

Mapping North Africa Soils Using Remote Sensing Methods

Ebenezer Kwanin

Supervisors: Dr Thomas Mayr
Dr Toby Waine

1. INTRODUCTION

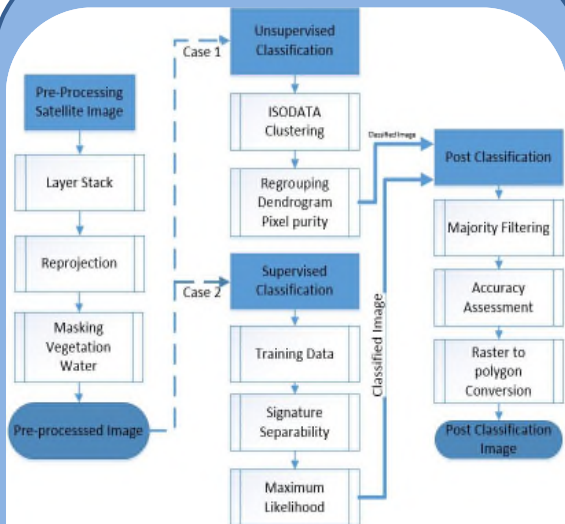
There is currently a desire to improve both the spatial resolution and the thematic content of the existing Global Soil Map for North Africa. Cranfield University is undertaking a contract for the European Joint Research Centre (JRC) to evaluate novel approaches based on remote sensing and digital soil mapping.

2. AIM & OBJECTIVES

This project aims at improving the spatial and spectral details of soils in North Africa for land use management.

- Develop a methodology to update soils in North Africa using coarse resolution imagery and image processing techniques
- Compare the resulting map with existing FAO soil map for North Africa
- Make recommendations for methodology application in whole of North Africa

3. METHODOLOGY



- MODIS data (surface reflectance, NDVI, day and night thermal products) were processed and analysed to map soils.
- Unsupervised ISODATA clustering and Supervised Maximum Likelihood classifications were applied on the data
- Post classification analysis subsequently applied to the classified image



MODIS true colour

MODIS pseudo colour (4-3-2)

4. RESULTS

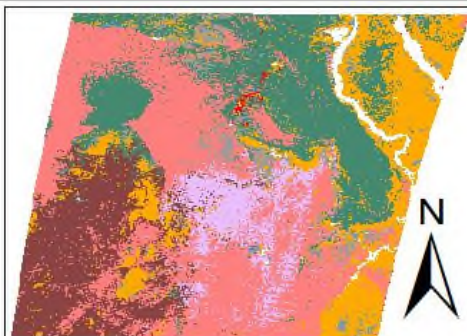


Fig. 1 Supervised classification of soils

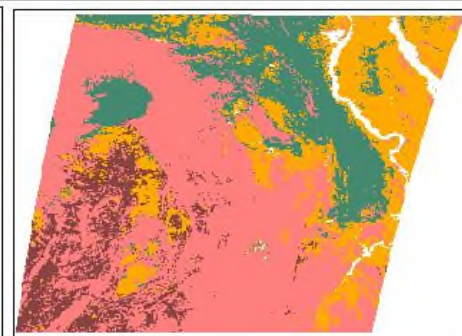


Fig. 2 Unsupervised classification of soils

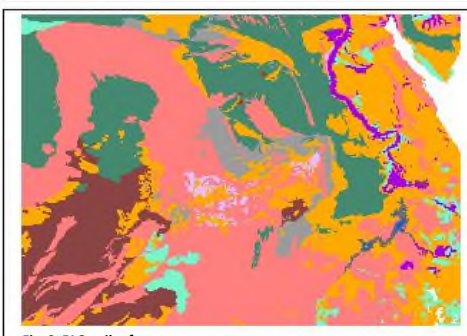
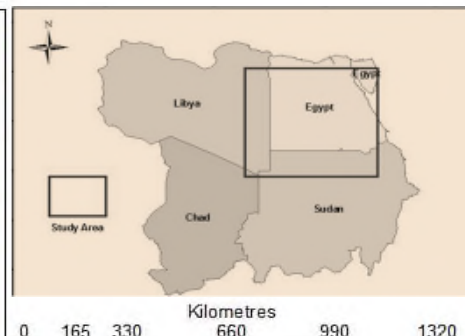


Fig. 3 FAO soil reference



- Supervised classification captured all the classes
- Both supervised and unsupervised classification had a good representation of Arenosols, Calcisols Cambisols and Leptosols
- Fluvisols were not represented in both maps due to their association with vegetation

Table 1: Accuracy Assessment Error Matrix

Soil class	Supervised Classification		Unsupervised Classification	
	Producer Accuracy (%)	User Accuracy (%)	Producer Accuracy(%)	User Accuracy (%)
Arenosols	64.39	76.17	86.95	66.63
Calcisols	71.88	61.48	64.42	59.47
Cambisols	80.38	60.76	50	59.47
Gypsisols	76.2	12.03	-	-
Leptosols	47.39	58.53	58.5	58.41
Regosols	4.23	13.33	-	-
Solonchaks	25.89	36.36	-	-
Vertisols	100	29.63	-	-
Overall Accuracy (%)		60.62	Overall Accuracy (%)	64.4
Kappa(%)		49	Kappa (%)	50

5. CONCLUSION

- MODIS reflectance and thermal products are suitable for updating some soils
- Sand dunes and rocks are easily identifiable on MODIS Imagery
- Unsupervised classification has a better overall accuracy but missed some soil classes
- Methodology can be extended to update North Africa soils if other soil formation factors are considered as input data