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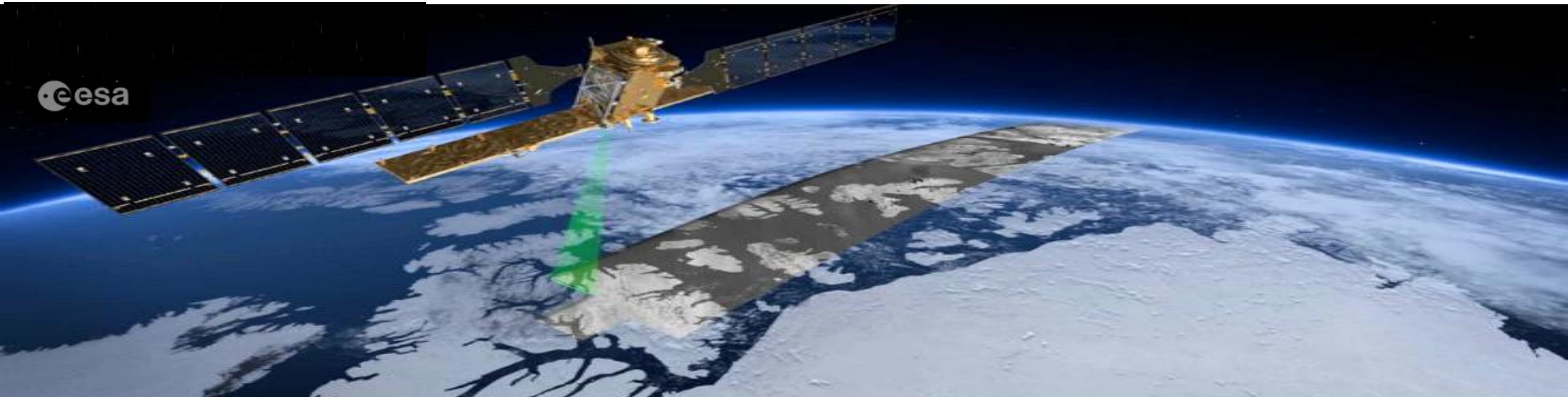
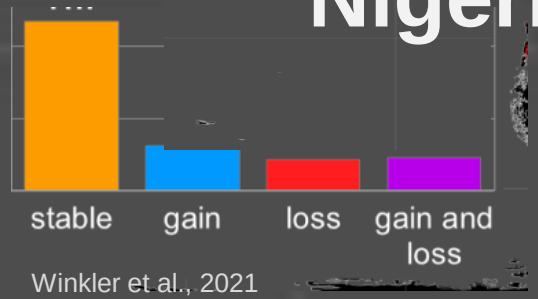
Institute of Geography

Human-appropriated Natural Land Cover in Nigeria are related to Urbanization and Cropland Expansion from 1986 to 2022

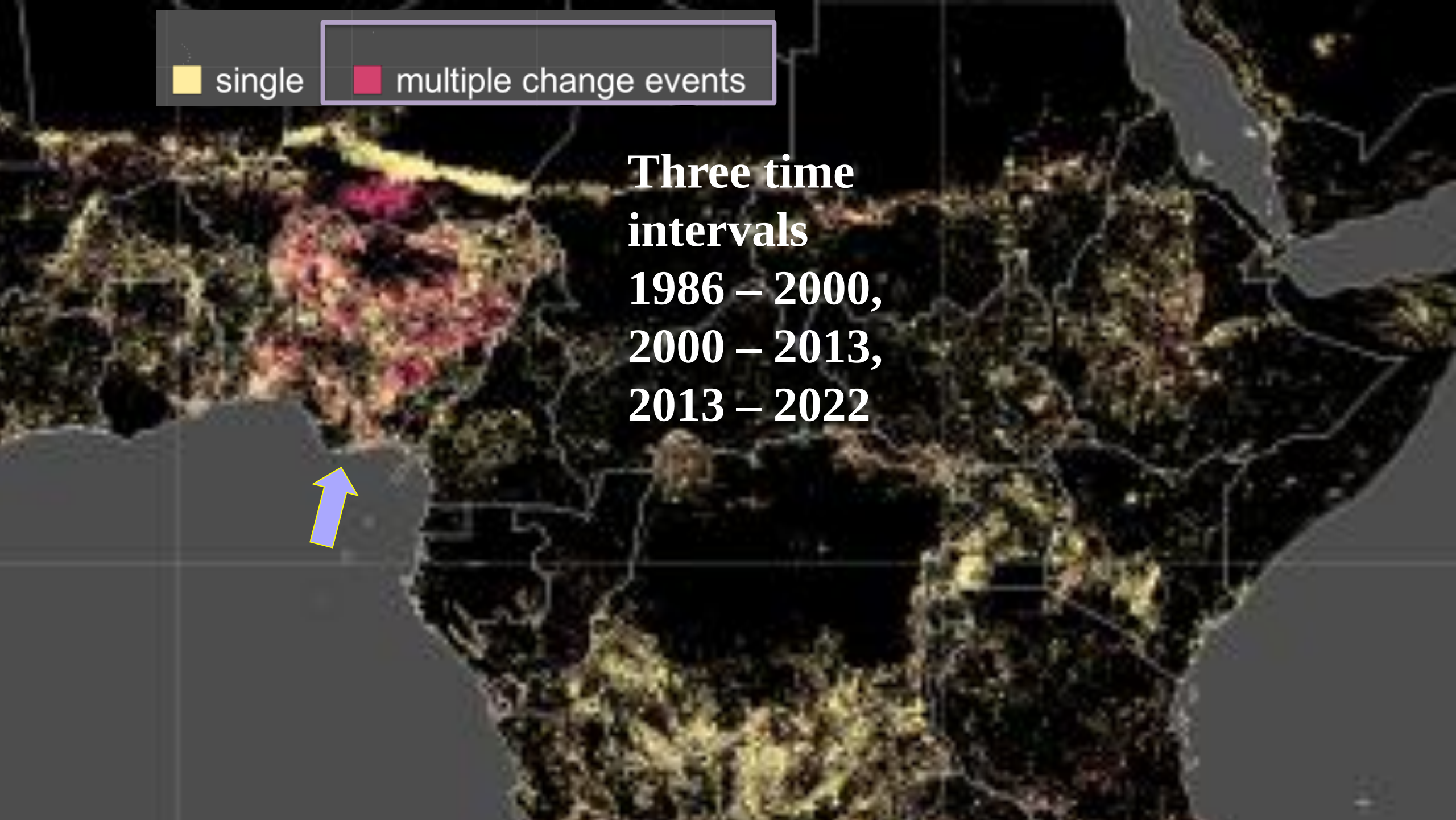


- Cropland expansion frontiers (Akinyemi & Ifejika Speranza, 2024)
- 29% of global cropland change hotspots in West Africa (2000-2010) (Creutzig, 2019)

Nigeria



Winkler et al., 2021


single
multiple change events
Three time intervals
1986 – 2000,
2000 – 2013,
2013 – 2022

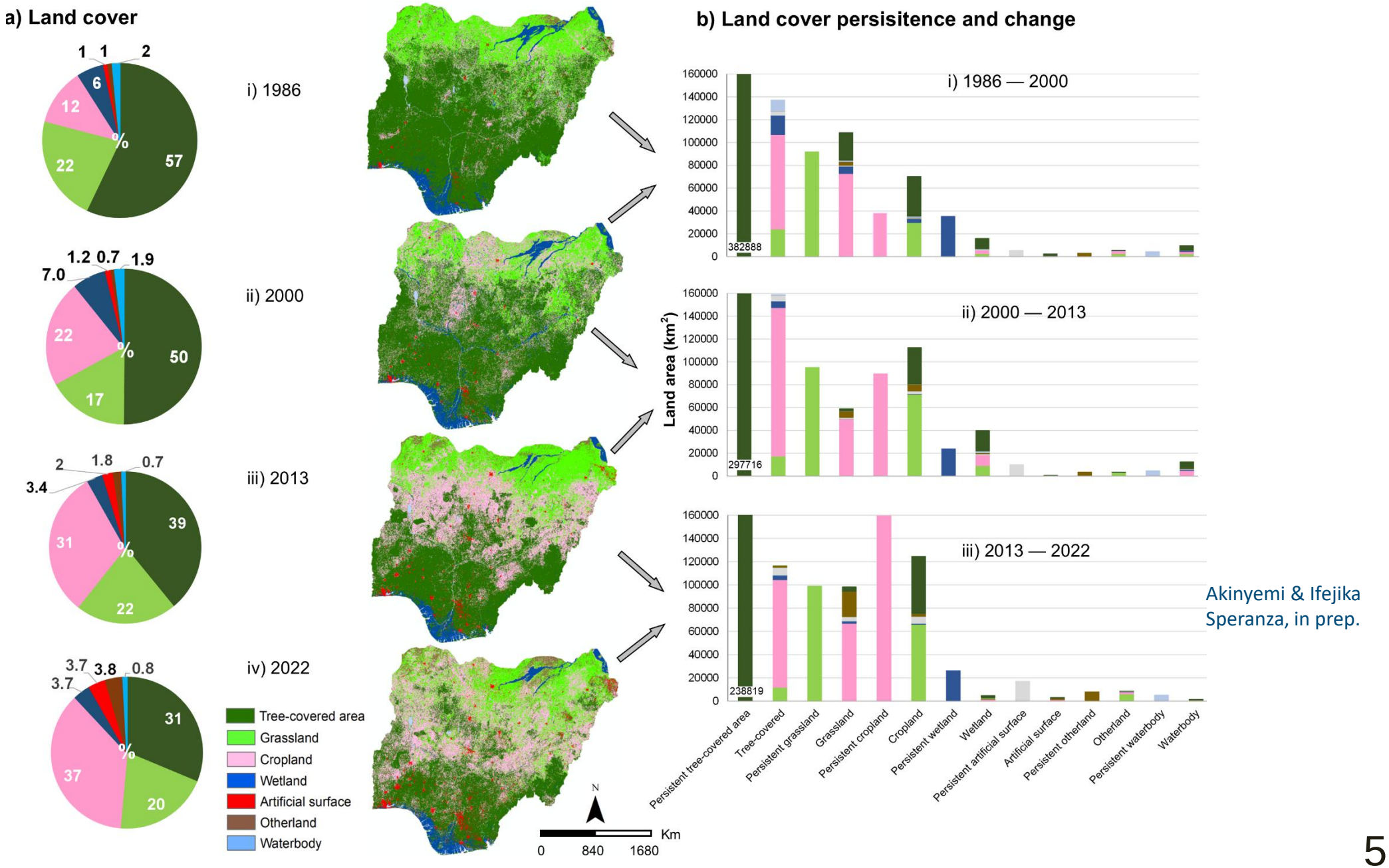
Objectives

1. Identify land cover change patterns that are stationary. Multidecade timescale using three time intervals (1986 – 2000, 2000 2013, 2013 – 2022)

2. Examine the speed of land transformation (Annual change intensities - rates among land cover types

3. Measure the extent of human appropriation of natural land cover

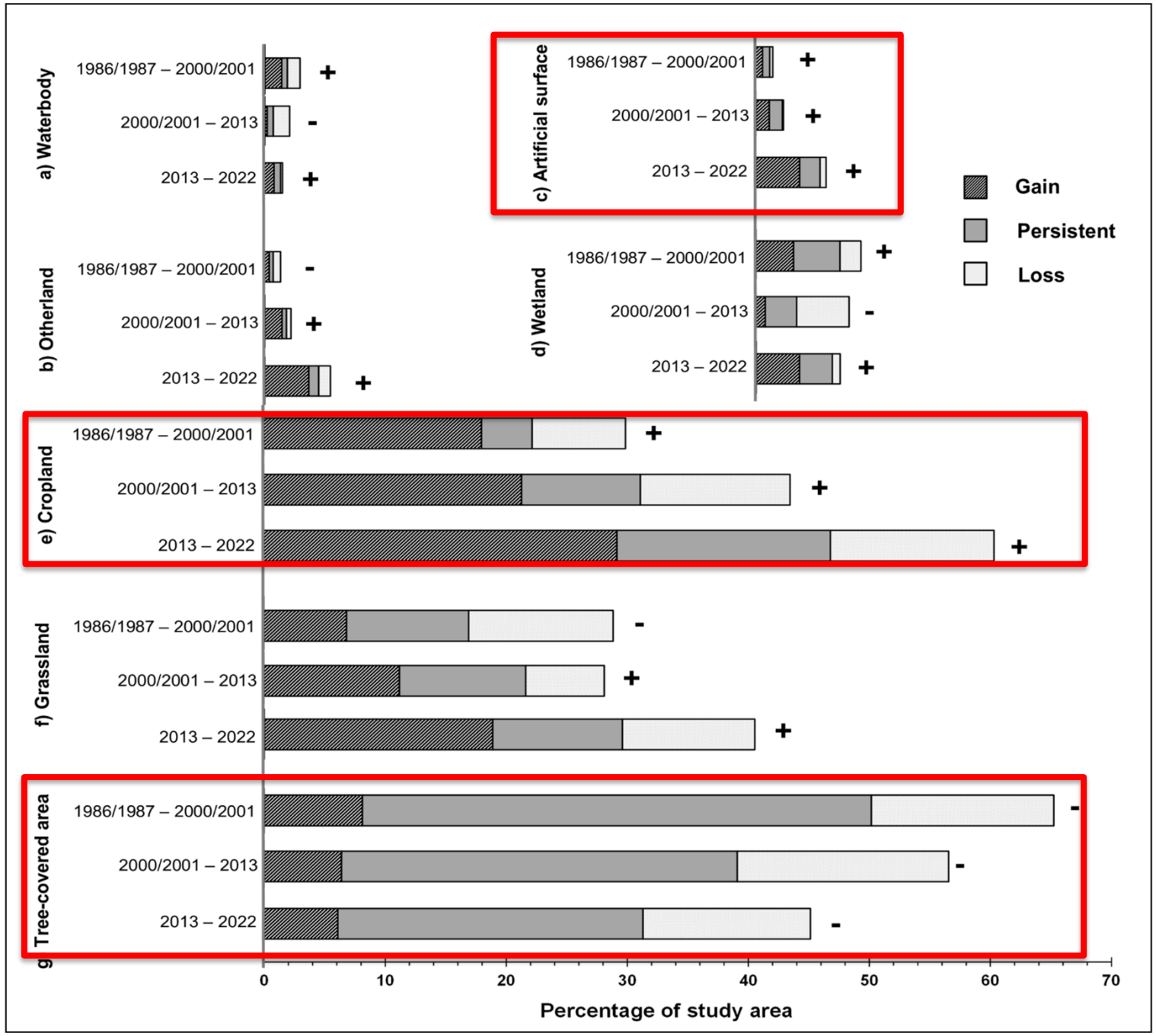
Obj. 1: Land cover change



Akinyemi & Ifejika Speranza, in prep.

Obj. 1: Land cover change accounting (budget)

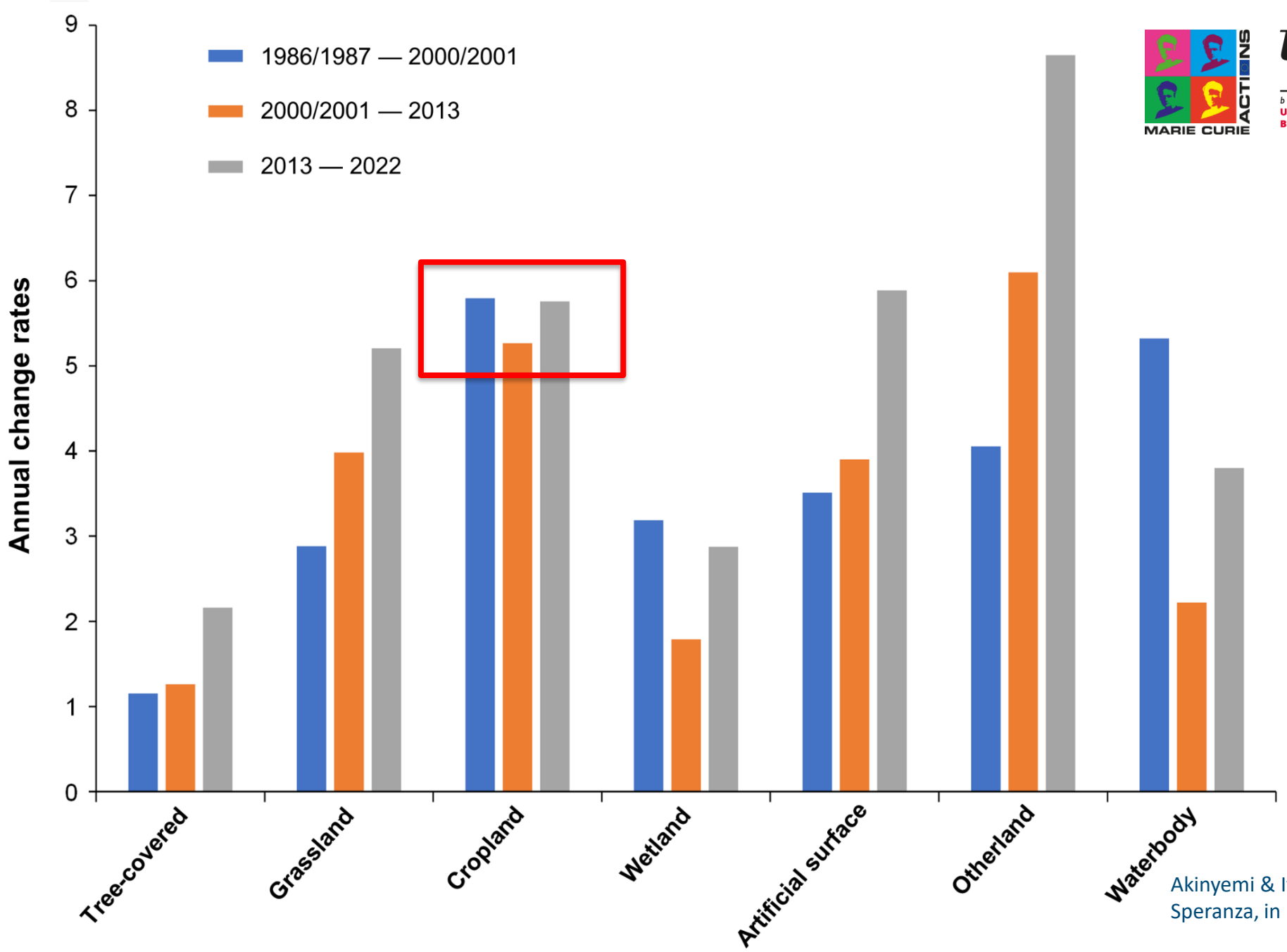
Temporal stationarity of change patterns in cropland, artificial surfaces (e.g., Settlement) and tree-covered areas were temporal stationarity (Aldwaik & Pontius, 2012)



Akinyemi & Ifejika Speranza, 2024

Obj 2: Speed of land transformation

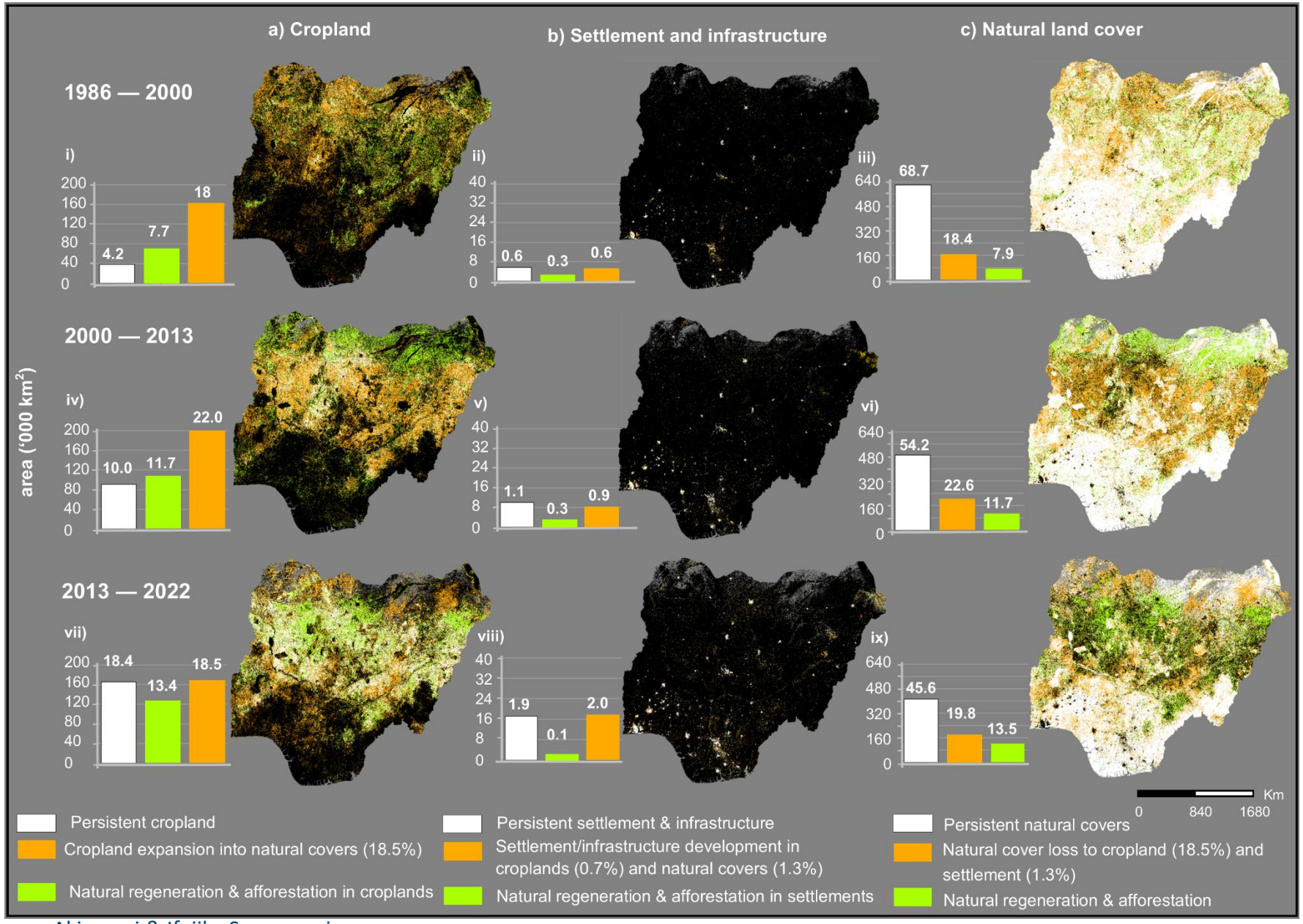
Annual change rates increased over time among most land cover types



Akinyemi & Ifejika Speranza, in prep.

Obj. 3: Human appropriated natural land cover (HANLC) in Nigeria

Identified important land cover transitions based on the measurement of the temporal stationarity of land cover changes



Akinyemi & Ifejika Speranza, in prep.

Take home

- Multidecade timescale analyses provides more insight about important land cover transitions based on the measurement of the temporal stationarity of land cover changes

- Humans have appropriated more natural land covers (HANLC) in Nigeria than were naturally regenerated and/or afforested. Natural regeneration and afforestation is limited to only areas where natural land cover expanded into human activity-related land covers.

Collaborators in LucFRes

Obafemi Awolowo University

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MARTIN-LUTHER UNIVERSITÄT HALLE-WITTENBERG

Thank you for your attention

Questions?

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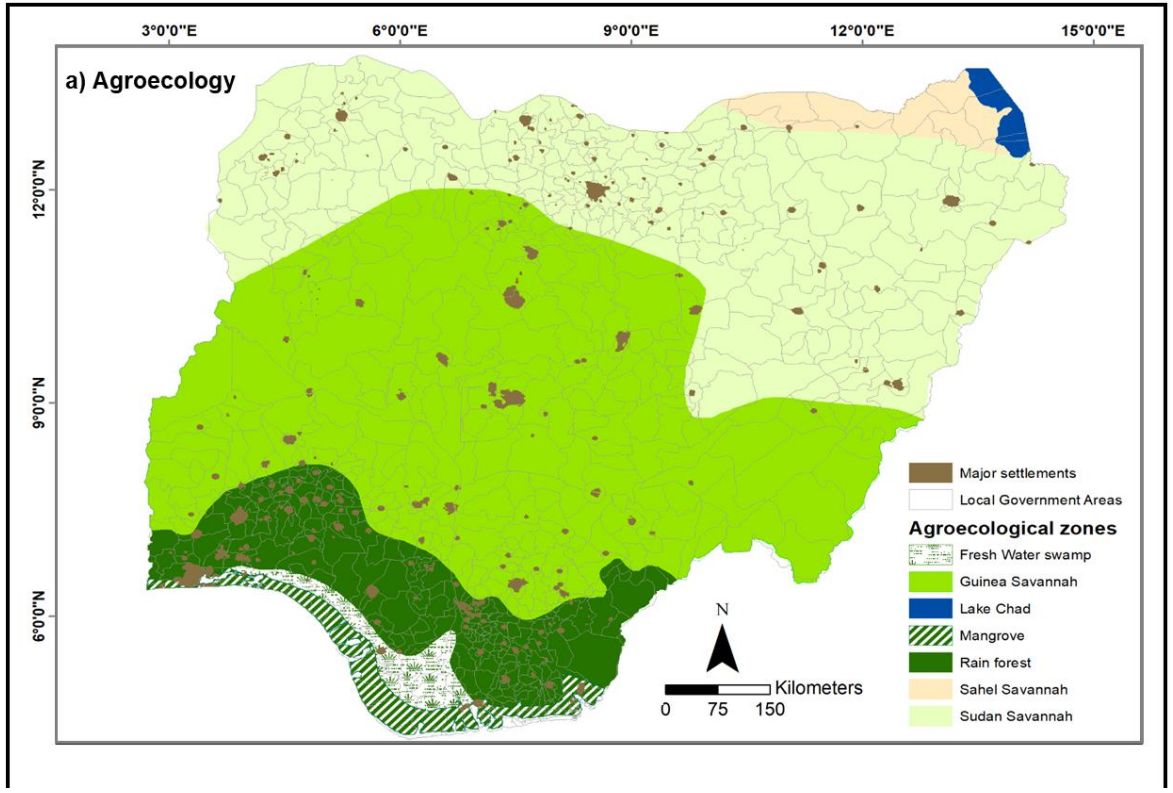
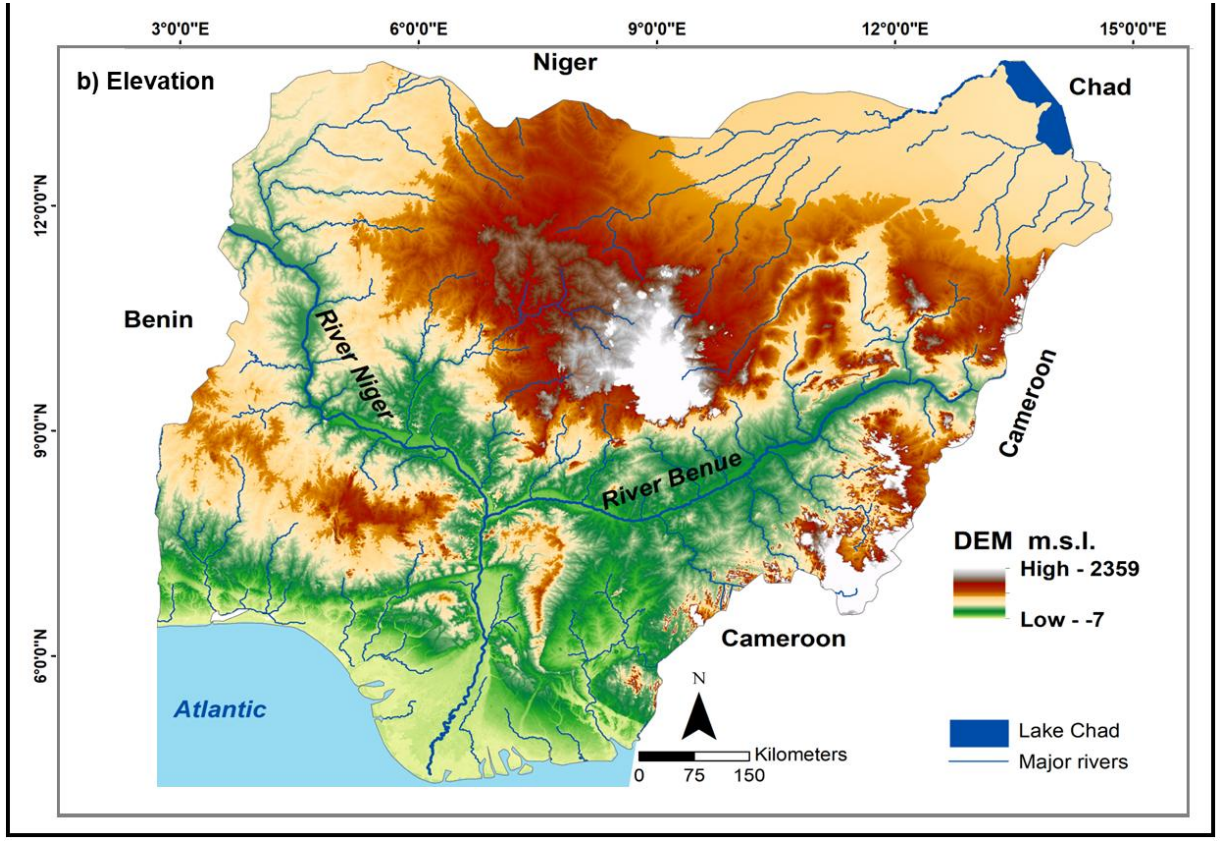
Nigeria





Potapov et al., 2022

Local stakeholder knowledge co-production

Farm soil sampling

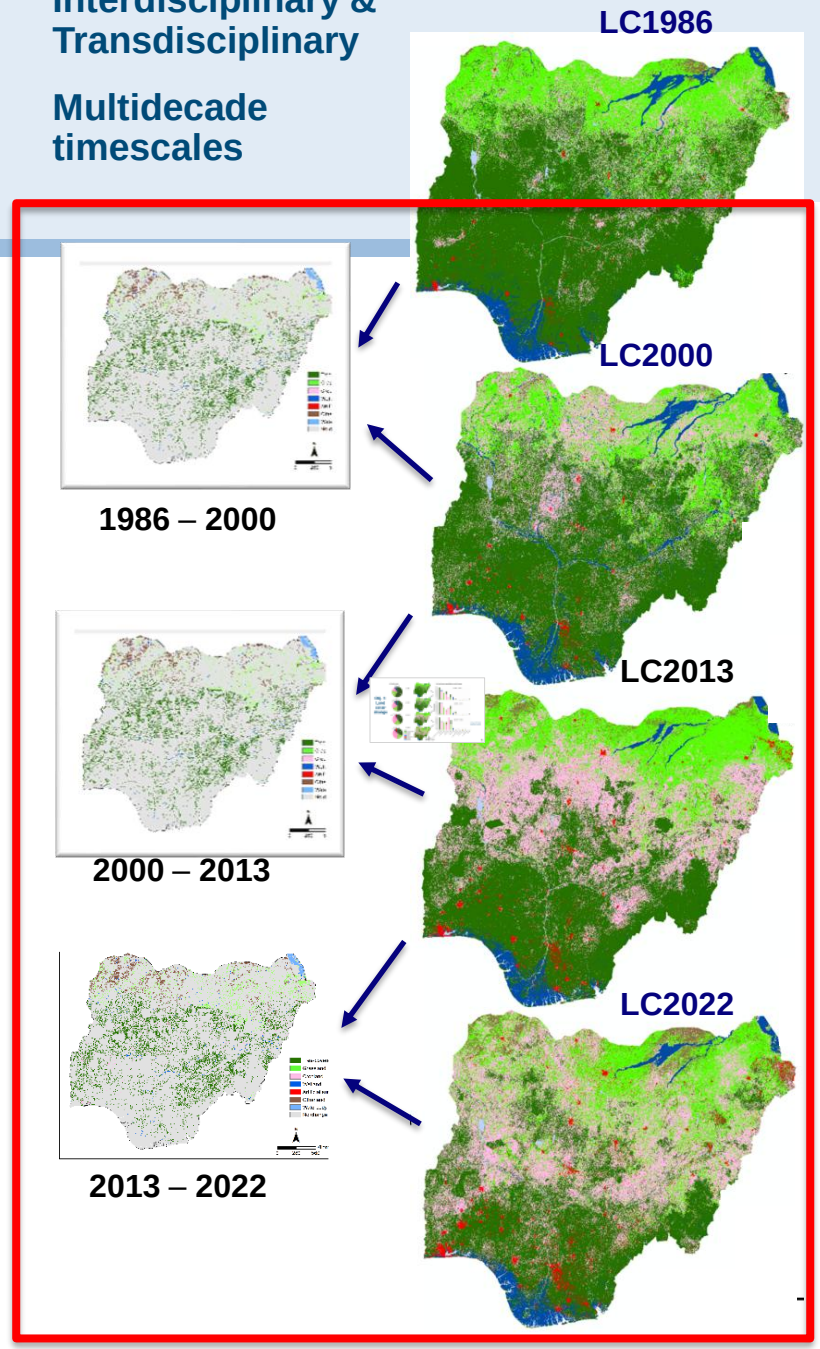
Farmer household survey

Farm transect walks

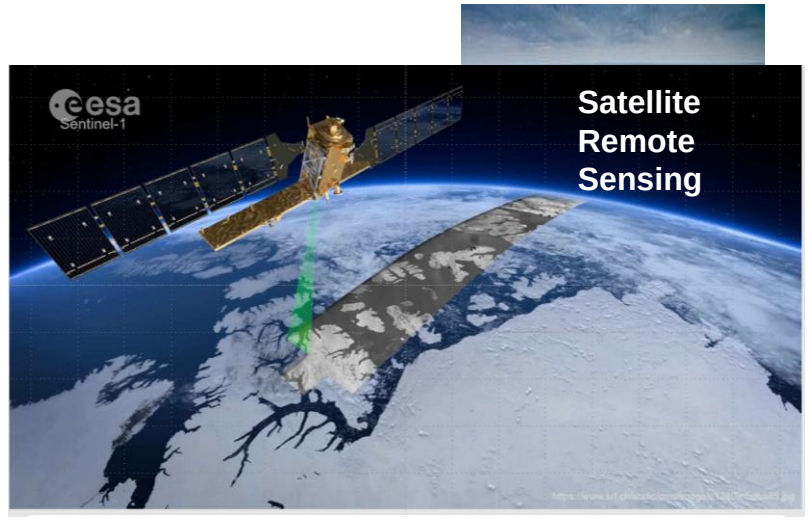
Focus group discussion

Interdisciplinary & Transdisciplinary

Multidecade timescales

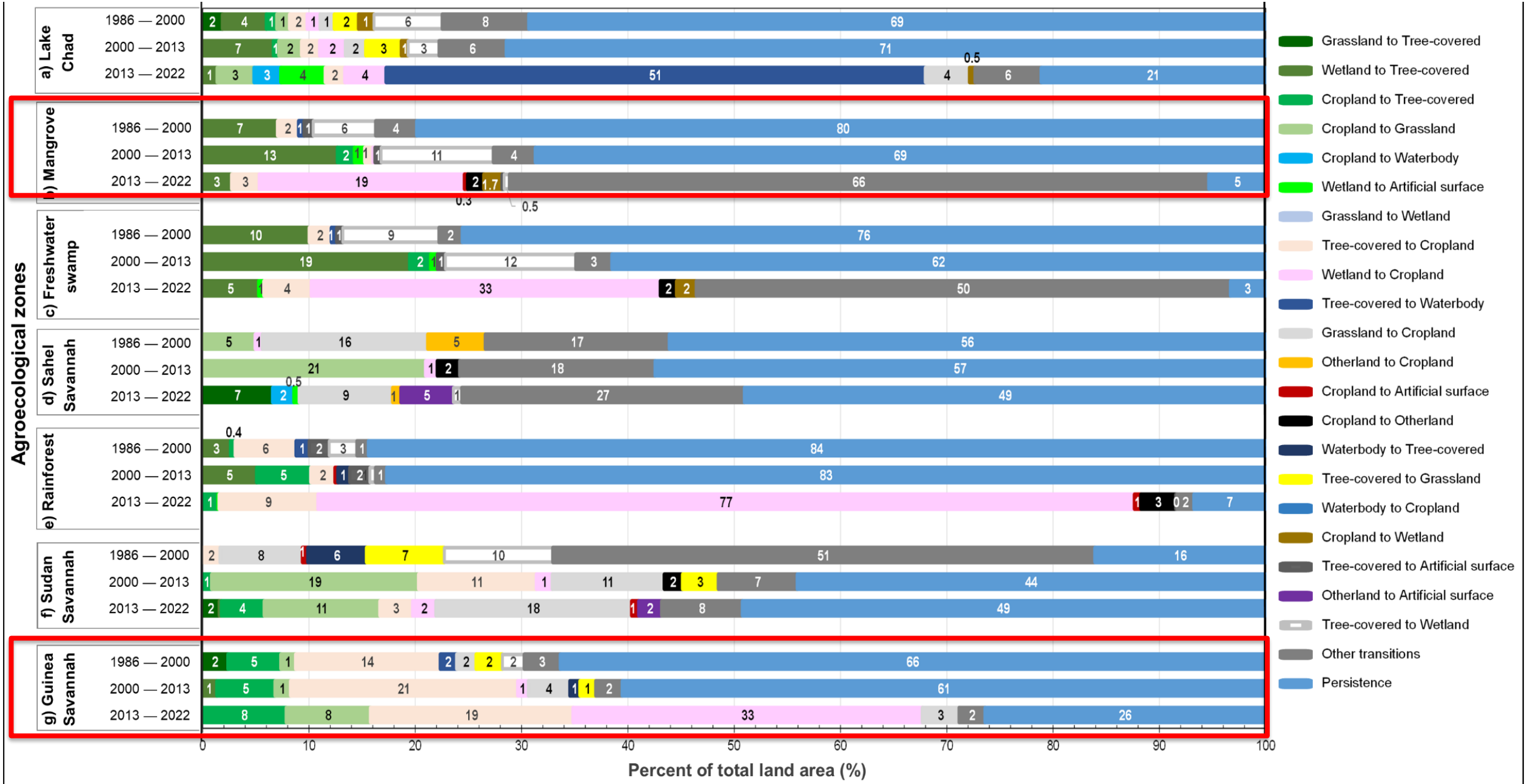


Land use sampling



Akinyemi & Ifejika Speranza, in prep.

Persistence and major land use transitions by agroecology



Obj. 3: Human appropriated natural land cover (HANLC) in Nigeria

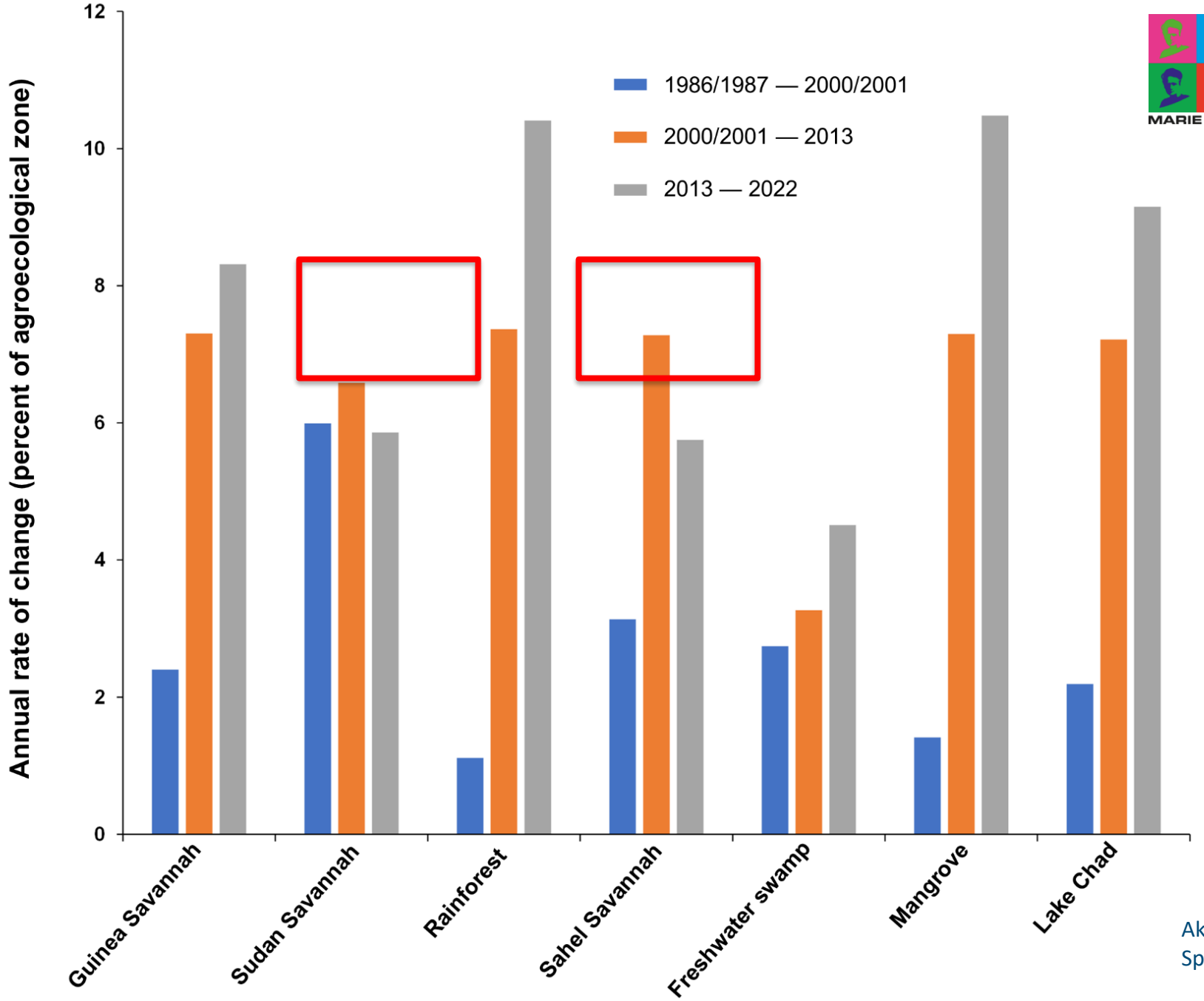
Identified important land cover transitions based on the measurement of the temporal stationarity of land cover changes

Drivers/Processes	Agroecological zones						
1986-2000 2000-2013 2013-2022	Guinea Savannah	Sudan Savannah	Rainforest	Sahel Savannah	Freshwater swamp	Mangrove	Lake Chad
*Natural regeneration and afforestation	6.64	1.96	0.54	13.80	0.11	0.74	3.66
	6.94	20.97	5.22	26.95	2.25	2.01	3.30
	16.56	15.41	1.70	0.65	2.92	2.66	5.20
Settlement and infrastructure development	0.43	11.19	7.85	21.97	3.26	3.51	4.26
	0.78	1.24	2.37	0.37	1.60	1.65	0.37
	3.65	4.50	0.89	5.56	0.41	0.60	5.20
	0.83	0.67	0.62	0.03	0.28	0.31	0.15
Cropland expansion	15.64	9.62	5.87	21.86	2.44	2.21	4.24
	26.25	23.11	2.35	1.58	0.69	0.97	6.04
	54.30	24.24	**86.18**	9.64	**37.33**	21.92	10.10

Akinyemi & Ifejika Speranza, in prep.

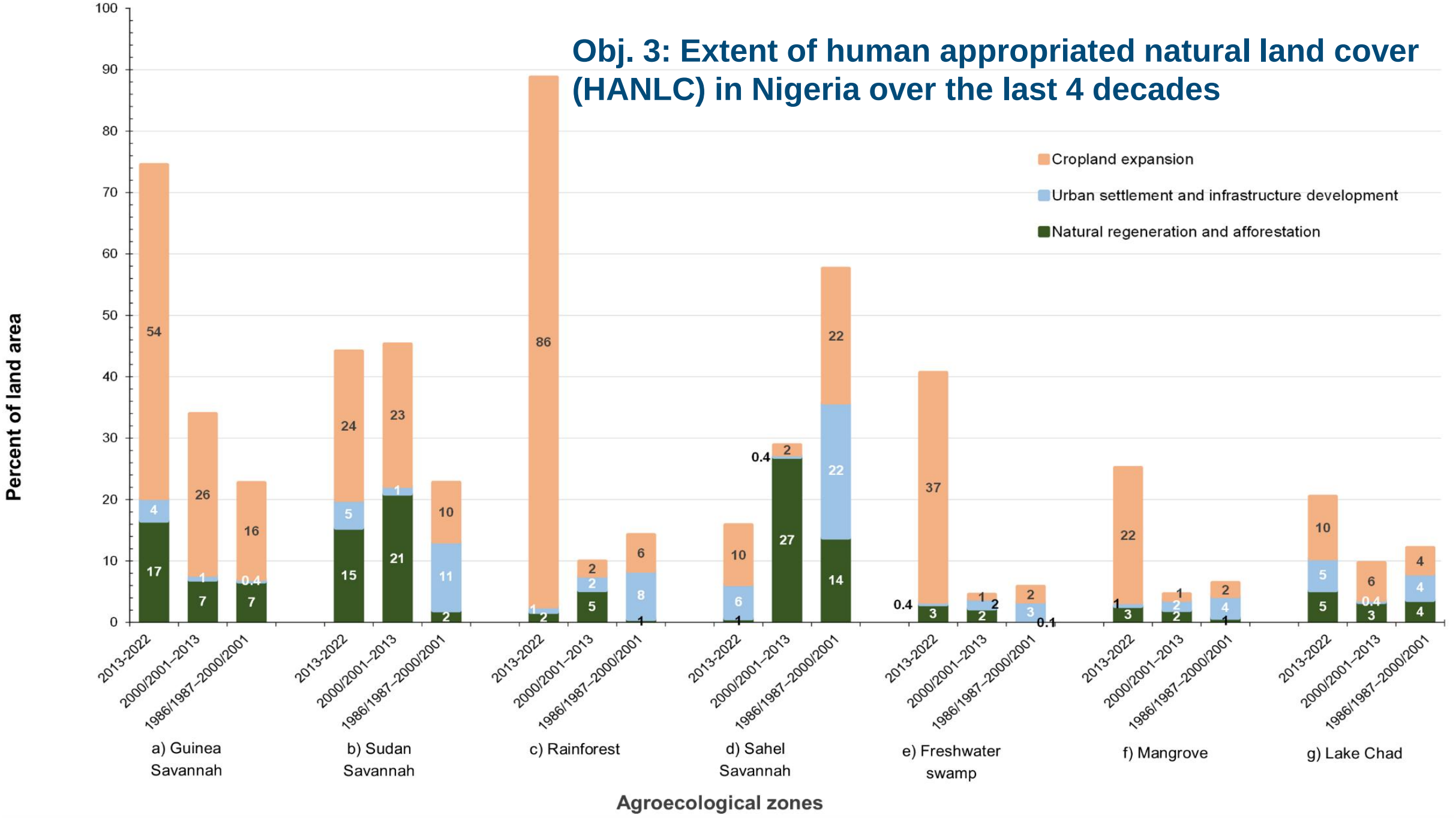
Obj. 2: Speed of land transformation by agroecology

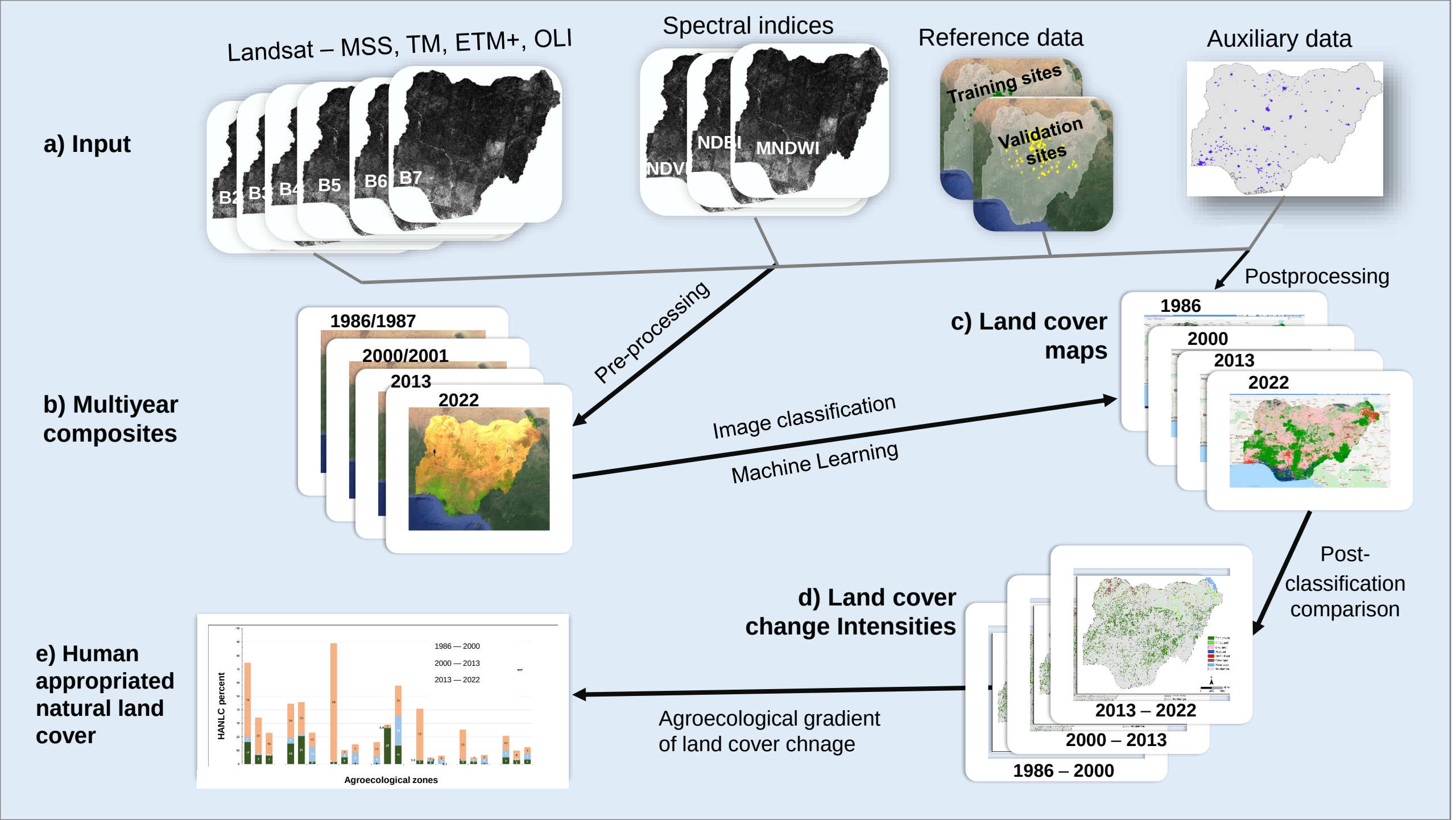
Annual change rates increased over time in most agroeological zones except in the Sudan and Sahel Savannahs



Akinyemi & Ifejika Speranza, in prep.

Obj. 3: Extent of human appropriated natural land cover (HANLC) in Nigeria over the last 4 decades




a) Input
Landsat – MSS, TM, ETM+, OLI
B2
B5
B6
B7
Spectral indices
NDBI
MNDWI
Reference data
Training sites
Validation sites
Auxiliary data
Pre-processing
b) Multiyear composites
1986/1987
2000/2001
2013
2022
Image classification
Machine Learning
c) Land cover maps
Postprocessing
1986
2000
2013
2022
Post-classification comparison
d) Land cover change Intensities
2013 – 2022
2000 – 2013
1986 – 2000
Agroecological gradient of land cover chnage
e) Human appropriated natural land cover
1986 — 2000
2000 — 2013
2013 — 2022
HANLC percent
Agroecological zones