

# Estimation of Above-Ground Carbon-Stocks for Urban Greeneries in Arid Areas: Case Study for Doha and FIFA World Cup Qatar 2022

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*Supplementary Information for the Article:*

# Estimation of Above-Ground Carbon-Stocks for Urban Greeneries in Arid Areas: Case Study for Doha and FIFA World Cup Qatar 2022

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**Table 1. Model summary and parameter estimates-PP**

Equation	R Square	Model summary				Parameter estimates			
		F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	<b>.631</b>	35.939	1	21	.000006	-20285.226	44988.726		
Logarithmic	<b>.627</b>	35.296	1	21	.000007	22476.450	31424.479		
Quadratic	<b>.640</b>	17.775	2	20	.000037	56026.282	-173102.683	155224.172	
Cubic	<b>.640</b>	17.741	2	20	.000037	29313.109	-61414.856	.000	71719.915
Exponential	<b>.640</b>	37.379	1	21	.000005	693.427	3.943		

**The independent variable is NDVI**

Equation	R Square	Model summary				Parameter estimates			
		F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	<b>.384</b>	13.073	1	21	.002	2133.624	4440.708		
Logarithmic	<b>.357</b>	11.645	1	21	.003	5047.251	8801.593		
Quadratic	<b>.437</b>	7.765	2	20	.003	20561.839	-13535.688	4267.226	
Cubic	<b>.441</b>	7.878	2	20	.003	11498.308	.000	-2324.179	1047.640
Exponential	<b>.340</b>	10.813	1	21	.004	5216.328	.364		

**The independent variable is EVI.**

Equation	R Square	Model summary				Parameter estimates			
		F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	<b>.561</b>	26.809	1	21	.00039	-4486.530	3.852		
Logarithmic	<b>.541</b>	24.784	1	21	.00063	-113580.389	15026.087		
Quadratic	<b>.612</b>	15.788	2	20	.00077	41231.243	-19.297	.003	
Cubic	<b>.611</b>	15.686	2	20	.00080	25884.820	-7.717	.000	2.378E-7
Exponential	<b>.579</b>	28.890	1	21	.00025	2734.438	.000341		

**The independent variable is DVI.**

Equation	R Square	Model summary				Parameter estimates			
		F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	<b>.708</b>	50.885	1	21	.0000005	588.411	2970.250		
Logarithmic	<b>.699</b>	48.683	1	21	.0000007	-2462.122	10880.810		
Quadratic	<b>.708</b>	24.291	2	20	.0000040	2226.405	2073.165	118.490	
Cubic	<b>.708</b>	24.292	2	20	.0000040	1690.911	2514.477	.000	10.370
Exponential	<b>.694</b>	47.651	1	21	.0000007	4389.013	.256		

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The independent variable is RVI.

Equation	Model summary					Parameter estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.491	20.276	1	21	.000195	-4076.308	18552.524		
Logarithmic	.489	20.097	1	21	.000205	14281.300	15363.351		
Quadratic	.491	9.662	2	20	.001000	-1252.454	11723.657	4077.617	
Cubic	.491	9.663	2	20	.001000	-2033.710	14839.182	.000	1752.100
Exponential	.509	21.775	1	21	.000132	2828.663	1.643		

The independent variable is SAVI.

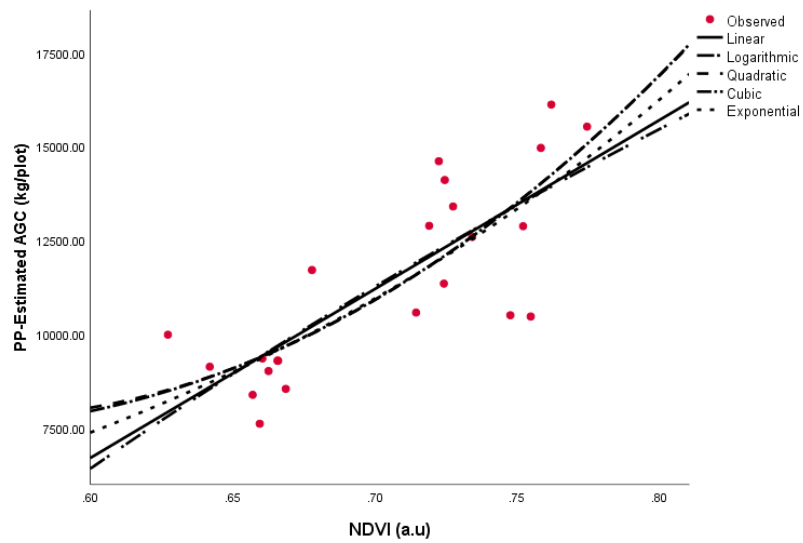


Figure 1. Regression models of NDVI values and their corresponding estimated AGC values of PP

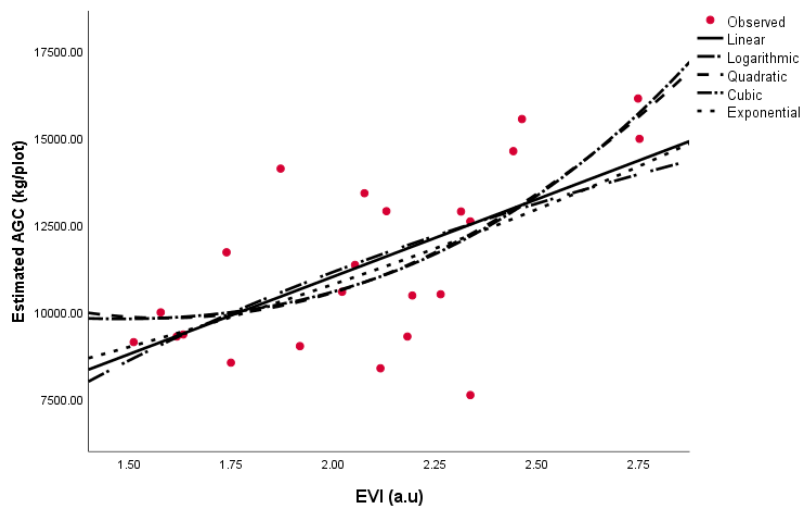


Figure 2. Regression models of EVI values and their corresponding estimated AGC values of PP

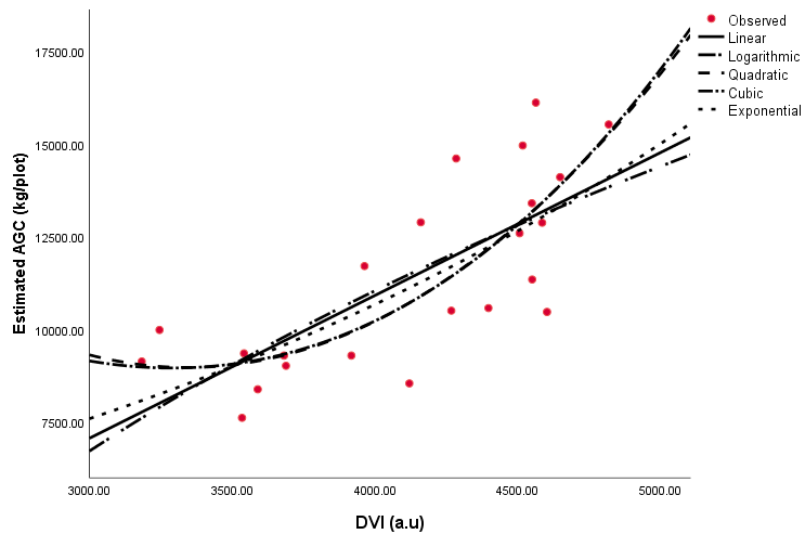


Figure 3. Regression models of DVI values and their corresponding estimated AGC values of PP

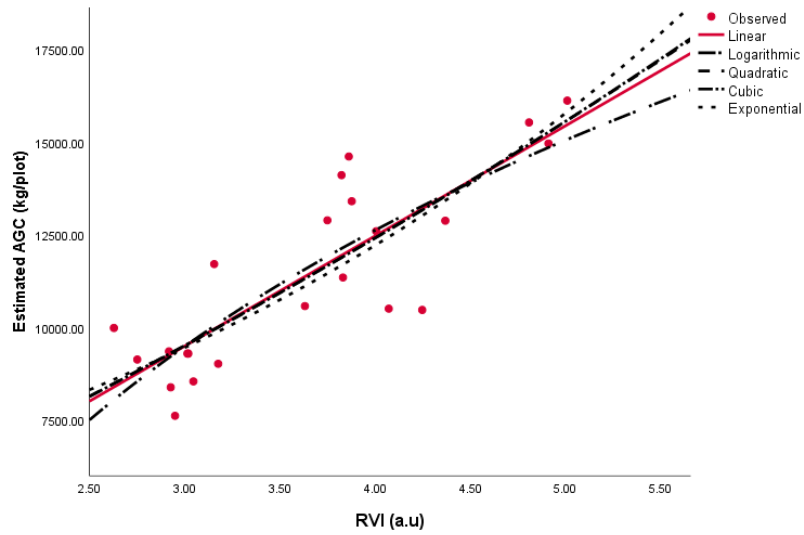


Figure 4. Regression models of RVI values and their corresponding estimated AGC values of PP

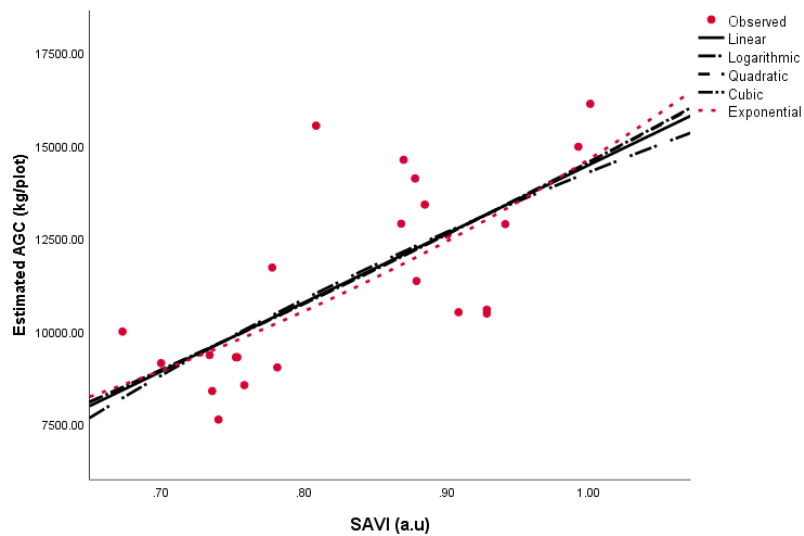


Figure 5. Regression models of SAVI values and their corresponding estimated AGC values of PP

**Table 2. Model summary and parameter estimates-IP**

Equation	Model summary					Parameter estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	<b>.692</b>	29.258	1	13	.000119	-25660.510	49844.482		
Logarithmic	<b>.667</b>	26.071	1	13	.000202	21452.520	33132.443		
Quadratic	<b>.747</b>	17.732	2	12	.000261	61508.906	-210260.677	189407.717	
Cubic	<b>.745</b>	17.494	2	12	.000277	32607.193	-81286.555	.000	91630.088
Exponential	<b>.633</b>	22.439	1	13	.000388	71.363	6.507		

**The independent variable is NDVI.**

Equation	Model summary					Parameter estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	<b>.779</b>	42.334	1	12	.000029	-6034.318	6972.360		
Logarithmic	<b>.714</b>	29.940	1	12	.000143	-431.301	13509.798		
Quadratic	<b>.806</b>	22.914	2	11	.000120	3462.176	-2853.118	2231.967	
Cubic	<b>.821</b>	15.316	3	10	.000455	23399.393	-34505.511	17680.697	-2350.652
Exponential	<b>.665</b>	23.779	1	12	.000381	969.970	.892		

**The independent variable is EVI.**

Equation	Model summary					Parameter estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	<b>.174</b>	2.524	1	12	.138	-4754.621	3.701		
Logarithmic	<b>.189</b>	2.795	1	12	.120	-104811.226	13874.320		
Quadratic	<b>.238</b>	1.718	2	11	.224	-49986.203	29.056	-.003	
Cubic	<b>.250</b>	1.829	2	11	.206	-38296.422	17.877	.000	-3.383E-7
Exponential	<b>.114</b>	1.538	1	12	.239	1428.787	.000		

**The independent variable is DVI.**

Equation	Model summary					Parameter estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	<b>.653</b>	22.586	1	12	.000470	-4860.224	3504.441		
Logarithmic	<b>.629</b>	20.336	1	12	.001000	-7991.322	12991.790		
Quadratic	<b>.653</b>	10.359	2	11	.003000	-4092.608	3076.187	52.657	
Cubic	<b>.717</b>	8.431	3	10	.004000	45975.707	-38964.851	10997.569	-894.335
Exponential	<b>.594</b>	17.551	1	12	.001000	1062.638	.463		

**The independent variable is RVI.**

Equation	Model summary					Parameter estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	<b>.603</b>	18.239	1	12	.001	-11994.812	24949.259		
Logarithmic	<b>.557</b>	15.118	1	12	.002	12795.840	18832.530		
Quadratic	<b>.676</b>	11.479	2	11	.002	25450.825	-72497.798	59843.456	
Cubic	<b>.673</b>	11.331	2	11	.002	13402.364	-25188.510	.000	24494.931
Exponential	<b>.524</b>	13.215	1	12	.003	441.280	3.221		

**The independent variable is SAVI.**

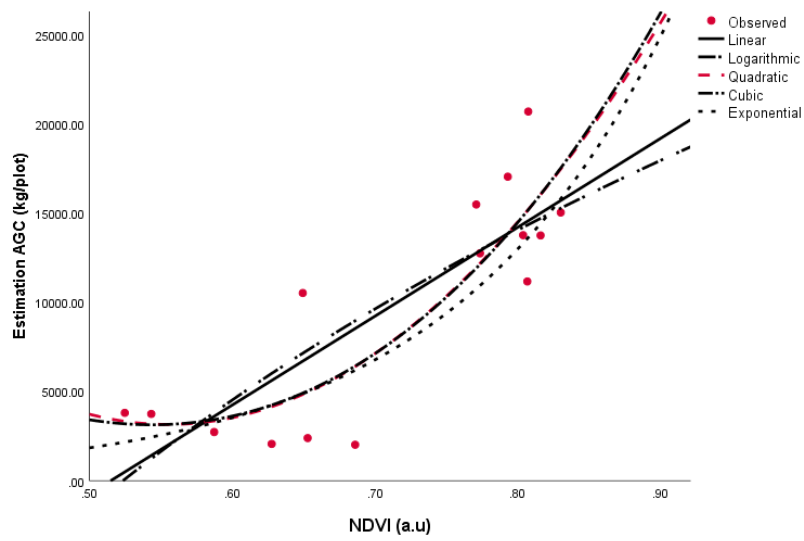


Figure 6. Regression models of NDVI values and their corresponding estimated AGC values of IP

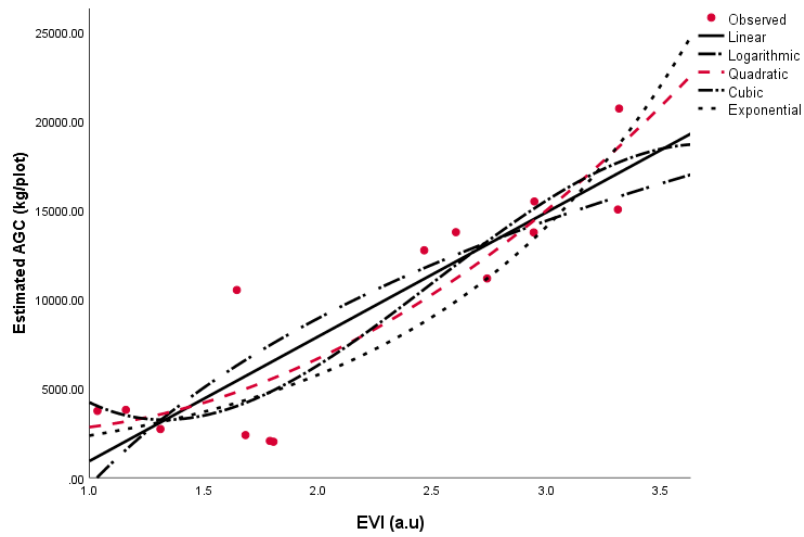


Figure 7. Regression models of EVI values and their corresponding estimated AGC values of IP

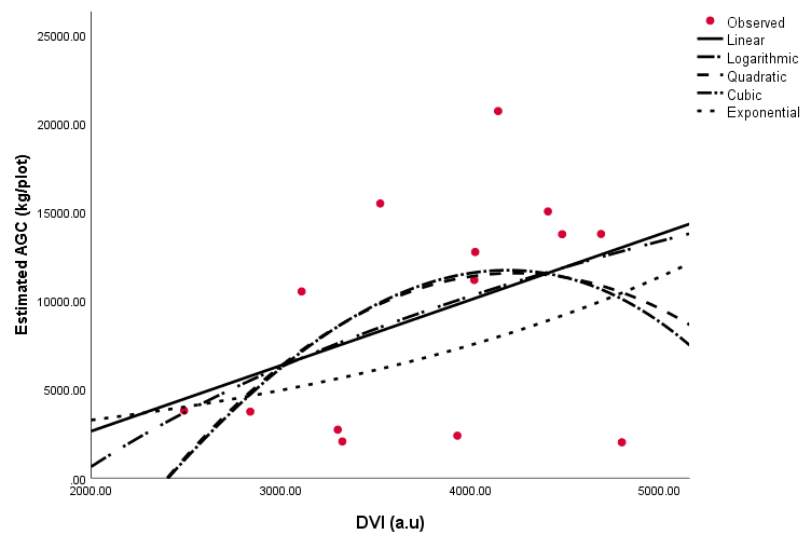


Figure 8. Regression models of DVI values and their corresponding estimated AGC values of IP

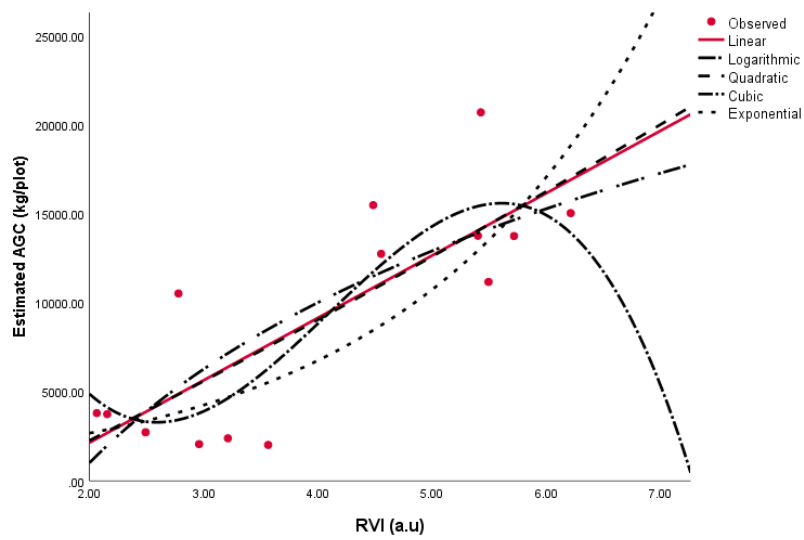


Figure 9. Regression models of RVI values and their corresponding estimated AGC values of IP

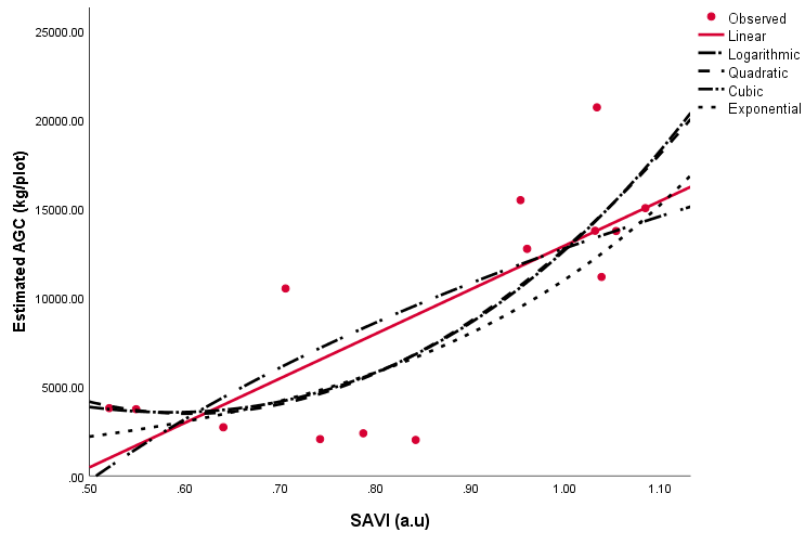


Figure 10. Regression models of SAVI values and their corresponding estimated AGC values of IP

**Table 3. Model summary and parameter estimates-AP**

Equation	Model summary					Parameter estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.780	35.393	1	10	.000141	-14599.534	53368.561		
Logarithmic	.762	32.049	1	10	.000209	28729.975	24006.056		
Quadratic	.850	25.416	2	9	.000199	86373.311	-393208.204	487545.233	
Cubic	.854	26.393	2	9	.000172	29015.018	.000	-404958.446	670295.602
Exponential	.867	65.233	1	10	.000011	853.747	5.230		

**The independent variable is NDVI.**

Equation	Model summary					Parameter estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.444	7.975	1	10	.018	2974.781	5033.699		
Logarithmic	.376	6.030	1	10	.034	8413.919	4924.063		
Quadratic	.523	4.925	2	9	.036	11006.438	-10606.301	6747.297	
Cubic	.523	2.923	3	8	.100	9309.509	-5250.499	1567.717	1553.232
Exponential	.522	10.935	1	10	.008	4698.132	.508		

**The independent variable is EVI.**

Equation	Model summary					Parameter estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.761	31.865	1	10	.000214	-1130.234	6.337		
Logarithmic	.728	26.743	1	10	.000418	-69069.026	10625.374		
Quadratic	.797	17.613	2	9	.001000	13615.302	-11.391	.005	
Cubic	.798	17.827	2	9	.001000	7807.209	.000	-.002	1.458E-6
Exponential	.822	46.146	1	10	.000048	3242.358	.001		

**The independent variable is DVI.**

Equation	Model summary					Parameter estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.792	38.134	1	10	.000105	-8417.629	10093.185		
Logarithmic	.768	33.048	1	10	.000185	-552.605	17861.118		
Quadratic	.861	27.864	2	9	.000139	45751.002	-50846.683	16740.680	
Cubic	.867	29.384	2	9	.000113	17073.577	.000	-12932.036	5689.375
Exponential	.868	65.489	1	10	.000011	1585.349	.982		

**The independent variable is RVI.**

Equation	Model summary					Parameter estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.760	31.691	1	10	.000219	-1056.228	25798.196		
Logarithmic	.709	24.356	1	10	.001000	18800.411	10069.694		
Quadratic	.848	25.140	2	9	.000207	18939.950	-75914.990	121354.812	
Cubic	.856	26.807	2	9	.000162	9629.804	.000	-78009.428	167859.079
Exponential	.842	53.453	1	10	.000026	3224.591	2.524		

**The independent variable is SAVI.**



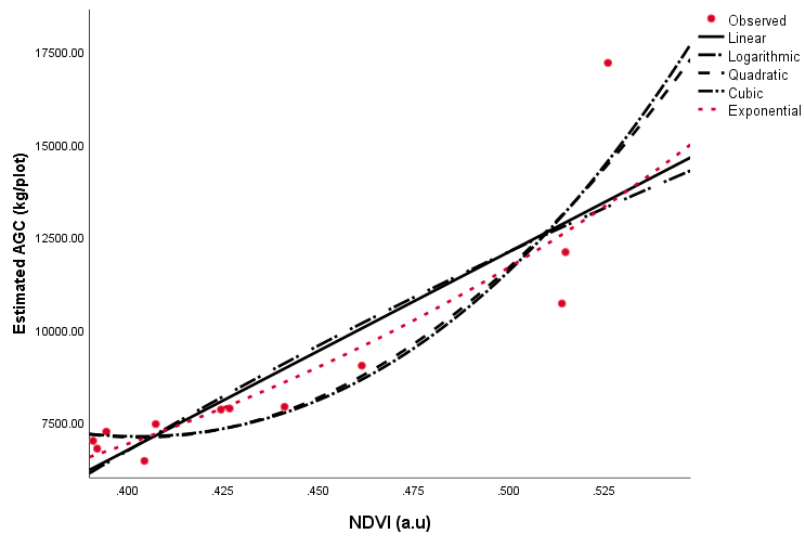


Figure 11. Regression models of SAVI values and their corresponding estimated AGC values of AP

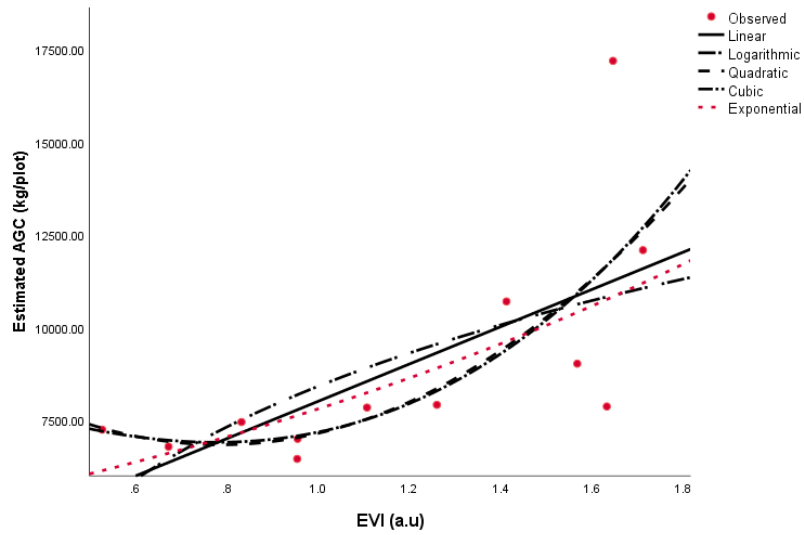


Figure 12. Regression models of EVI values and their corresponding estimated AGC values of AP

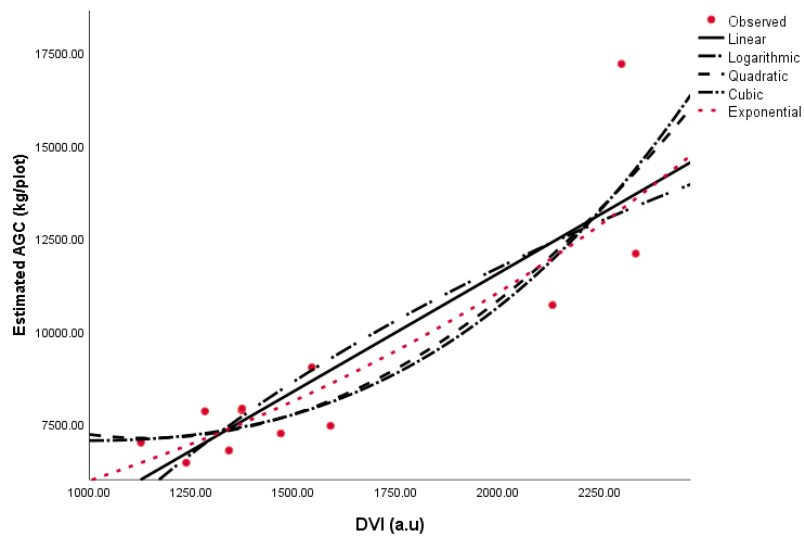


Figure 13. Regression models of DVI values and their corresponding estimated AGC values of AP

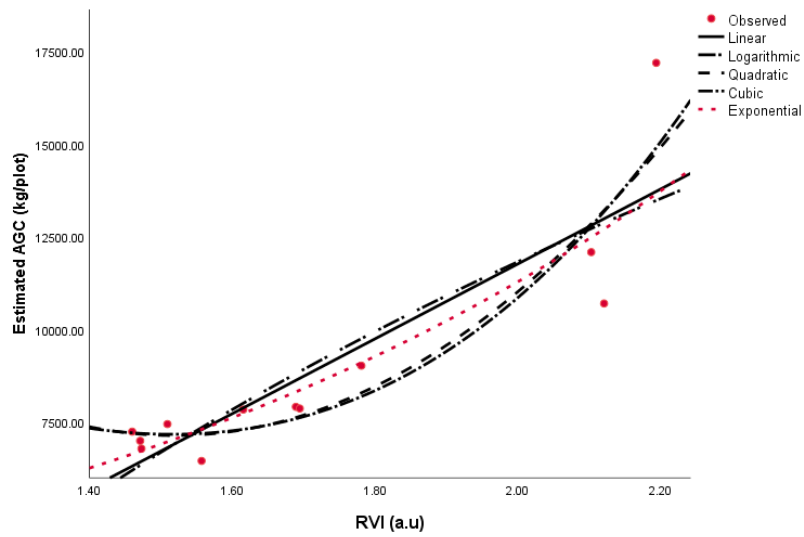


Figure 14. Regression models of RVI values and their corresponding estimated AGC values of AP

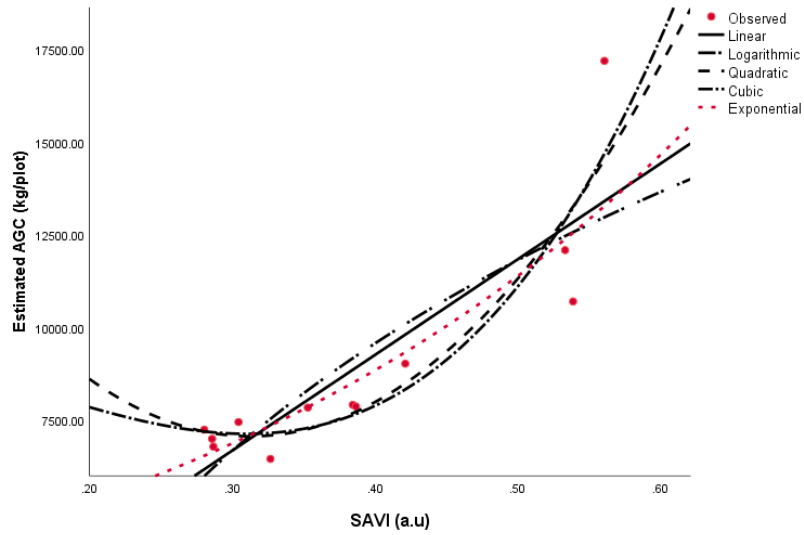


Figure 15. Regression models of SAVI values and their corresponding estimated AGC values of AP