
9 Appendix A – Sediment

9.1.1 Sediment Data Tables

Table 9-1: Elemental concentrations of light coloured sediment samples from the WFS

Light coloured sediment samples from the WFS				
Element	Average	STDEV	Minimum	Maximum
Co mg/kg	64.81	44.15	23.50	162.50
Ni mg/kg	526.88	398.19	170.00	1425.00
Cu mg/kg	15.91	7.24	5.00	25.00
Zn mg/kg	264.38	242.91	57.50	825.00
Se mg/kg	1.20	0.23	0.88	1.48
Cd mg/kg	0.12	0.08	0.05	0.30
Pb mg/kg	10.89	15.50	1.90	47.50
Au mg/kg	0.36	0.24	0.11	0.88
U mg/kg	7.61	3.57	1.63	10.75
V mg/kg	20.50	9.72	11.25	35.00
Cr mg/kg	87.50	50.80	37.50	187.50
Mn mg/kg	485.63	929.49	47.50	2750.00
Fe mg/kg	7562.50	4925.79	2750.00	14000.00
As mg/kg	4.38	2.06	2.18	7.00
Ba mg/kg	94.16	196.53	10.25	575.00

Table 9-2: Elemental concentration of dark coloured sediment samples from the WFS

Dark coloured sediment samples from the WFS				
Element	Average	STDEV	Minimum	Maximum
Co mg/kg	262.50	182.71	47.50	575.00
Ni mg/kg	2202.50	1751.56	525.00	5000.00
Cu mg/kg	79.18	65.50	8.50	197.50
Zn mg/kg	1335.00	1166.26	225.00	3500.00
Se mg/kg	0.92	0.71	0.12	2.20
Cd mg/kg	0.80	0.69	0.11	2.25
Pb mg/kg	15.74	10.02	0.85	35.00
Au mg/kg	2.77	2.23	0.45	6.25
U mg/kg	45.30	29.99	20.50	100.00
V mg/kg	22.09	12.84	2.10	47.50
Cr mg/kg	71.78	40.30	5.25	135.00
Mn mg/kg	391.75	232.05	42.50	875.00
Fe mg/kg	12292.50	8891.63	925.00	27500.00
As mg/kg	11.38	6.36	1.78	24.75
Ba mg/kg	198.20	423.63	24.50	1400.00

Table 9-3: Elemental concentrations of sediment samples from the MR

Sediment samples from the MR				
Element	Average	STDEV	Minimum	Maximum
Co mg/kg	16.04	14.89	1.18	40.00
Ni mg/kg	72.45	59.44	9.75	167.50
Cu mg/kg	22.05	15.87	5.00	47.50
Zn mg/kg	12.90	10.25	4.00	30.00
Se mg/kg	0.17	0.12	0.08	0.38
Cd mg/kg	0.04	0.05	0.00	0.11
Pb mg/kg	11.90	1.36	10.50	13.75
Au mg/kg	0.58	0.36	0.28	1.20
U mg/kg	0.12	0.13	0.01	0.33
V mg/kg	44.50	36.89	17.25	107.50
Cr mg/kg	123.50	43.39	72.50	175.00
Mn mg/kg	8616.50	9129.40	57.50	18500.00
Fe mg/kg	36100.00	42583.96	4250.00	110000.00
As mg/kg	11.33	15.00	0.73	37.50
Ba mg/kg	620.50	609.10	15.00	1350.00

9.1.2 Sediment Texture Tables

Table 9-4: Particle size distribution and texture classes of light coloured sediment samples from the WFS

Light coloured sediment samples-Wonderfonteinspruit				
Sample no.	Sand	Silt	Clay	Texture
1	93.9	1.0	5.2	Sand
2	96.4	0.9	2.8	Sand
3	96.1	1.0	3.0	Sand
4	93.5	1.0	5.4	Sand
5	93.9	1.0	5.1	Sand
6	95.9	1.0	3.1	Sand
7	94.2	1.4	4.4	Sand
8	94.5	1.0	4.5	Sand

Table 9-5: Particle size distribution and texture classes of dark coloured sediment samples from the WFS

Dark coloured sediment samples-Wonderfonteinspruit				
Sample no.	Sand	Silt	Clay	Texture
1	66.5	20.4	13.1	Sandy loam
2	66.6	11.6	21.8	Sandy loam
3	65.3	22.1	12.6	Sandy loam
4	79.4	10.4	10.2	Loamy sand
5	87.6	6.2	6.1	Loamy sand
6	34.4	52.9	12.6	Silt loam
7	43.0	42.3	14.8	Loam
8	53.1	30.9	16.0	Sandy Loam

Table 9-6: Particle size distribution and texture classes of sediment samples from the Mooi River

Sediment samples-Mooi River				
Sample no.	Sand	Silt	Clay	Texture
1	32	47.55	20.45	Loam
2	34.6	40.1	25.3	Loam
3	30.93	48.02	21.05	Loam
4	32.7	43.2	24.1	Loam
5	31.3	38.1	30.6	Clay loam

9.1.3 Identification of Elements of Interest

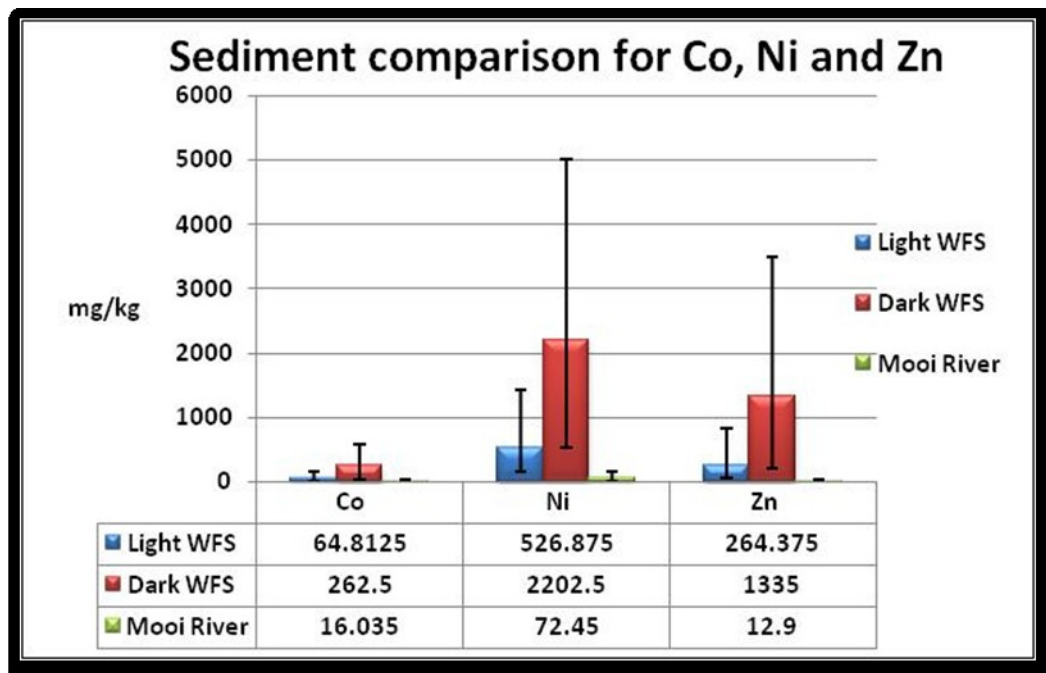


Figure 9-1: A comparison of cobalt, nickel and zinc concentrations. Light coloured sediment samples from the WFS blue, dark coloured sediment samples from the WFS in red and the background sediment samples from the MR in green

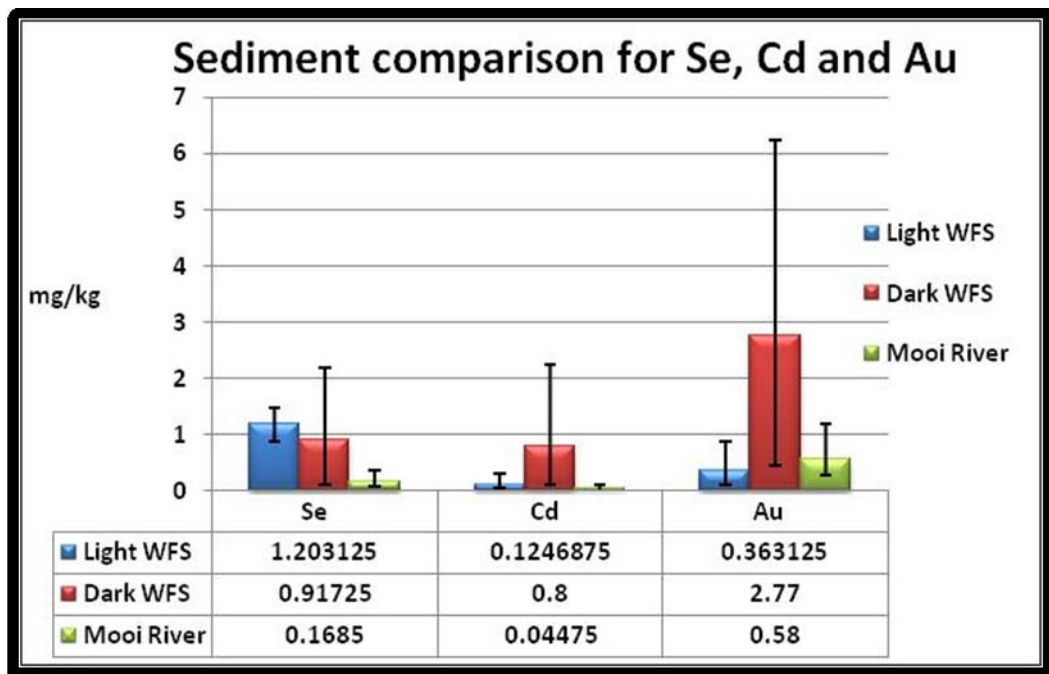


Figure 9-2: A comparison of selenium, cadmium and gold concentrations. Light coloured sediment samples from the WFS in blue, dark coloured sediment samples from the WFS in red and the background sediment samples from the MR in green

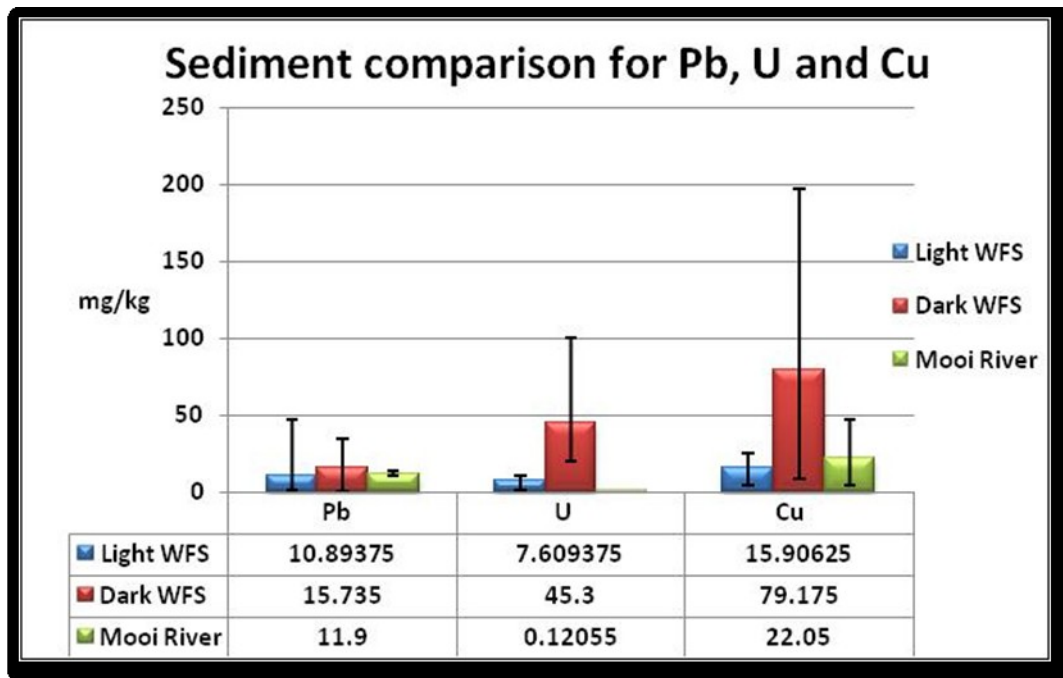


Figure 9-3: A of lead, uranium and copper concentrations. Light coloured sediment samples from the WFS in blue, dark coloured sediment samples from the WFS in red and the background sediment samples from the MR in green.

9.2 Comparison of the Elemental Concentrations within the different particle size fractions of Sediments Samples

Table 9-7: Sand sized fraction from sediment samples from the WFS

Elemental concentrations of the sand sized fraction from sediment samples from the WFS				
Element	Average	STDEV	Minimum	Maximum
Co mg/kg	37.19	12.86	23.98	56.40
Ni mg/kg	154.15	58.21	88.00	240.88
Cu mg/kg	14.78	4.18	7.61	18.01
Zn mg/kg	127.15	72.77	17.47	201.08
Se mg/kg	0.00	0.00	0.00	0.00
Cd mg/kg	0.13	0.08	0.02	0.20
Pb mg/kg	12.23	12.79	2.04	30.00
Au mg/kg	1.06	0.58	0.39	1.78
U mg/kg	36.93	33.33	6.29	89.80

Table 9-8: Silt sized fraction from sediment samples from the WFS

Elemental concentrations of the Silt sized fraction from sediment samples from the WFS				
Element	Average	STDEV	Minimum	Maximum
Co mg/kg	51.55	35.14	14.55	109.33
Ni mg/kg	231.06	150.73	53.05	469.00
Cu mg/kg	18.63	6.82	9.07	25.73
Zn mg/kg	200.27	175.15	21.73	480.25
Se mg/kg	0.05	0.06	0.00	0.13
Cd mg/kg	0.14	0.12	0.03	0.30
Pb mg/kg	6.99	3.36	2.42	10.61
Au mg/kg	1.14	0.49	0.43	1.74
U mg/kg	54.46	39.85	5.92	103.00

Table 9-9: Clay sized fraction from sediment samples from the WFS

Elemental concentrations of the clay sized fraction from sediment samples from the WFS				
Element	Average	STDEV	Minimum	Maximum
Co mg/kg	120.57	114.93	24.09	305.00
Ni mg/kg	547.46	502.22	100.40	1345.75
Cu mg/kg	38.39	13.44	23.80	56.38
Zn mg/kg	515.71	507.70	38.88	1313.25
Se mg/kg	0.52	0.25	0.30	0.81
Cd mg/kg	0.36	0.26	0.06	0.68
Pb mg/kg	16.02	2.72	12.21	19.02
Au mg/kg	2.18	0.54	1.44	2.87
U mg/kg	129.86	84.83	31.35	244.53

Table 9-10: Particle size distribution of a sediment sample from the MR

Elemental concentrations in the various particle size fractions of a sediment sample from the MR			
Element	Sand	Silt	Clay
Co mg/kg	27.68	34.53	40.63
Ni mg/kg	56.05	80.50	96.40
Cu mg/kg	10.50	13.75	24.64
Zn mg/kg	8.35	11.28	15.53
Se mg/kg	0.00	0.06	0.21
Cd mg/kg	0.06	0.08	0.10
Pb mg/kg	5.65	9.02	11.67
Au mg/kg	0.23	0.22	0.23
U mg/kg	0.37	0.49	0.82

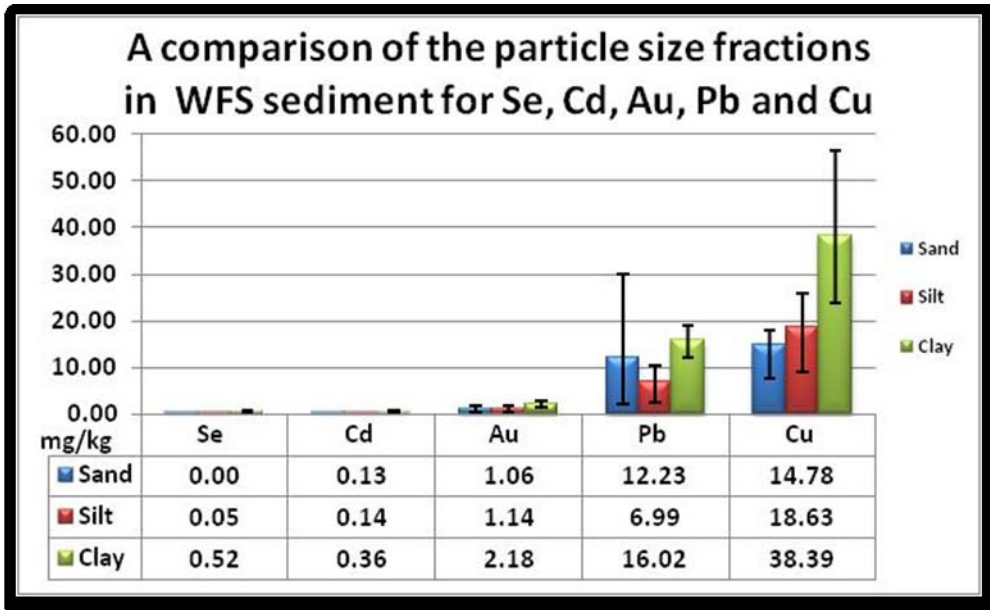


Figure 9-4: A comparison of the selenium, cadmium, gold, lead and copper concentrations in the different fractions (sand in blue, silt in red and clay in green) from the WFS sediment samples.

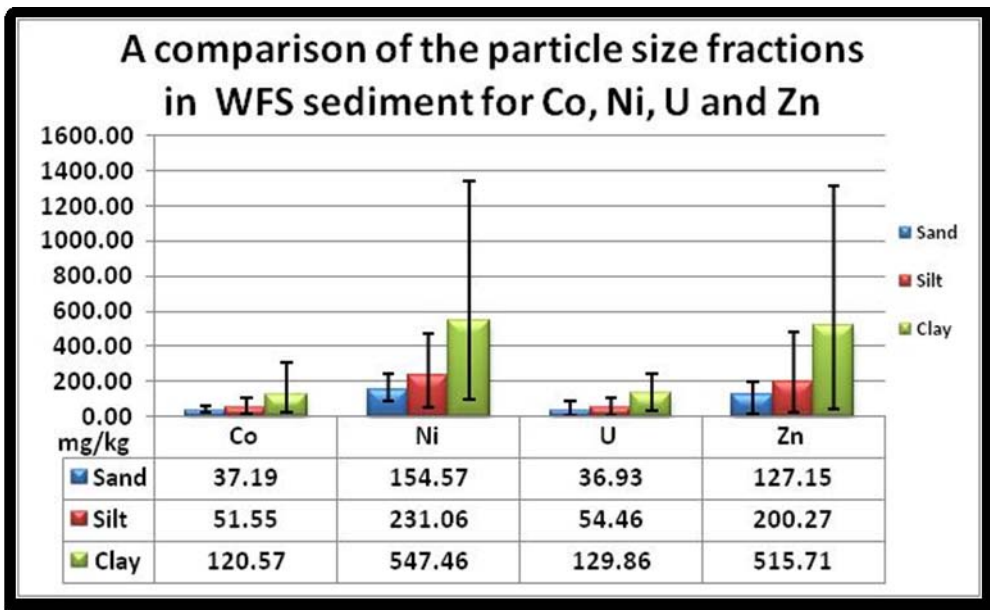


Figure 9-5: A comparison of the cobalt, nickel, uranium and zinc concentrations in the different fractions (sand in blue, silt in red and clay in green) from the WFS sediment samples.

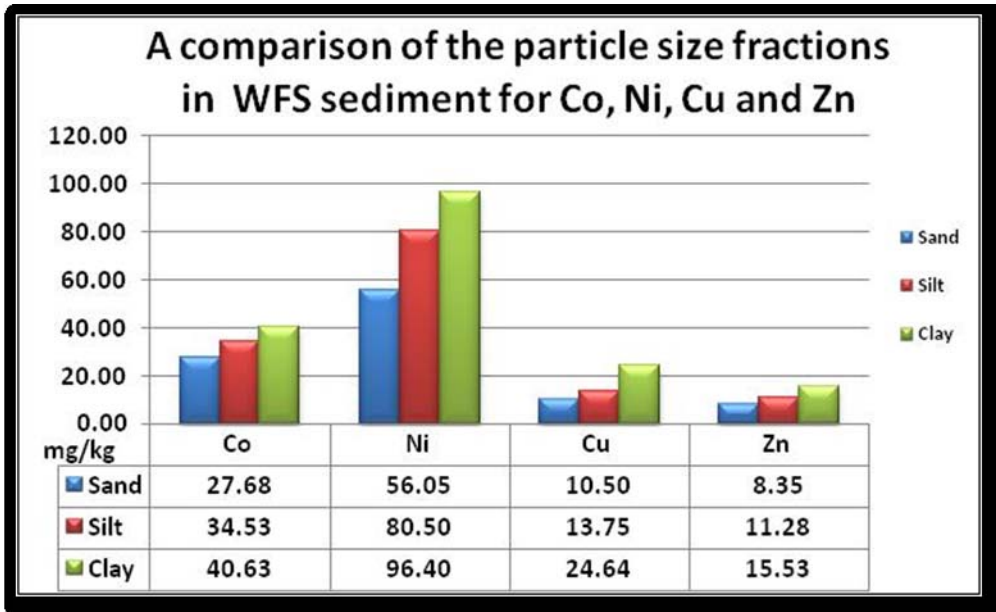


Figure 9-6: A comparison of the cobalt, nickel, copper and zinc concentrations in the different fractions (sand in blue, silt in red and clay in green) from the MR sediment samples.

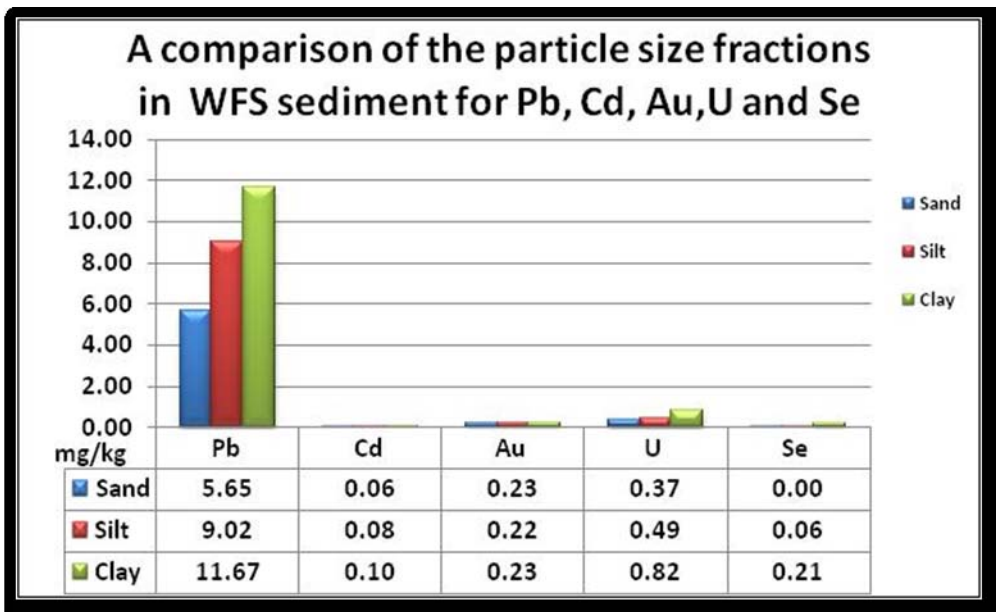


Figure 9-7: A comparison of the lead, cadmium, gold, uranium and selenium concentrations in the different fractions (sand in blue, silt in red and clay in green) from the MR sediment samples.

10 Appendix B - Water

10.1 Water Tables

Table 10-1: Elemental concentrations found in Mooi River water samples

Mooi River water samples				
Element	Average	STDEV	Minimum	Maximum
Co (mg/L)	0.00004	0.00002	0.00002	0.00006
Ni (mg/ L)	0.00192	0.00004	0.00190	0.00200
Cu (mg/ L)	0.00382	0.00011	0.00370	0.00390
Zn (mg/ L)	0.00280	0.00080	0.00180	0.00390
Se (mg/ L)	0.00688	0.00066	0.00580	0.00750
Cd (mg/ L)	ND	ND	ND	ND
Pb (mg/ L)	0.00054	0.00003	0.00050	0.00057
U (mg/ L)	0.00078	0.00001	0.00076	0.00080

Table 10-2: Elemental concentrations found in Wonderfonteinspruit water samples

Wonderfonteinspruit water samples				
Element	Average	STDEV	Minimum	Maximum
Co (mg/L)	0.02417	0.03232	0.00293	0.20000
Ni (mg/ L)	0.12746	0.10979	0.00950	0.64000
Cu (mg/ L)	0.10267	0.08926	0.00520	0.28604
Zn (mg/ L)	0.10707	0.10161	0.00520	0.44299
Se (mg/ L)	0.06253	0.02315	0.03400	0.10733
Cd (mg/ L)	0.00184	0.00441	0.00040	0.02438
Pb (mg/ L)	0.00509	0.00583	0.00150	0.02440
U (mg/ L)	0.05704	0.04302	0.01593	0.23358

Table 10-3: Elemental concentrations found in Disturbed water samples from the WFS

Disturbed water samples from the WFS				
Element	Average	STDEV	Minimum	Maximum
Co (mg/L)	0.3879	0.2413	0.1143	0.6524
Ni (mg/ L)	2.4142	1.4982	0.6708	4.3860
Cu (mg/ L)	0.0997	0.0832	0.0001	0.1946
Zn (mg/ L)	4.2020	2.8852	1.4090	7.2950
Se (mg/ L)	0.0012	0.0023	0.0001	0.0053
Cd (mg/ L)	0.0063	0.0006	0.0055	0.0069
Pb (mg/ L)	0.0269	0.0237	0.0000	0.0570
U (mg/ L)	0.1537	0.1039	0.0451	0.2628

10.2 Water Graphs

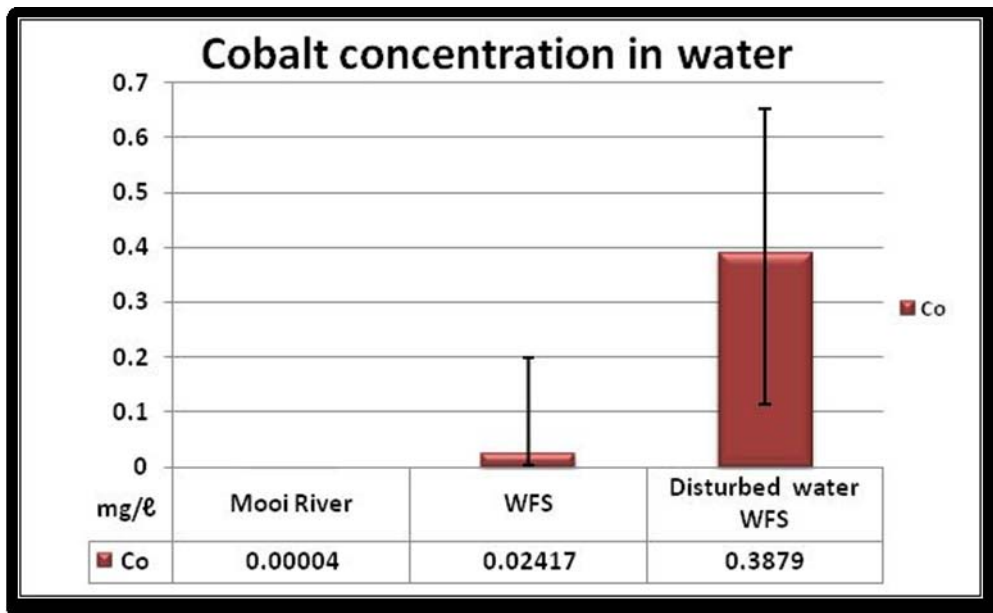


Figure 10-1: Cobalt concentration in the respective water samples

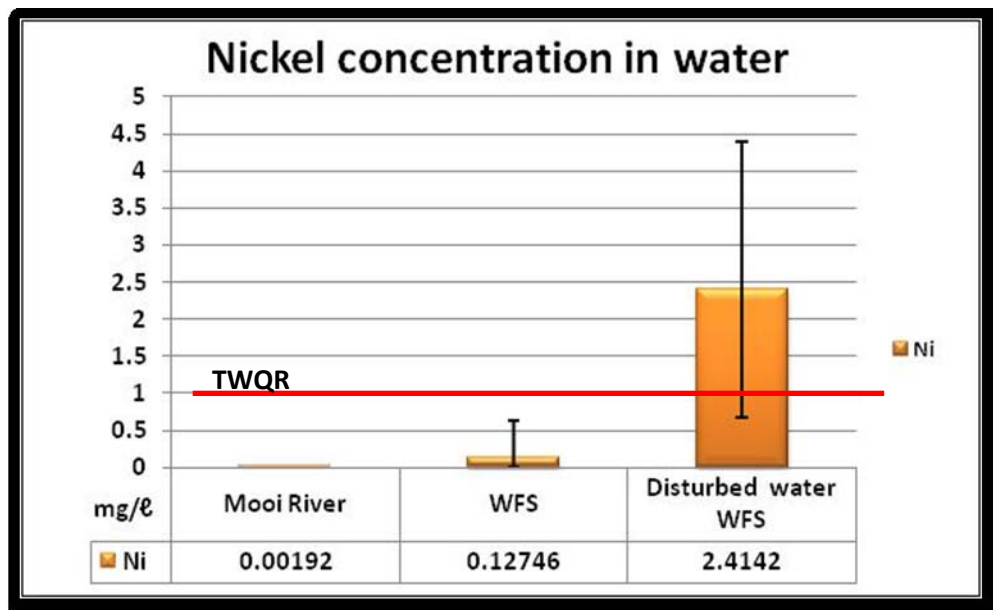


Figure 10-2: Nickel concentration in the respective water samples

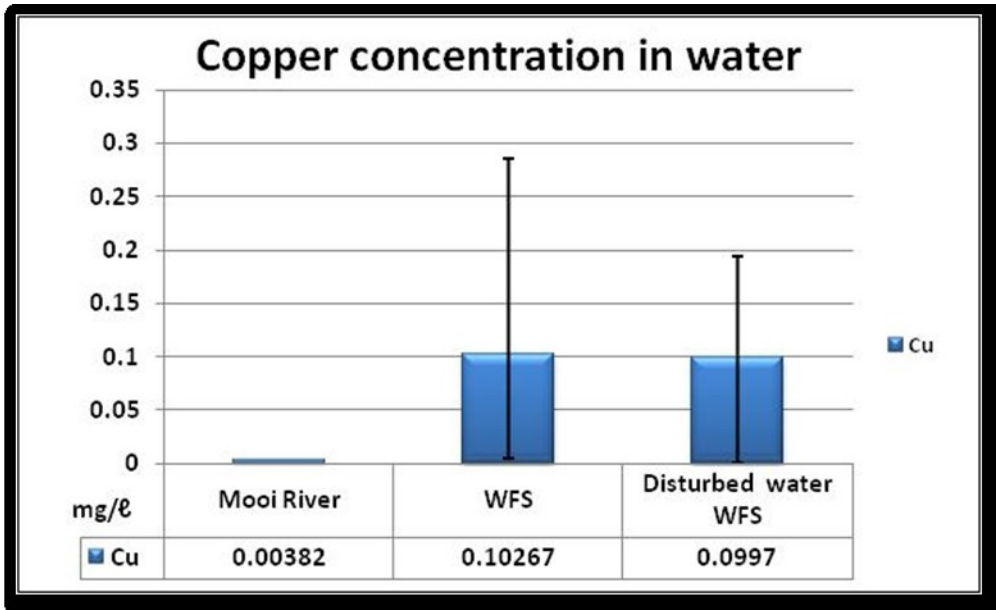


Figure 10-3: Copper concentration in the respective water samples

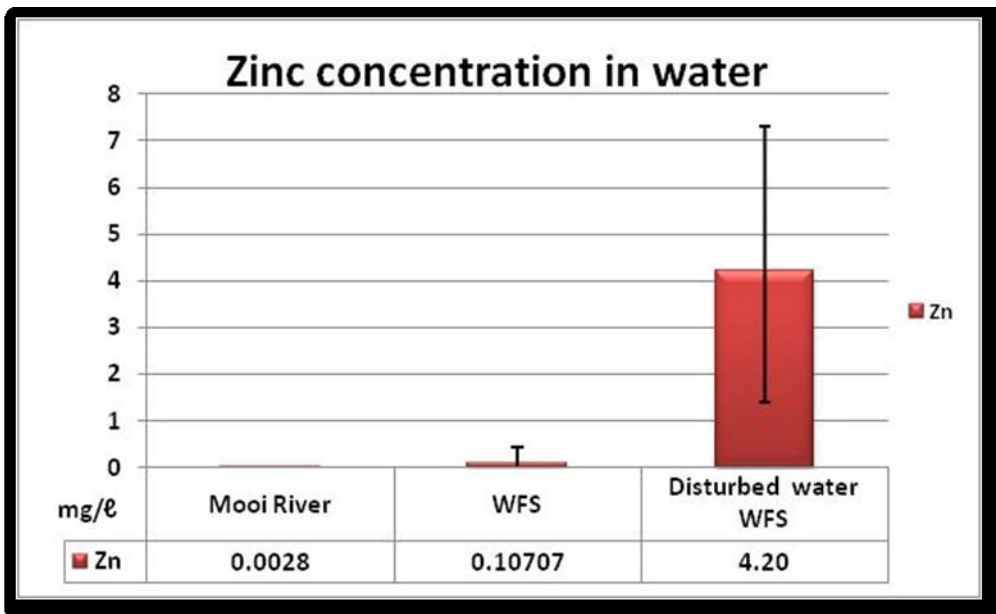


Figure 10-4: Zinc concentration in the respective water samples

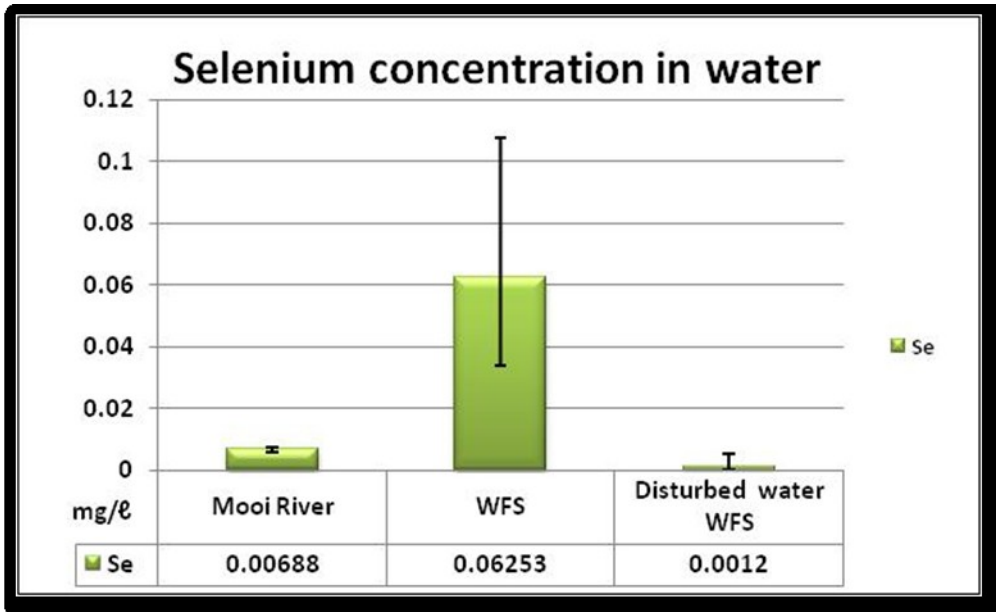


Figure 10-5: Selenium concentration in the respective water samples

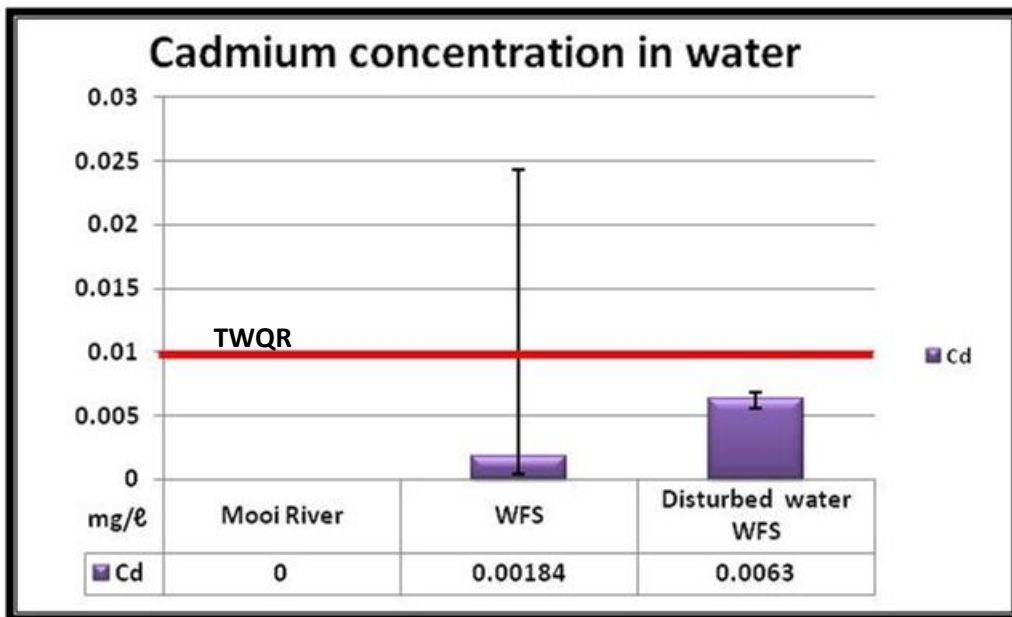


Figure 10-6: Cadmium concentration in the respective water samples

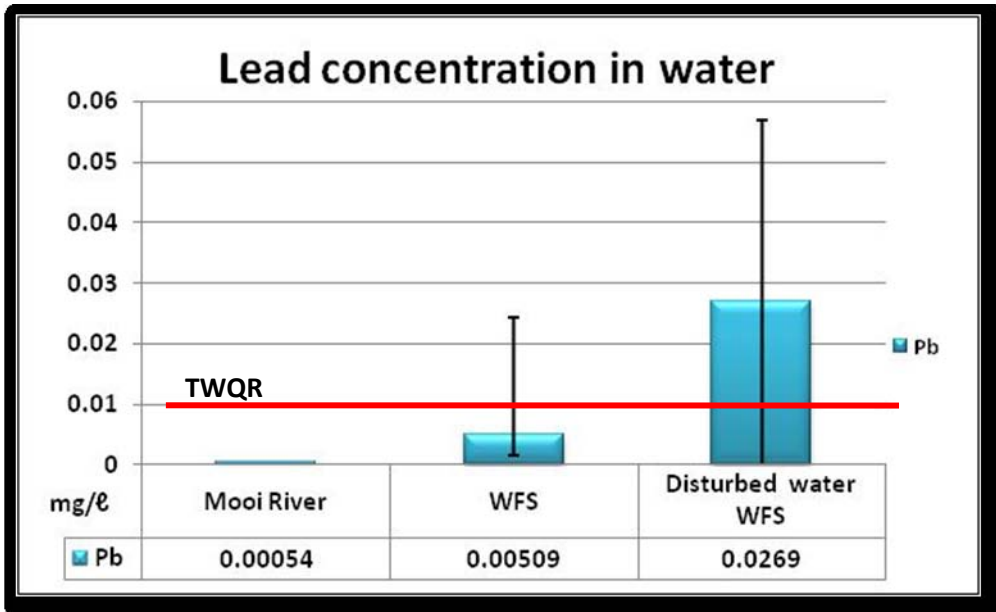


Figure 10-7: Lead concentration in the respective water samples

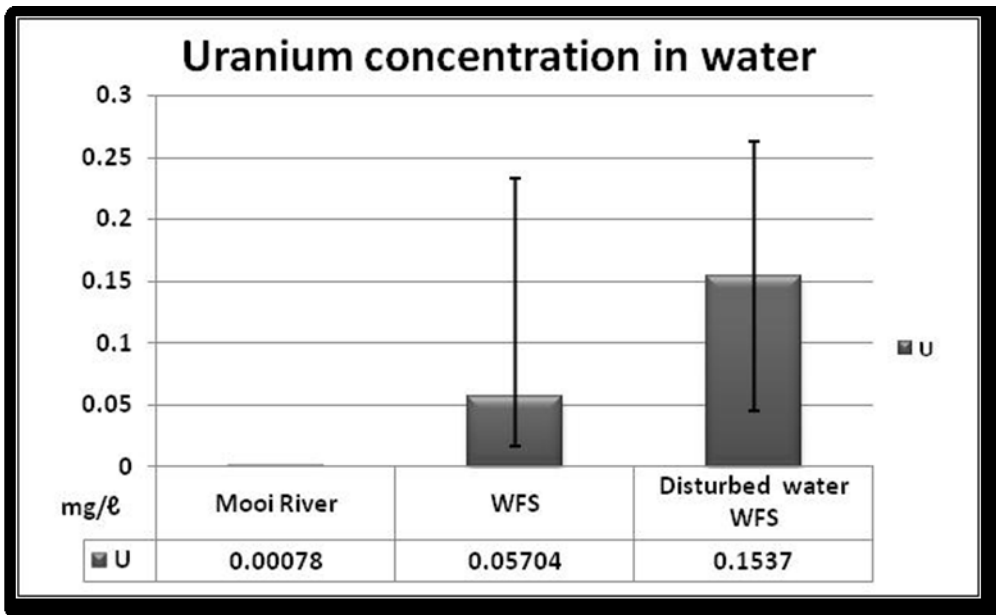


Figure 10-8: Uranium concentration in the respective water samples

11 Appendix C - Soil

11.1 Soil Data Tables

Table 11-1: Elemental concentrations of soil samples in the respective sites

Elemental concentrations of soil samples in the respective sites								
	Irrigated soil - WFS				Irrigated soil - MR			
Element	Average	STDEV	Min	Max	Average	STDEV	Min	Max
Co mg/kg	9.70	1.41	8.00	11.25	31.40	18.71	17.00	62.50
Ni mg/kg	36.50	7.62	27.50	45.00	98.00	48.00	60.00	180.00
Cu mg/kg	15.30	4.54	11.50	20.50	37.65	21.95	23.25	75.00
Zn mg/kg	13.00	0.47	12.50	13.75	28.00	1.12	27.50	30.00
Se mg/kg	0.74	0.06	0.63	0.78	0.76	0.65	0.08	1.55
Cd mg/kg	0.02	0.00	0.02	0.02	0.09	0.04	0.05	0.15
Pb mg/kg	9.85	2.23	7.75	12.50	34.50	13.04	25.00	50.00
U mg/kg	2.18	0.64	1.70	3.00	0.83	0.42	0.45	1.45
	Soil along WFS				Soil along MR			
Element	Average	STDEV	Min	Max	Average	STDEV	Min	Max
Co mg/kg	172.75	239.63	9.75	525.00	47.70	13.59	23.50	55.00
Ni mg/kg	1377.50	1851.53	60.00	4750.00	208.00	40.40	137.50	237.50
Cu mg/kg	83.11	72.34	10.25	220.00	54.50	9.91	37.50	62.50
Zn mg/kg	783.06	1030.04	30.00	2500.00	29.95	6.92	22.25	40.00
Se mg/kg	2.83	1.02	1.53	4.50	0.25	0.46	0.04	1.08
Cd mg/kg	0.34	0.35	0.04	0.98	0.12	0.04	0.05	0.17
Pb mg/kg	23.36	9.98	5.25	40.00	16.55	6.36	11.75	27.50
U mg/kg	110.44	84.54	2.45	200.00	0.60	0.12	0.45	0.78
	Soil in wetland - WFS				Soil in control site - WFS			
Element	Average	STDEV	Min	Max	Average	STDEV	Min	Max
Co mg/kg	4.99	1.95	3.04	7.57	4.39	2.47	1.95	7.57
Ni mg/kg	51.04	13.87	37.05	66.55	52.92	25.47	30.00	100.00
Cu mg/kg	23.16	6.43	15.33	32.28	19.46	8.23	11.50	32.50
Zn mg/kg	37.81	11.50	25.45	56.43	11.75	1.66	9.50	13.75
Se mg/kg	1.05	0.15	0.82	1.25	0.83	0.16	0.63	1.10
Cd mg/kg	0.10	0.06	0.05	0.18	0.04	0.02	0.02	0.08
Pb mg/kg	19.48	4.95	11.90	24.53	14.83	7.34	7.75	27.50
U mg/kg	117.02	87.74	38.70	227.28	1.60	0.63	1.00	2.75

11.2 Soil Data Graphs

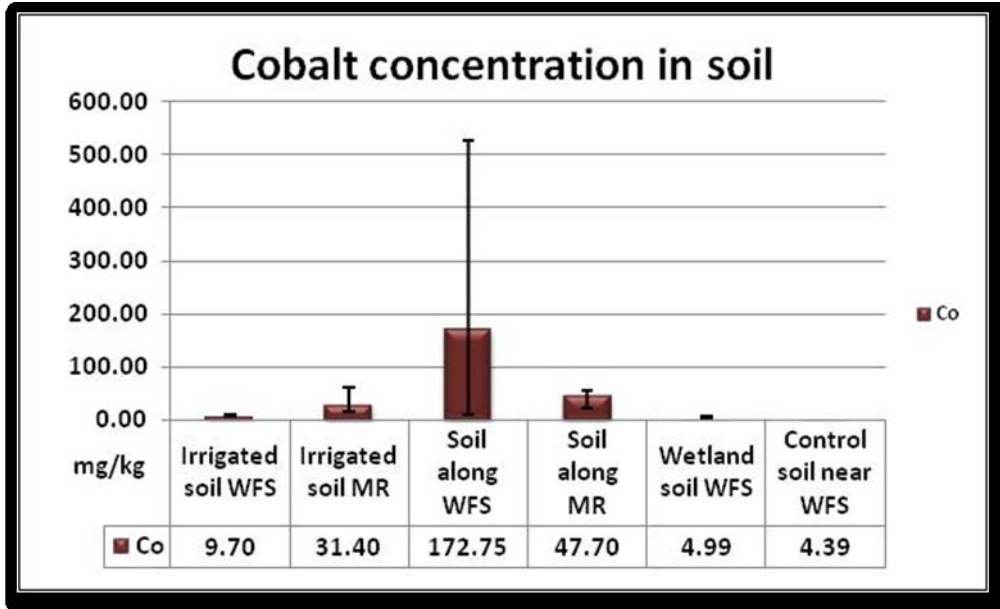


Figure 11-1: Cobalt concentration in the soil samples from the respective sampling sites.

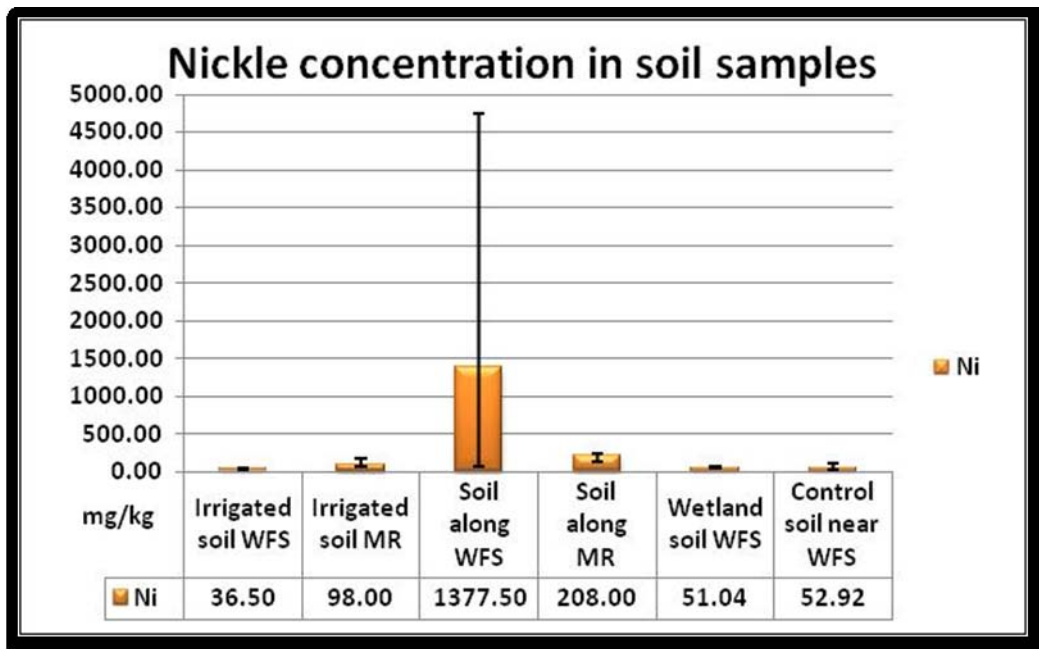


Figure 11-2: Nickel concentration in the soil samples from the respective sampling sites.

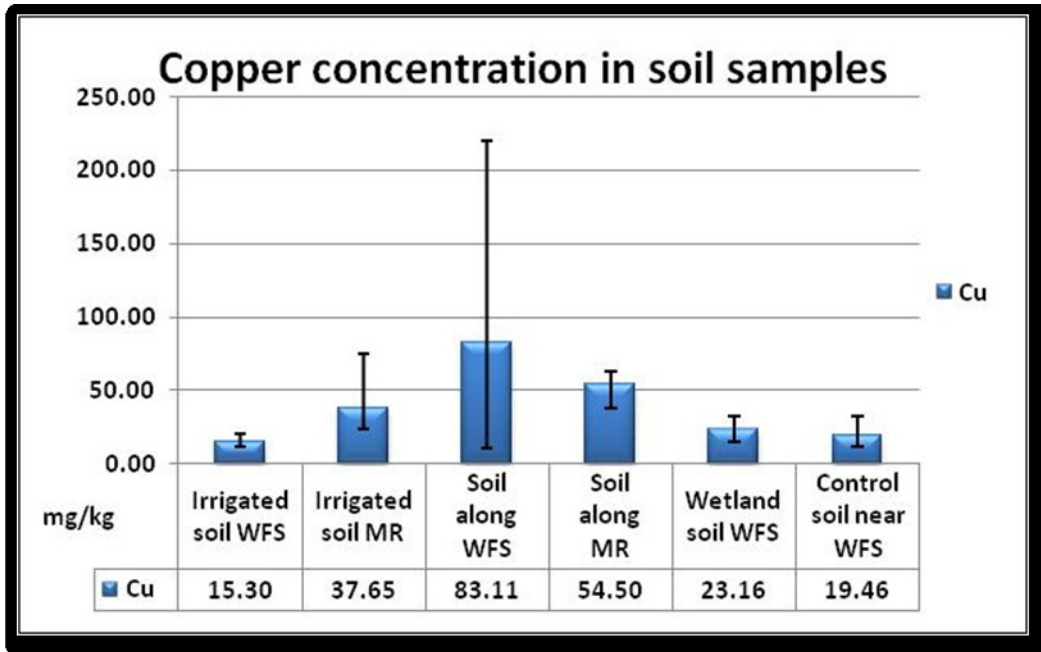


Figure 11-3: Copper concentration in the soil samples from the respective sampling sites

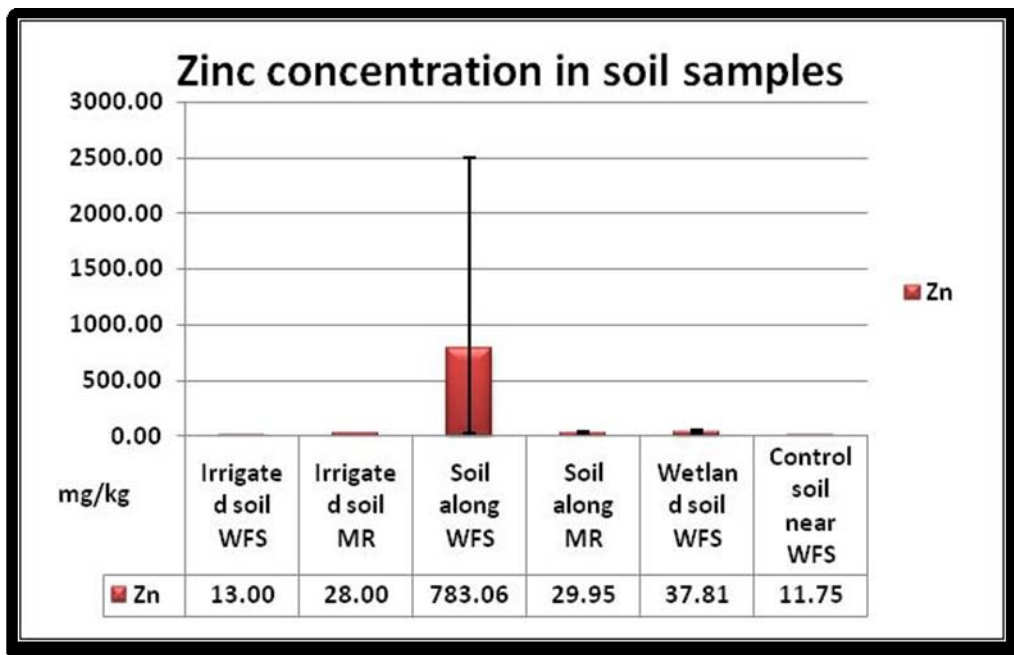


Figure 11-4: Zinc concentration in the soil samples from the respective sampling sites

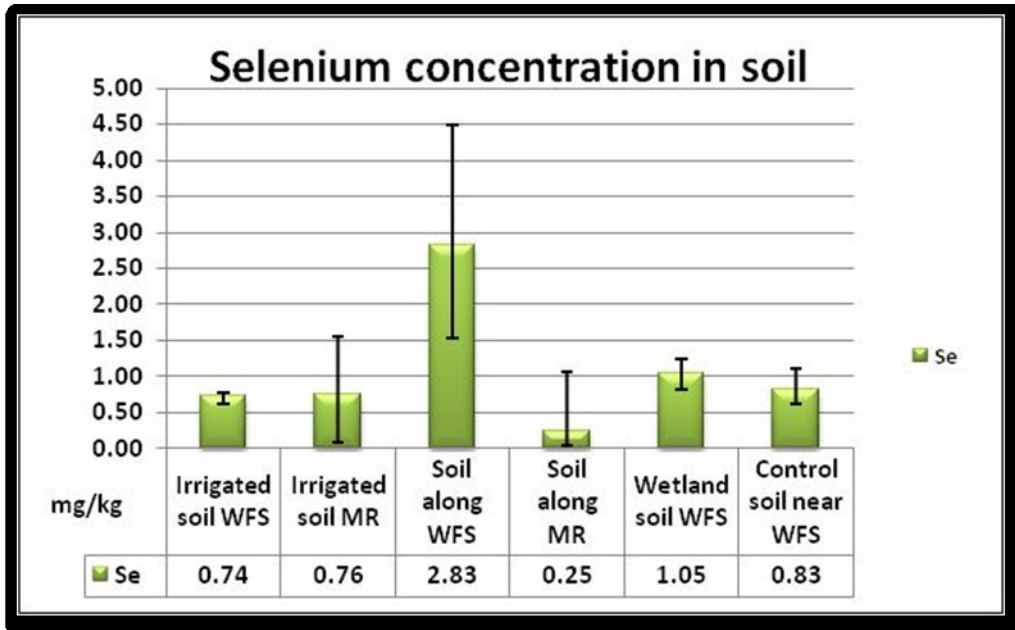


Figure 11-5: Selenium concentration in the soil samples from the respective sampling sites

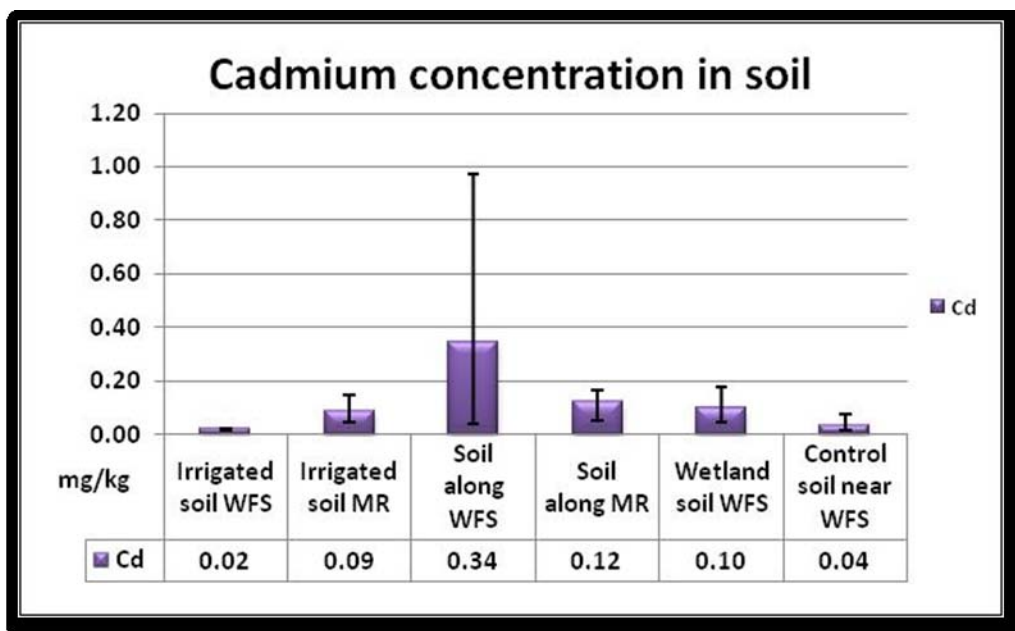


Figure 11-6: Cadmium concentration in the soil samples from the respective sampling sites

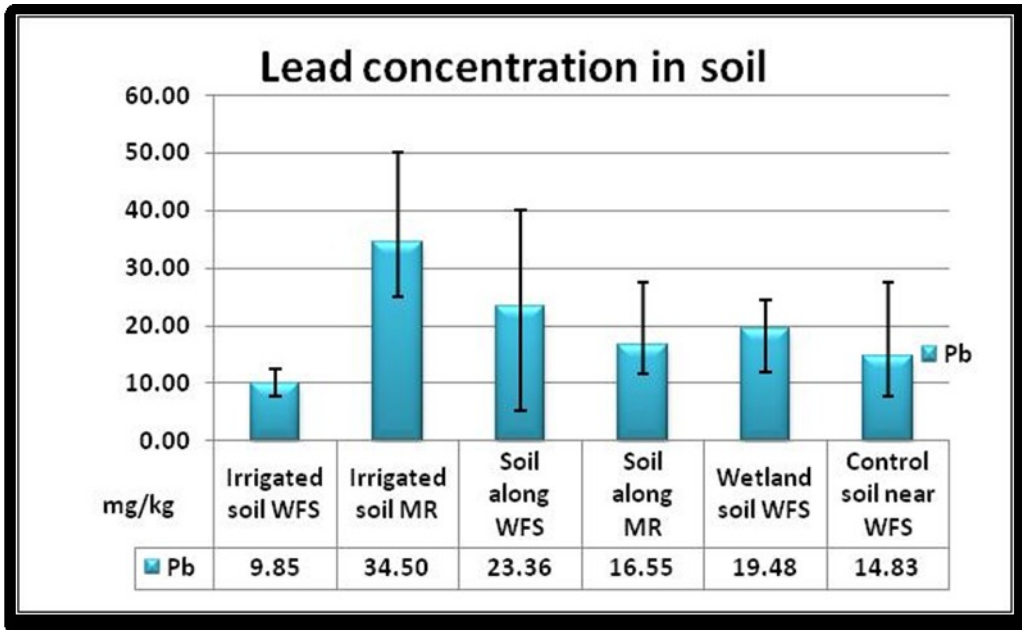


Figure 11-7: Lead concentration in the soil samples from the respective sampling sites

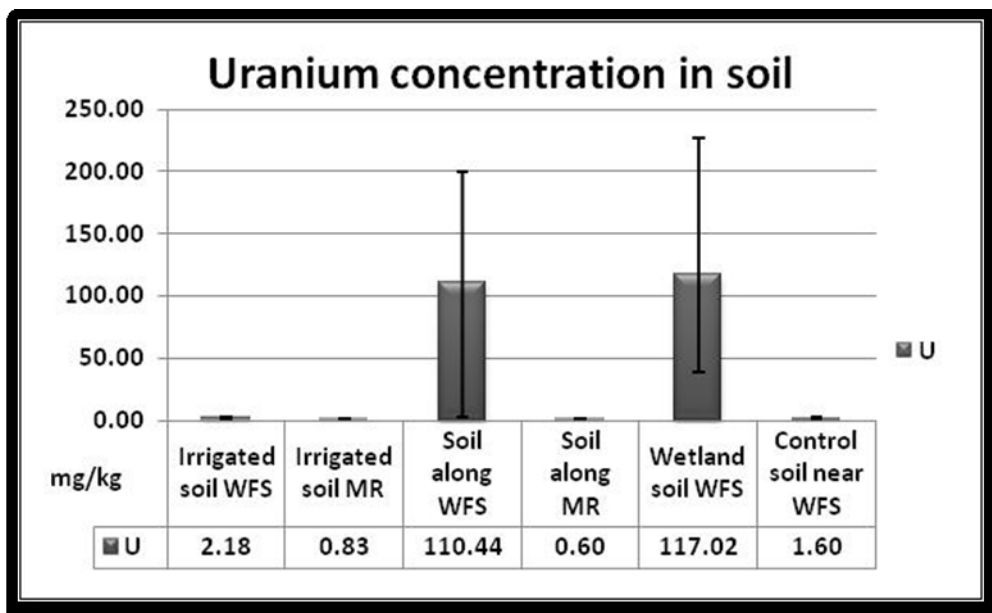


Figure 11-8: Uranium concentration in the soil samples from the respective sampling sites

11.3 Comparison of the Elemental Concentrations within the different particle size fractions of Soil Samples from the Respective Sites

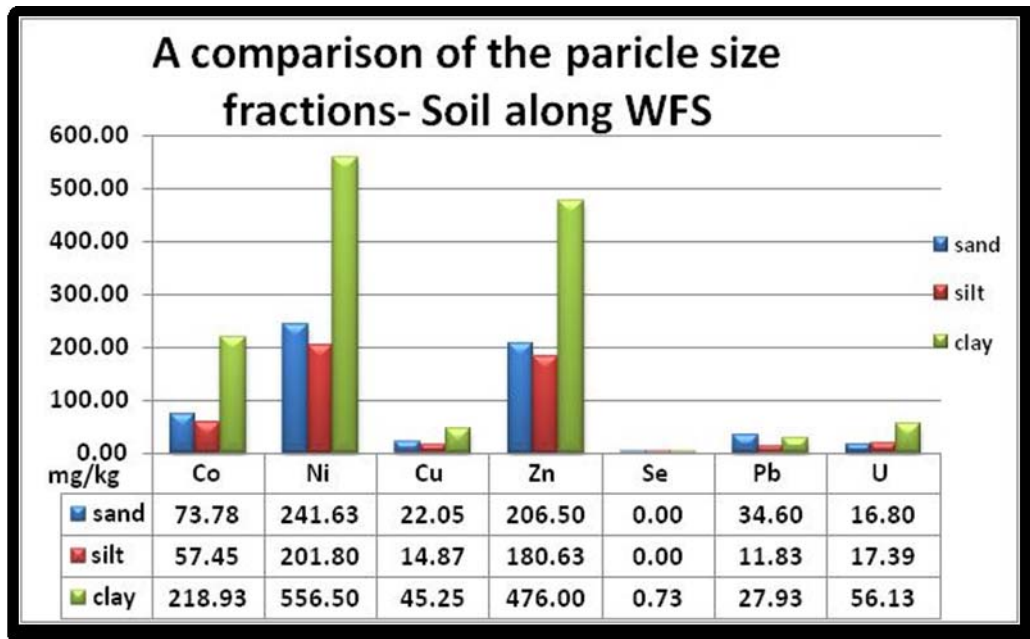


Figure 11-9: A comparison of the elemental concentrations in the different particle size fractions (sand, silt and clay) in a soil samples from the soil along the WFS

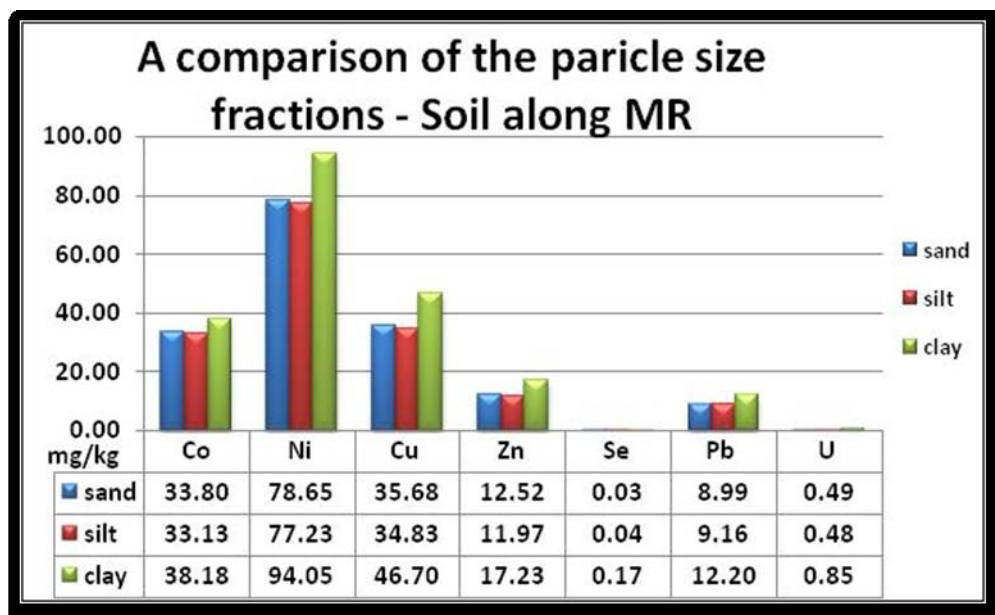


Figure 11-10: A comparison of the elemental concentrations in the different particle size fractions (sand, silt and clay) in a soil samples from the soil along the MR

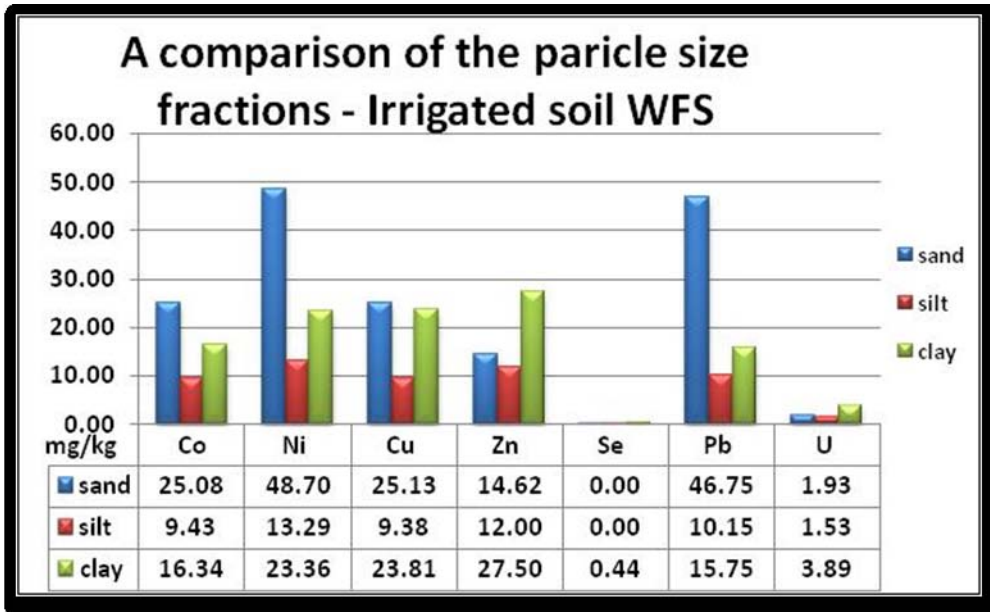


Figure 11-11: A comparison of the elemental concentrations in the different particle size fractions (sand, silt and clay) in a soil samples from the irrigated soil WFS site

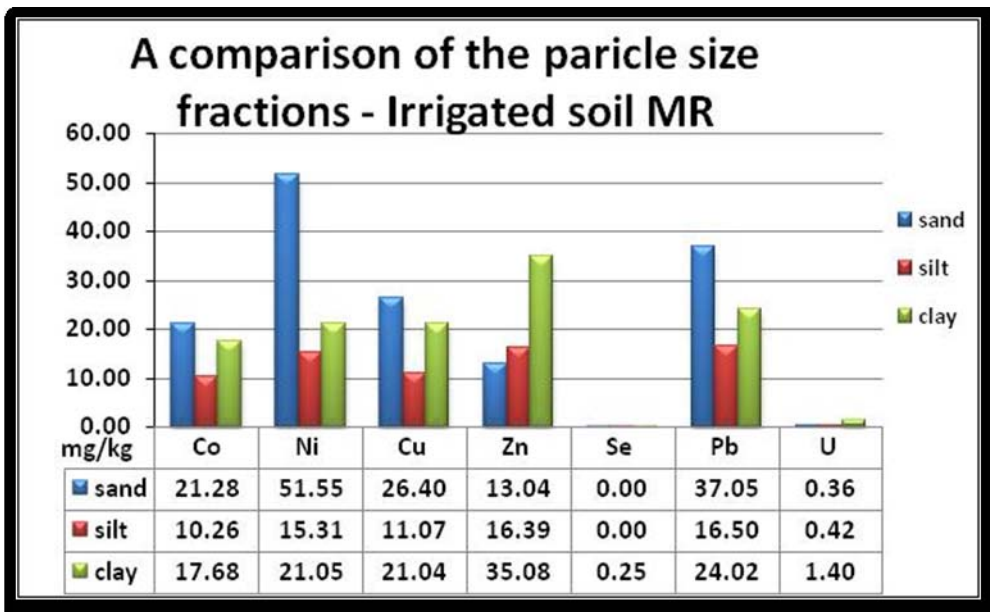


Figure 11-12: A comparison of the elemental concentrations in the different particle size fractions (sand, silt and clay) in a soil samples from the irrigated soil MR group

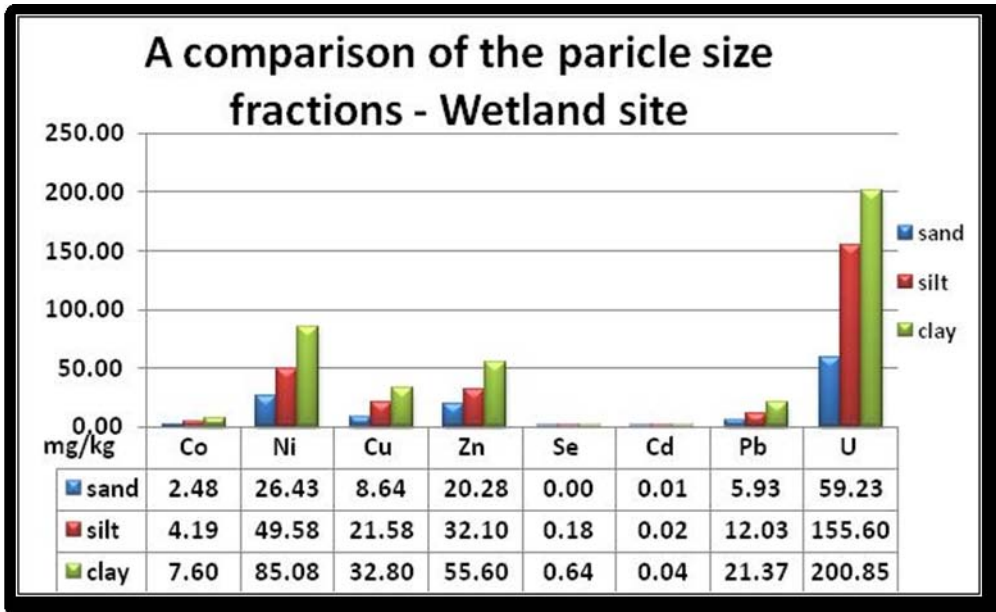


Figure 11-13: A comparison of the elemental concentrations in the different particle size fractions (sand, silt and clay) in a soil samples from the Wetland WFS site

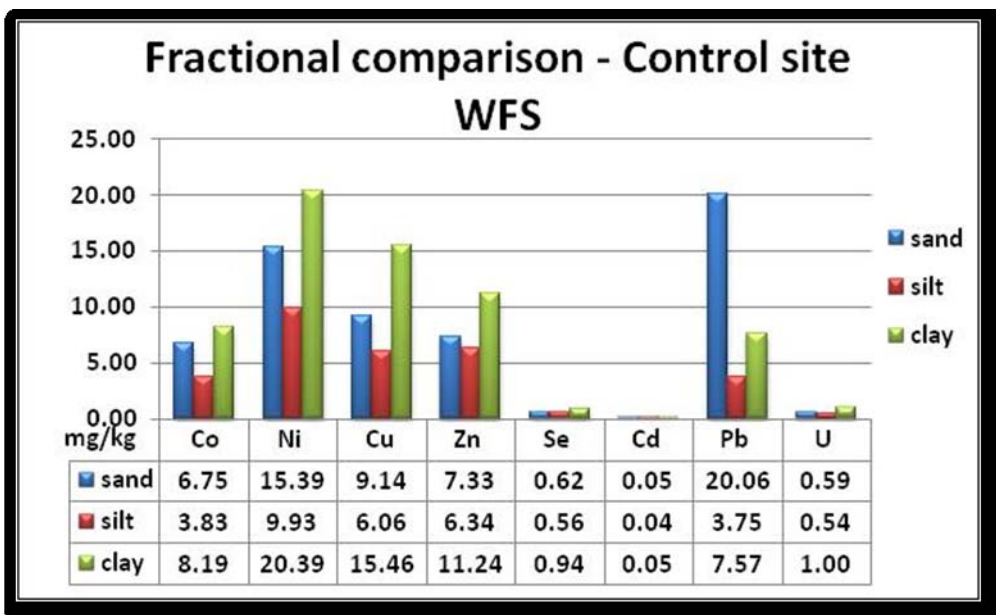


Figure 11-14: A comparison of the elemental concentrations in the different particle size fractions (sand, silt and clay) in a soil samples from the Control WFS site

12 Appendix D - Vegetation

12.1 Vegetation Data Table

Table 12-1: Elemental concentrations of grass samples in the respective sites

Elemental concentrations of grass samples in the respective sites								
	Irrigated grass - WFS				Irrigated grass - MR			
Element	Average	STDEV	Min	Max	Average	STDEV	Min	Max
Co mg/kg	1.24	0.06	1.13	1.28	0.63	0.31	0.16	1.03
Ni mg/kg	15.40	0.68	14.75	16.25	5.25	2.85	0.48	8.00
Cu mg/kg	17.60	10.22	10.00	30.00	12.45	3.11	8.00	15.50
Zn mg/kg	40.50	6.71	32.50	47.50	34.30	14.94	9.00	47.50
Se mg/kg	1.69	0.26	1.48	2.00	0.74	0.61	0.11	1.40
Cd mg/kg	0.03	0.01	0.02	0.04	0.01	0.01	0.00	0.03
Pb mg/kg	4.54	6.69	1.40	16.50	0.77	0.29	0.30	1.08
U mg/kg	15.85	2.98	11.25	19.25	0.04	0.03	0.01	0.07
	Grass along WFS				Grass along MR			
Element	Average	STDEV	Min	Max	Average	STDEV	Min	Max
Co mg/kg	7.42	9.69	0.45	35.00	1.12	0.51	0.63	1.73
Ni mg/kg	65.12	66.46	5.25	245.00	5.90	0.96	4.50	7.00
Cu mg/kg	20.42	7.71	11.00	37.50	7.95	4.36	4.25	15.50
Zn mg/kg	343.33	222.76	72.50	700.00	30.75	7.79	21.25	42.50
Se mg/kg	2.46	1.18	1.83	6.50	0.65	0.68	0.14	1.45
Cd mg/kg	0.15	0.08	0.05	0.35	0.03	0.01	0.02	0.05
Pb mg/kg	1.65	0.55	0.95	2.50	1.03	0.23	0.83	1.40
U mg/kg	40.10	87.23	6.50	350.00	0.04	0.05	0.01	0.12
	Grass in wetland - WFS				Grass in control site - WFS			
Element	Average	STDEV	Min	Max	Average	STDEV	Min	Max
Co mg/kg	2.07	1.29	1.30	4.35	0.36	0.03	0.33	0.40
Ni mg/kg	13.19	6.36	9.29	24.48	3.46	0.53	3.00	4.25
Cu mg/kg	7.36	3.39	3.99	11.07	8.00	4.91	4.00	14.75
Zn mg/kg	32.70	15.46	20.30	56.70	33.25	10.73	20.50	47.50
Se mg/kg	0.35	0.10	0.27	0.50	1.48	0.13	1.23	1.55
Cd mg/kg	0.04	0.03	0.02	0.09	0.07	0.09	0.02	0.25
Pb mg/kg	0.23	0.29	0.08	0.74	1.45	0.29	1.08	1.85
U mg/kg	13.70	4.76	6.30	18.57	4.04	1.40	3.00	6.75

12.2 Vegetation Data Graphs

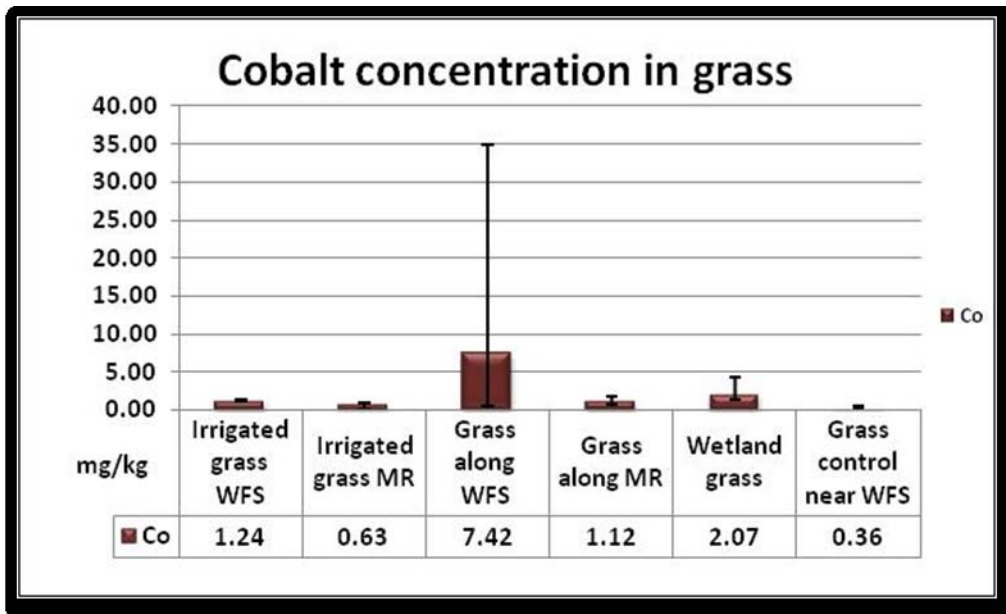


Figure 12-1: Cobalt concentration in the grass samples from the respective sampling sites

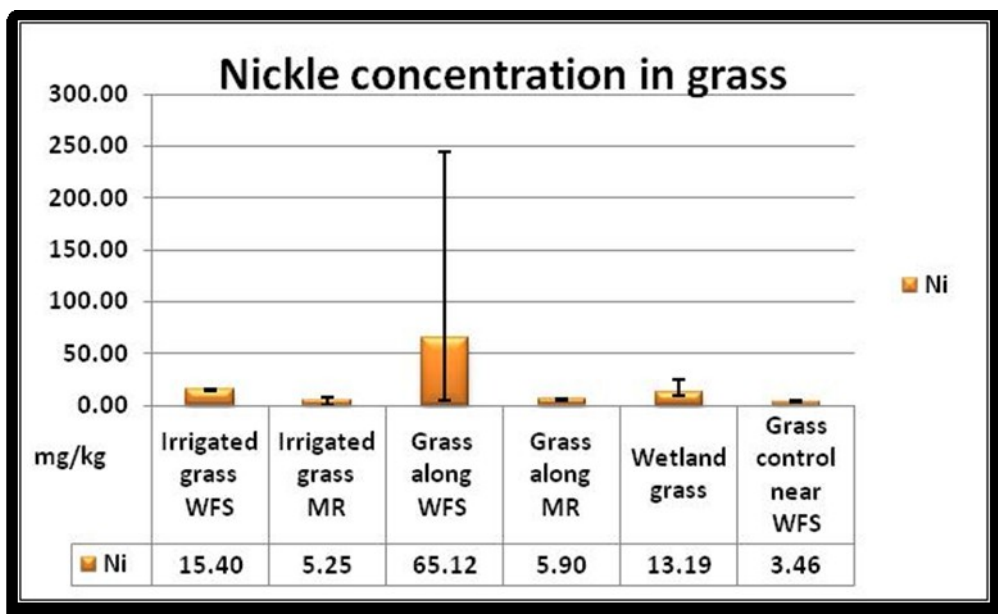


Figure 12-2: Nickel concentration in the grass samples from the respective sampling sites

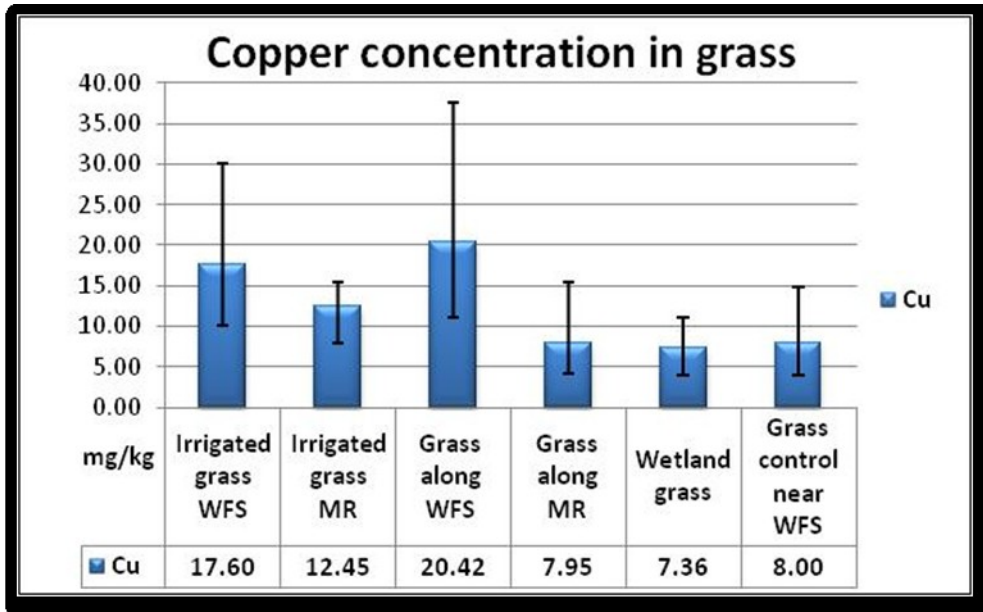


Figure 12-3: Copper concentration in the grass samples from the respective sampling sites

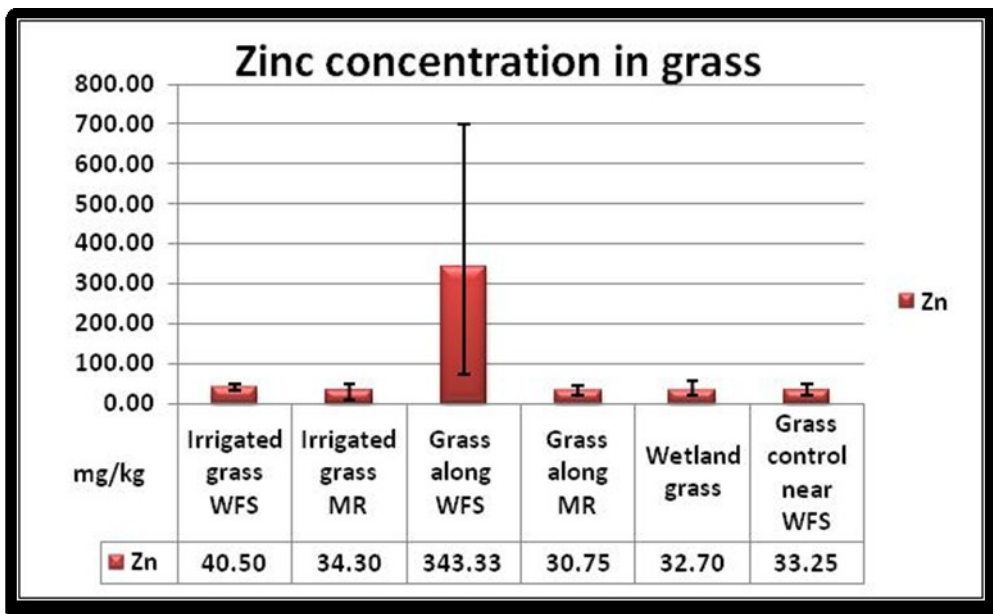


Figure 12-4: Zinc concentration in the grass samples from the respective sampling sites

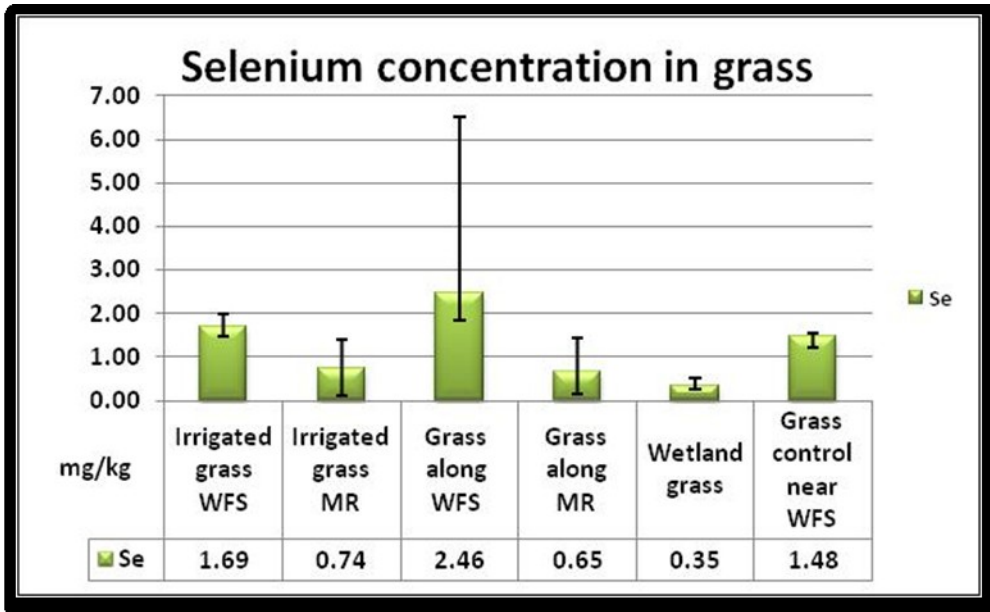


Figure 12-5: Selenium concentration in the grass samples from the respective sampling sites

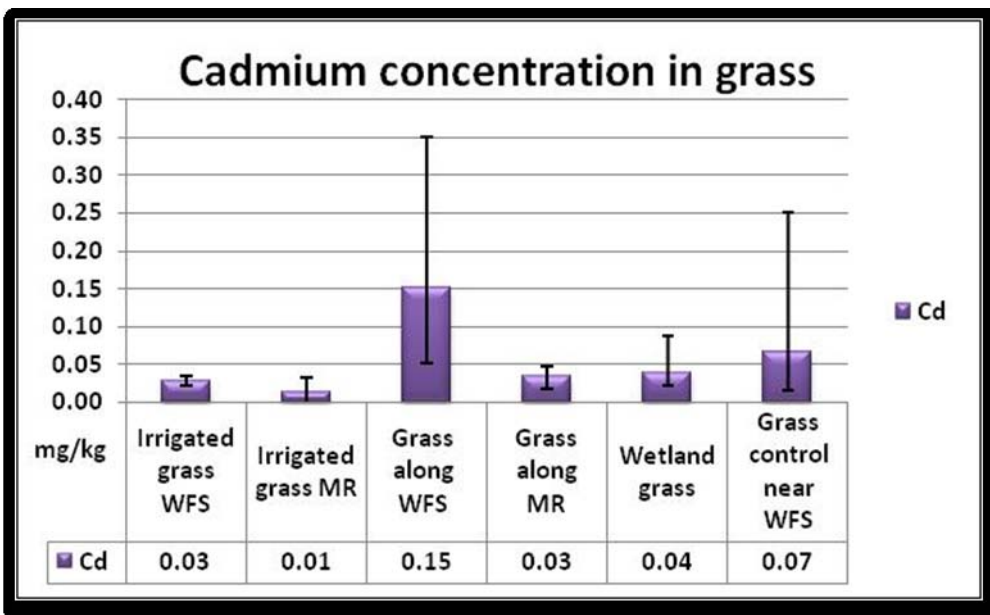


Figure 12-6: Cadmium concentration in the grass samples from the respective sampling sites

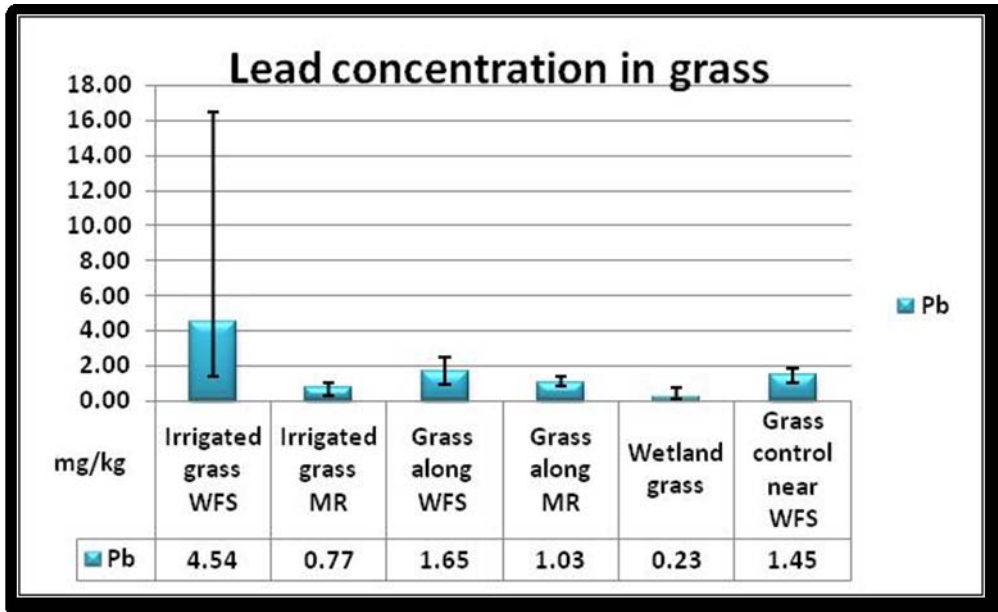


Figure 12-7: Lead concentration in the grass samples from the respective sampling site

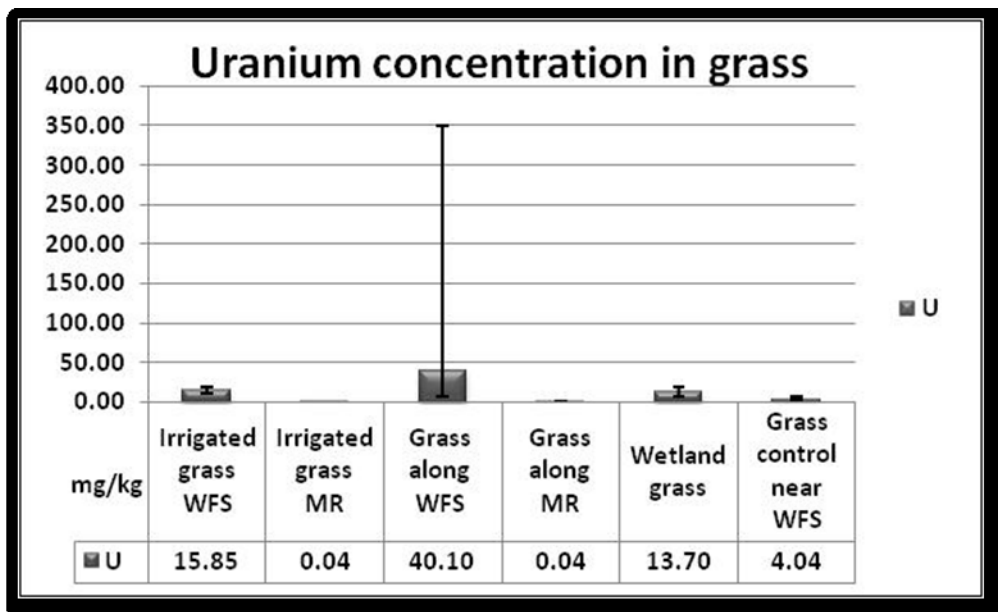


Figure 12-8: Uranium concentration in the grass samples from the respective sampling sites

13 Appendix E - Cattle

13.1 Cattle Data Tables

Table 13-1: Elemental concentrations in the experimental group cattle tissue samples

Experimental group - WFS								
	Liver				Kidney			
Element	Average	STDEV	Min	Max	Average	STDEV	Min	Max
Co mg/kg	0.30	0.13	0.09	0.58	0.27	0.09	0.17	0.40
Ni mg/kg	0.43	0.16	0.23	0.69	0.62	0.22	0.40	1.08
Cu mg/kg	166.05	132.13	5.50	500.00	22.98	4.20	18.88	32.50
Zn mg/kg	304.00	495.80	107.50	1712.50	151.50	26.48	117.50	195.00
Se mg/kg	2.80	0.24	2.40	3.13	9.95	1.28	7.88	13.00
Cd mg/kg	0.12	0.08	0.01	0.24	1.33	0.49	0.71	2.29
Pb mg/kg	0.42	0.20	0.24	0.90	0.52	0.17	0.30	0.84
U mg/kg	5.07	9.50	0.56	31.81	1.74	1.00	0.75	4.01
	Spleen				Muscle tissue			
Element	Average	STDEV	Min	Max	Average	STDEV	Min	Max
Co mg/kg	0.10	0.04	0.04	0.16	0.07	0.04	0.02	0.13
Ni mg/kg	0.50	0.25	0.24	0.89	0.56	0.20	0.31	1.03
Cu mg/kg	6.04	1.64	4.00	8.88	5.41	1.68	2.63	8.38
Zn mg/kg	122.50	28.57	66.25	156.25	202.19	110.55	85.00	562.50
Se mg/kg	3.23	0.63	2.08	4.25	2.21	0.67	1.44	4.00
Cd mg/kg	0.02	0.01	0.00	0.03	0.01	0.02	0.00	0.08
Pb mg/kg	0.49	0.38	0.24	1.44	0.48	0.25	0.26	1.23
U mg/kg	1.91	1.31	0.66	5.20	1.58	0.82	0.98	4.63
	Bone				Hair			
Element	Average	STDEV	Min	Max	Average	STDEV	Min	Max
Co mg/kg	0.31	0.01	0.30	0.33	0.15	0.14	0.01	0.33
Ni mg/kg	3.35	0.10	3.20	3.50	1.53	1.53	0.10	3.50
Cu mg/kg	3.59	1.21	2.34	6.13	3.92	2.49	1.21	8.38
Zn mg/kg	79.79	15.49	48.75	97.50	150.22	175.13	15.49	562.50
Se mg/kg	1.15	0.35	0.88	2.05	1.59	1.17	0.35	4.00
Cd mg/kg	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.08
Pb mg/kg	0.90	0.40	0.50	1.79	0.73	0.54	0.25	1.79
U mg/kg	0.60	0.22	0.41	1.08	1.29	1.41	0.22	4.63

Table 13-2: Elemental concentrations in the control group cattle tissue samples

Control group cattle - WFS								
	Liver				Kidney			
Element	Average	STDEV	Min	Max	Average	STDEV	Min	Max
Co mg/kg	0.33	0.08	0.24	0.44	0.11	0.01	0.10	0.12
Ni mg/kg	0.30	0.07	0.23	0.37	0.00	0.00	0.00	0.00
Cu mg/kg	159.34	40.09	112.13	208.00	18.12	4.81	12.63	22.28
Zn mg/kg	104.29	9.86	93.83	114.70	78.05	2.00	75.53	80.73
Se mg/kg	0.68	0.11	0.51	0.76	6.57	0.87	5.63	7.48
Cd mg/kg	0.16	0.04	0.13	0.22	1.18	0.83	0.57	2.09
Pb mg/kg	0.11	0.06	0.01	0.16	0.03	0.06	0.00	0.13
U mg/kg	0.04	0.01	0.03	0.05	0.0038	0.01	0.00	0.02
	Spleen				Muscle tissue			
Element	Average	STDEV	Min	Max	Average	STDEV	Min	Max
Co mg/kg	0.04	0.02	0.02	0.08	0.01	0.01	0.00	0.02
Ni mg/kg	0.21	0.10	0.15	0.36	0.20	0.02	0.17	0.24
Cu mg/kg	4.86	0.85	4.05	5.93	3.31	0.42	2.79	3.83
Zn mg/kg	98.64	4.87	87.98	113.40	154.74	31.71	127.85	209.83
Se mg/kg	1.02	0.18	0.79	1.22	0.39	0.08	0.28	0.46
Cd mg/kg	0.03	0.01	0.02	0.04	0.02	0.00	0.02	0.02
Pb mg/kg	0.15	0.02	0.11	0.16	0.15	0.01	0.14	0.16
U mg/kg	0.04	0.02	0.02	0.05	0.05	0.00	0.04	0.05
	Bone				Hair			
Element	Average	STDEV	Min	Max	Average	STDEV	Min	Max
Co mg/kg	0.38	0.03	0.34	0.42	0.42	0.20	0.24	0.74
Ni mg/kg	0.02	0.00	0.02	0.02	0.02	0.00	0.02	0.02
Cu mg/kg	0.24	0.04	0.18	0.28	7.54	1.26	6.00	9.17
Zn mg/kg	64.17	11.36	54.50	83.35	96.83	17.32	70.73	117.65
Se mg/kg	0.34	0.02	0.30	0.36	0.32	0.04	0.26	0.36
Cd mg/kg	0.04	0.00	0.04	0.05	0.06	0.01	0.05	0.08
Pb mg/kg	0.10	0.20	0.00	0.45	0.06	0.02	0.02	0.09
U mg/kg	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.01

13.2 Cattle Data Graphs

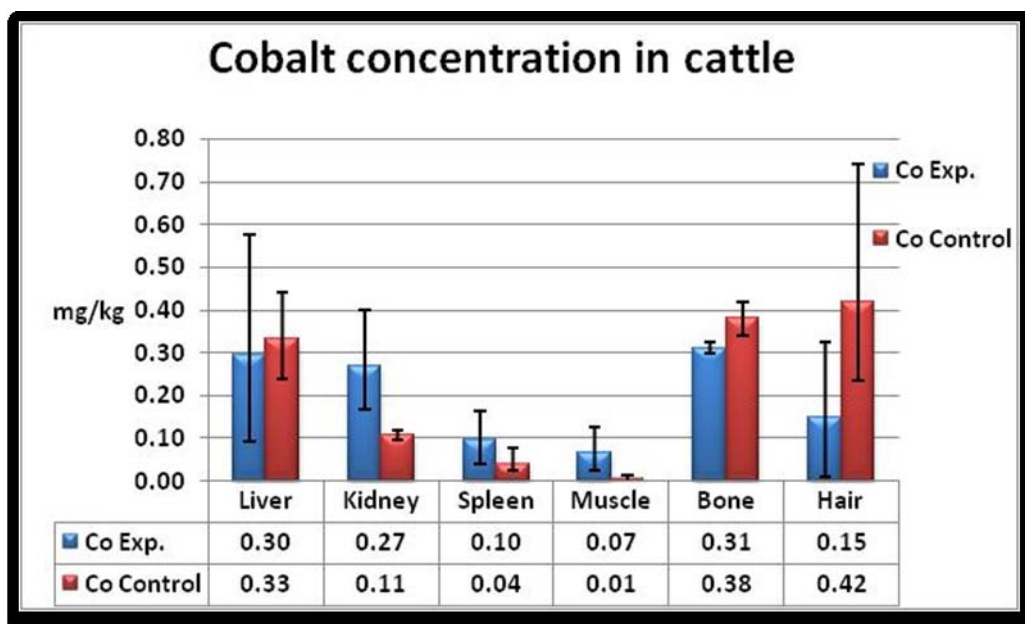


Figure 13-1: Cobalt concentration in cattle tissue samples. Control group in red, experimental group in blue

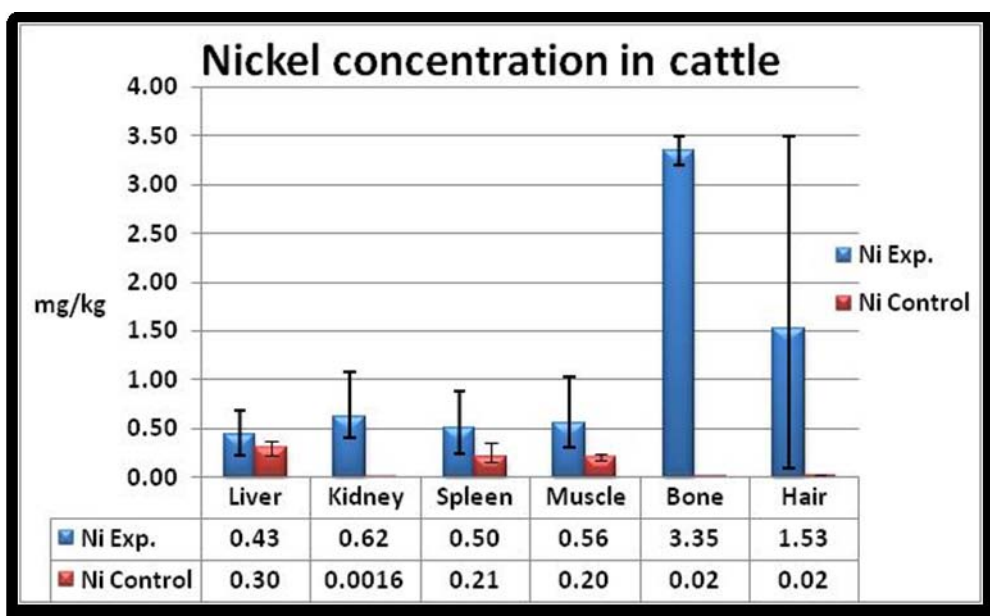


Figure 13-2: Nickel concentration in cattle tissue samples. Control group in red, experimental group in blue

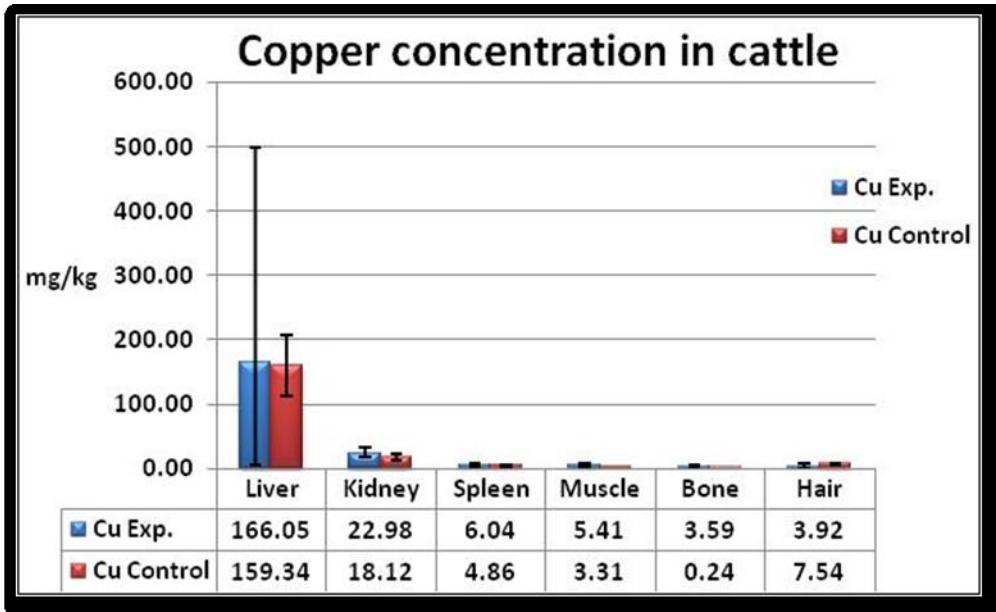


Figure 13-3: Copper concentration in cattle tissue samples. Control group in red, experimental group in blue

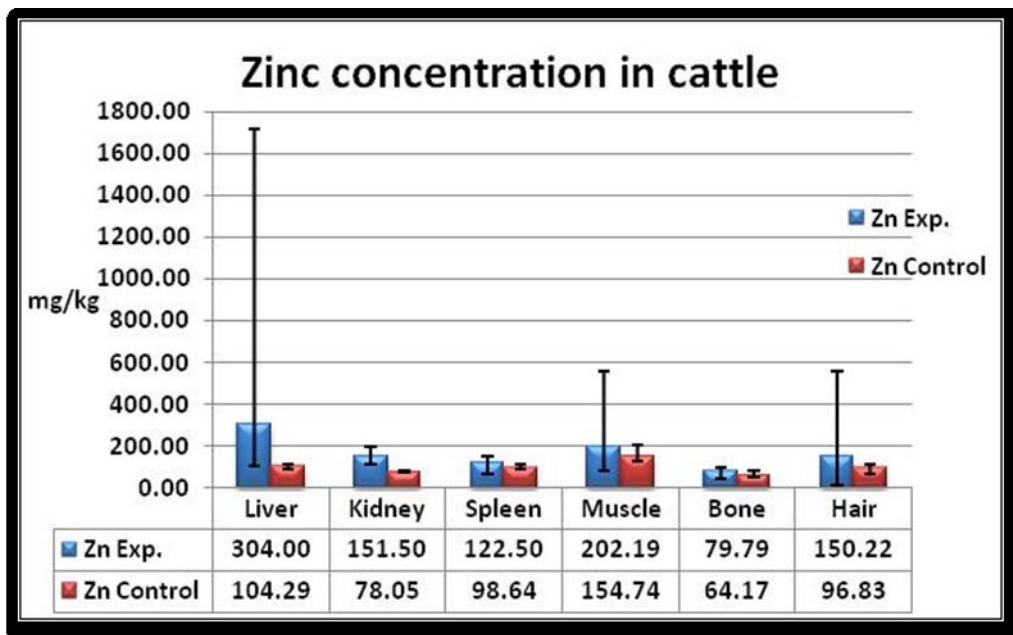


Figure 13-4: Zinc concentration in cattle tissue samples. Control group in red, experimental group in blue

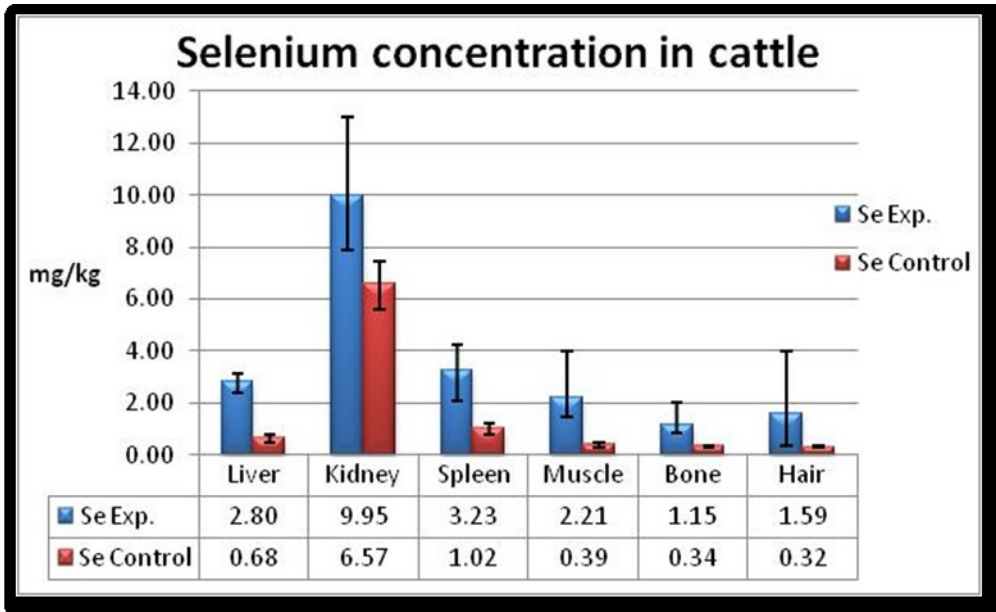


Figure 13-5: Selenium concentration in cattle tissue samples. Control group in red, experimental group in blue

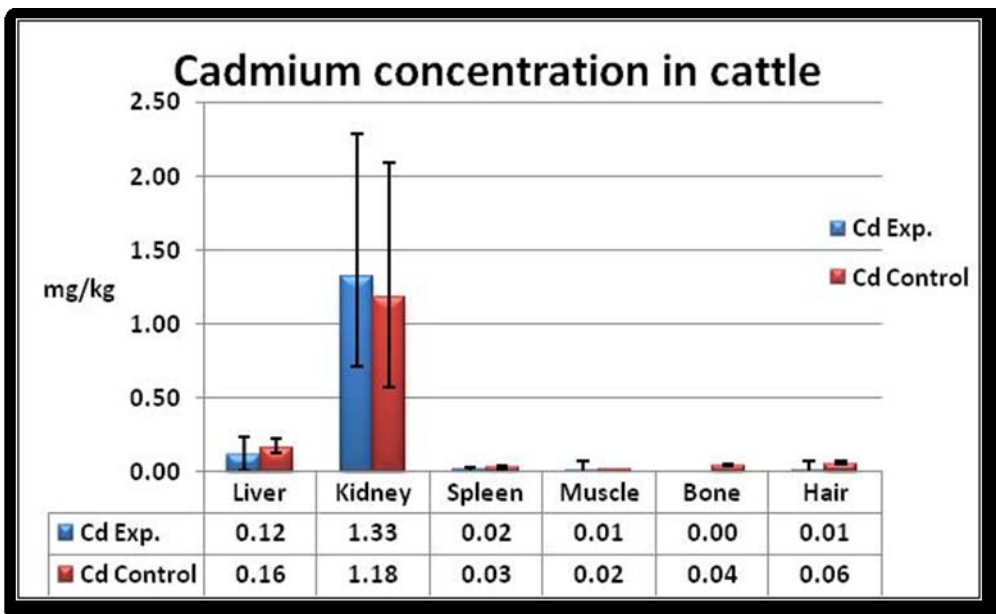


Figure 13-6: Cadmium concentration in cattle tissue samples. Control group in red, experimental group in blue

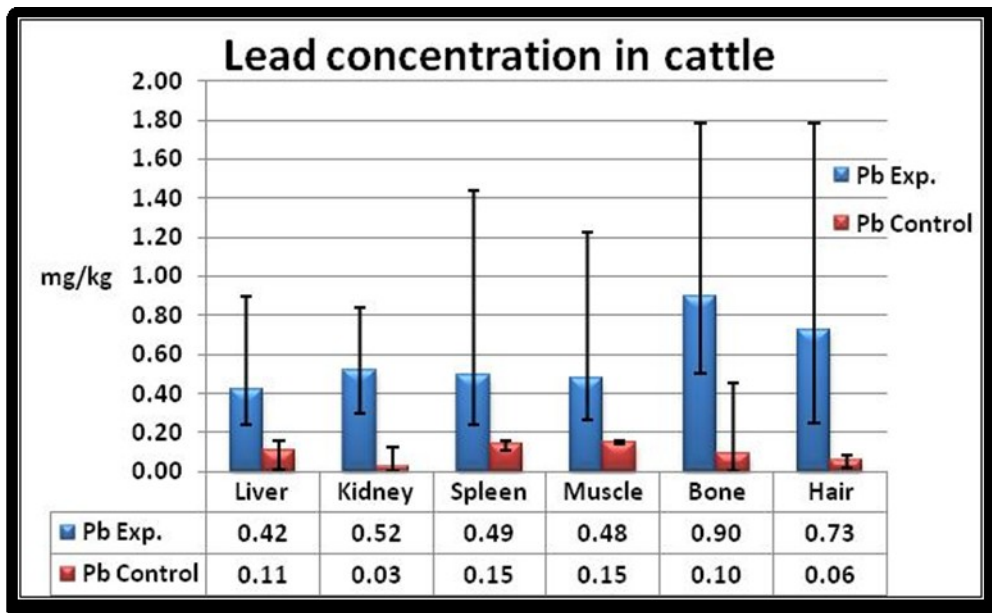


Figure 13-7: Lead concentration in cattle tissue samples. Control group in red, experimental group in blue

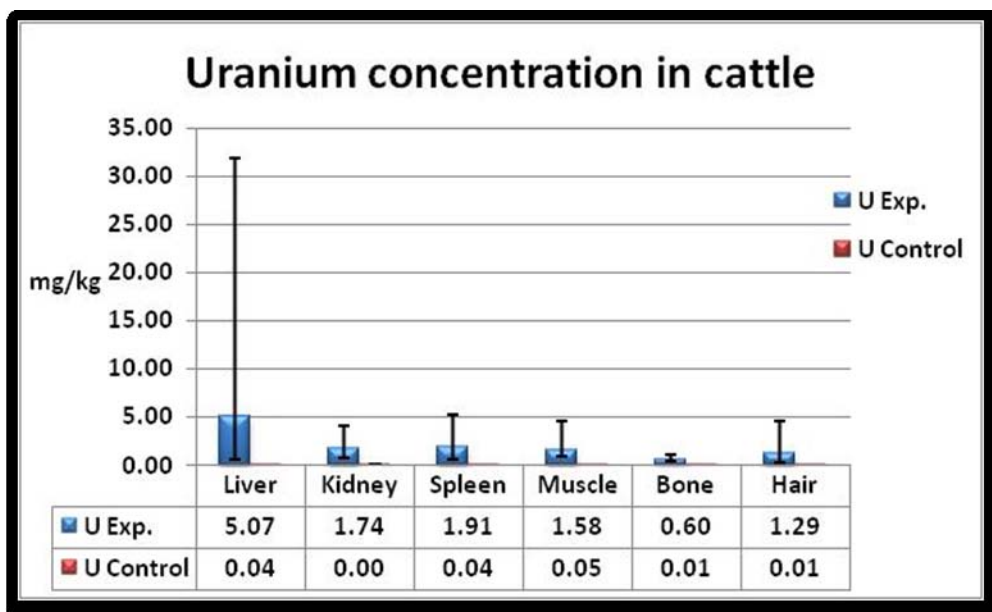


Figure 13-8: Uranium concentration in cattle tissue samples. Control group in red, experimental group in blue

14 Appendix F – Transfer Factors and Exposure Routes

14.1 Soil-to-plant transfer Factors

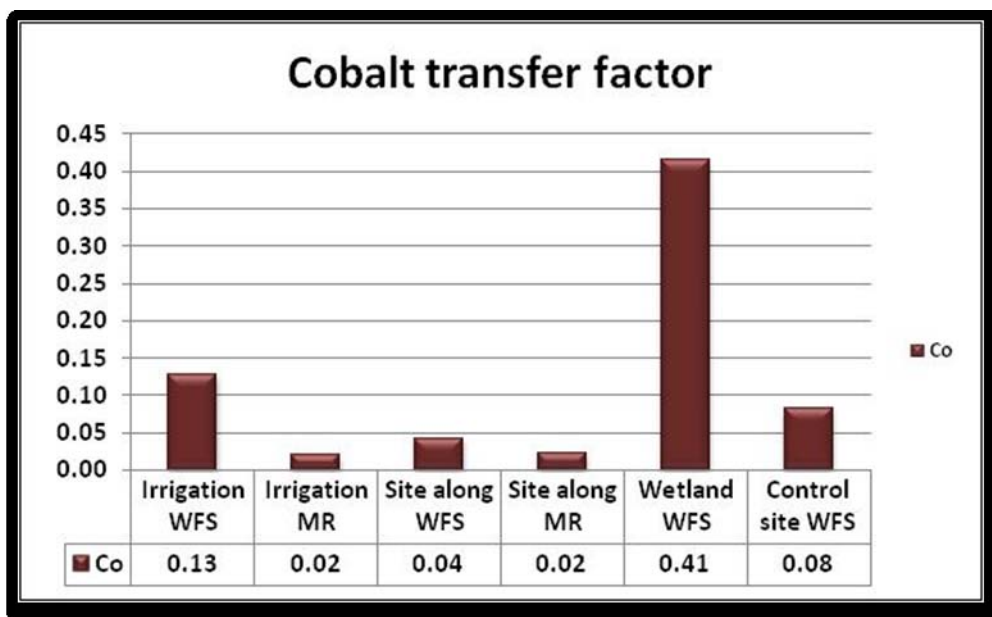


Figure 14-1: Cobalt transfer factor for the respective sampling sites

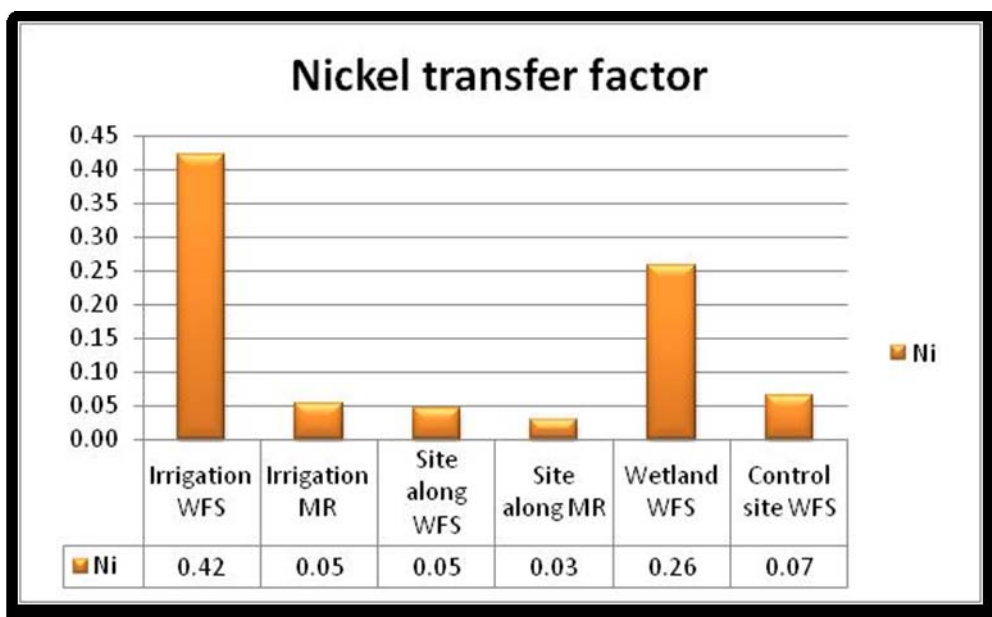


Figure 14-2: Nickel transfer factor for the respective sampling sites

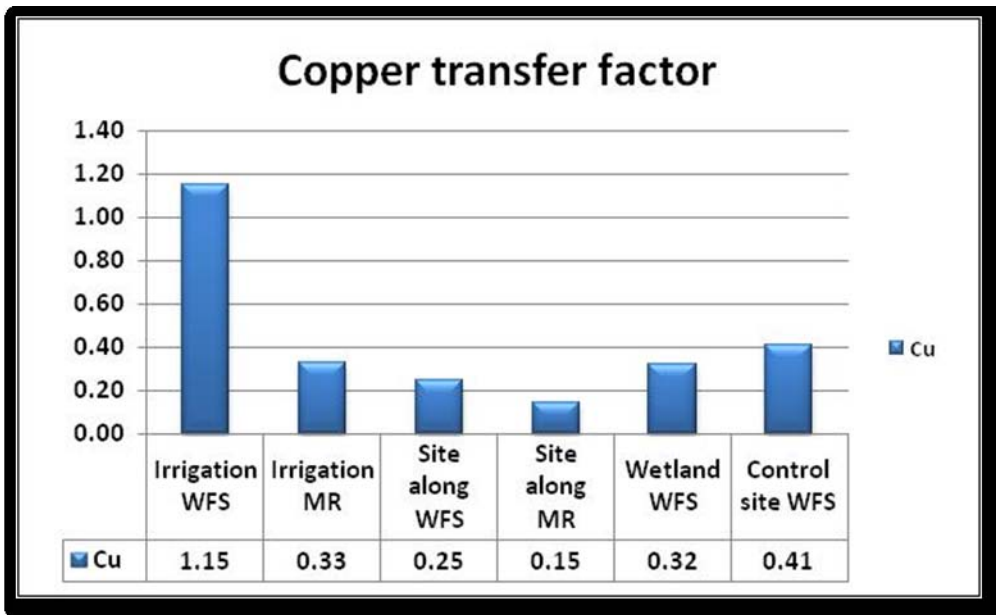


Figure 14-3: Copper transfer factor for the respective sampling sites

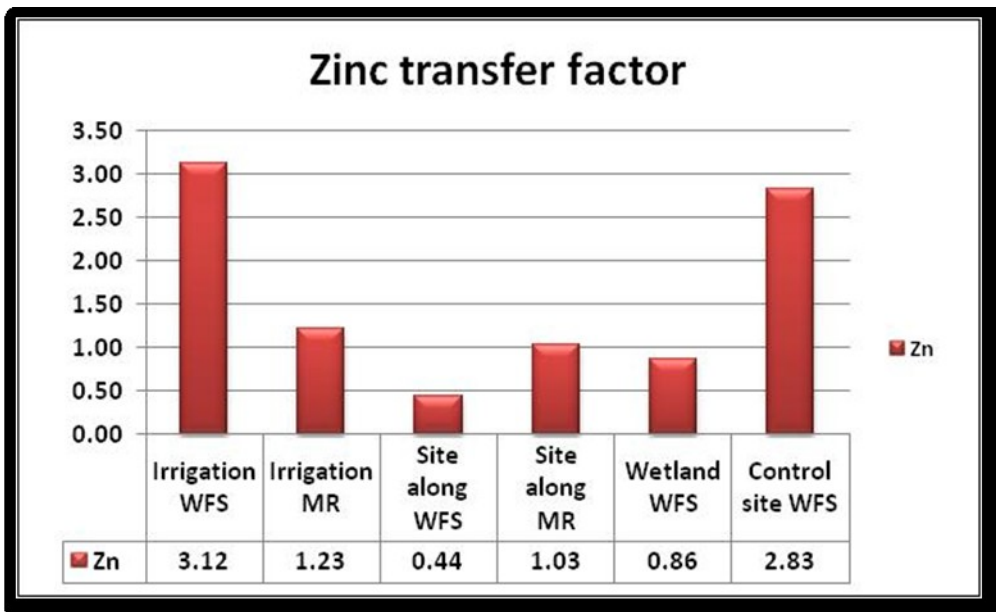


Figure 14-4: Zinc transfer factor for the respective sampling sites

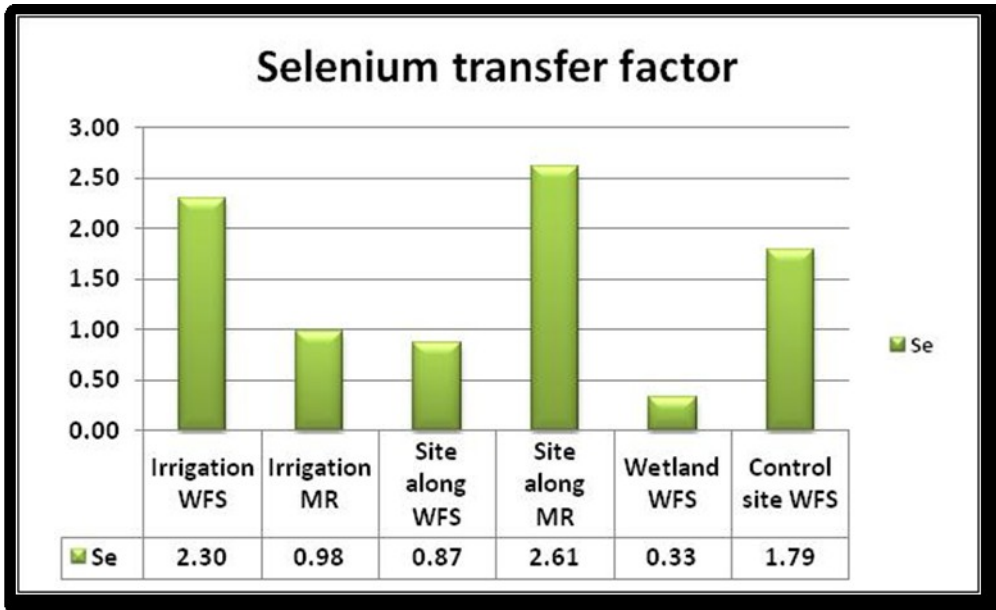


Figure 14-5: Selenium transfer factor for the respective sampling sites

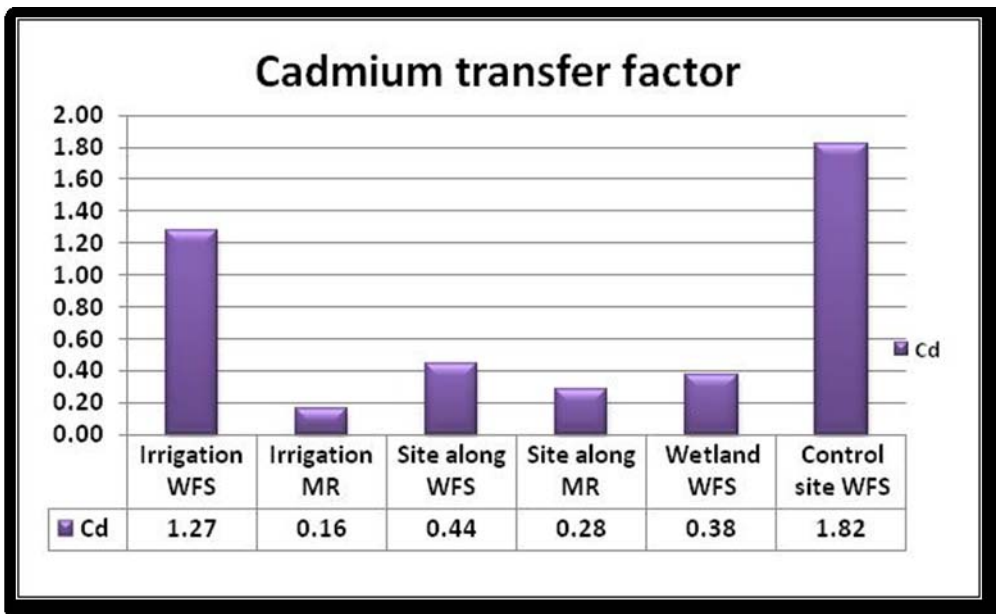


Figure 14-6: Cadmium transfer factor for the respective sampling sites

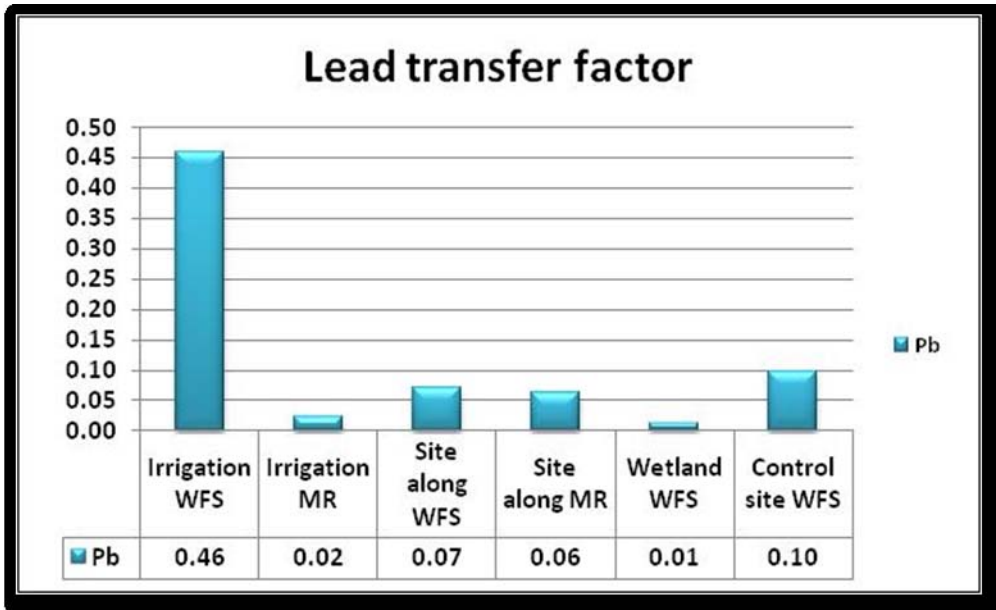


Figure 14-7: Lead transfer factor for the respective sampling sites

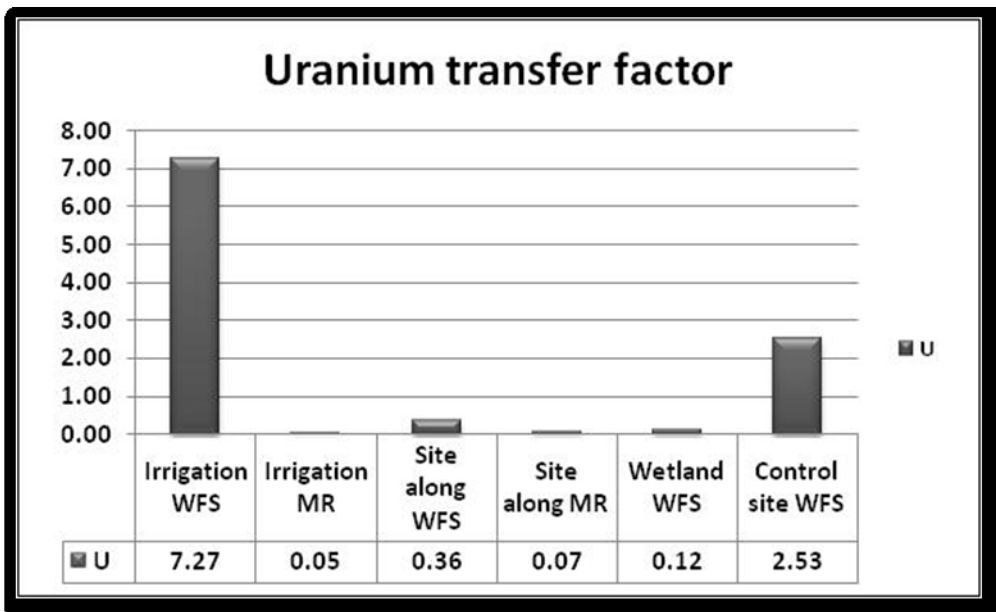


Figure 14-8: Uranium transfer factor for the respective sampling sites

14.2 Major Route of Exposure

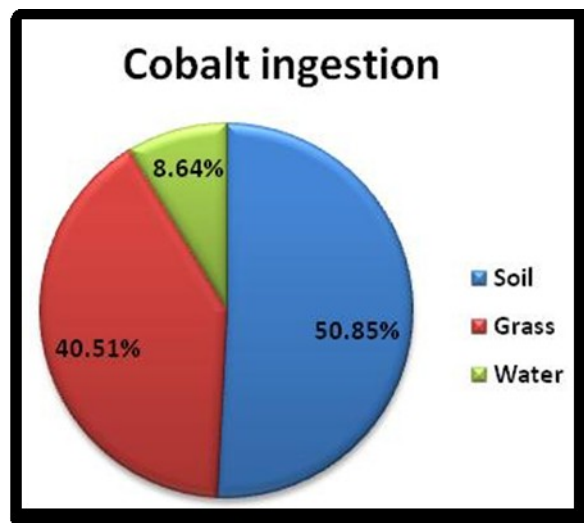


Figure 14-9: Cobalt ingestion percentages for soil, grass and water

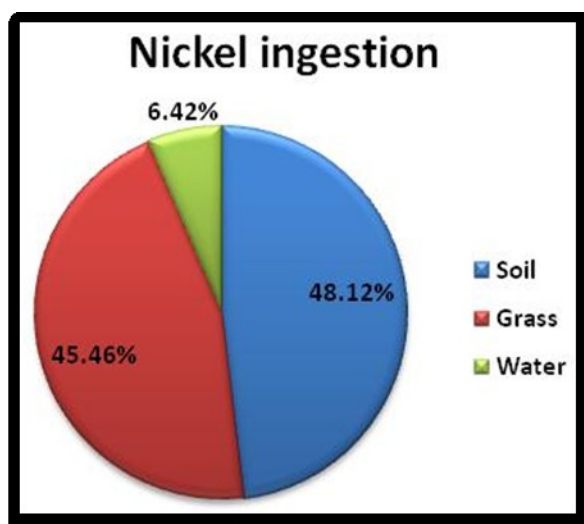


Figure 14-10: Nickel ingestion percentages for soil, grass and water

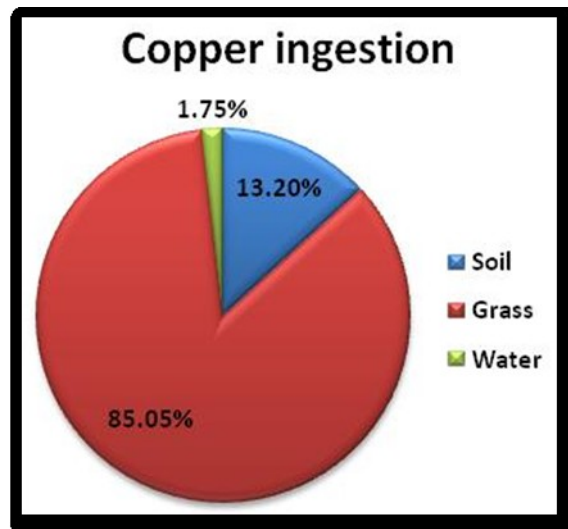


Figure 14-11: Copper ingestion percentages for soil, grass and water

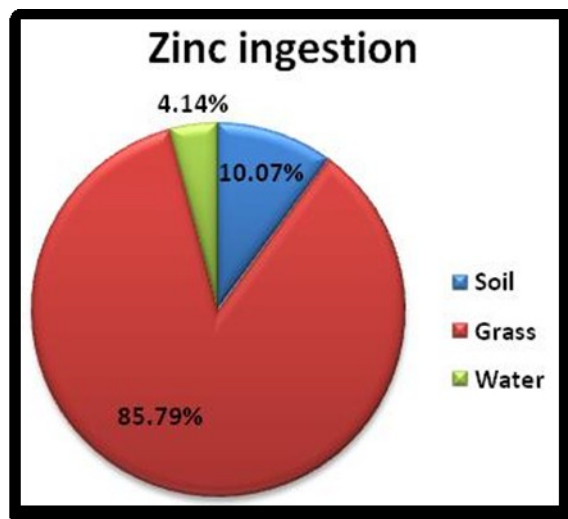


Figure 14-12: Zinc ingestion percentages for soil, grass and water

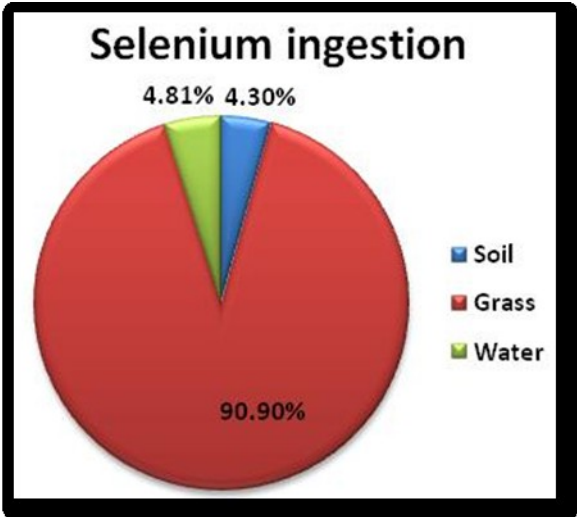


Figure 14-13: Selenium ingestion percentages for soil, grass and water

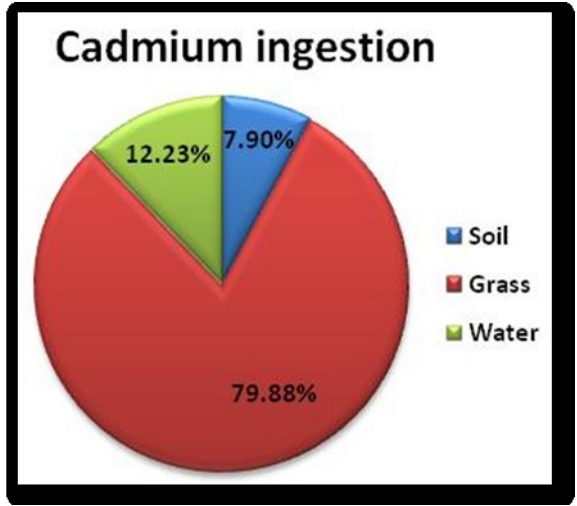


Figure 14-14: Cadmium ingestion percentages for soil, grass and water

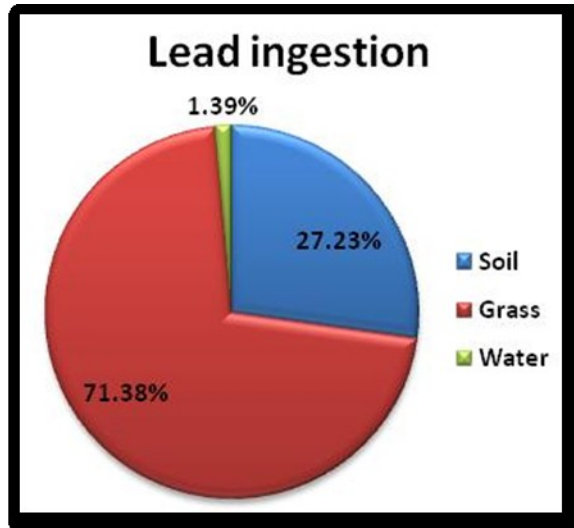


Figure 14-15: Lead ingestion percentages for soil, grass and water

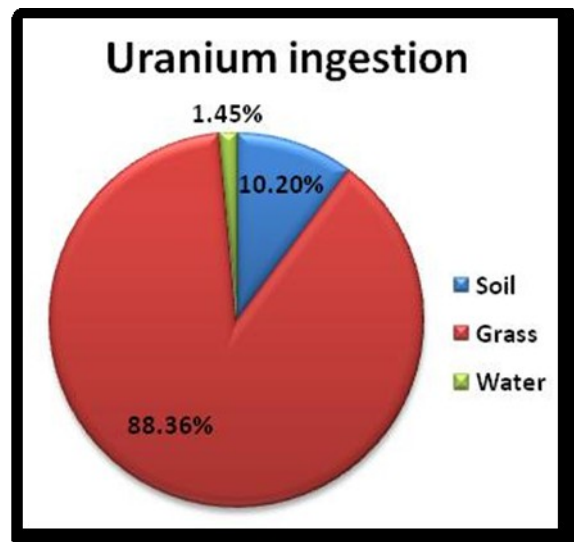


Figure 14-16: Uranium ingestion percentages for soil, grass and water