

Evaluation of Agronomic Practices on Growth, Yield of Cassava and Physical Properties of Soils in Southwestern Nigeria

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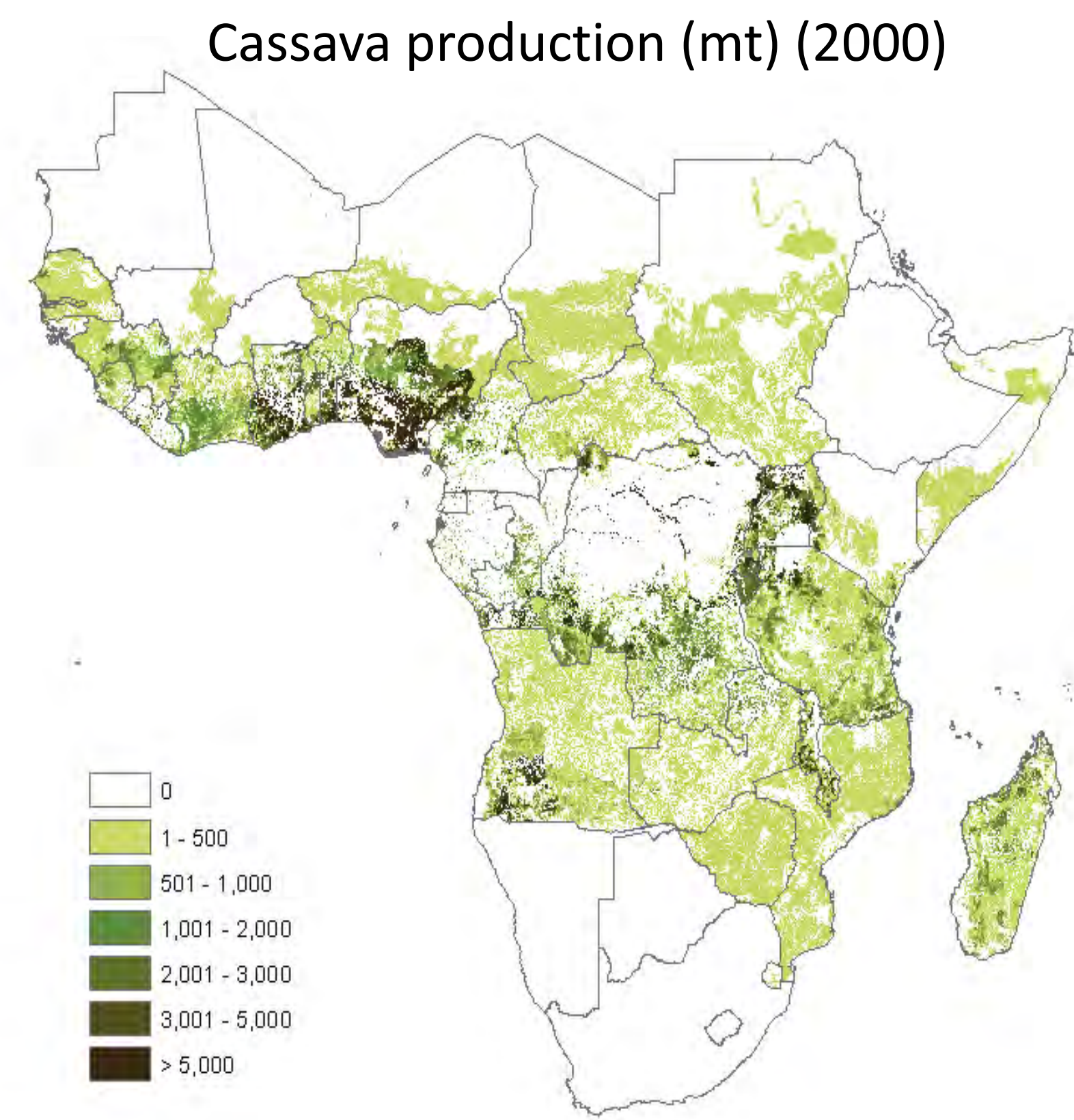


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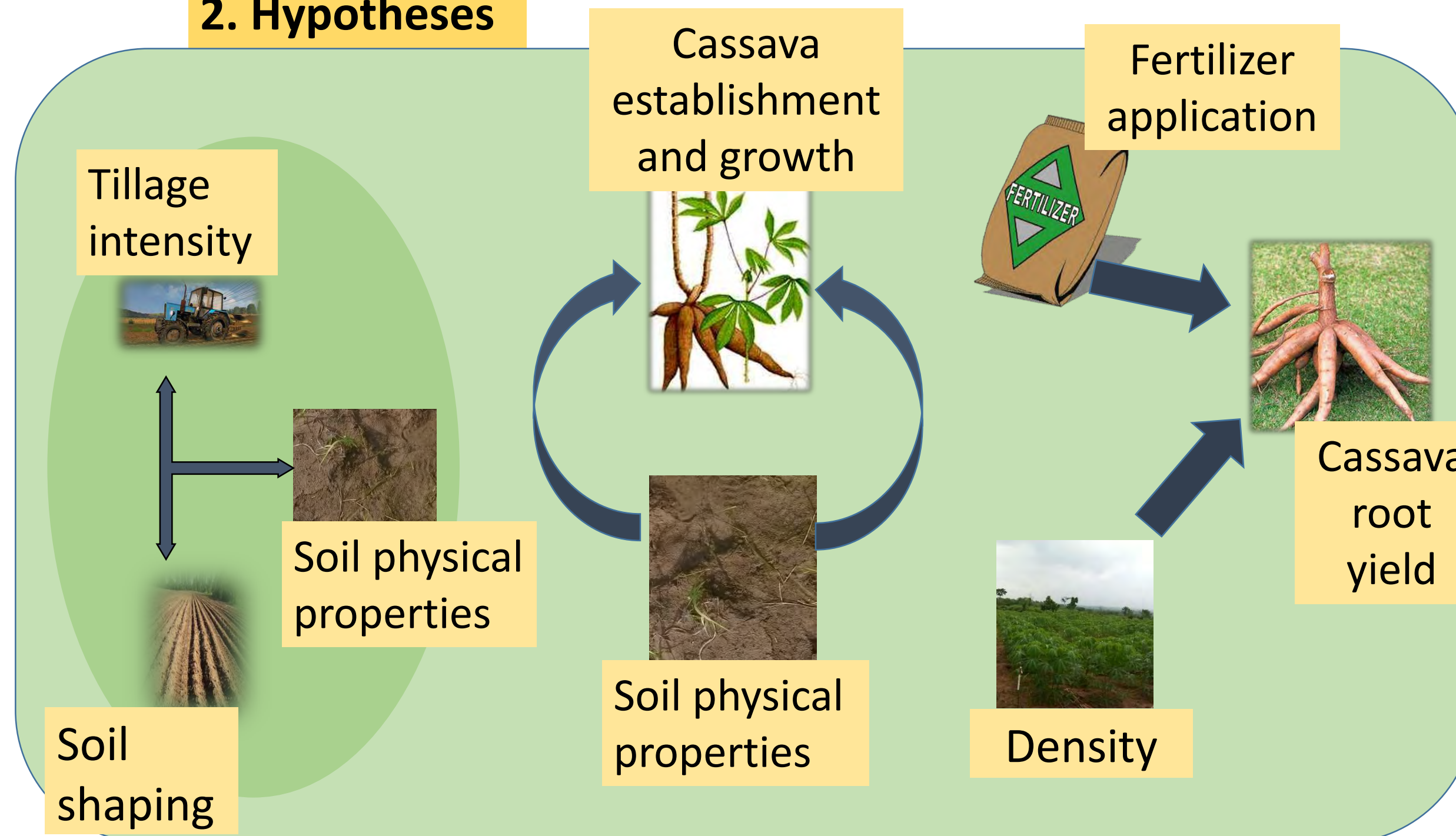


1. Background Information

Cassava (*Manihot esculentus* Crantz) is a main food crop that constitutes 50% of the food intake in Sub-Saharan Africa. It is a crop that is also used in industries as raw materials (starch, alcohol and livestock feed to mention a few). The drive for increased revenue by government from the export of cassava led to a great need to increase cassava production in Nigeria (Odedina et al, 2012). Interestingly, Nigeria is the largest cassava producer in the world (Figure 1), but still not attaining the potential yield as productivity per unit of area is low (10-15 t ha⁻¹). The major cause of this is low soil fertility driven by poor agronomic practices and imbalance of nutrients between soil inputs and crop output (Borin & Frankow-Lindberg 2005). It is known that the growth, root yield quality and quantity of cassava depend largely on planting practices (tillage intensity, planting density, fertilisation etc.). However, there is a paucity of knowledge on how these practices affect the cassava yield and soil functions.



2. Hypotheses



3. Objectives

- ❖ Determine the effect of different levels of tillage intensity (double, single and zero tillage) and ridging on soil physical properties
- ❖ Investigate the relationships between soil physical properties (as modified by tillage) and cassava establishment, growth and root yield
- ❖ Investigate and establish if positive interactions exist between tillage intensity, density and fertilizer application on growth and root yield of cassava

Figure 1: Cassava production in Africa (You et al., 2000)



4. Experiment setup

- ❖ The farmer's field will be selected based on demand based approach of ACAI (Figure 2) within Oyo and Ogun State of Nigeria
- ❖ A RCBD experiment will be established on selected farmer's field with 4 factors in a split - split plot arrangement (Figure 3 and 4)
- ❖ Factors are tillage intensity (zero tillage, single vs double ploughing); soil shaping (flat vs ridging); plant density (10,000 vs 12,500 plants ha⁻¹) and fertilizer application (0 vs 75, 20, 90 kg ha⁻¹ of N, P and K)

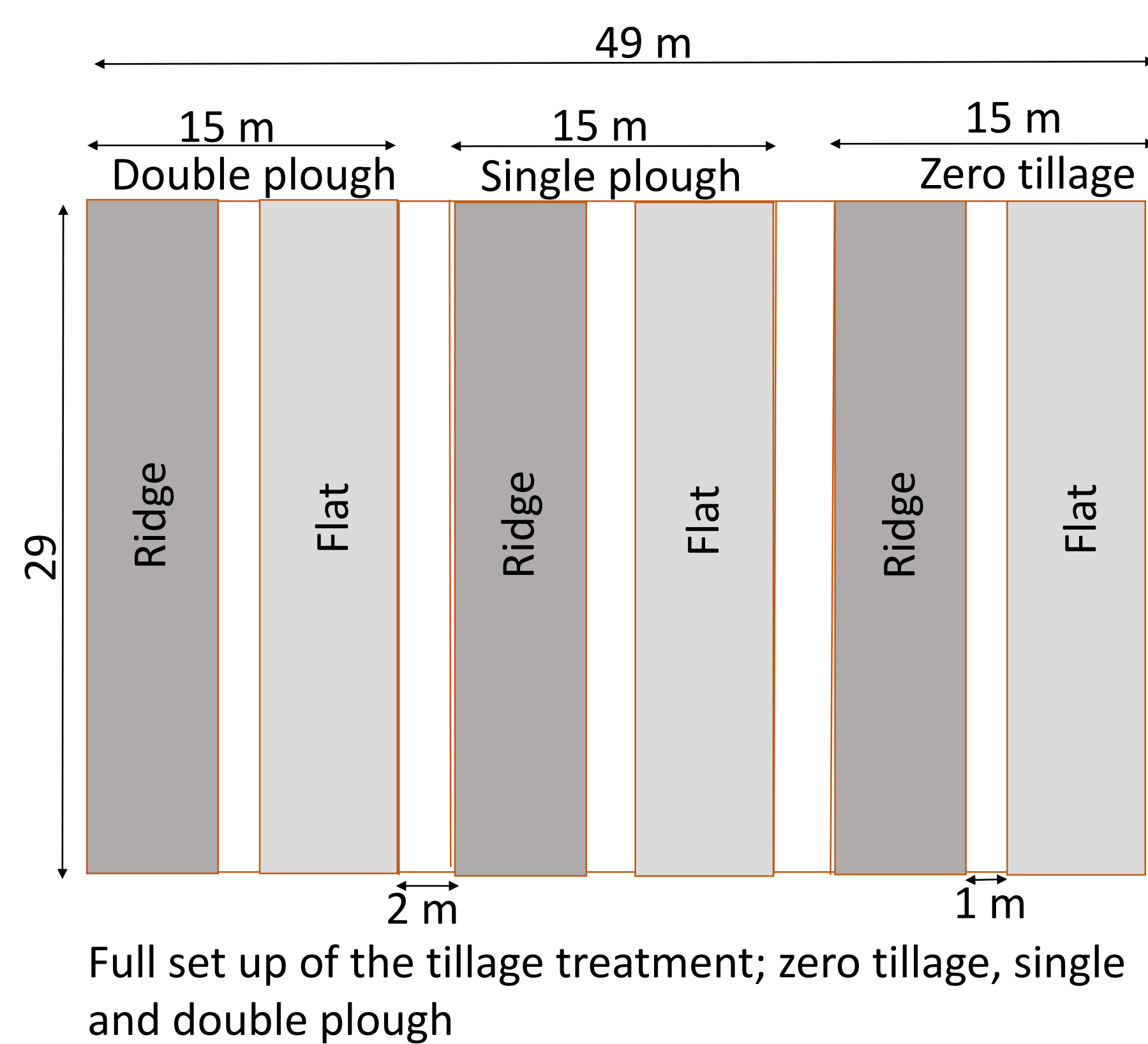


Figure 3: Split-split plot design of the experiment where tillage treatment is the main plot, soil shaping is the sub plot, planting density is the sub-sub plot and fertilizer application within plant density

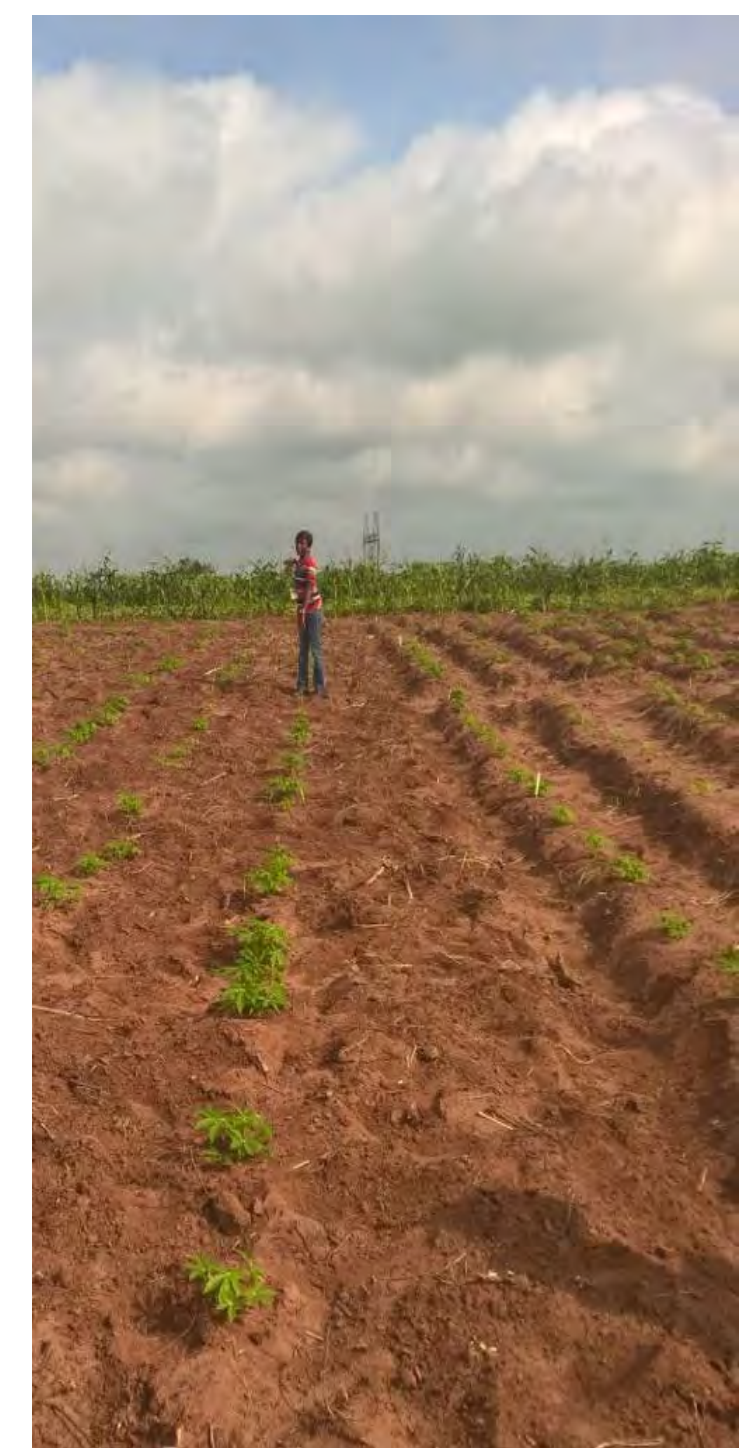
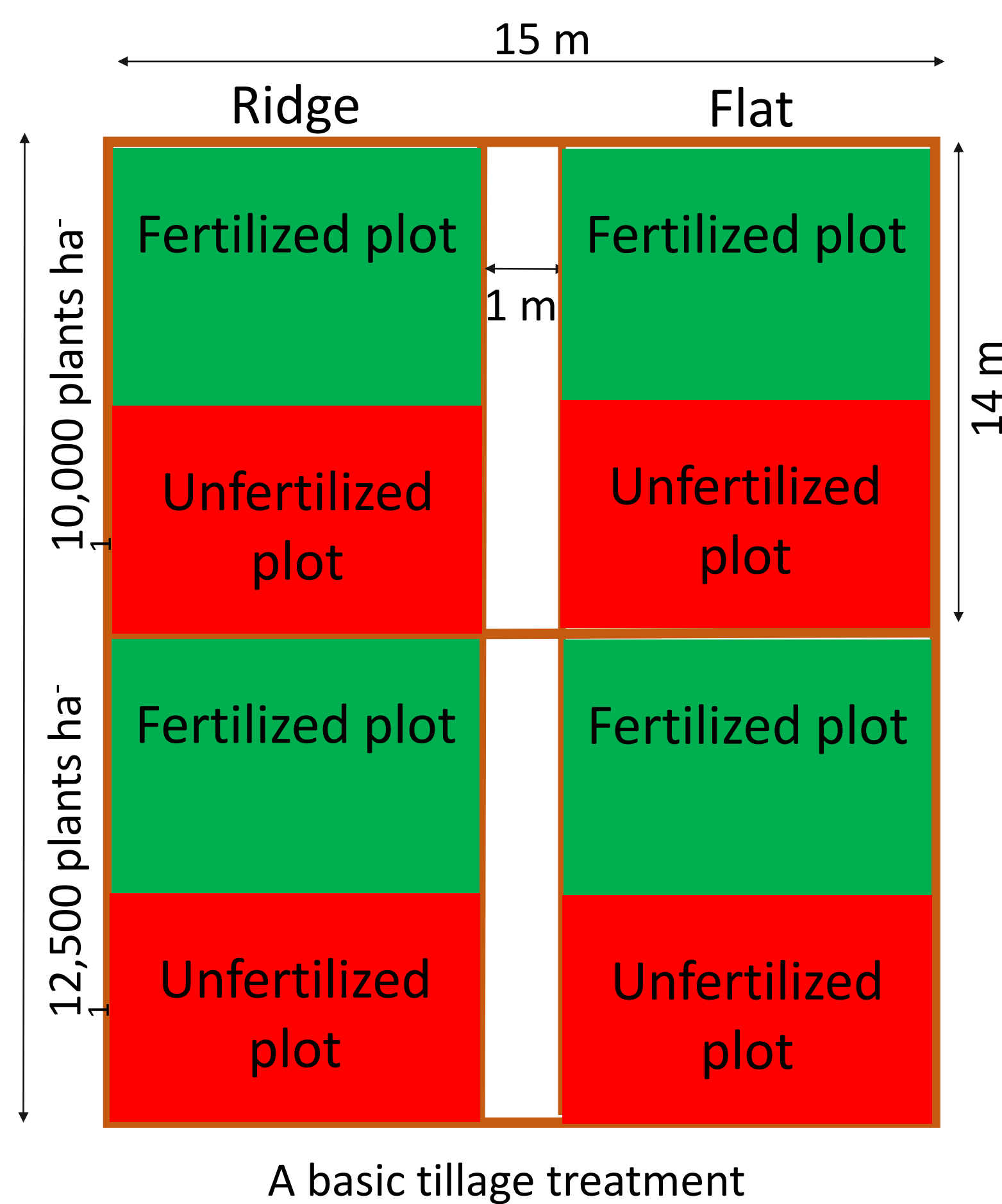


Figure 4: Soil shaping by ridge (right) or flat (left)

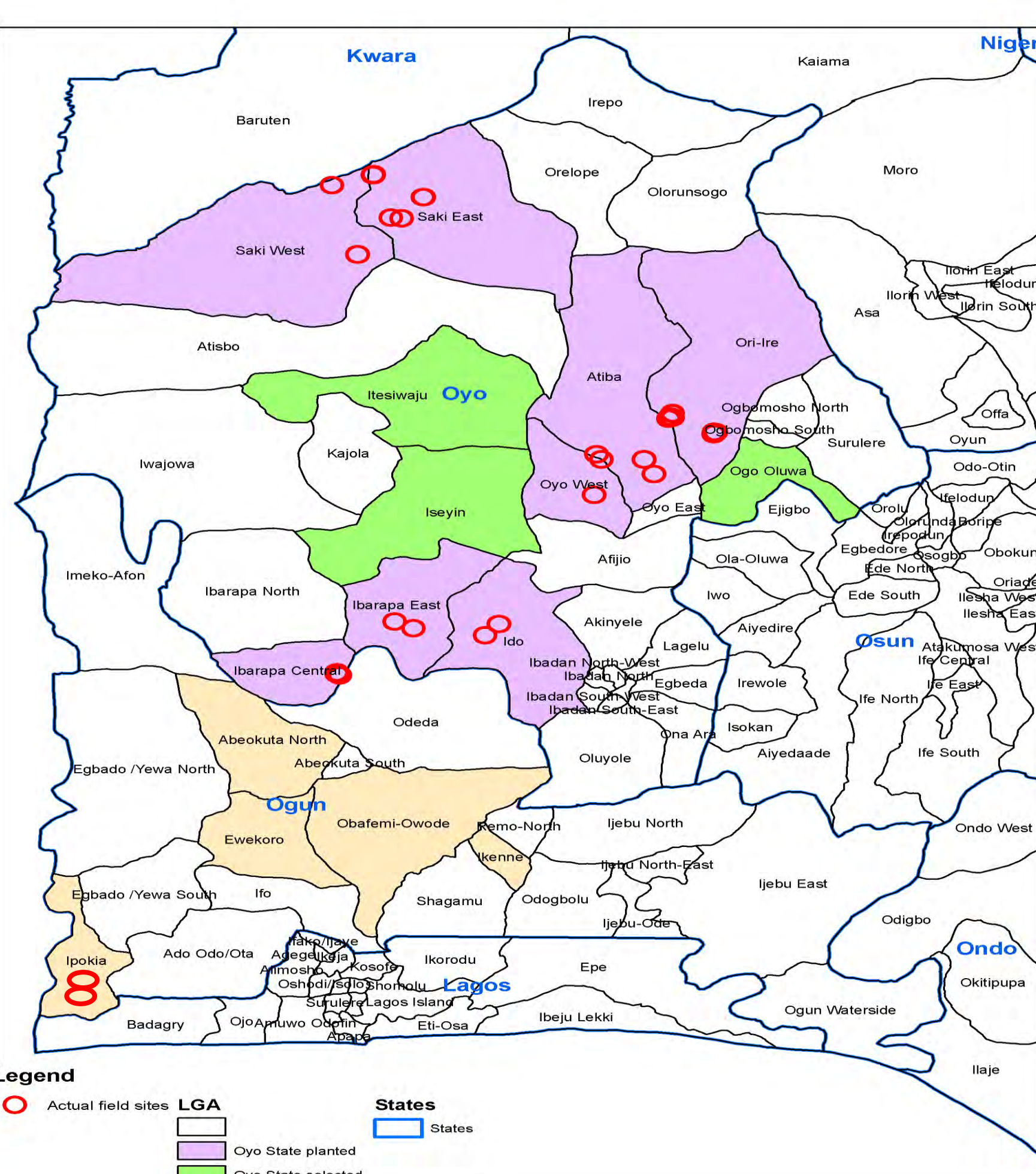


Figure 2: Farmer's fields selected within Local Government Areas in Oyo and Ogun States of Nigeria are indicated by red circles

5. Observations over two growing seasons 2017-2019

Task 1: Trials to evaluate and quantify the effect of tillage (zero, single and double ploughing) and ridging on soil physical properties

Monthly measurements:

- ✓ Penetration resistance
- ✓ Infiltration rate
- ✓ Soil moisture content
- ✓ Matric potential
- ✓ Soil temperature
- ✓ Bulk density

Pre and post planting measurements

- ✓ Particle size distribution
- ✓ Clay dispersion ratio
- ✓ Aggregate stability

Task 2: Unravel the relationships between soil physical properties (as modified by tillage) and cassava establishment and growth

2 weeks after planting:

- ✓ Cassava sprout count
- Monthly measurements:**
- ✓ Plant height
- ✓ Stem girth
- ✓ Number of leaves
- ✓ Number of main stems

Task 3: Investigate and establish if positive interactions exist between tillage intensity, density and fertilizer application on growth and root yield of cassava

At harvest (48 weeks after planting):

- ✓ fresh root weight
- ✓ dry root weight
- ✓ root length
- ✓ root girth
- ✓ number of root/plants

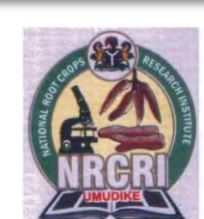
6. Expected Outcomes

- Agronomic practices that enhance high soil productivity leading to maximum and sustainable cassava root yields
- Site specific agronomic recommendation for farmers and development partners

Task 1

Task 2

Task 3



7. Acknowledgements

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8. References

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