

Supp Table 1: Classification accuracy assessments of 1992, 2002,2012 and 2022 images using error matrix

LULC	1992		2002		2012		2022	
	UA (%)	PA (%)	UA (%)	PA (%)	UA (%)	PA (%)	UA (%)	PA (%)
Bareland	72.73	66.7	79.2	70.4	80.64	80.6	91.42	74.04
Farmland and settlement	84.72	91.04	83.3	90.58	89.3	92	95.27	98.4
Forestland	75.75	80.6	88	77.8	85	63.83	92.6	86.2
Grassland	79.5	70.45	86.5	84.2	89.74	83.33	93.1	87.1
Shrubland	87.02	87.02	89.65	90.74	82.54	86.4	91.6	96.4
Waterbodies	88.9	80	77.8	70	82.5	100	88	95.8
Over all accuracy	83.0		83.6		88.5		85.2	
Kappa coefficient	82.2		81.4		86.1		84.58	

Where : UA is user's accuracy, PA is producer's accuracy

Supp Table 2: Spatio-temporal distribution of LULC classes b/n 1992-2022

Year	1992		2002		2012		2022		1992-2022		
LULC	Area(ha)	%	Area(ha)	%	Area(ha)	%	Area(ha)	%	Area(ha)	%	Per year
Water bodies	20.35	0.06	20.28	0.06	40.08	0.12	706.23	2.13	685.88	3371.23	108.75
Bareland	875.37	2.63	1182.88	3.56	997.87	3	1402.38	4.22	527	60.2035	1.94
Grassland	3216.37	9.68	2869.79	8.64	3795.03	11.42	1333.99	4.02	-1882.38	-58.525	-1.88
Farmland & settlement	5431.63	16.35	10072.37	31.32	12109.31	36.45	15503.47	46.67	10071.84	185.43	5.98
Shrub land	13627.58	41.02	10520.32	31.67	9048.57	27.24	9064.72	27.29	-4562.86	-33.48	-1.08
Forest	10051	31.25	8556.66	25.76	7231.44	21.77	5211.52	15.69	-4839.48	-48.15	-1.5532
Total	33222.3	100	33222.3	100	33222.3	100	33222.3	100	0		

Supp Table 3: Extent, and Rates of LULC Changes between 1 992-2022

Year	1992	2002	1992-	2012	2002-2012	2022	2012-	1992-2022
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LULC	2002					2022		
	ha	ha	RΔ	ha	RΔ	ha	RΔ	RΔ
Water bodies	20.35	20.28	-0.007	40.08	1.98	706.23	66.62	22.13
Bare land	875.37	1182.88	30.75	997.87	-18.5	1402.38	40.45	17.00
Grassland	3216.37	2869.79	-34.66	3795.03	92.52	1333.99	-246.105	-60.72
Farm land	5431.63	10072.37	464.07	12109.31	203.7	15503.47	339.42	324.89
Shrub land	13627.58	10520.32	-310.73	9048.57	-147.2	9064.72	1.612	-147.2
Forest	10051	8556.66	-149.43	7231.44	-132.53	5211.52	-202	-156.1
Total	33222.3	33222.3	0	33222.3	-0.00047	33222.3	0.00095	0.000152

Where ha area in hectare, RΔ is rate of change (%)

Supp Table 4: Classification of accuracy assessments of 2032, 2042 and 2052 predicted images using error matrix

LULC	2032		2042		2052	
	UA (%)	PA (%)	UA (%)	PA (%)	UA (%)	PA (%)
Bareland	85.72	66.67	80	72.72	63.63	63.63
Farmland and settlement	94.3	96.35	98.06	98.06	97.16	98.27
Forestland	81.25	83.33	82.14	75.86	75	66.67
Grassland	72.92	83.33	94.12	76.2	78.57	73.33
Shrubland	90	81.8	81.25	86.21	88.46	88.46
Waterbodies	90	90	84.2	100	92	95.83
Over all accuracy	89.3		86.1		83.58	
Kappa coefficient	87.12		85.04		82.32	

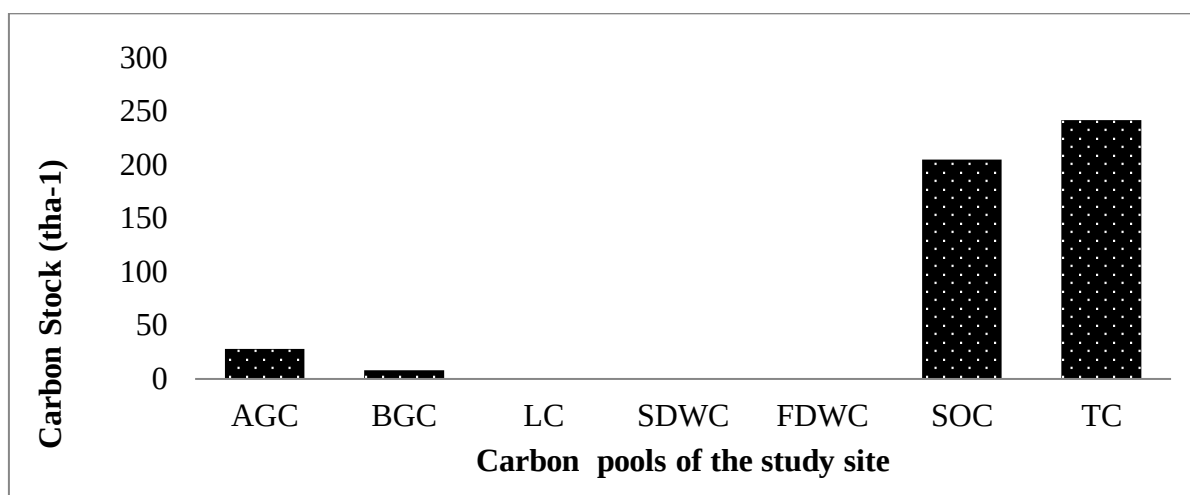
Where :UA is the user's accuracy, PA is the producer's accuracy

Supp Table 5: Predicted LULC area change (ha) from 2022 to 2052 of Gena district

LULC	2022		2032		2042		2052		2022-2052	
	Area	%	Area	%	Area	%	Area	%	ΔR	%
WB	706.23	2.13	712.40	2.14	721.09	2.17	1235.86	3.72	529.63	74.99
BL	1402.38	4.22	1537.24	4.63	1900.63	5.72	1886.31	5.68	483.93	34.51
GL	1333.99	4.02	1961.22	5.90	3158.53	9.21	1934.24	5.82	600.26	45.00
FS	15503.47	46.67	15985.23	48.12	16564.23	49.86	17897.23	53.87	2393.76	15.44
SL	9064.72	27.29	9036.10	27.20	8449.97	25.43	8759.13	26.37	-315.59	-3.37
FL	5211.52	15.69	3990.12	12.01	2527.86	7.61	1509.53	4.54	-3701.99	-71.03

Total	33222.31	100.00	33222.31	100.00	33222.31	100.00	33222.31	100.00	0.00	95.53
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Where BL is bareland, FS is farmland & settlement, GL is grassland is shrubland, FL is forestland



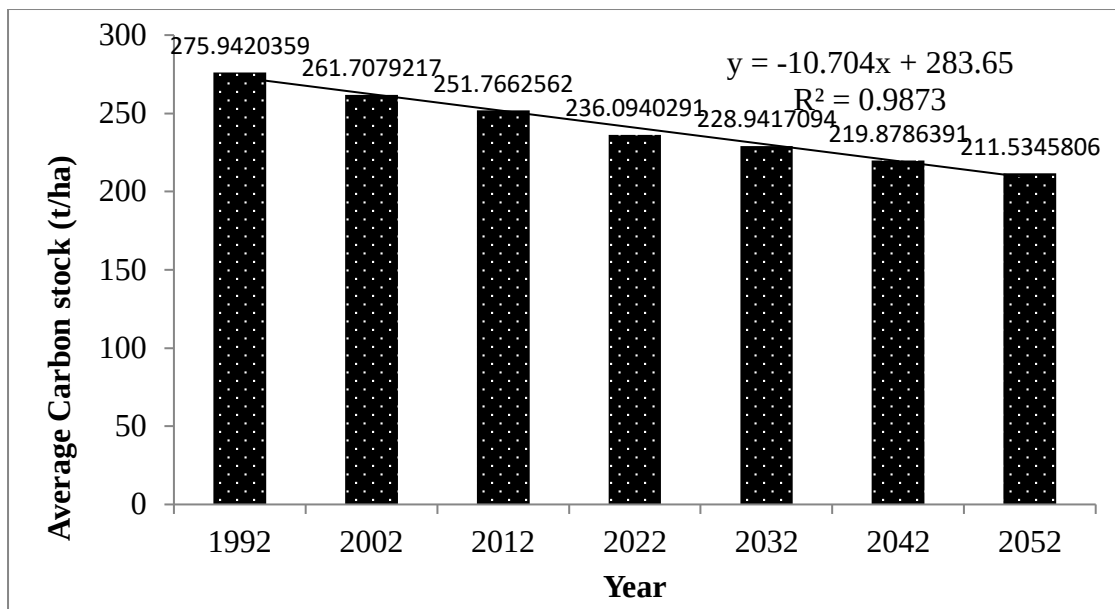
Supp Figure 1: Carbon Pools of the Study Site

Where;AGC:Aove Ground Caron,BGC:elow Ground Carbon,LC;Litter Carbon ,SDWC:Standing Dead Wood carbon ,FDWC: Fallen Dead Wood Carbon,SOC:Soil Organic Carbon,TC:Total Carbon

Supp Table 6: Carbon stock in different carbon pools in the Gena district

LULC	AGC	BGC	LC	DWC	SOC	Total C(tha ⁻¹)	P_value
FL	103.45±27.18	28.74±6.76	0.12±0.0025	4.5±2.73	237.53±7.15	374.35±36.47	>0.05
SL	34.85±4.40	10.82±1.26	0.114±0.0028	0.92±0.25	215.05±5.72	261.77±8.84	>0.05
GL	0.36±0.36	0.108±0.108			203.64±3.0	204.11±3.17	>0.05
FS	1.75±1.75	0.47±0.47	0.005±0.005		189.88±2.3	192.1±2.76	>0.05
BL					178.86±2.15	178.86±2.15	>0.05

Abbreviations are the same as explained in Figure 1



Supp Figure 2: Observed and Predicted Impact of LULC Change on Carbon Stocks