Forest Measurement in the Tropical Rain Forests of Nigeria

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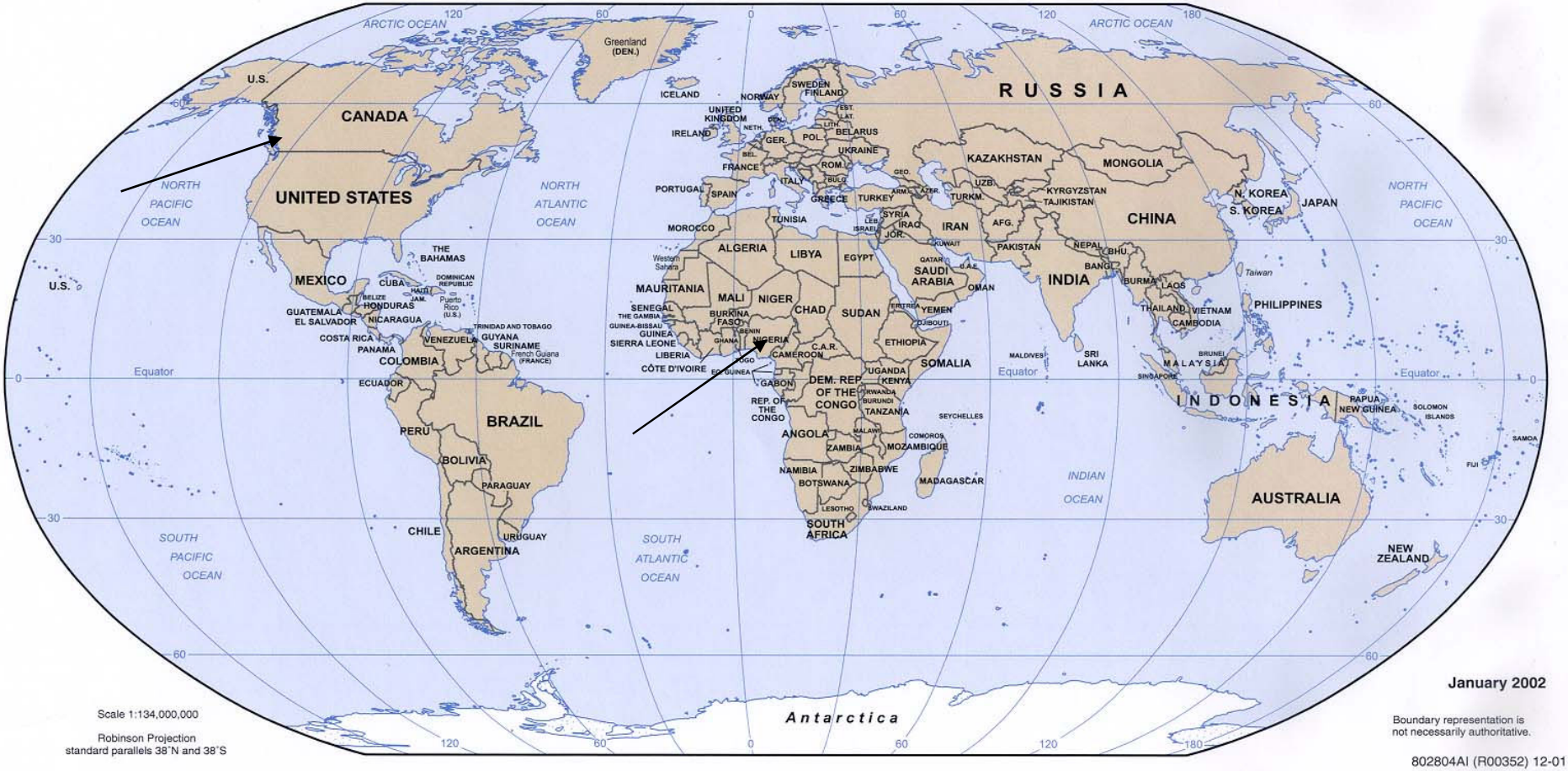
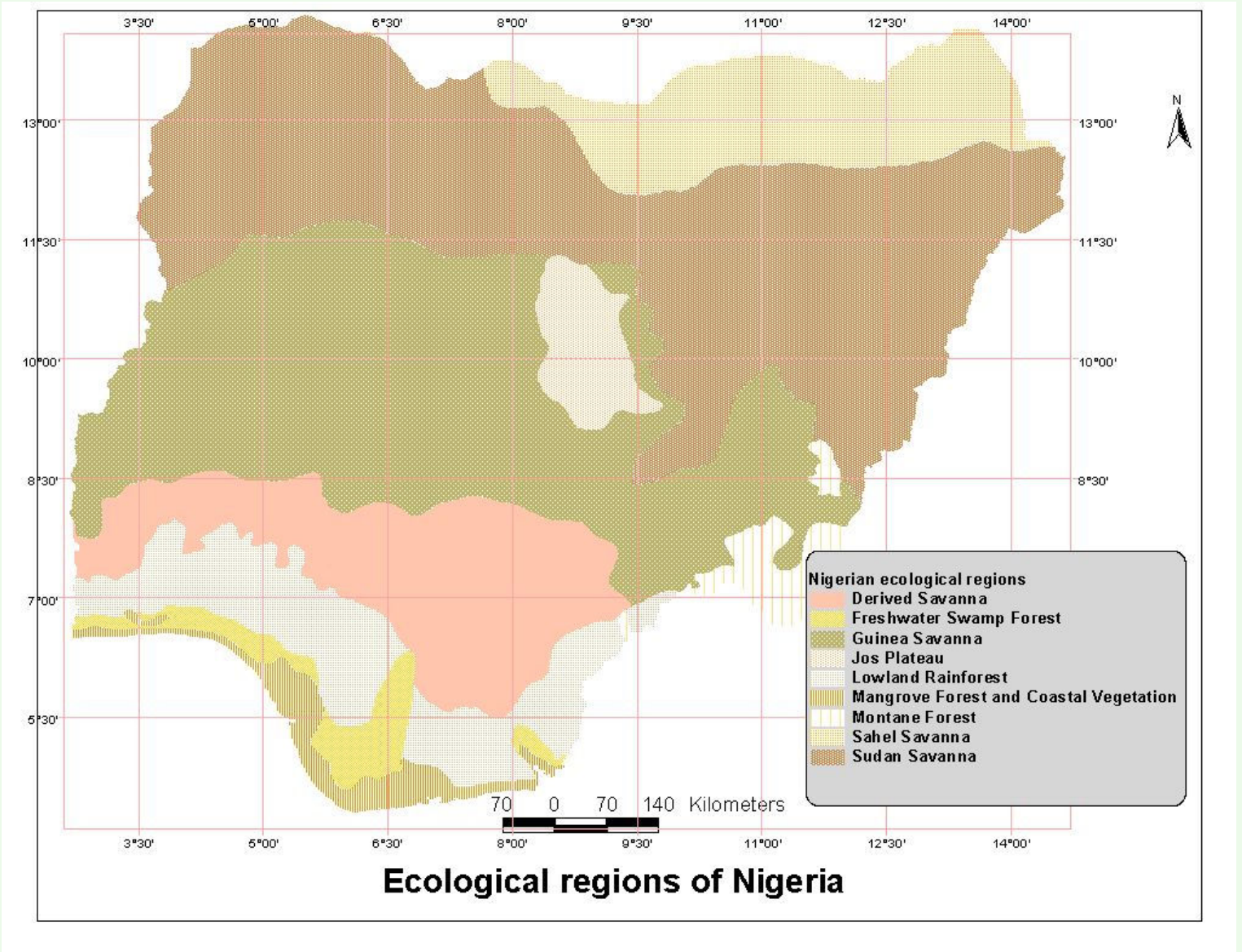


World Map with arrows pointing to the location of Canada and Nigeria


20°0'W
10°0'W
0°0'
10°0'E
20°0'E
30°0'E
40°0'E
50°0'E
60°0'E
70°0'E
40°0'N
30°0'N
20°0'N
10°0'N
0°0'
10°0'S
20°0'S
30°0'S
Nigeria
Map of Africa
showing Nigeria

Some facts about Nigeria

- Lat. 4°16'N & 13°52'N; Long. 2°49'E & 14°37'E;
- Total Land Area = 923,768 km^2 (BC = 947,800 km^2);
- Highest Elevation = 2,419 m (BC = 4,663 m);
- Population = 137 million (Canada $\approx$ 33 million);
- Forest Cover $\approx$ 10% of land area (Canada = 50%);
- Plant diversity: Over 4,600 plant species identified (Ranked 11th in Africa);
- The forests have over 560 tree species (with a range of 30 to 70 species per hectare for trees $\geq$ 5 cm dbh).


3°30'
5°00'
6°30'
8°00'
9°30'
11°00'
12°30'
14°00'
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11°30'
10°00'
8°30'
7°00'
5°30'
N
Nigerian ecological regions
Derived Savanna
Freshwater Swamp Forest
Guinea Savanna
Jos Plateau
Lowland Rainforest
Mangrove Forest and Coastal Vegetation
Montane Forest
Sahel Savanna
Sudan Savanna
70 0 70 140 Kilometers
Ecological regions of Nigeria

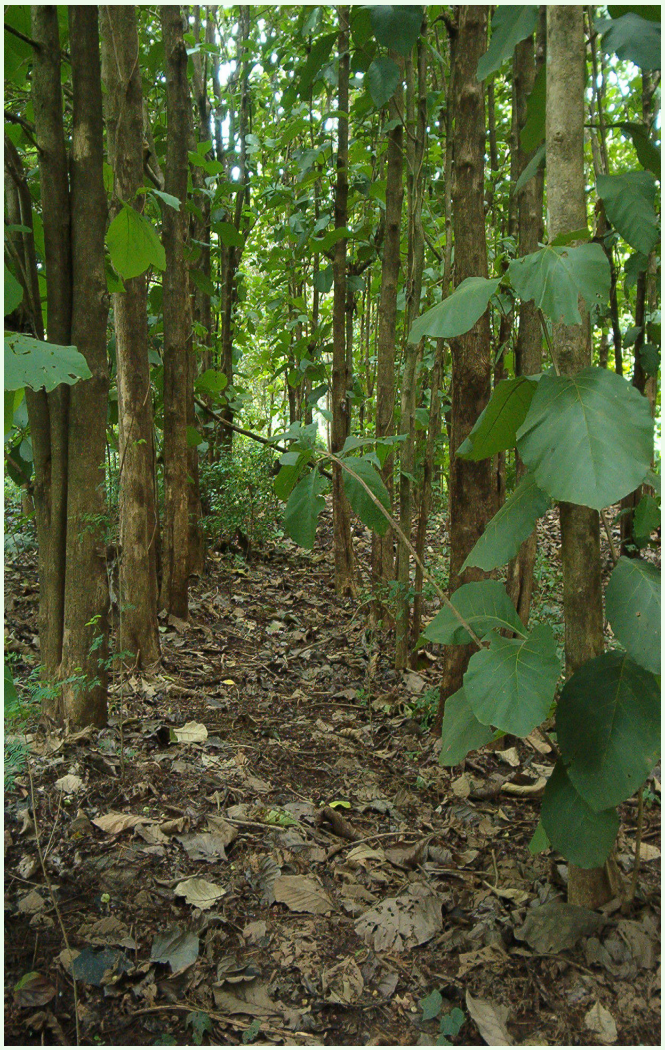
Forest Types in Nigeria

Natural forests:

- Uneven-aged, with small trees more frequent than large trees;
- Low density of commercially utilisable trees;
- Characterised by high species diversity;
- Irregular stand structure;
- MAI = 5m^3/ha/yr (All species); 3.7m^3/ha/yr (Commercial species);
- Many species have buttresses of various sizes, and sometimes the buttresses extend higher than the breast height point (1.3m);
- Undergrowth may be sparse or dense.

Forest Types in Nigeria

Plantations:



- Mostly monocultures, even-aged;
- More of fast-growing exotic species;
- Gmelina and Teak occupy about 60% and 25% of total plantation area, respectively;
- Mean annual increment of about 25 m^3/ha for Gmelina plantations;
- Planted at espacement of 2.4 m x 2.4 m;
- Closes canopy at 18 to 24 months after planting;
- Thinned at 7 years; harvested on a 15-year rotation when dbh would have reach at least 60 cm.

Sampling techniques

For Natural forests

Systematic sampling

- Plot layout varies between temporary sample plots and permanent sample plots.
- Plot size is 50m x 50m for TSPs. It varies for PSPs (Max. = 1ha).

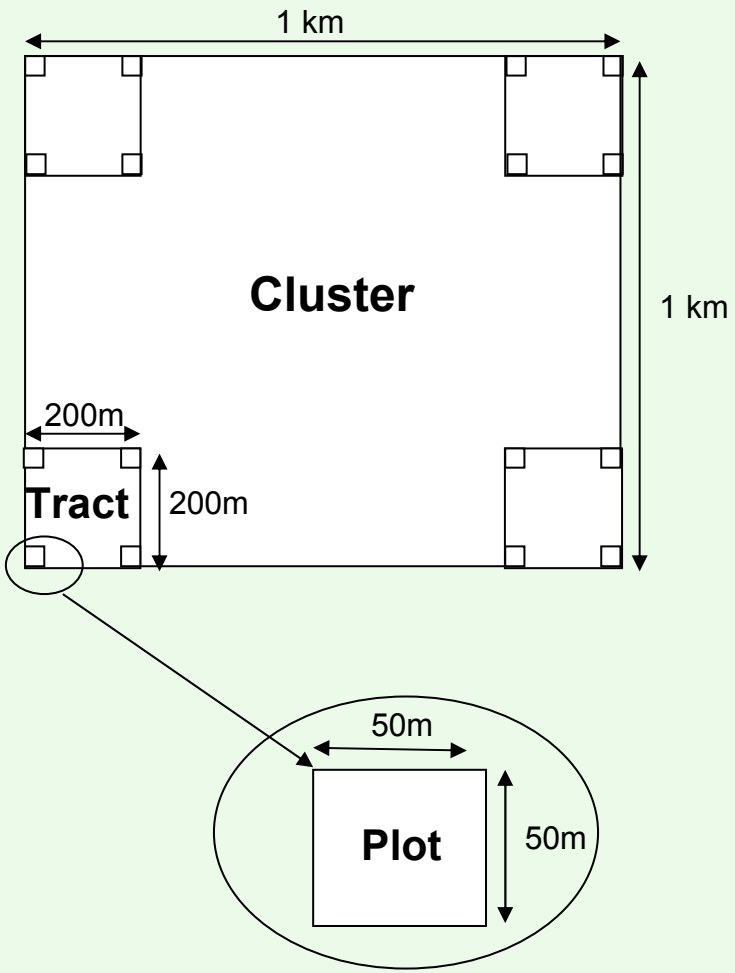
For Plantations

Stratified Random Sampling

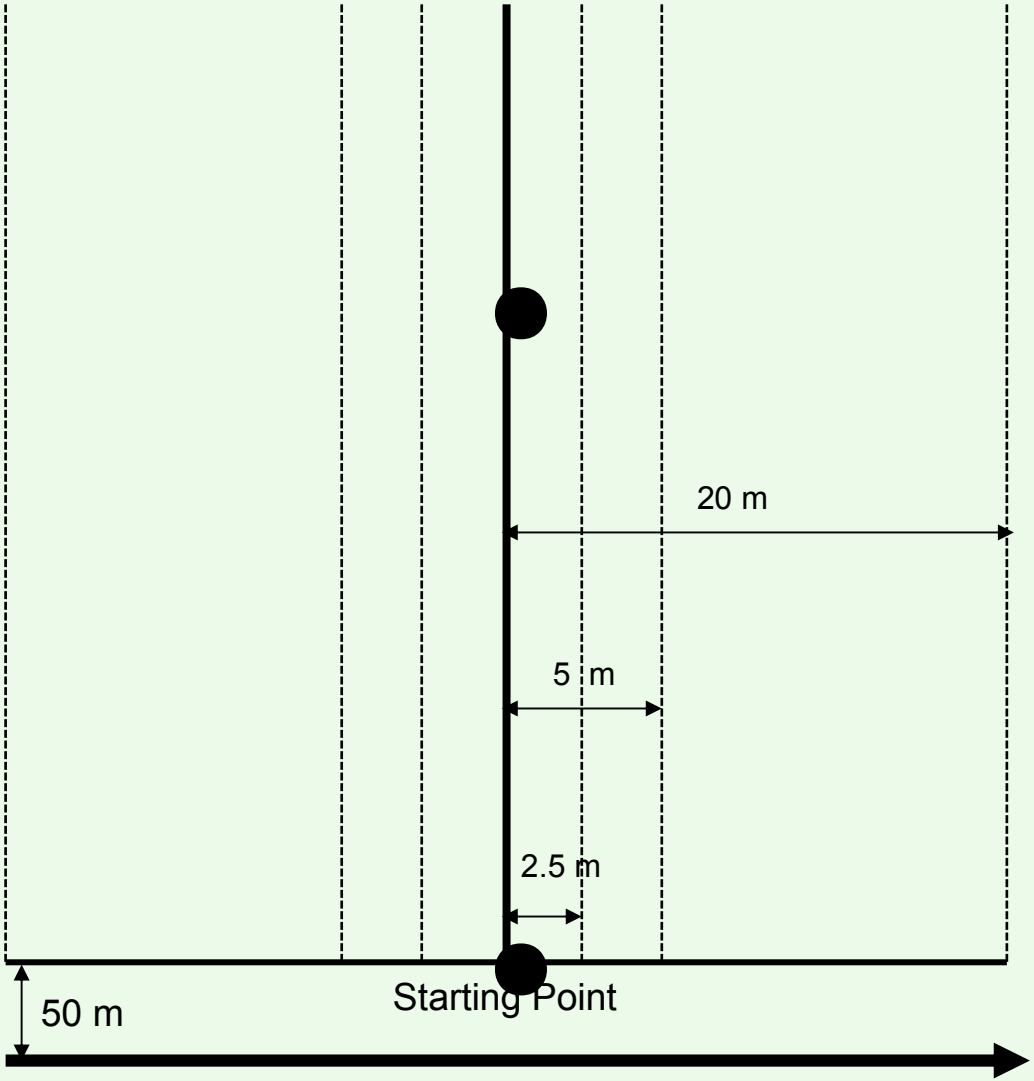
- Stratification based on species and age;
- Square plots (0.01ha, 0.04ha, 0.0625ha).
- For a single species stand with the same age, simple random sampling is used.

Layout for the natural forest sample plots

- Sampling units with an area of 1km^2 each;
- Each unit consists of 4 tracts (200m x 200m each) at each of the four corners;
- Plots of 50m x 50m were laid at the four corners of each tract.



Layout of a Permanent Sample Plot



Measurement of various size classes was restricted to areas within different distances from the centre line, viz: 5 - 20 cm dbh to 2.5 m either side the centre line, 20 - 40 cm dbh to 5 m either side the centre line, and over 40 cm dbh to 20 m either side the line.

From the starting point, concrete pillars numbered sequentially were erected at 50 m intervals along the centre line.

Constraints to forest measurements in the tropics

- High biodiversity, requiring taxonomists for species identification;
- Difficult terrain and dense undergrowth, resulting in much time spent in plot location than in actual enumeration;
- Lack of field equipment;
- Presence of dangerous animals; enumerators face high risk;
- Lack of funds (Field measurement is very expensive).

Constraints to the use of aerial photographs

- Individual species recognition is difficult;
- Extent of crown cover for individual tree difficult to determine;
- Height estimation is difficult since the ground level is not visible in most cases;
- Information on relationship between crown characteristics and dbh is not available for many species.