

Effects of Land Use/Land Cover Change (LULCC) on Net Primary Production as a Proxy of Ecosystem Services: a Case Study of Bongo District (Ghana) (2002-2010)

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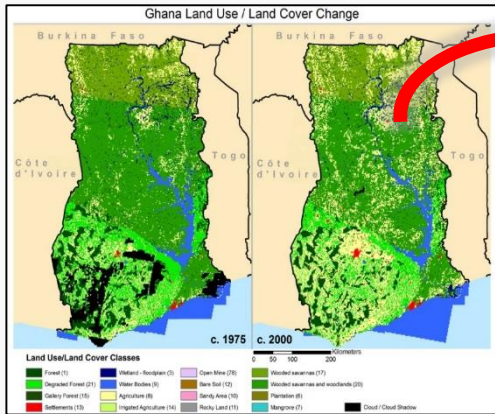


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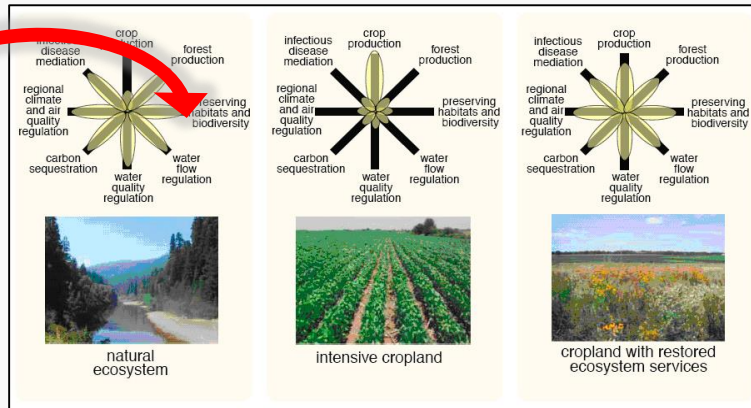
Outline

- Introduction
- Study Area
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- Analyses
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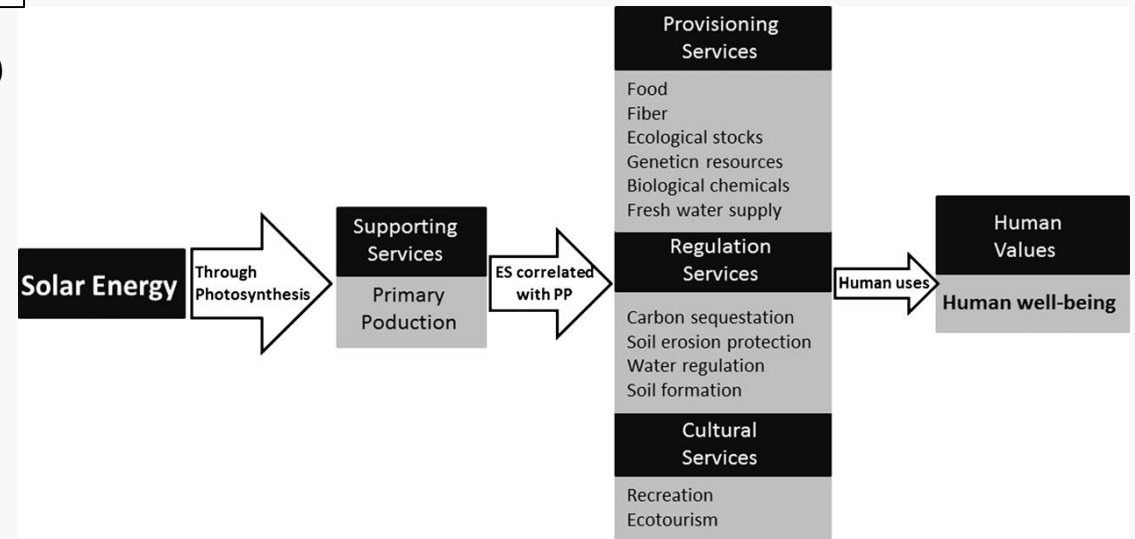
Introduction



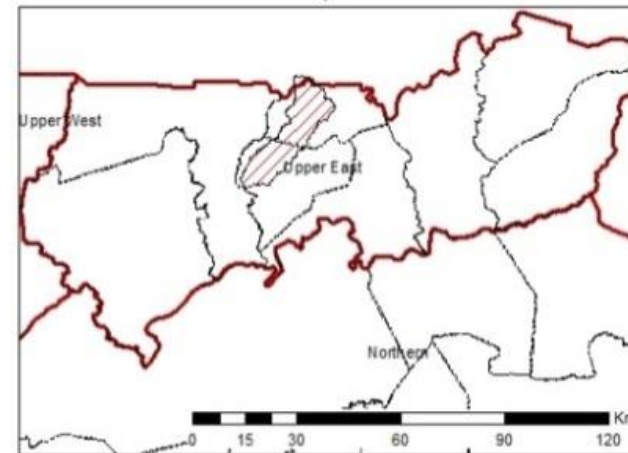
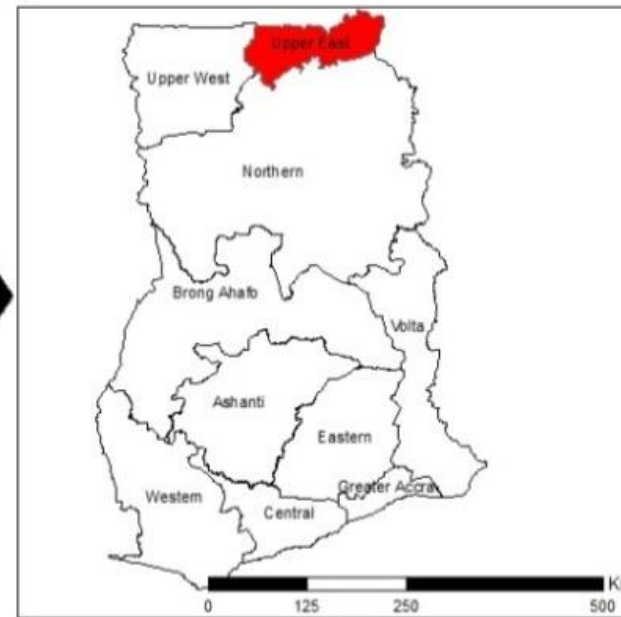
(USGS-LCA, 2013)



(Foley et. al., 2005)

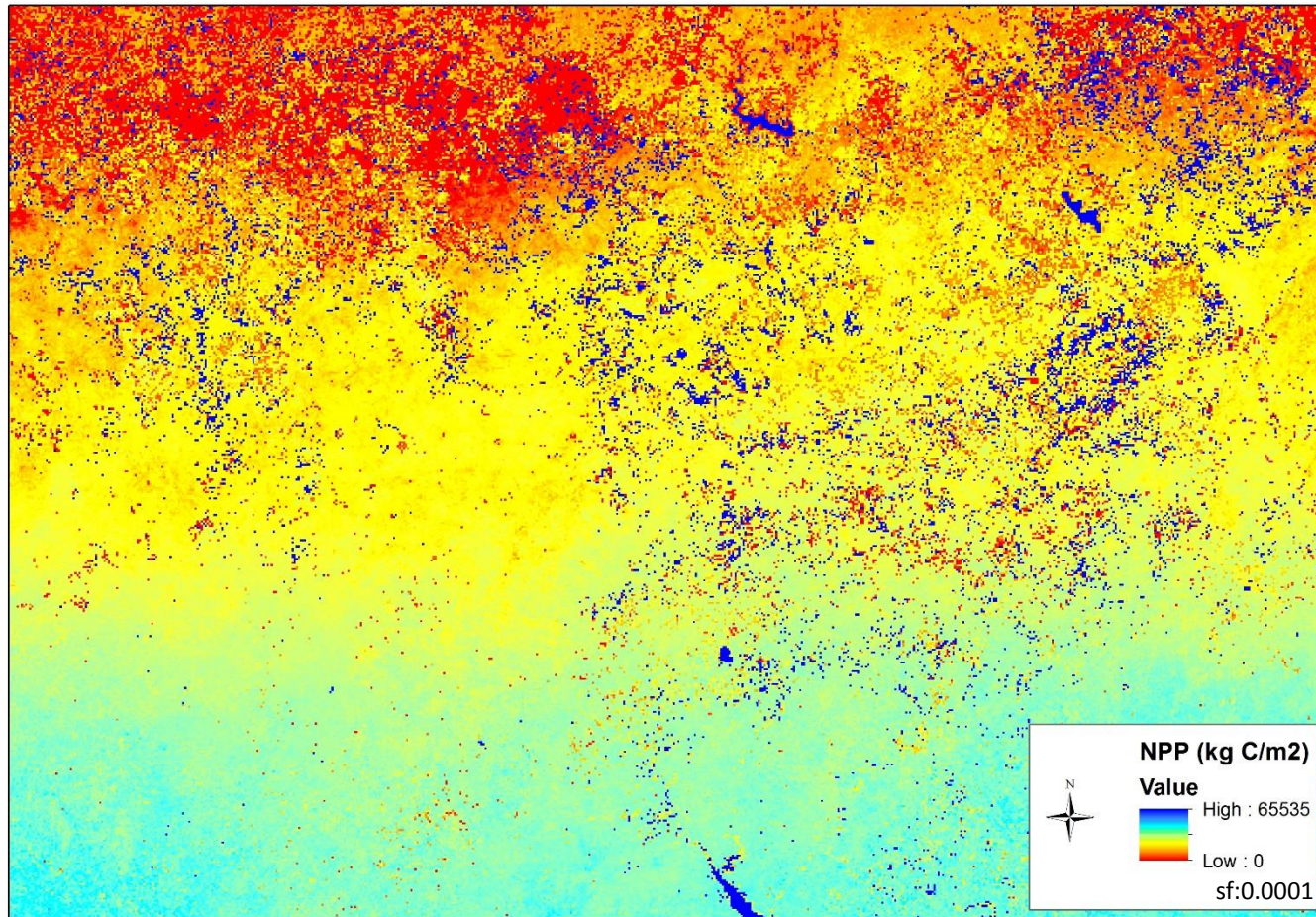


Study Area

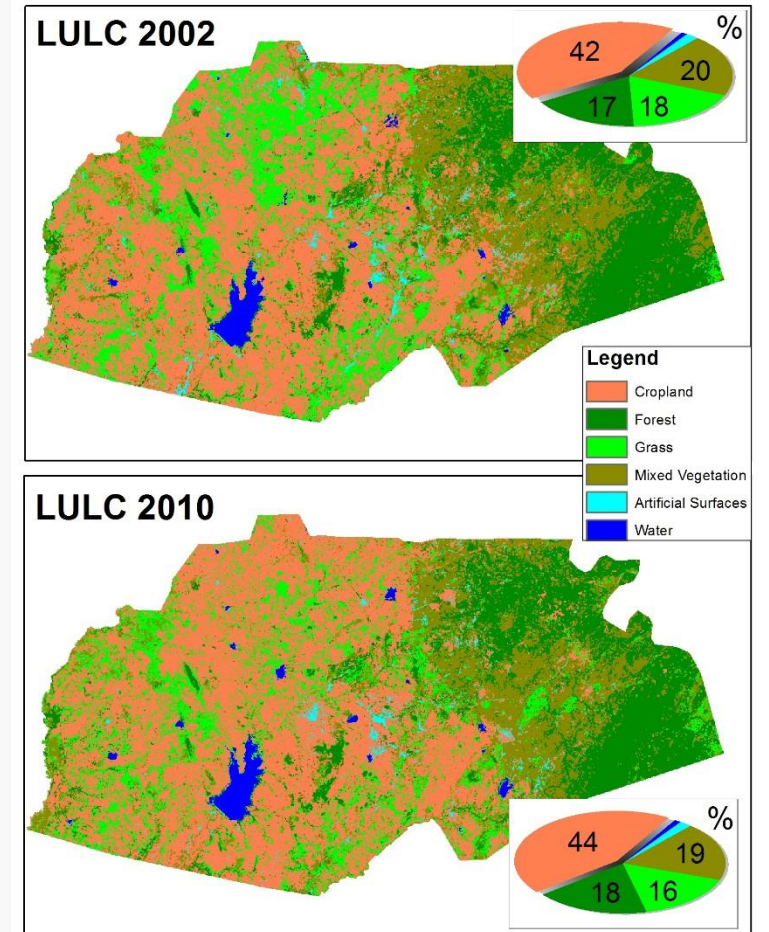


Data

MOD17A3 Net Primary Production (NPP) (1km)

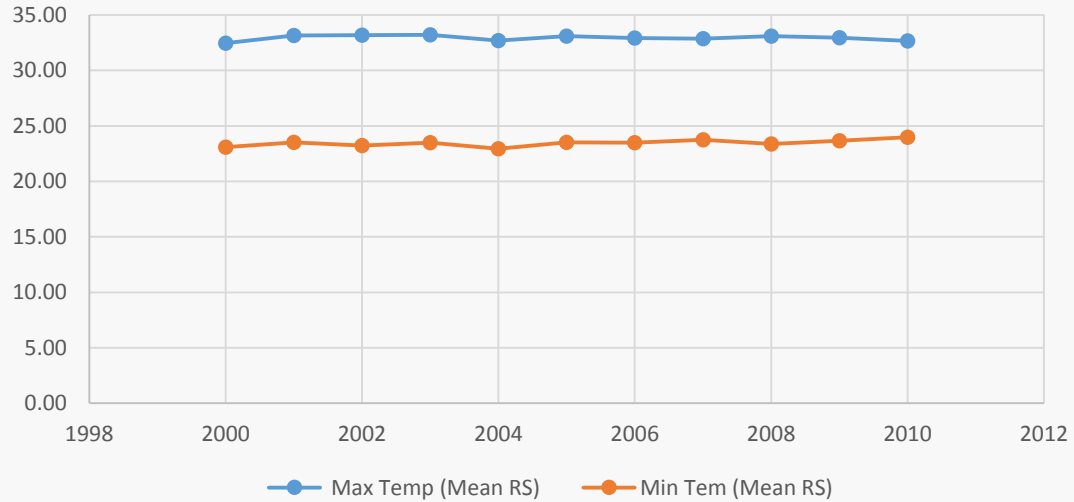


LULC From MODIS and LANDSAT (30m)

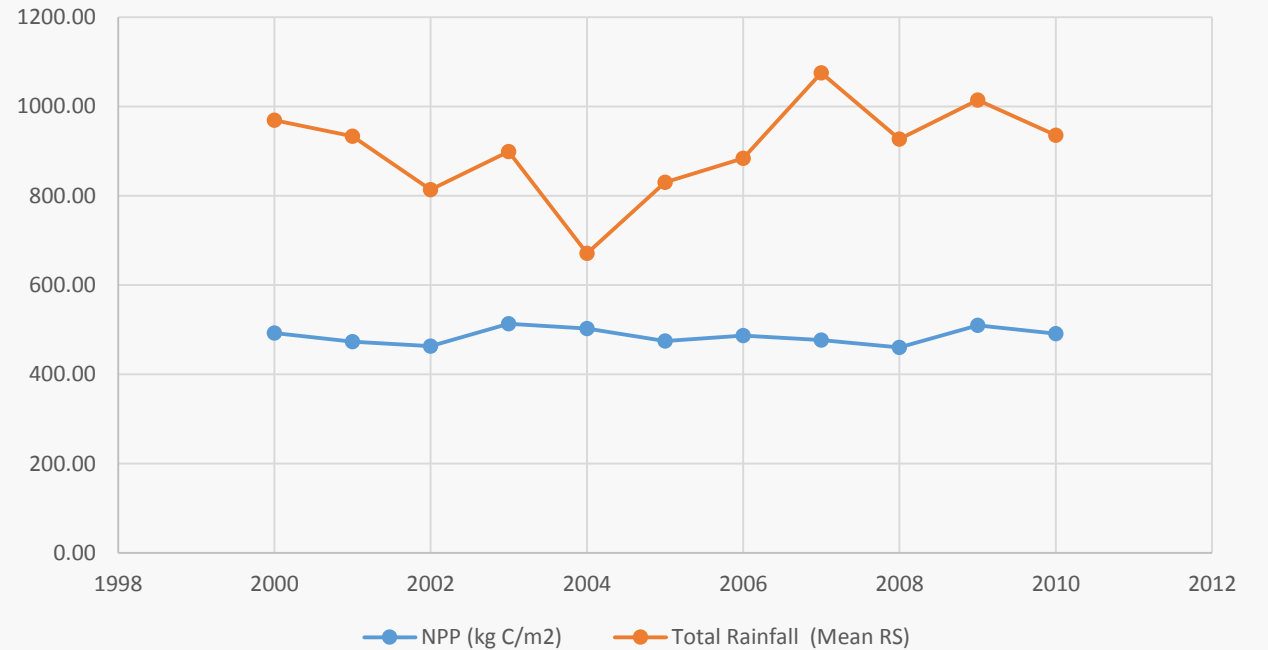


Analyses

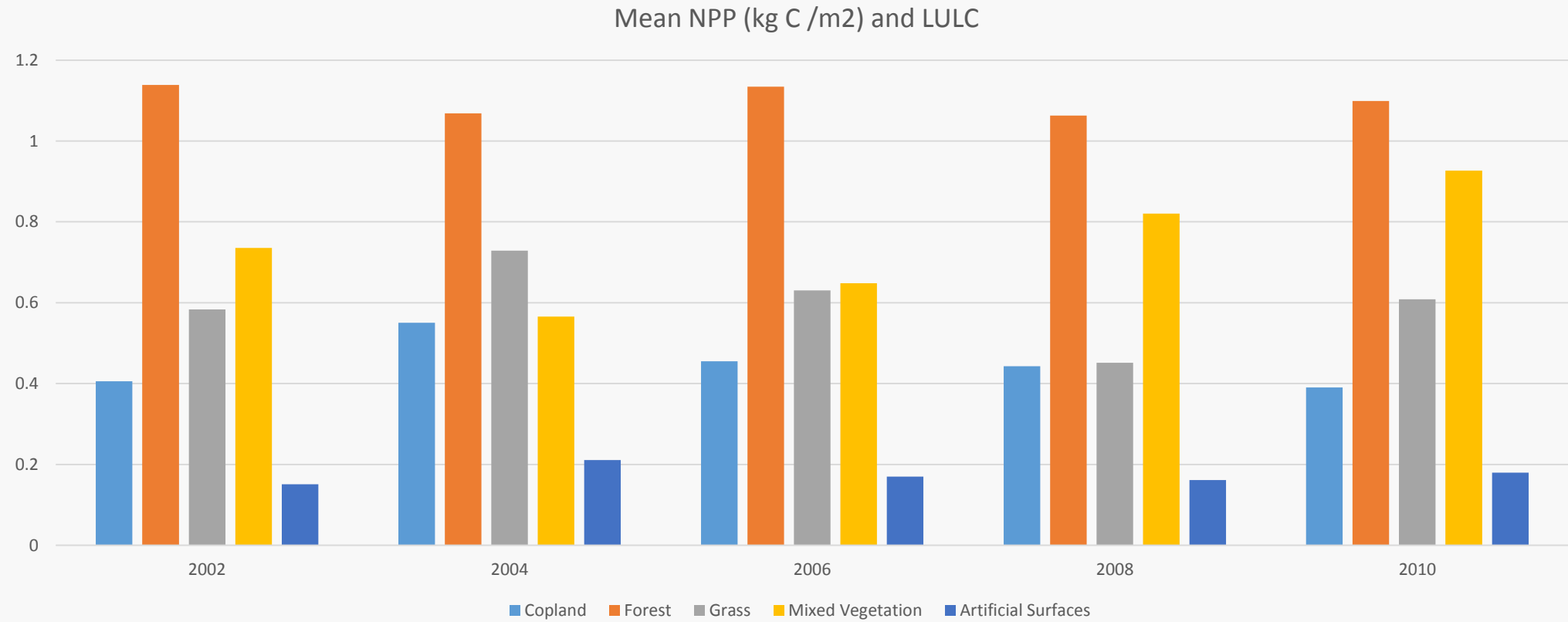
Variability in Minimum and Maximum Temperature in Rainy Season



NPP vs Rainfall



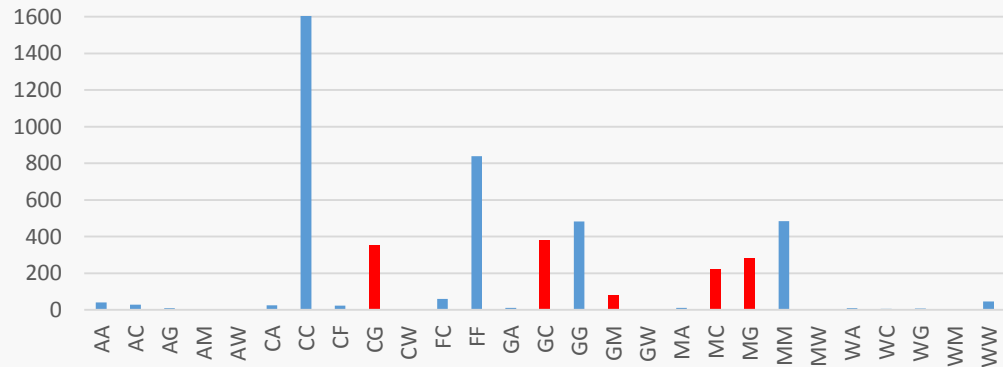
Analyses



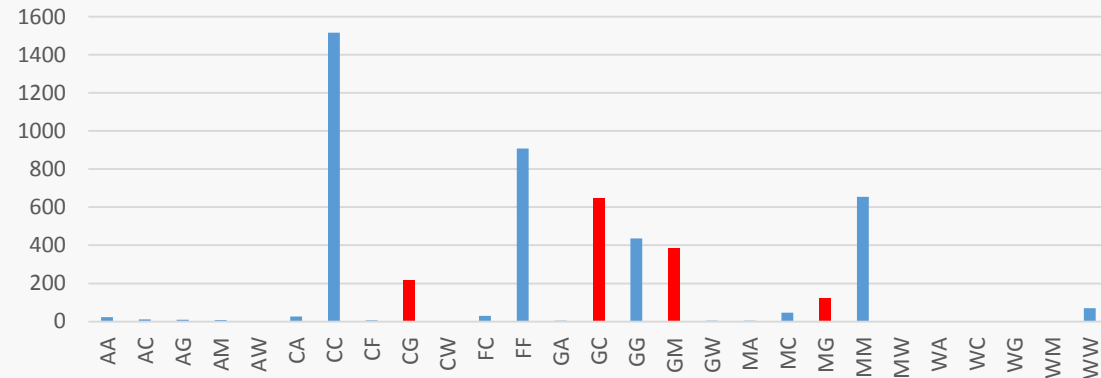
Main LULCC Trajectories

A	Artificial Surfaces
C	Cropland
F	Forest
G	Grass
M	Mixed Vegetation
W	Water

LULCC(2002_2004)

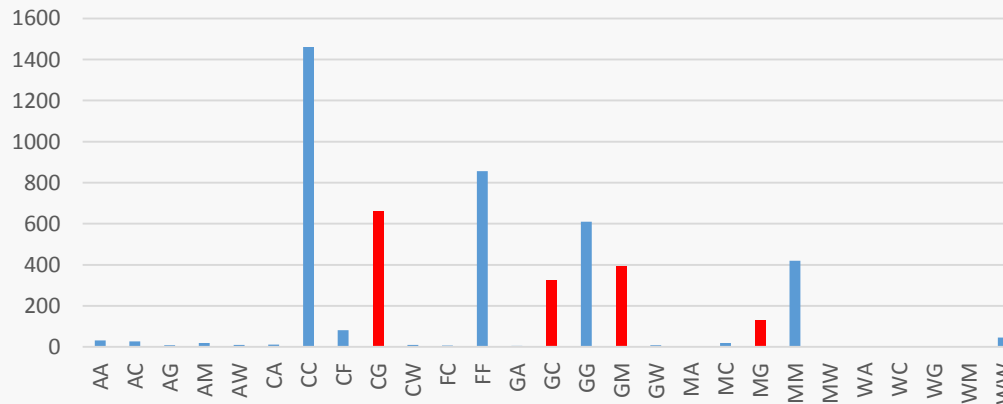


LULCC(2006_2008)

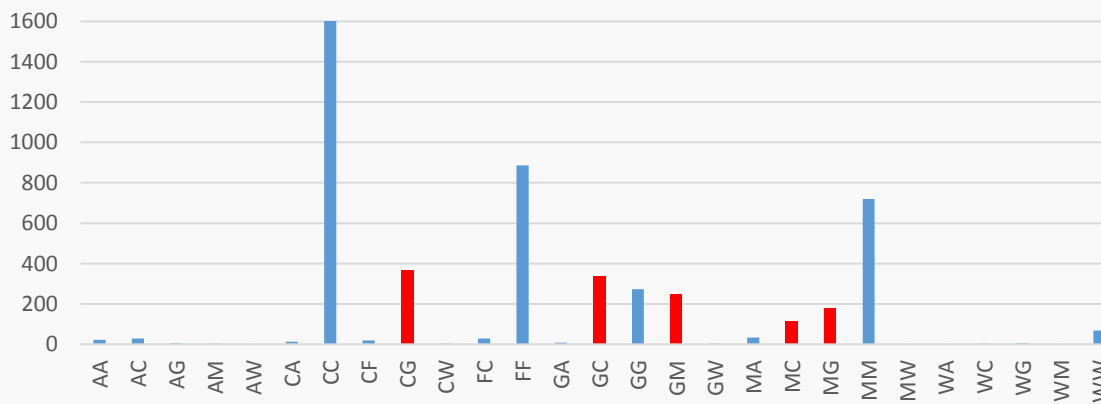


Cropland to Grassland
 Grassland to Cropland
 Grassland to Mixed Vegetation
 Mixed Vegetation to Grassland

LULCC(2004_2006)



LULCC(2008_2010)



A	Artificial Surfaces
C	Cropland
F	Forest
G	Grass
M	Mixed Vegetation
W	Water

LULCC vs NPP

2002_2004

Analysis of Variance					
Source	SS	df	MS	F	Prob > F
Between groups	4534265.18	3	1511421.73	41.26	0.0000
Within groups	13443106.9	367	36629.7191		
Total	17977372.1	370	48587.4922		

Bartlett's test for equal variances: chi2(3) = 48.9991 Prob>chi2 = 0.000

2002_2004

Analysis of Variance					
Source	SS	df	MS	F	Prob > F
Between groups	211290.356	3	70430.1188	3.75	0.0111
Within groups	7359644.88	392	18774.6043		
Total	7570935.24	395	19166.9247		

Bartlett's test for equal variances: chi2(3) = 1.0585 Prob>chi2 = 0.787

Comparison of Change in NPP by LULCC (Bonferroni)				
Row Mean- Col Mean	CG	GC	GM	
GC	-56.7654			GM-CG
	0.269			GM-GC
GM	233.949	290.714		MG-GC
	0.000	0.000		MG-GM
MG	85.9288	142.694	-148.02	
	0.014	0.000	0.000	

Comparison of Change in NPP by LULCC (Bonferroni)				
Row Mean- Col Mean	CG	GC	GM	
GC	-27.2171			
	0.978			
GM	8.81677	36.0339		
	1.000	0.394		
MG	37.6653	64.8824	28.8485	
	0.319	0.006	0.836	

MG-GC

A	Artificial Surfaces
C	Cropland
F	Forest
G	Grass
M	Mixed Vegetation
W	Water

2006_2008

2008_2010

Analysis of Variance					
Source	SS	df	MS	F	Prob > F
Between groups	337590.735	3	112530.245	5.81	0.0007
Within groups	6583695.82	340	19363.8112		
Total	6921286.56	343	20178.678		

Bartlett's test for equal variances: chi2(3) = 5.3491 Prob>chi2 = 0.148

Analysis of Variance					
Source	SS	df	MS	F	Prob > F
Between groups	2608717.93	3	869572.642	8.69	0.0000
Within groups	39634969.9	396	100088.308		
Total	42243687.8	399	105873.904		

Bartlett's test for equal variances: chi2(3) = 36.1594 Prob>chi2 = 0.000

Comparison of Change in NPP by LULCC (Bonferroni)				
Row Mean- Col Mean	CG	GC	GM	
GC	-26.6049 1.000			GM-CG GM-GC
GM	-85.2917 0.001	-58.6868 0.044		
MG	-54.1772 0.059	-27.5724 1.000	31.1145 0.977	

Comparison of Change in NPP by LULCC (Bonferroni)				
Row Mean- Col Mean	CG	GC	GM	
GC	11.34 1.000			MG-CG MG-GC
GM	99.96 0.156	88.62 0.290		
MG	200.79 0.000	189.45 0.000	100.83 0.149	

Findings

- NPP ~ Precipitation: There is a significant relation between NPP and precipitation
- NPP ~ Temperature: Temperature variability in rainy season is not significant
- NPP ~ LULCC: According to ANOVA results for each sample year significant differences occur between :

MG(Mixed Vegetation to Grassland) and GC(Grassland to Cropland)

Data Provided by

- **Land Use /Cover data:** Gerald Forkour (WASCAL WP 2.1)
- **Temperature and Rainfall:** Ghana Meteorological Agency
- **MODIS- NPP:** Africa Soil Information Service

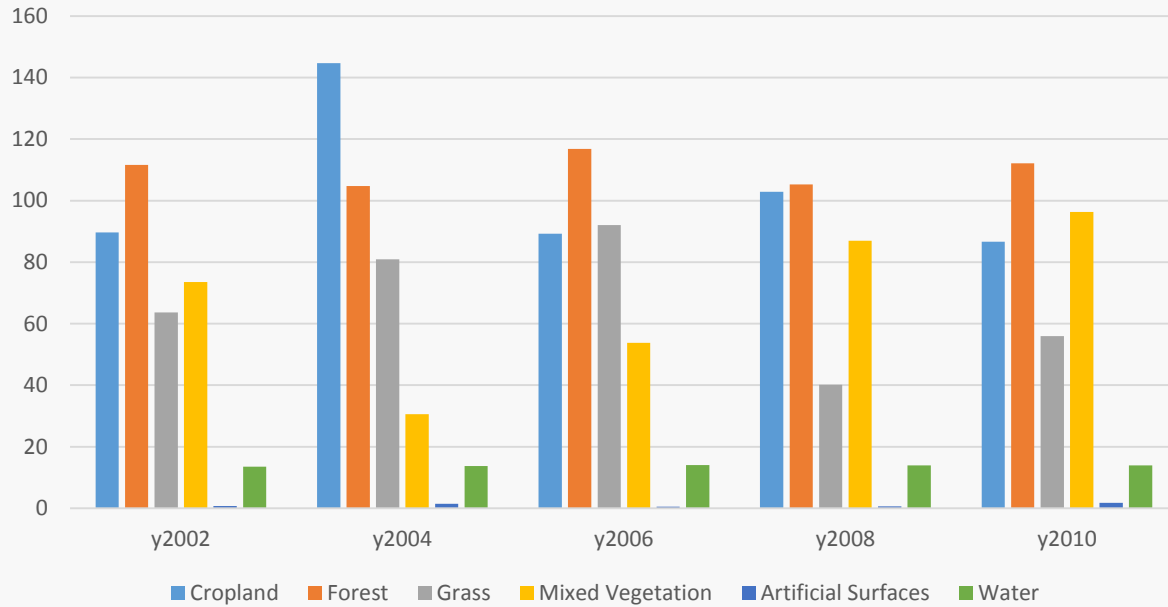
A word cloud featuring the phrase "Thank You" in multiple languages. The words are arranged in a roughly rectangular shape, with "THANK YOU" being the largest and most prominent. Other languages include Spanish (GRACIAS, ARIGATO), Arabic (SHUKURIA, SHUKRIA), Persian (BIYAN), Chinese (TASHAKKUR ATU), and many others. The words are in various orientations, some horizontal and some vertical.

GRACIAS
ARIGATO
SHUKURIA
SHUKRIA
BIYAN
SHUKRIA
TASHAKKUR ATU
THANK
YOU
BOLZIN
MERCY

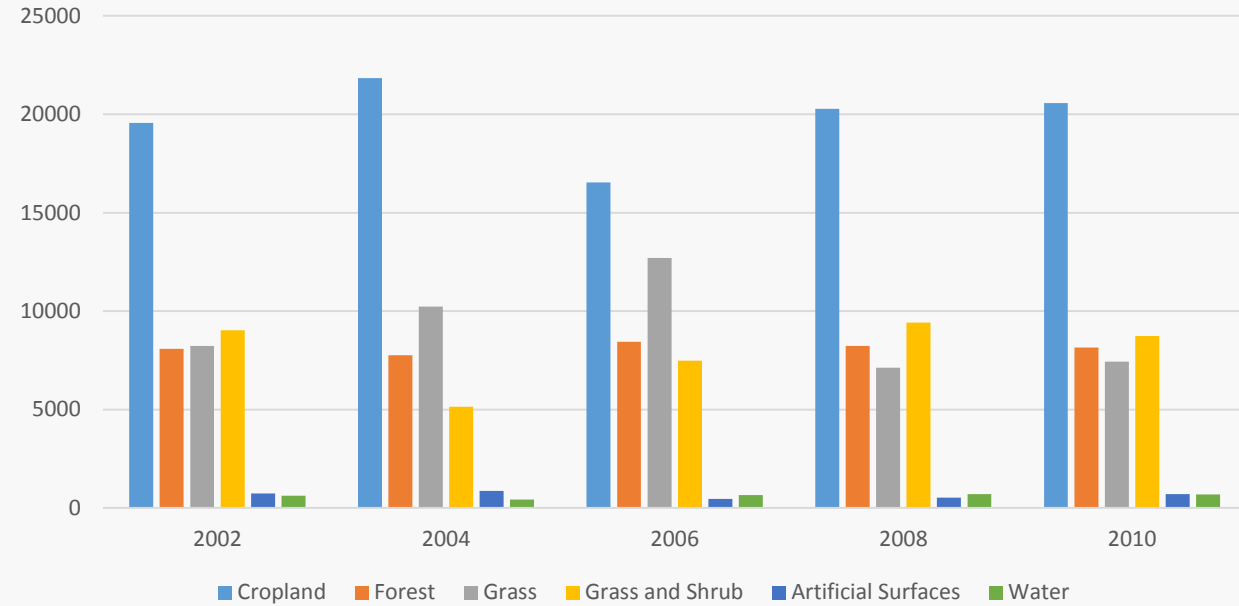
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Analyses

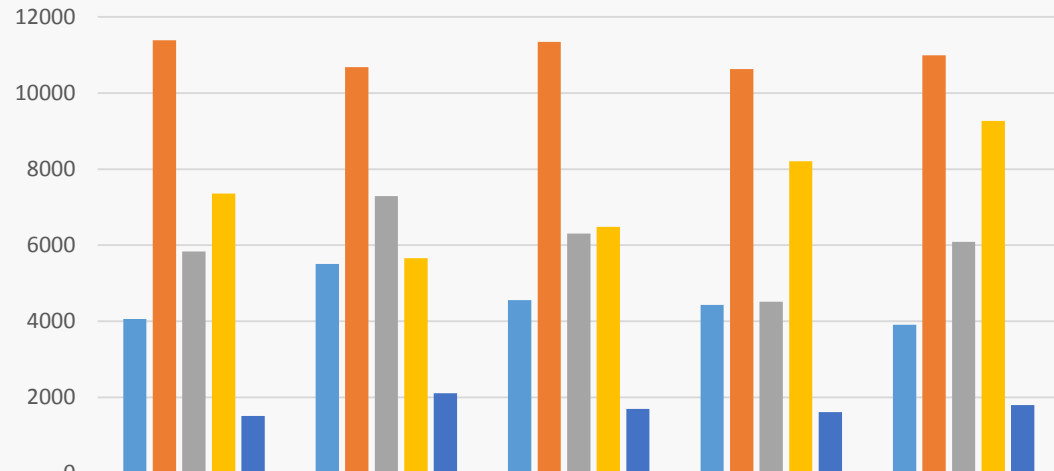
NPP vs LULC



LULC Area (ha)



Total NPP per LULC Type / Area



Results

