> Jacq.	Malvaceae	7	2.5
9	<i>Coffea mufindiensis</i> Hutch. ex Bridson	Rubiaceae	5	1.8
10	<i>Ipomoea pes-caprae</i> (L.) R.Br.	Convolvulaceae	5	1.8
11	<i>Mellera submutica</i> C.B. Clarke	Acanthaceae	4	1.4
12	<i>Ipomoea sinensis</i> (Desr.) Choisy	Convolvulaceae	3	1.1
13	<i>Lippia javanica</i> (Burm.f.) Spreng	Verbenaceae	3	1.1
14	<i>Asparagus africanus</i> Lam.	Asparagaceae	2	0.7
15	<i>Convolvulus sagittatus</i> agg.	Convolvulaceae	2	0.7
16	<i>Solanum incanum</i> L.	Solanaceae	2	0.7

Appendix 4: The survey Team combined

