Agriculture Change Detection:
a Case Study of the Nile Delta in Egypt

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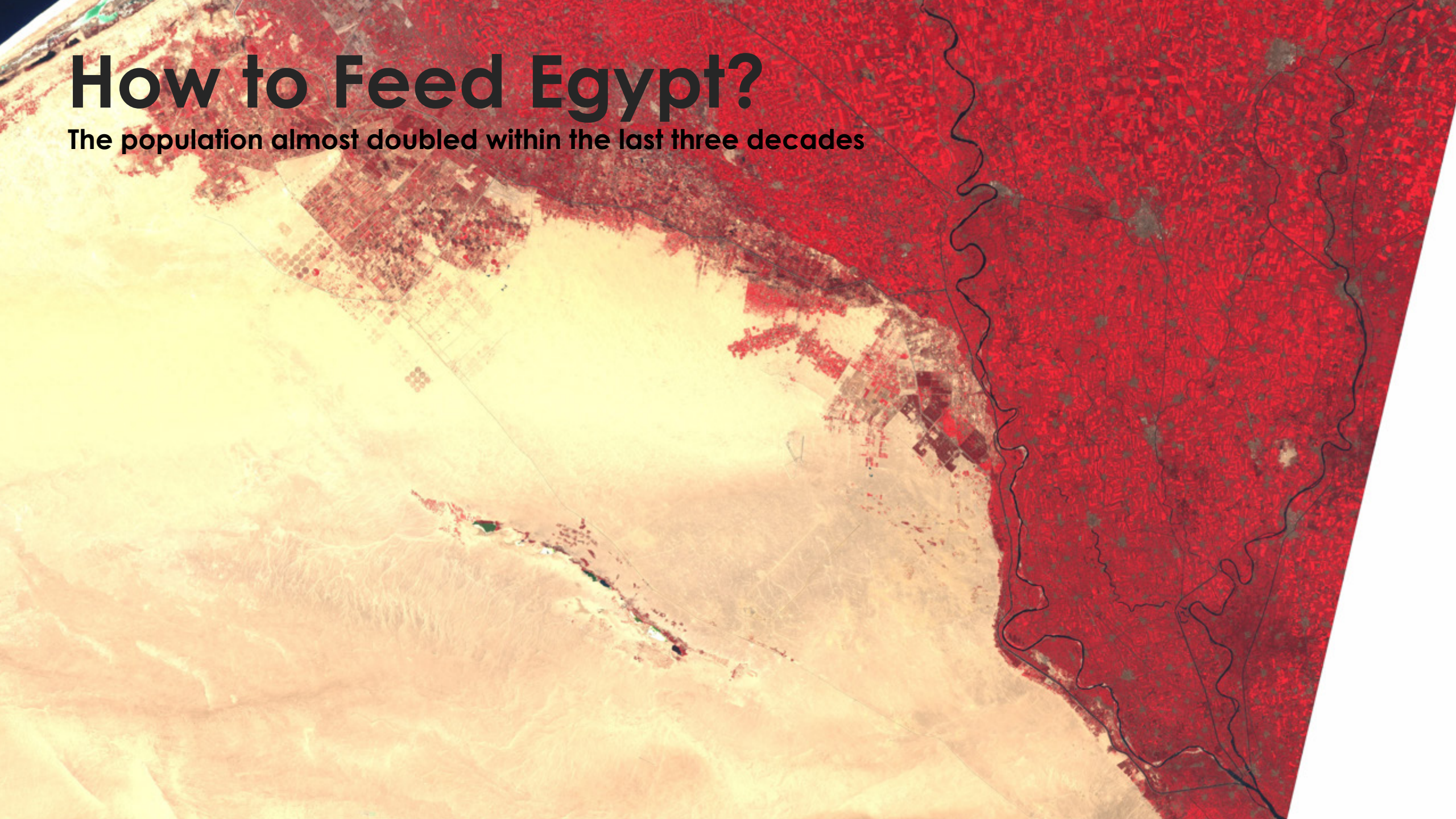
GEO3515, Remote Sensing, 4. Nov. 2021

How to Feed Egypt?

The population almost doubled within the last three decades



How to Feed Egypt?

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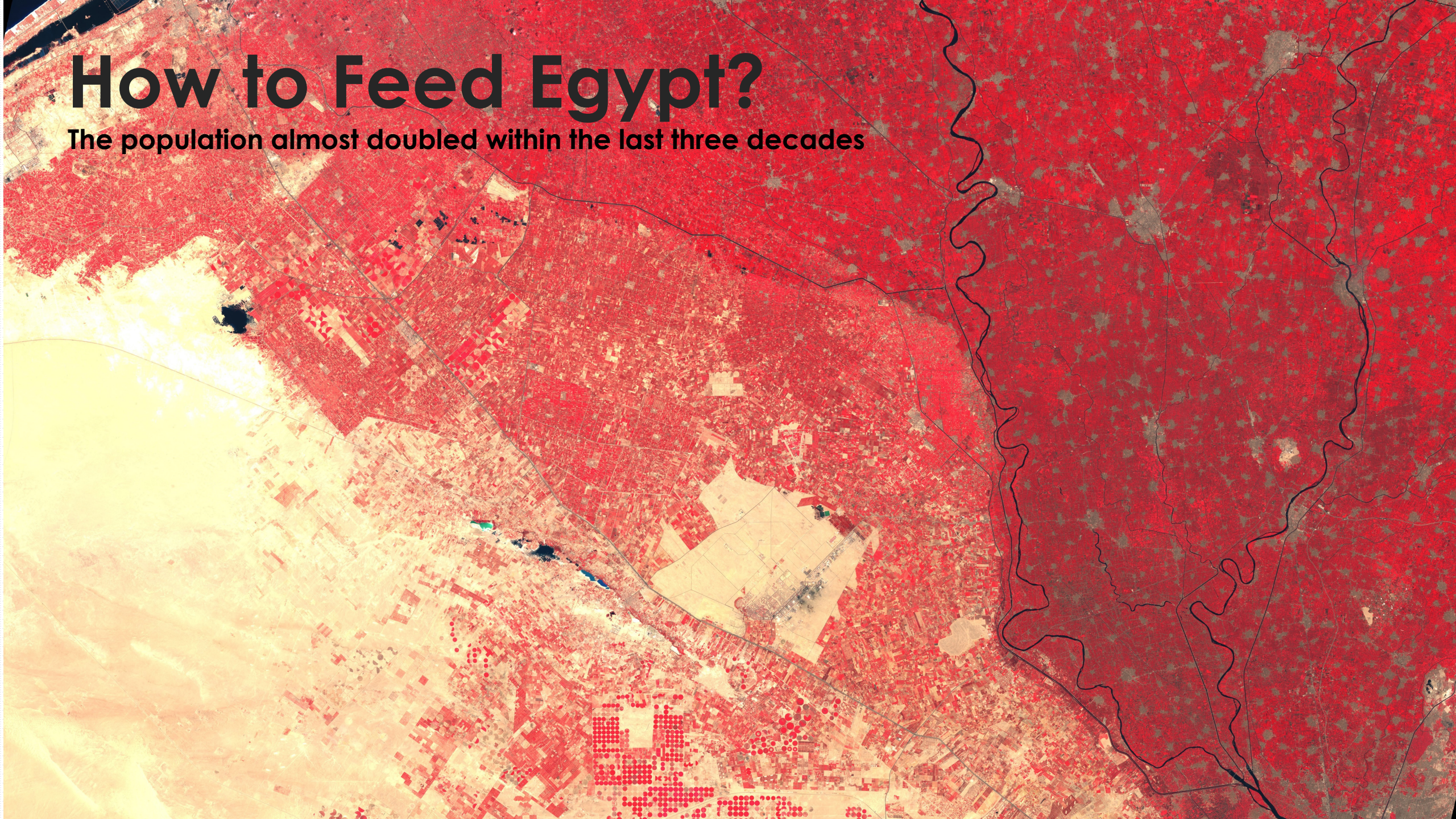


Study Area

Could we repeat the study? Or could we find more?

- Radwan, 2019
- Tiba district
- 125 sq km

(Radwan, 2019)

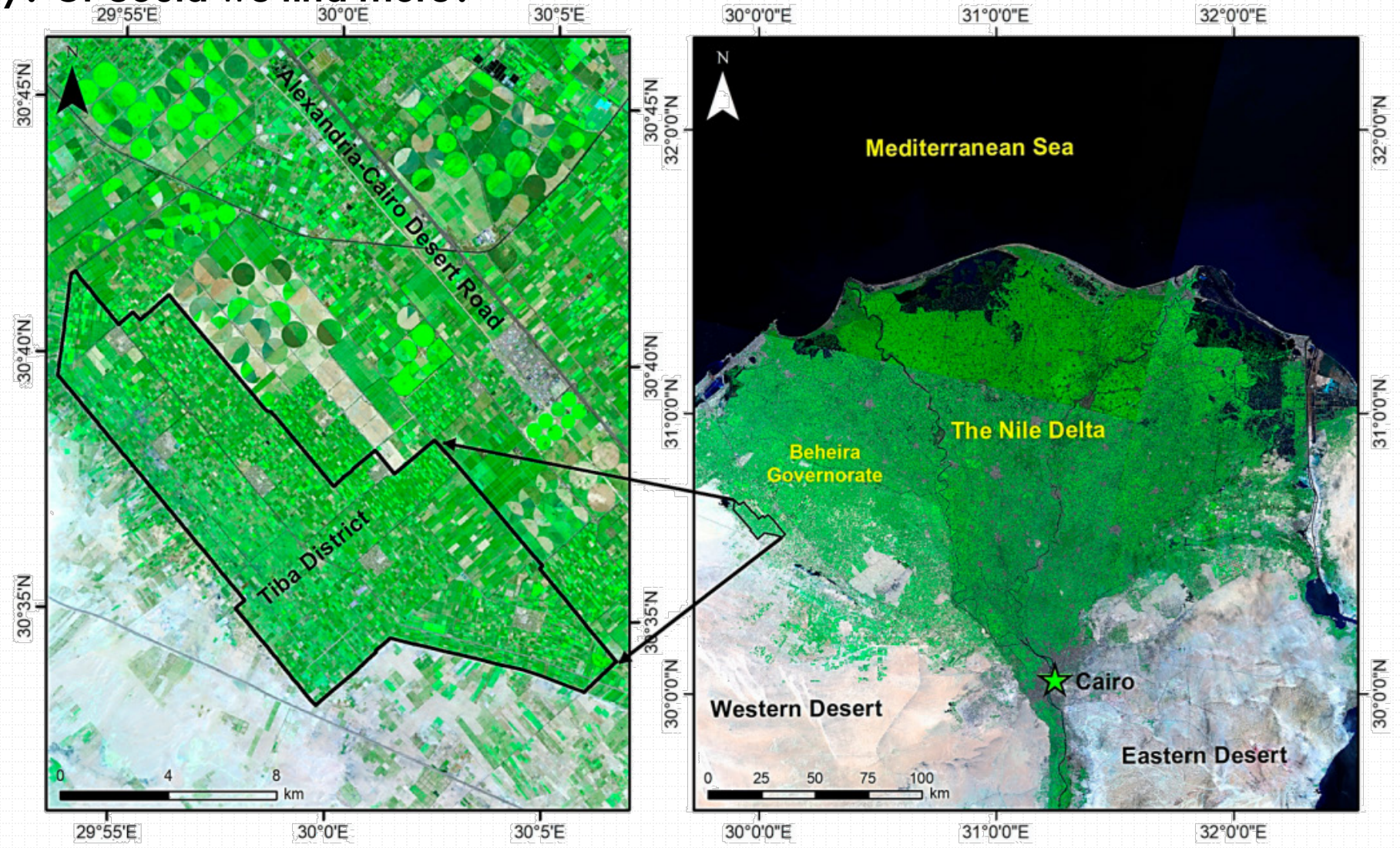


Figure 1. Location of the Tiba district, western Nile Delta of Egypt (study area).

Dataset

Landsat 5& Landsat 8

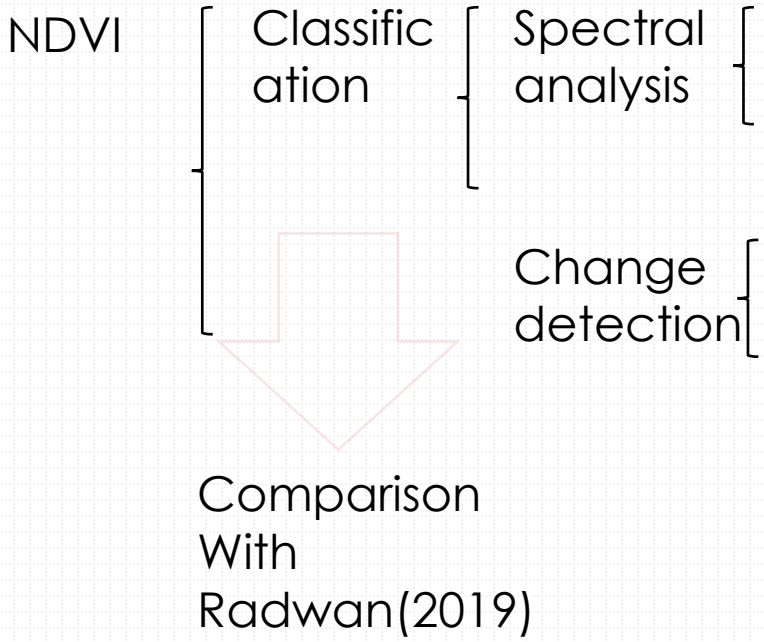
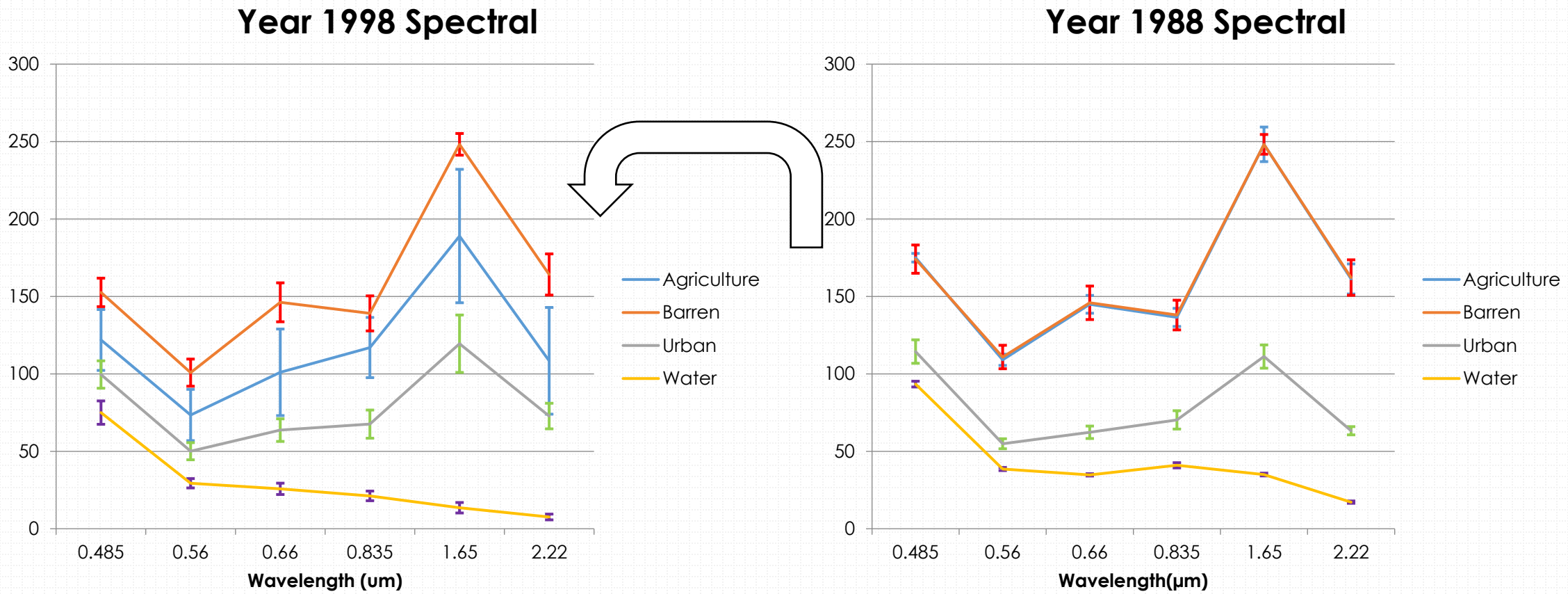


Table 1. Landsat satelite imageries information

Satellite	Spatial Resolution	Product Level	Acquisition Date
Landsat-5 (TM)	30 m	L1TP	07/1988
Landsat-5 (TM)	30 m	L1TP	07/1998
Landsat-5 (TM)	30 m	L1TP	07/2009
Landsat-8 (OLI)	30 m	L1TP	08/2013
Landsat-8 (OLI)	30 m	L1TP	08/2021

Dataset

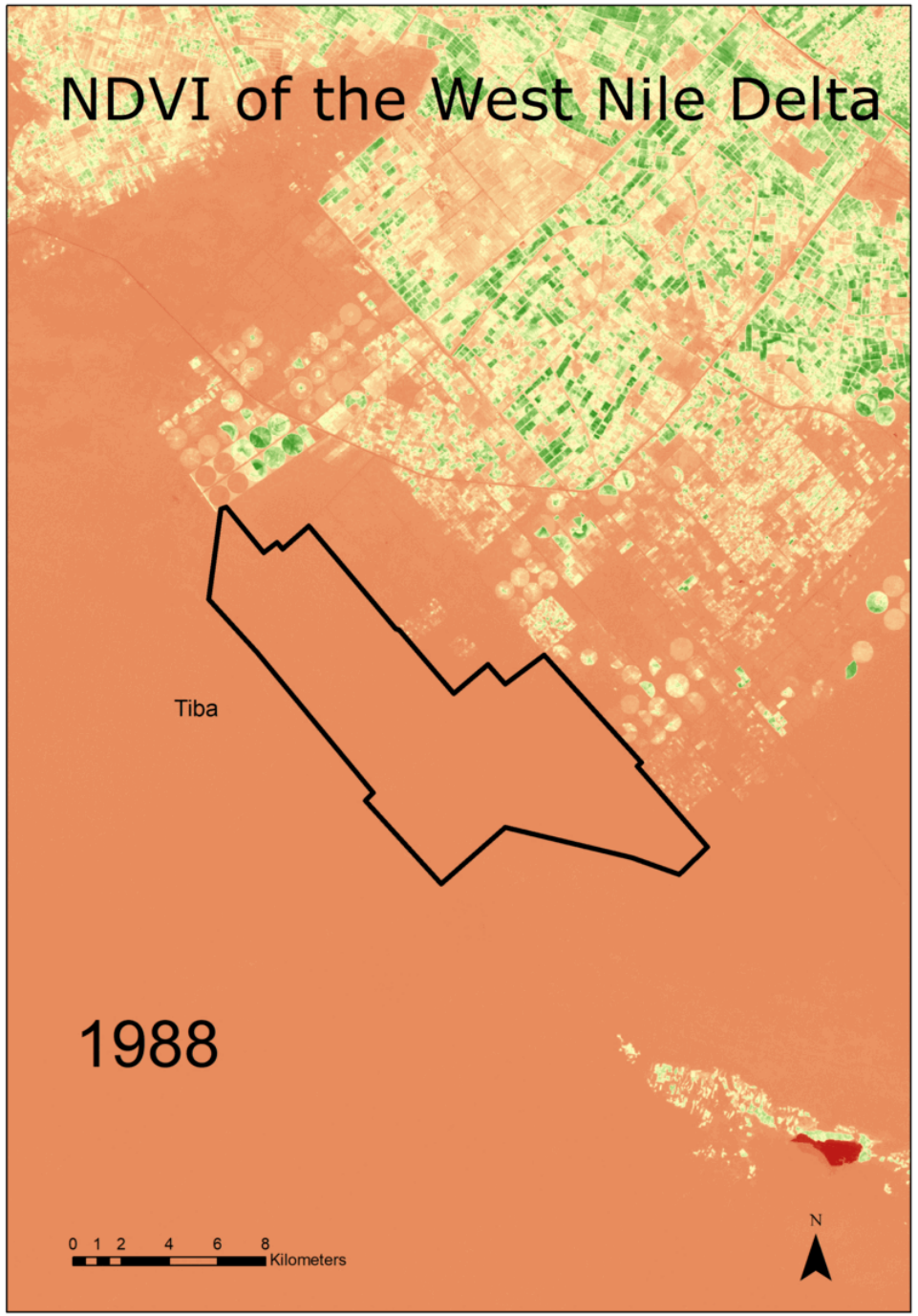
Landsat 5 spectral



Spectral Analysis was carried on exactly same pixel for two images.
Half Barren pixel (1988) -> agriculture pixel (1998), half stay barren.

NDVI

Landsat 5& Landsat 8



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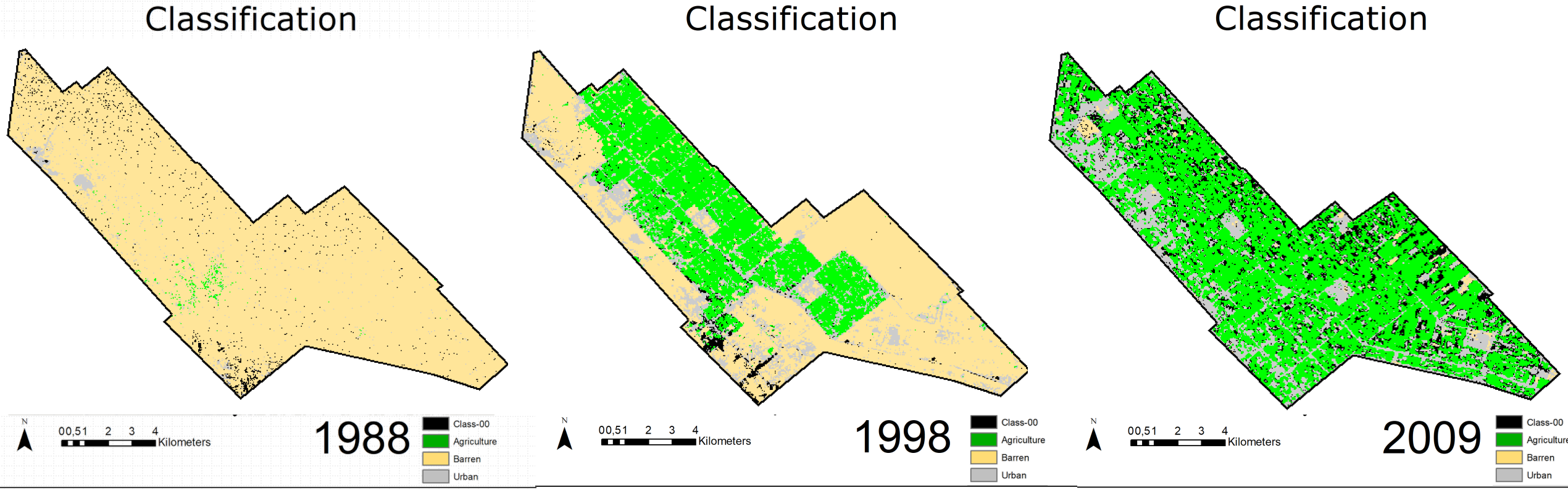
Classification

Landsat 5



Classification

Accuracy Assessment

Table 2. Classification report

Year	Name	Code	Pixels	0	1	2	3
1988	Agriculture	1	6543	3.15	82.61	3.19	11.05
	Barren	2	14527	3.10	0.25	92.46	4.19
	Urban	3	488	5.33	11.07	3.28	80.33
	Average	accuracy	=	85.13	%		
	Overall	accuracy	=	89.19	%		
	KAPPA	COEFFICIENT	=	0.78119			
	Standard	Deviation	=	0.00390			

Year	Name	Code	Pixels	0	1	2	3
1998	Agriculture	1	13167	0.98	91.58	2.42	5.03
	Barren	2	10700	2.52	0.32	90.47	6.69
	Urban	3	1671	2.15	3.05	9.87	84.92
	Average	accuracy	=	88.99	%		
	Overall	accuracy	=	90.68	%		
	KAPPA	COEFFICIENT	=	0.83951			
	Standard	Deviation	=	0.00299			

Year	Name	Code	Pixels	0	1	2	3
2009	Agriculture	1	2814	0.75	97.69	0	1.56
	Barren	2	3157	3.80	0	93.66	2.53
	Urban	3	3240	3.46	4.29	3.61	88.64
	Average	accuracy	=	93.33	%		
	Overall	accuracy	=	93.13	%		
	KAPPA	COEFFICIENT	=	0.89825			
	Standard	Deviation	=	0.00385			

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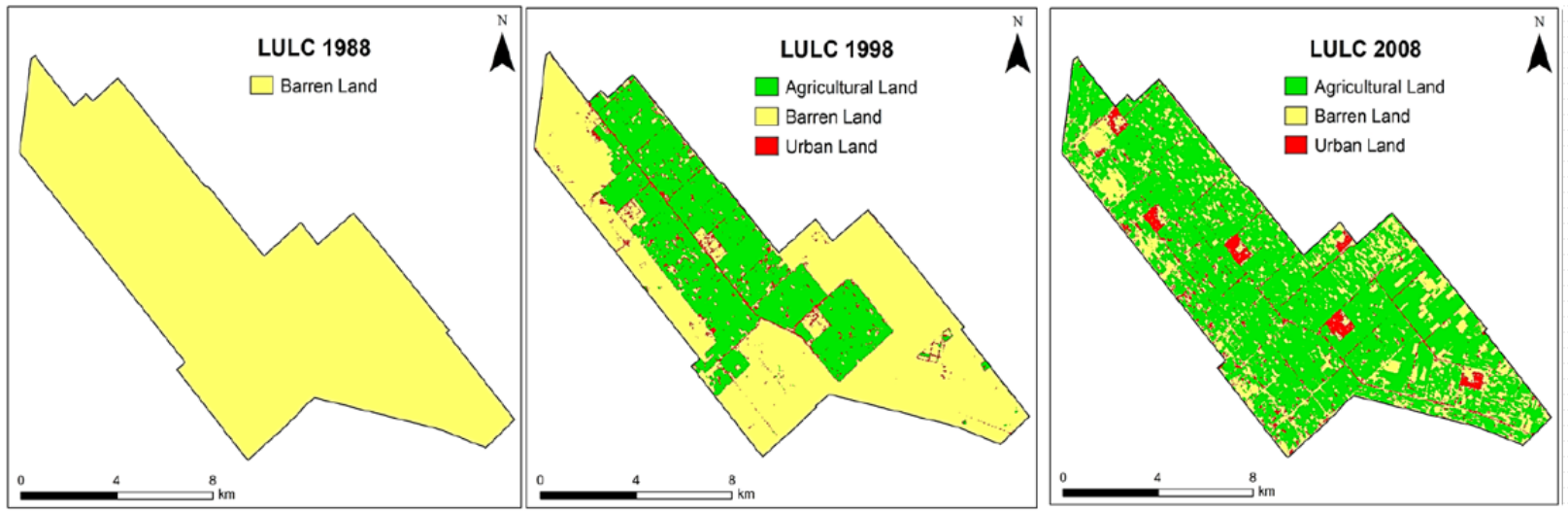
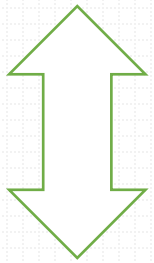
Comparison with Radwan

Clipping to Tiba district





Comparison with Radwan

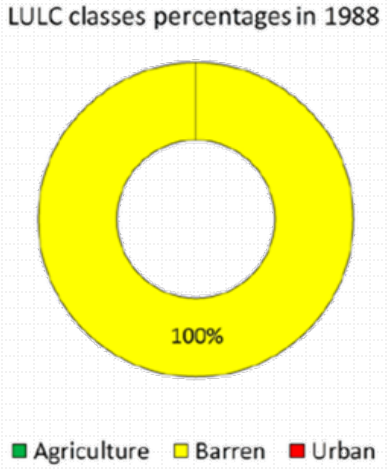
Clipping to Tiba district

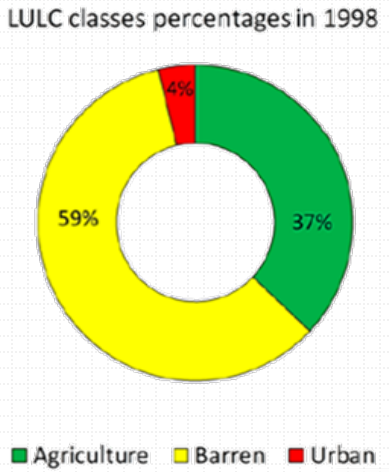
Table 2. Area coverage for each land cover class across Tiba District over the studied period.

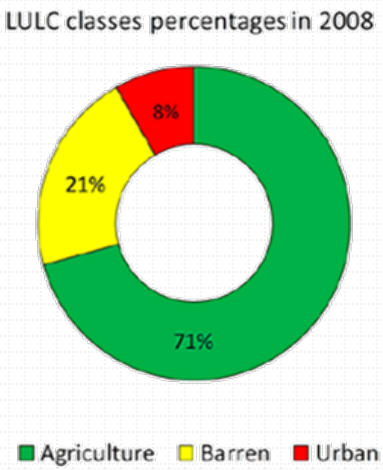
LULC Class Year	Agriculture		Barren		Urban	
	Hectares	(%)	Hectares	(%)	Hectares	(%)
1988	0.00	0.00	12,527	100.00	0.00	0.00
1998	4640	37.04	7413	59.18	474	3.78
2003	7421	59.24	4179	33.36	927	7.40
2008	8860	70.73	2625	20.95	1042	8.32
2013	10,111	80.71	1021	8.15	1395	11.14
2018	510	83.90	855	6.82	1162	9.28
Net change (1998–2018)	5870	126.51	−6558	−88.47	688	145.15

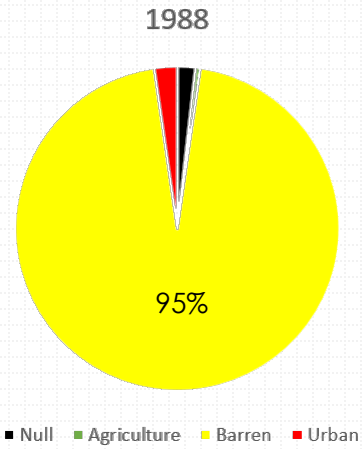
Table 3. Statistics

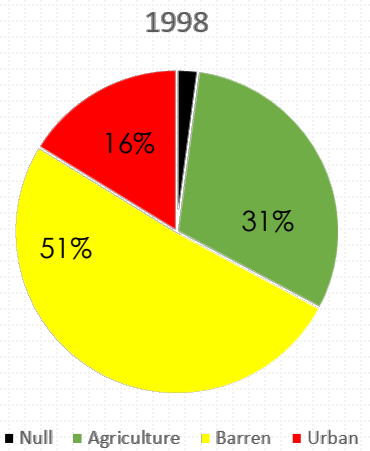
Year	Argriculture		Barren		Urban		Null	
	Pixels	%	Pixels	%	Pixels	%	Pixels	%
1988	664	0,47	134055	95,44	3206	2,28	2529	1,80
1998	43105	30,69	71567	50,95	22811	16,24	2971	2,12
2009	84233	59,97	2338	1,66	35392	25,20	18491	13,17

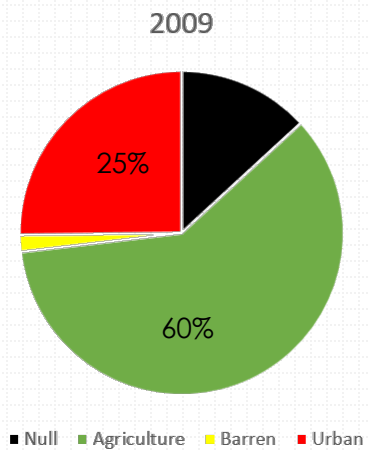






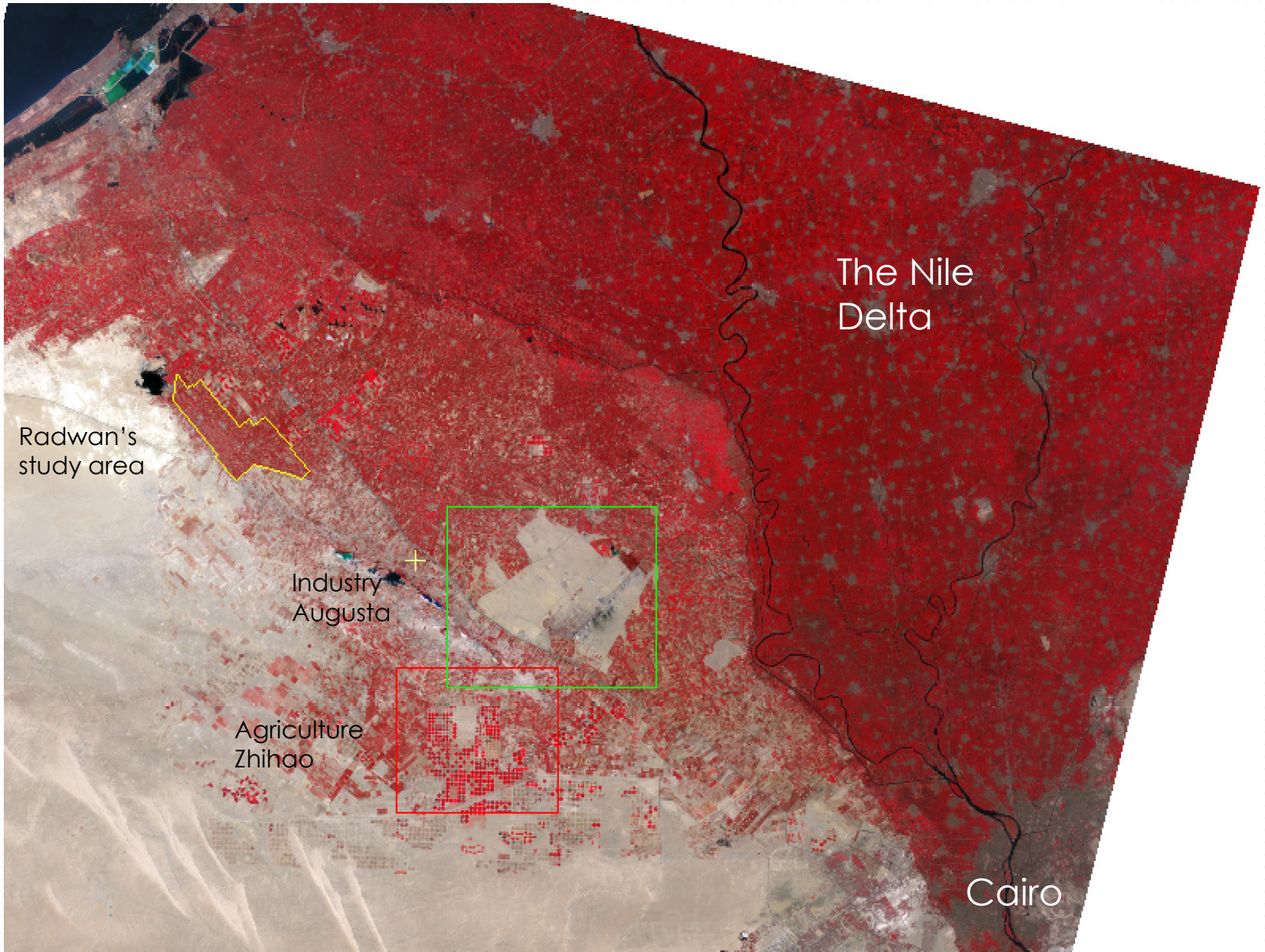






Study Area

Change detection



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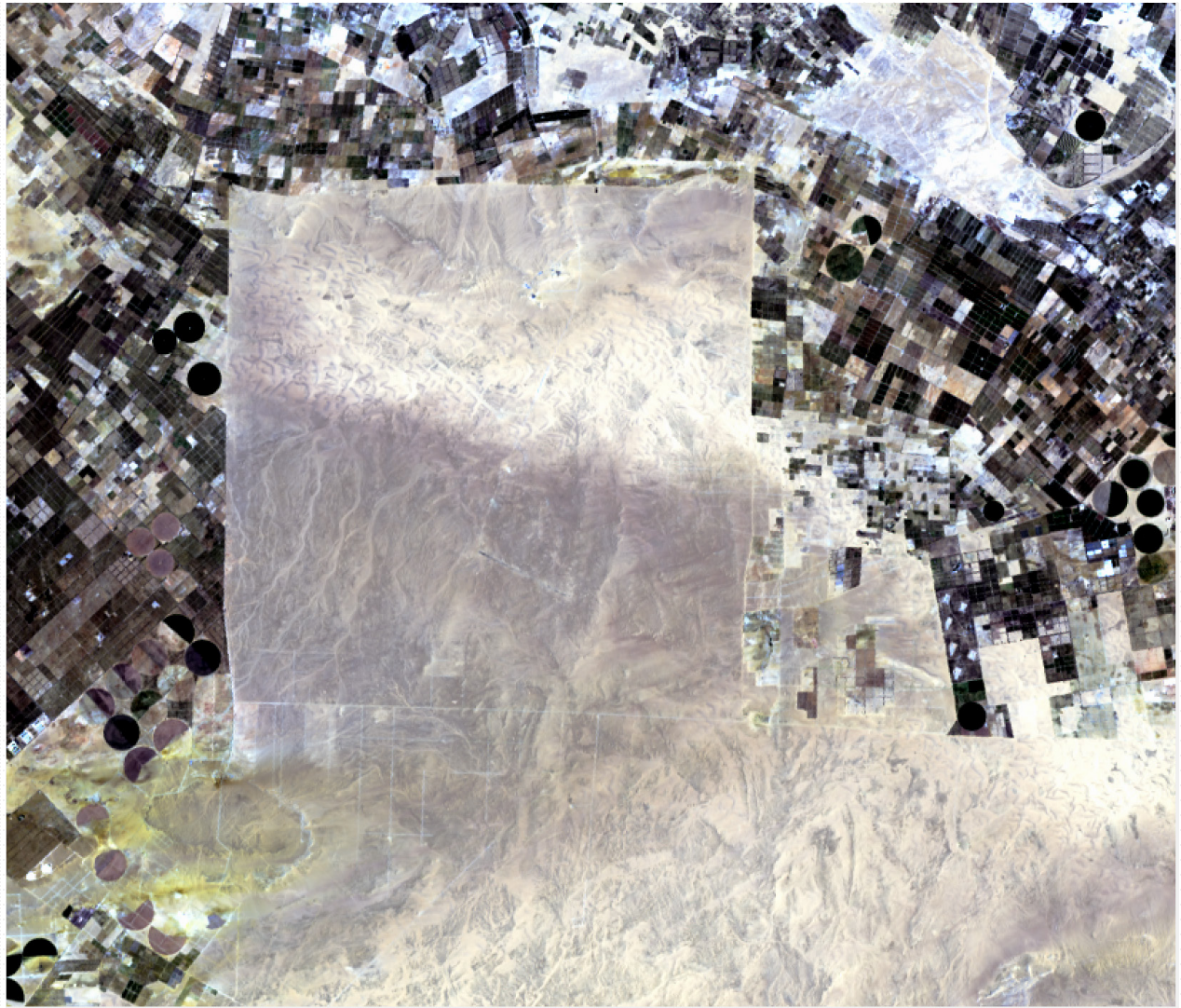
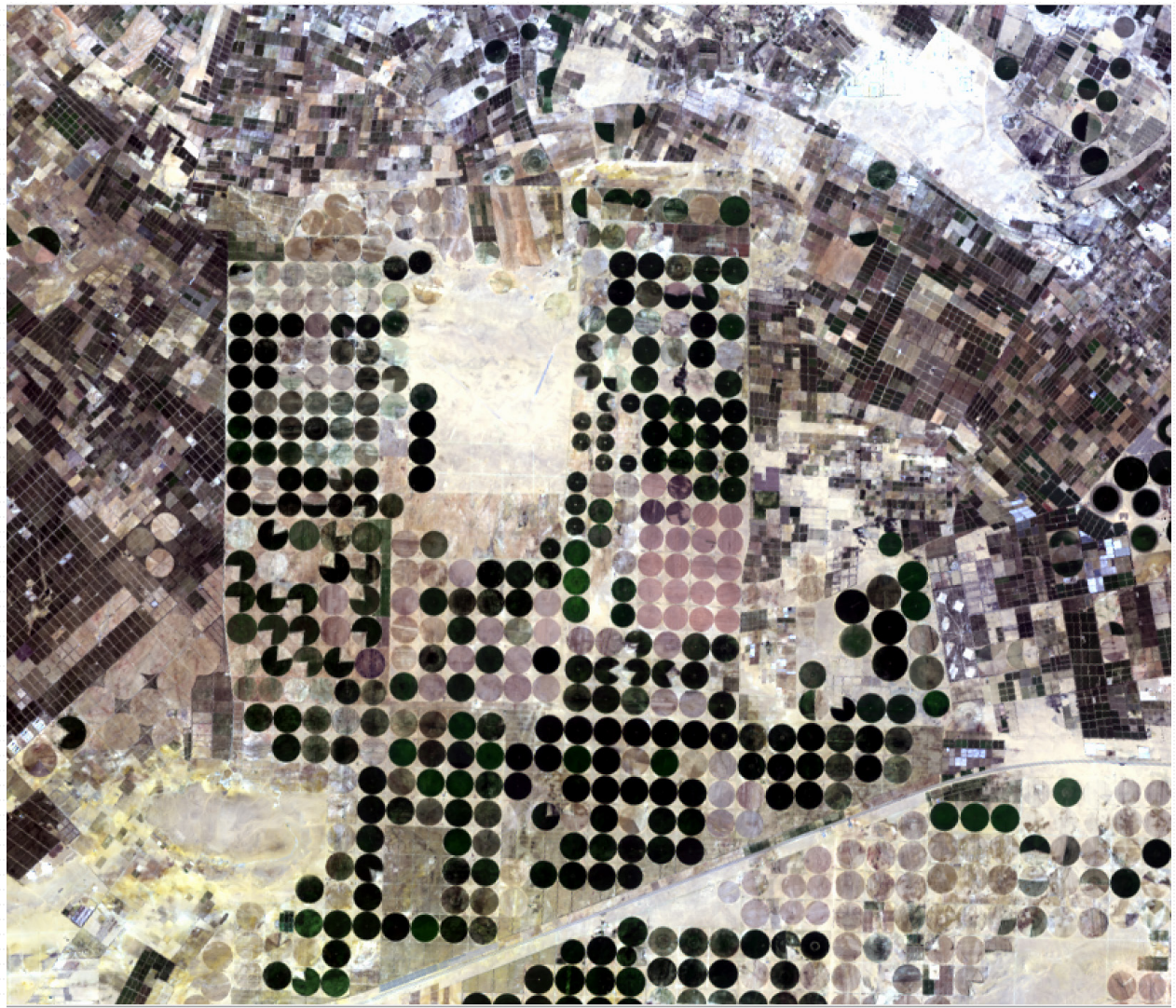
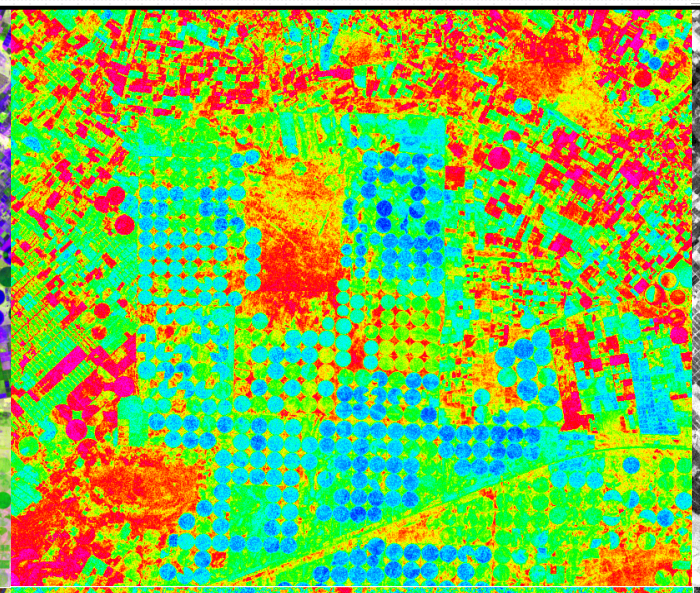
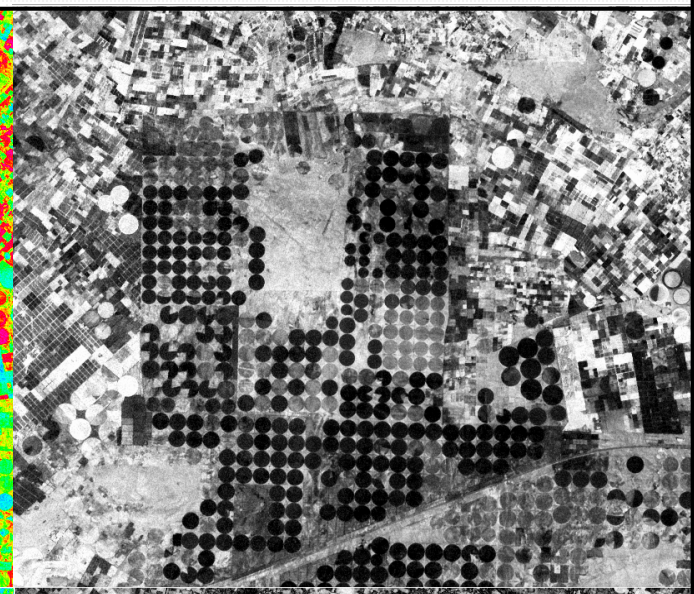
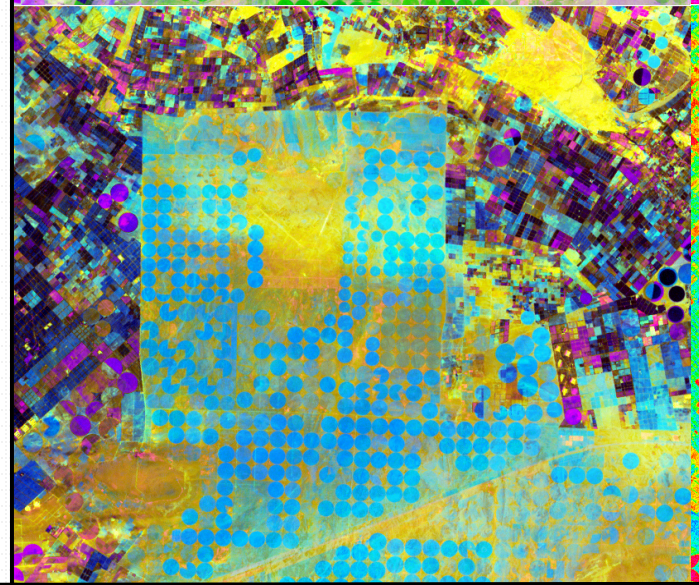
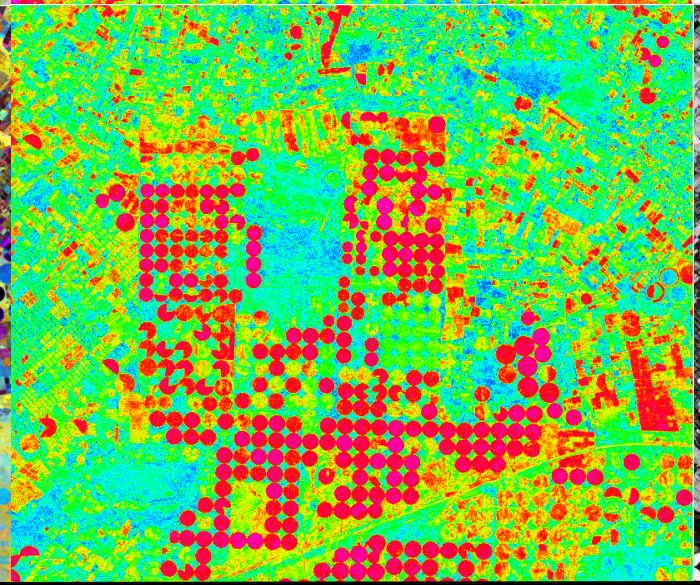
Change Detection

Landsat 8 – Modern agriculture

2013 and 2021



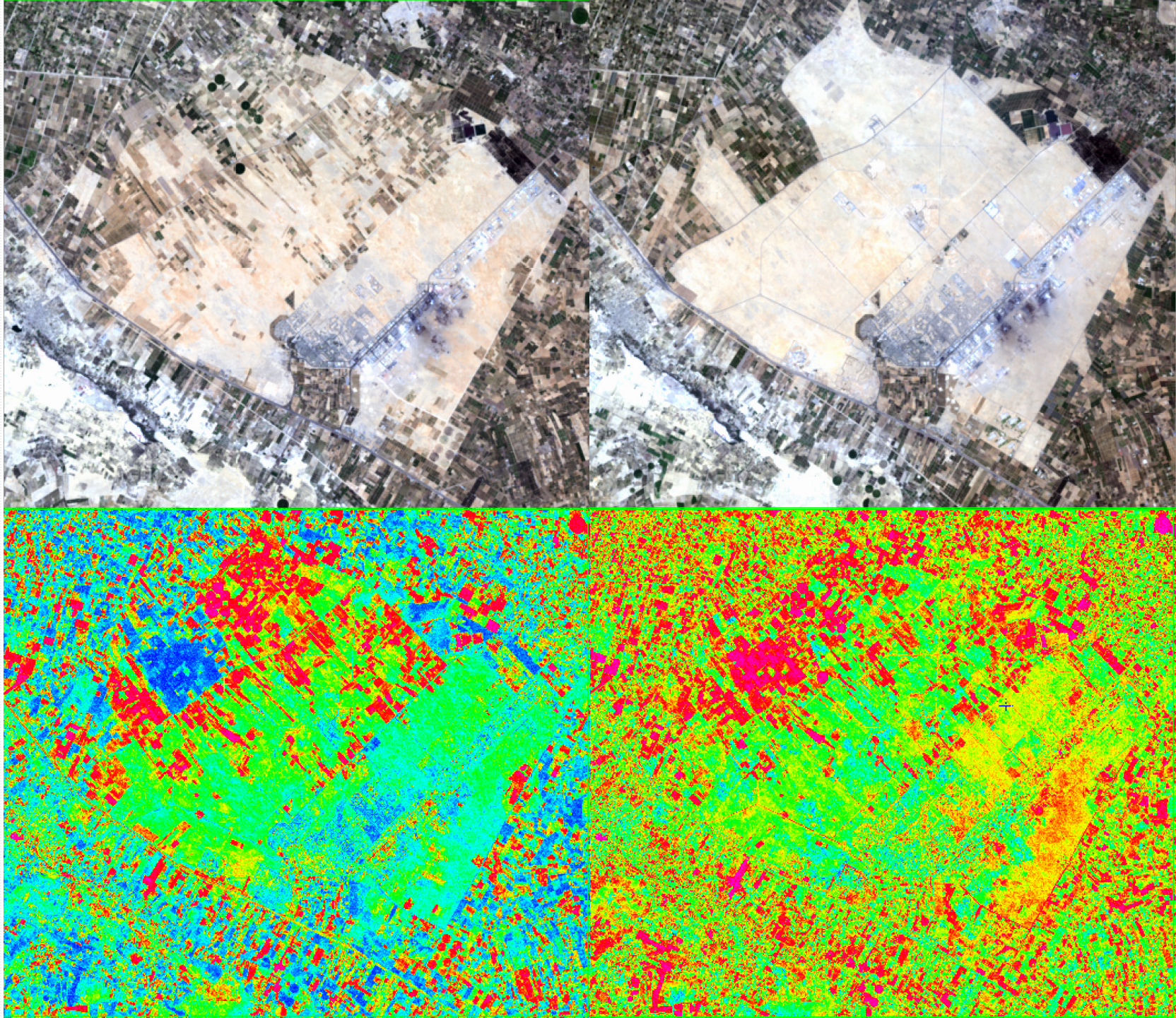


	RGB	Pseudocolor	Grayscale
‘2021’/’2013’			
‘2021’-’2013’			

Change Detection

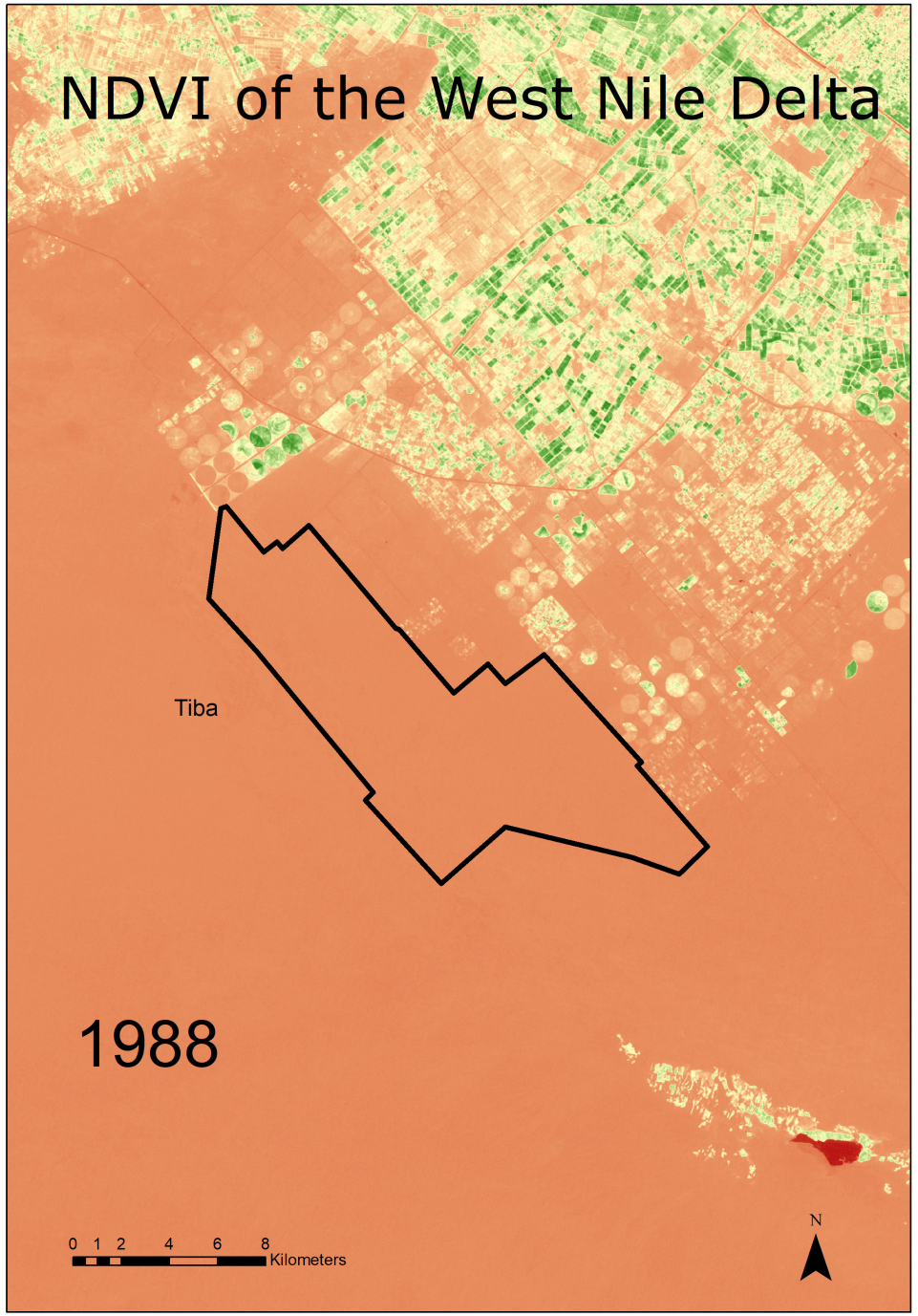
Landsat 8 – Industry

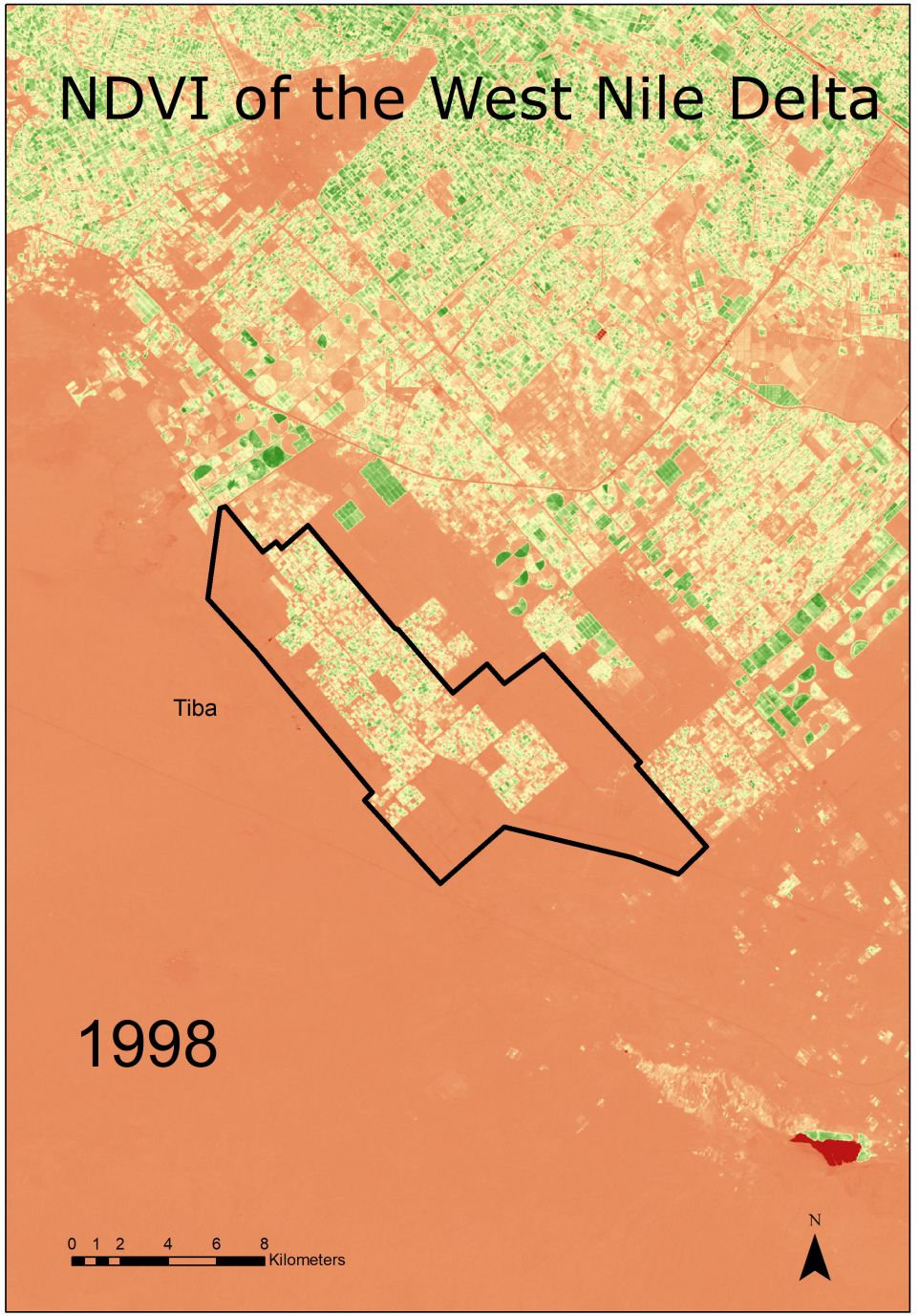
2013	2021
‘2021’/’2013’ Pseudocolor	‘2021’-’2013’ Pseudocolor

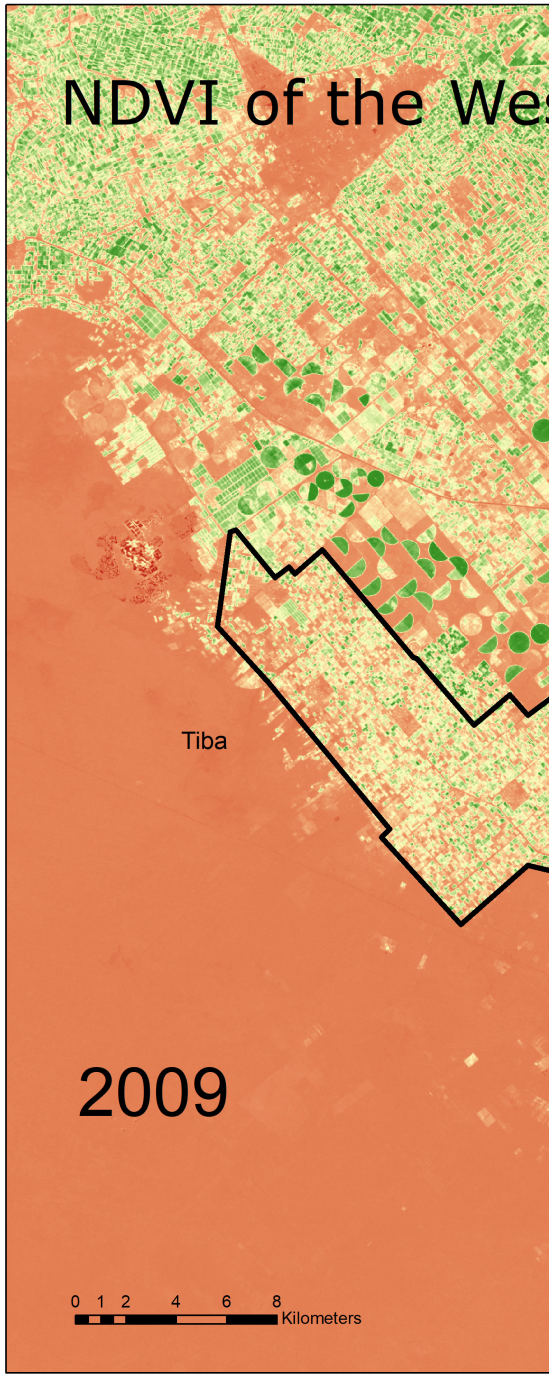


Reference

Radwan, T. M. (2019). Monitoring agricultural expansion in a newly reclaimed area in the western nile delta of Egypt using landsat imageries. *Agriculture*, *9*(7), 137.


NDVI of the West Nile Delta
Tiba
1988
0 1 2 4 6 8
Kilometers
N


NDVI of the West Nile Delta
Tiba
1998
0 1 2 4 6 8
Kilometers
N


NDVI of the We
Tiba
2009
0 1 2 4 6 8
Kilometers


THANK YOU