



# Status and Needs of Soil Information in Africa

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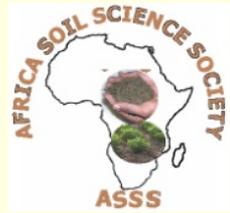
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# About the Africa Soil Science Society

- The ASSS was founded in **1986** as a **non-profit making scientific organization** grouping scientists working in the area of **soil science and application of soil information in Africa**.
- It promotes and fosters Soil Science in all its facets and gives support to regional and national societies.
- The 5<sup>th</sup> ASSS conference organized in Yaoundé in November 2009 was attended by over than 120 participants from 26 countries.
- The next one is being organized in Kenya for early next year



## ABOUT THIS PRESENTATION

- The production and the needs of soil information in Africa.
- Soil information is essential and needed to allocate each land portion to the uses that provide the greatest sustainable benefits



## Production of soil information in Africa

### ■ 3 or 4 generations have marked production Soil Info:

#### 1. Soil Mapping during the colonial period or just after the independencies.

- broader scale: 1:1000 000 to 1:3 000 000
- scale varying depending on the size of the country
- they are available for all the countries
- all these maps are available mostly in **hardcopy**

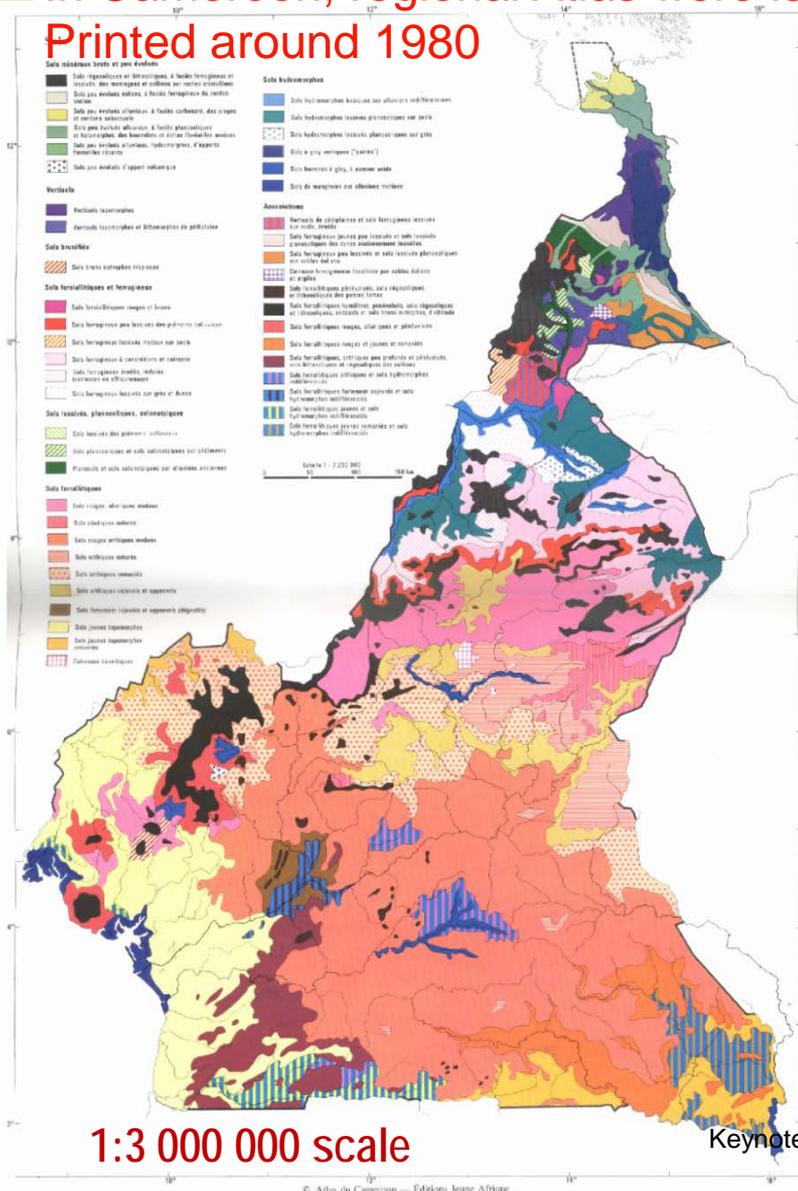
#### **format**

- they are often rare be found in these country but more certainly in:

- Belgium (for RD Congo, Rwanda, Burundi)
- France (IRD) for other French speaking countries
- UK for English speaking countries

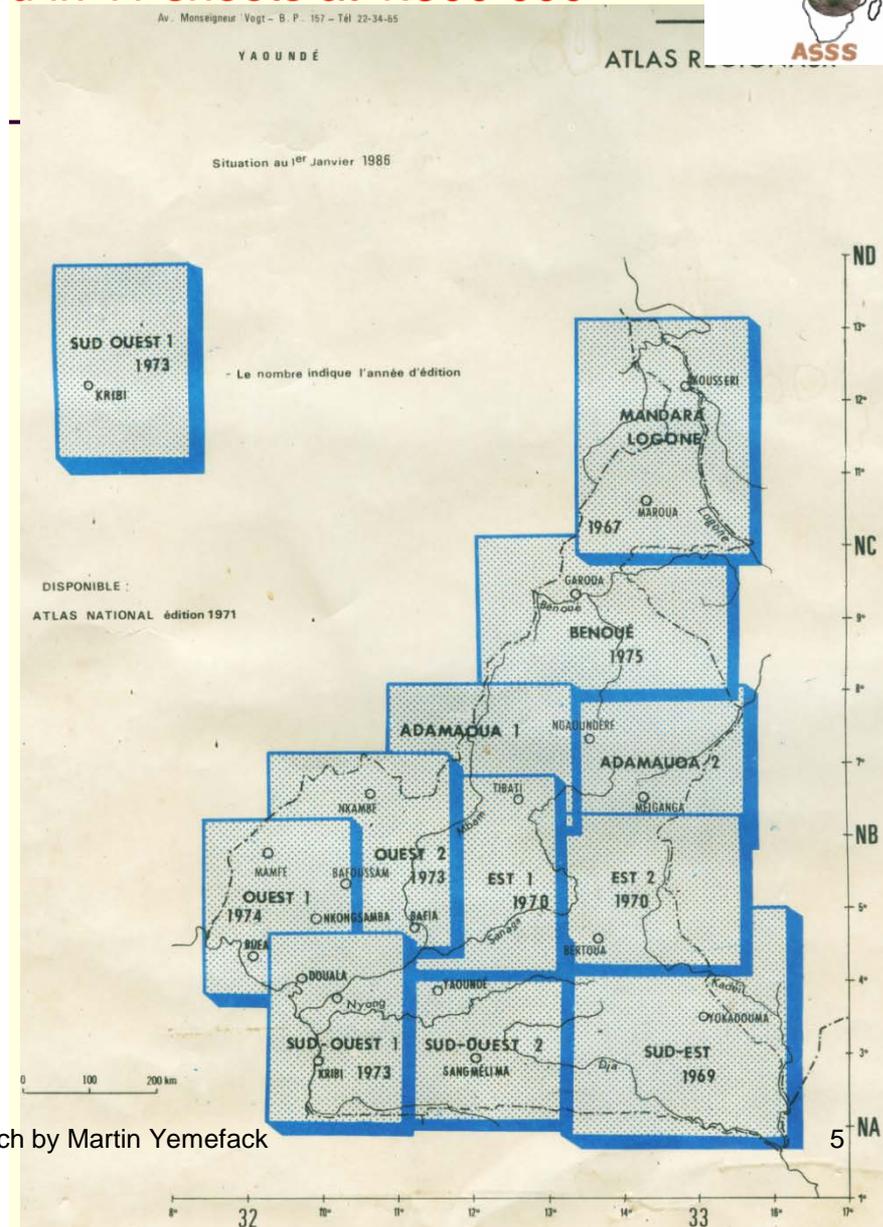
In Cameroon, regional Atlas were issued in 11 sheets at 1:500 000

Printed around 1980

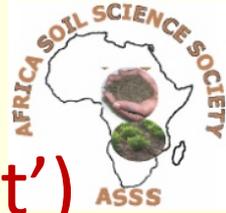


1:3 000 000 scale

Keynote speech by Martin Yemefack



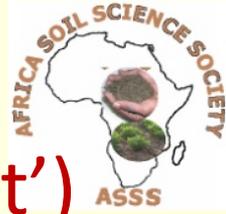
DISPONIBLE :  
ATLAS NATIONAL édition 1971



## Production of soil information in Africa (cont')

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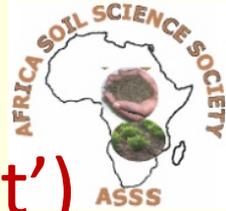
2. Maps issued most recently in **hard and digital formats** are not available in all the countries of Africa.
  - scales are variable from one country to another, but more detailed than the previous maps, but not all the country have done this
  - The Soil Atlas of Africa initiative, with a strong involvement of the ASSS, to be issued in 2012.



## Production of soil information in Africa (cont')

3. The 3<sup>rd</sup> Generation is concerned with the creation of **Soil Databases** from scanned old maps, with **Several International and Regional initiatives**:
- Harmonized World Soil Database
  - SOTER with some country level reports
  - European digital archive on soil maps (EUDASM) for preserving soil data
  - ISRIC database
  - IRD database of scanned maps;
  - Etc.

*However, actual fragmented knowledge on the condition and trend of soils, will not support the implementation of the current policies for intensive agriculture in Africa.*



## Production of soil information in Africa (cont')

### 4. The 4<sup>rd</sup> Generation is concerned with the creation of **Digital Soil Mapping Databases**.

- The Globally Integrated **Africa Soil Information Service (AfSIS)** is one the prime initiative towards a real Digital soil mapping database.

AfSIS is designed to ***Map soil conditions, set a baseline for monitoring changes, and provide options for soil and land management***

➤ Modernizing african agriculture should be based on such database, which is able to use the benefit from technologies developments, to provide accurate prediction of soil properties.

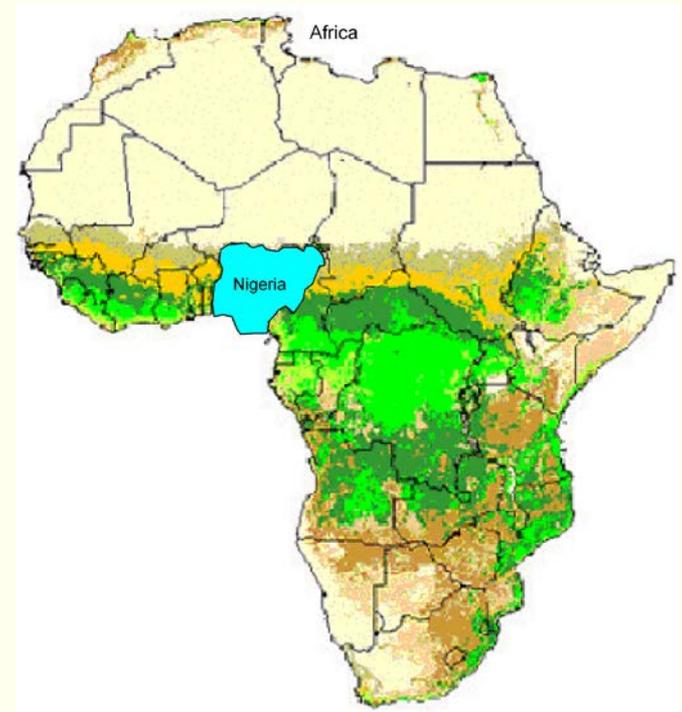


# The Digital Soil Mapping in Africa

- With regards to AFSIS project and in the framework of ASSS, the University of Sydney has organized, in last november, a one month workshop for 6 West African soil scientists to undertake intensive training in digital soil mapping, with the sponsorship of AusAID
- Some more initiative are ongoing to train African young scientist at the University of Sydney, in develop African soil information
- Africans are also working hard to do the job themselves; after all they are the custodians and users of the soil information. Some national initiatives are ongoing, with the example of Nigeria shown below.

# Digital soil property mapping for Nigeria from legacy soil data:

Working towards the first approximation



FACULTY OF  
AGRICULTURE, FOOD  
& NATURAL RESOURCES

Inakwu O.A. Odeh, with contributions from Hannes Reuter, Johan Leenaars, Alfred Hartemink

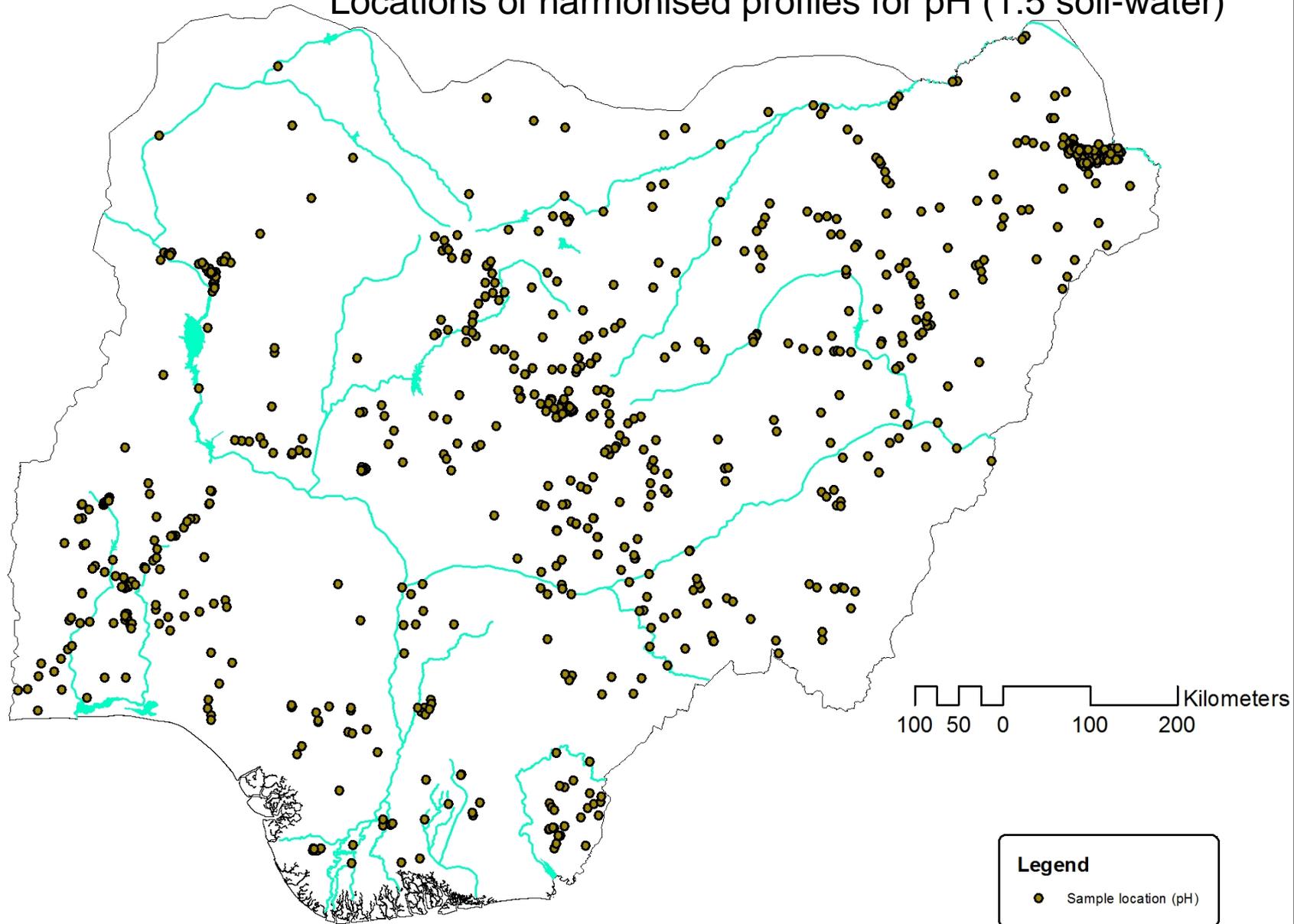


THE UNIVERSITY OF  
SYDNEY



World Soil Information

# Locations of harmonised profiles for pH (1:5 soil-water)



Kilometers  
100 50 0 100 200

**Legend**  
● Sample location (pH)

*N* = 878

# Digital Soil Mapping For Nigeria

Steps in DSM for Nigeria  
(following Rossiter, 2008):

Acquisition and/or transformation  
of covariate data at fine (100m)  
grid & sample location

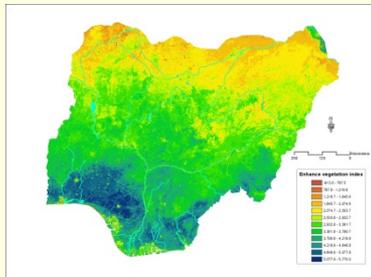
Data archeology-  
locating and  
cataloguing of soil  
legacy data

Data capture- scanning  
and digitisation of  
analogue soil legacy  
data

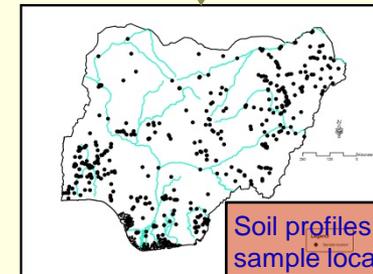
Data renewal-  
transformation of captured  
legacy data into usable  
digital database

Use data mining tool to interpolate a soil  
property at each depth onto the fine grid

$$V_d = f(Q) + e$$



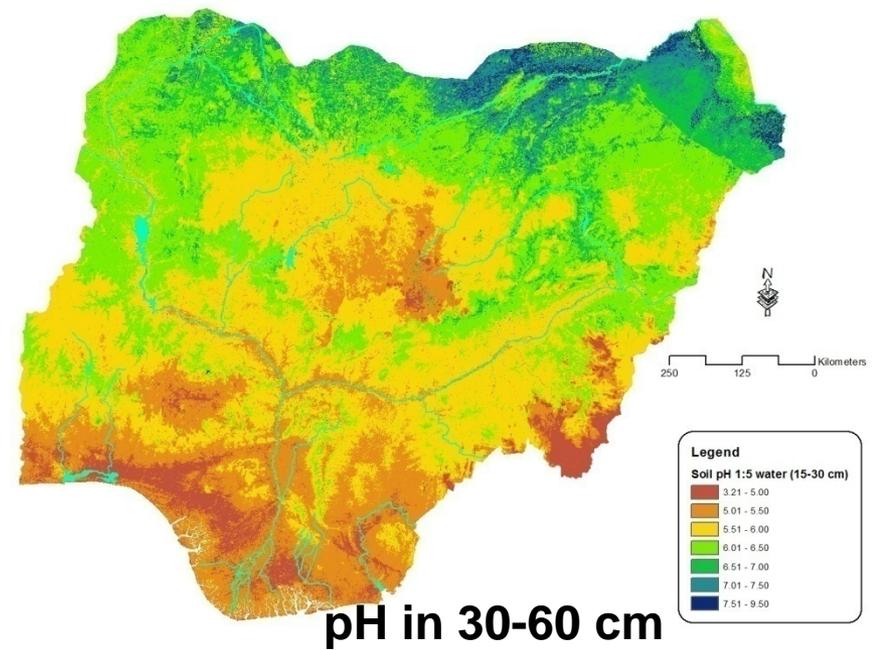
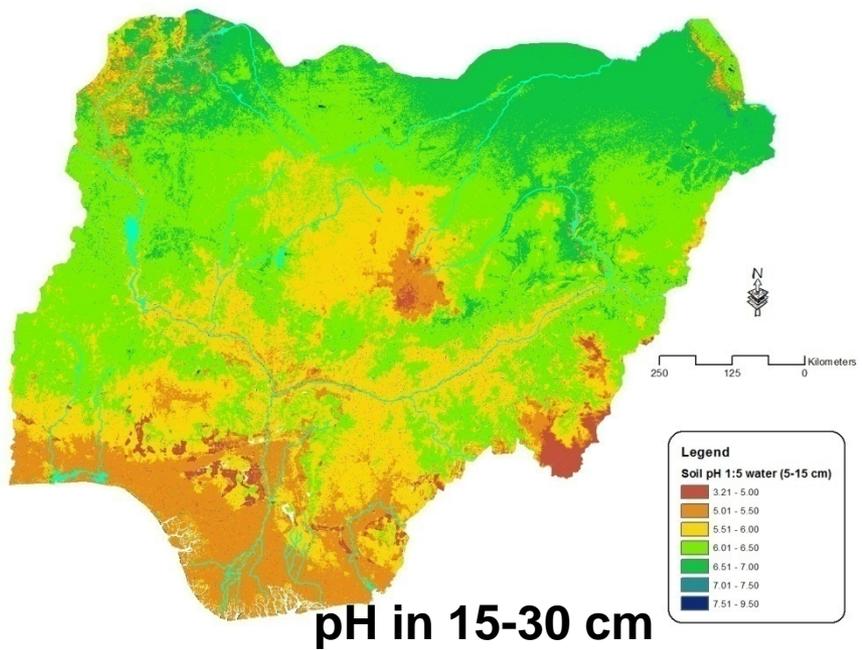
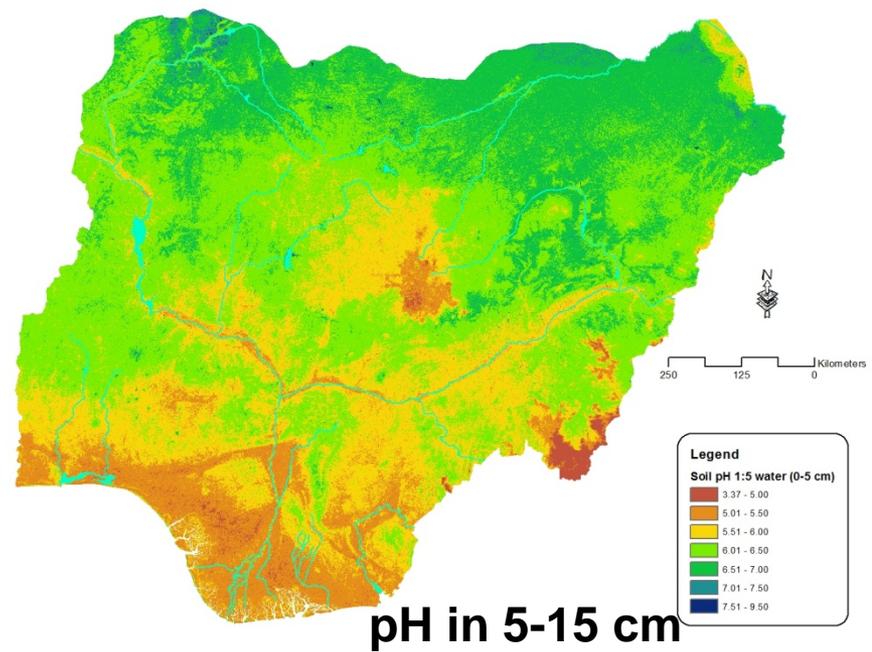
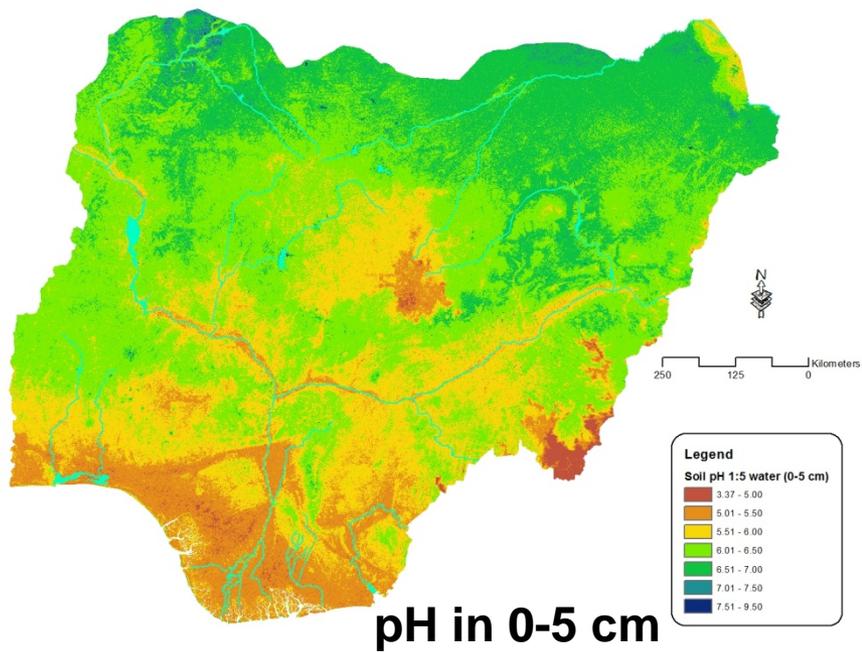
E.g., Digital map (100-m resolution) of a  
target soil attribute at a given depth predicted  
from 572 locations and covariates

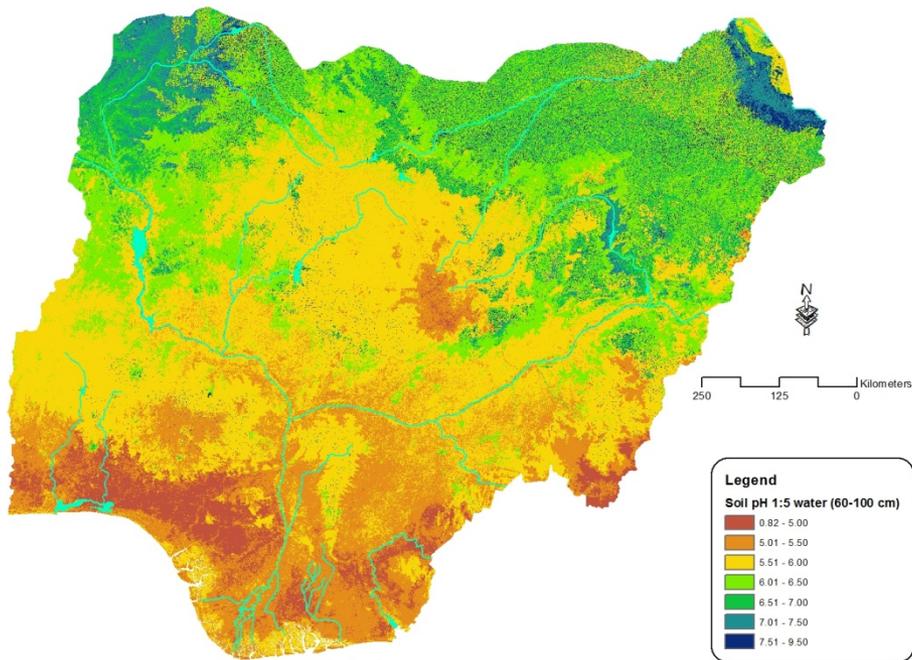


Spline function- fit a spline  
function to each soil profile  
to estimate values at GSM  
standard depths

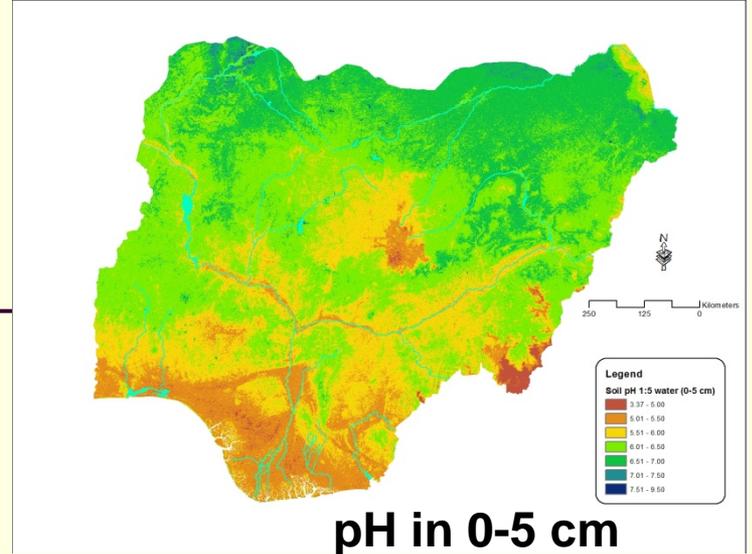
# Digital Soil Mapping For Nigeria

Results for Soil pH in Water

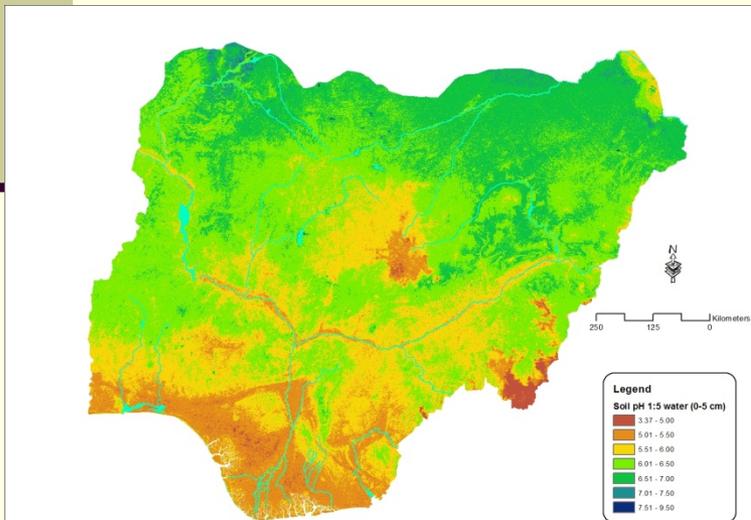




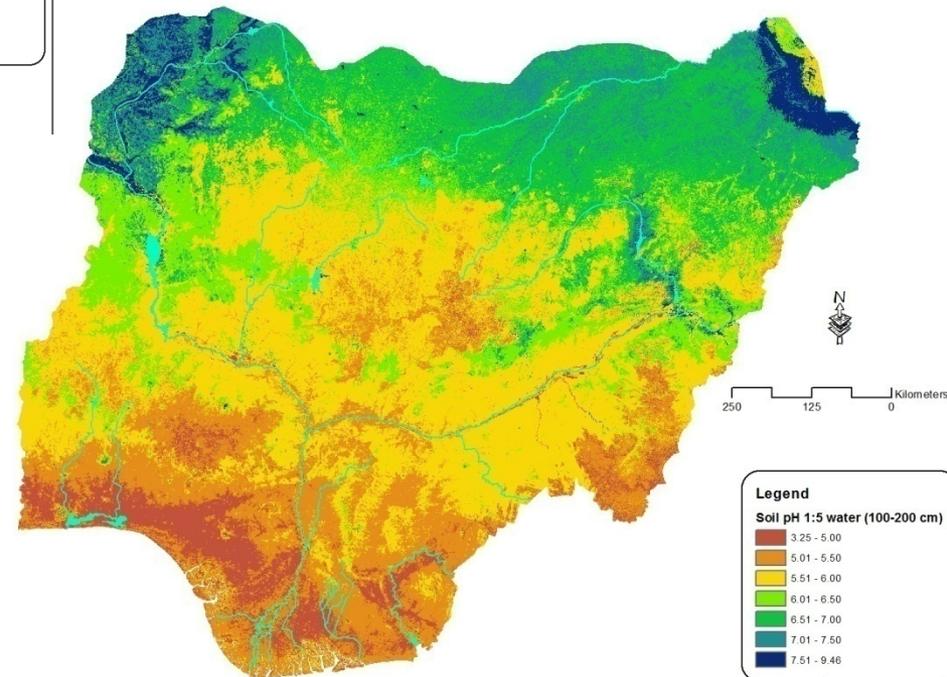
**pH in 60-100 cm**



**pH in 0-5 cm**



**pH in 5-15 cm**



**pH in 100-200 cm**



## The Digital Soil Mapping in Africa (con't): The current AfSIS Project?

➤ AFSIS is really a project for hope in Africa soil science.

However, when looking at the running of this project so far, we, African soil scientists, have had several questions regarding the usefulness and sustainability of such a project in our Continent:

- Why not involve national soil institutions?
- Why not involve national capacities?
- Why not provide capacity development in the continent?
- Why use national soil scientists just as field technicians to collected soil samples in the so-called sentinel sites?
- What is the result so far after 3 years of implementation?
- What are the challenges?
- ..... ?
- What will us, finally gain from such a project?



## Ways forward for African soil information systems

☞ If something is still to be done, we continue to believe that AFSIS project, being able to work at 100 m resolution, is the basis for improving the quality and the delivery of soil information in Africa where they are **growing needs for more accurate data** including:

- information on the distribution of critical soil parameters (pH, OM, soil depth, soil texture, water-holding capacity, etc.)
- degradation/conservation issues
- an overview of the environmental conditions



## Ways forward for African soil information systems

- ☞ For Africa to make good use of produced soil information and to be able to produce more detailed soil information where needed, AFSIS project or any other project within the GSP, should adopt a participatory approach to:
- fully involve regional national soil institutions and national capacities
  - provide capacity development to national scientists who carry out more detailed studies, making better use of fragmented legacy data, to the benefit of something towards precision agriculture in the continent.

N.B: The availability of legacy data from the previous generations of soils surveys in Africa (as mentioned above) is a good opportunity for applying all the requirement of Digital Soil Mapping approaches

- ☹ Additional national initiatives will also the example of Nigeria



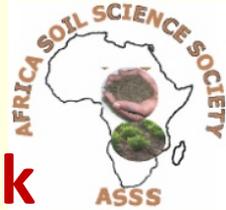
## About the Africa Expertise in soil science

- ➡ **Great Availability of African soil science Experts**
  - **Well-trained at university degree**
  - **Well-experienced through national and international services and institutions**
- ➡ **100s of African Soil Scientists are ready to contribute positively to DSM and agricultural development of Africa**
- ➡ **ASSS, through a strong networking with National and regional soil science societies and in collaboration with international institutions, could interact for a significant input of African soil scientists to the production of Soil Information and Service in Africa**



## About the Africa Expertise in soil science

- ☞ **For ASSS, any soil information initiative in Africa will be an opportunity to:**
  - ✓ Strengthen the capacity of expertise of African soil scientists (training process)
  - ✓ Realize a lobbying towards political institutions in Africa for a better consideration of soil aspects by decision makers
  - ✓ Insure a widespread diffusion, appropriation and information updating of the soil information and usefulness by most African users, through ASSS website and regular ASSS activities.



## ASSS and national SSS in Africa is a strong network

- ➔ **Northern Africa:** Egypt, Morocco, Tunisia, Libya, etc.
- ➔ **Eastern Africa:** (Kenya, Tanzania, Uganda), Ethiopia, Sudan, etc.
- ➔ **Central Africa:** Cameroon, Chad, etc.
- ➔ **Southern Africa:** South Africa, Zambia, etc.
- ➔ **Western Africa:** Nigeria, Ghana, Senegal, Burkina Faso, Ivory-Coast, Benin, Sierra Leone, etc.



## The ASSS within the framework of collaborative initiatives

Finally, ASSS highly support all the collaborative initiatives such GSP, and is ready to work with all, for enlightening the relationship between soil and society, and to help create the conditions for Africa soils, in their diversity, to fulfil their various functions and play a full role in food production and environment conservation, which are indeed, factors of peace and stability.

**Thank You for  
your kind attention**