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Black Soils and Landuse in Indonesia

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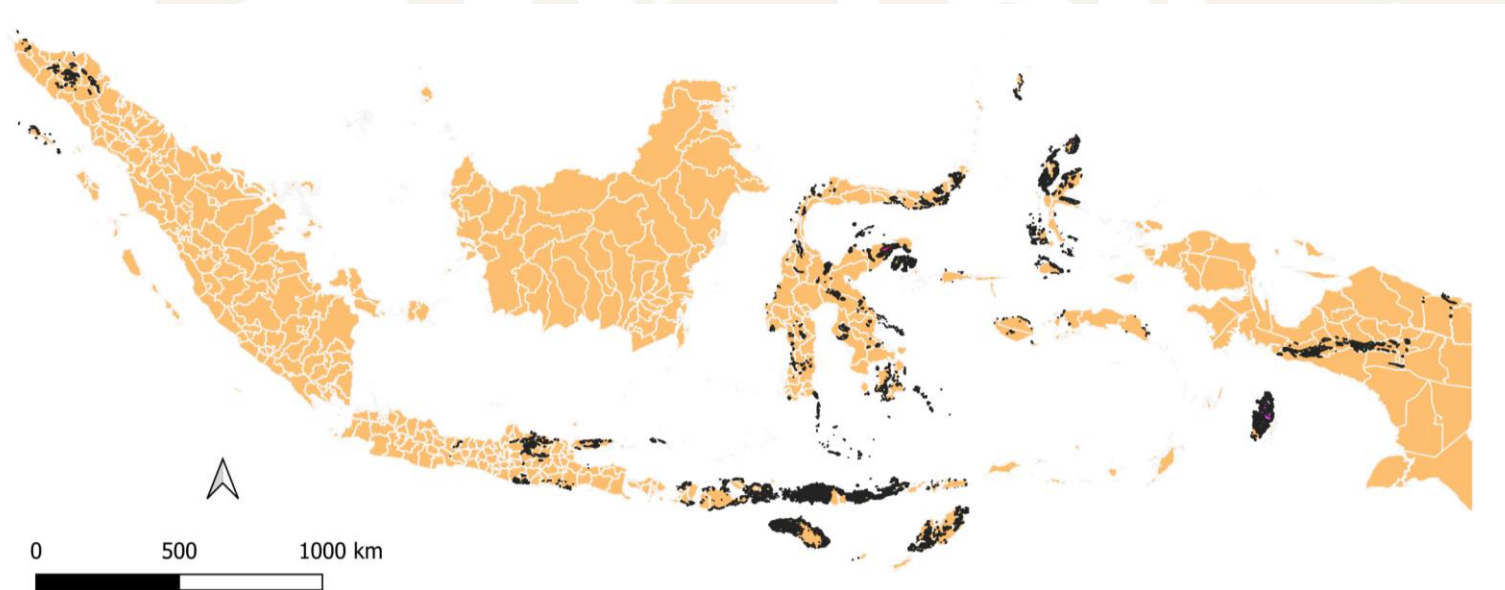
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Context

- Black Soil: **6,312,309 ha**
- Spread across Aceh, East Java, Nusa Tenggara, Sulawesi, Maluku and Papua



- Little known how this black soils used in Indonesia
- This presentation elaborate soil properties of black soils in relation to landuse based on legacy soil survey data

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Ricefield

Organic carbon: **0.6 – 2.7 %**

Total N: **0.04 – 0.32 %**

Total P2O5: **107 – 266g/100g**

Total K2O: **194 – 251g/100g**

Olsen P2O5: **10 – 185 ppm**

Ca: **8.4 – 26.2 cmol/kg**

Mg: **1.7 – 13.4 cmol/kg**

K: **0.5 – 2.7 cmol/kg**

Na: **0.4 – 4.2 cmol/kg**

CEC: **14.9 – 48.6 cmol/kg**

BS: **66 – 100 %**

pH water: **6.4 – 8.4**

pH KCL: **5.3 – 7.3**

Crop: rice, green pea, soybean

Soil:

Hapludolls (Fluventic, Vertic)

Haplustolls (Fluvaquentic,
Oxyaquic, Vertic, Fulventic)



South Minahasa
(Doc. Yiyi Sulaeman)

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Dryland Agriculture

Organic carbon: **0.62 – 8.2 %**

Total N: **0.05 – 0.46 %**

Total P₂O₅: **52 – 333g/100g**

Total K₂O: **11 – 633g/100g**

Olsen P₂O₅: **20 – 423 ppm**

Ca: **1.32 – 38.29 cmol/kg**

Mg: **0.39 – 6.10 cmol/kg**

K: **0.13 – 1.56 cmol/kg**

Na: **0.11 – 1.42 cmol/kg**

CEC: **10.35 – 47,51 cmol/kg**

BS: **11 – 98 %**

pH water: **4 – 8**

pH KCL: **3.8 – 7.1**

Crop: corn, cassava, green pea,
upland rice, soybean

Soil:
Hapludolls (Lithic, Typic)
Argiudolls (Typic, Udic)
Haplustolls (Lithic, Pachic, Typic)
Argiustolls (Lithic, Pachic, Typic)



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Smallholder Plantation/Single Garden

Crop: coconut, teak, cocoa, palm oil, Albizia, coffee, eucalyptus, banana, clove, palm sugar, palmyra, candlenut, tamarind

Soil:

Haprendolls (Lithic, Typic)

Hapludolls (Lithic, Typic, Fluventic, Pachic)

Argiudolls (Typic)

Haplustolls (Fluventic, Pachic, Typic)

Argiustolls (Pachic, Typic)

Organic carbon: **0.72 – 3.75 %**

Total N: **0.05 – 0.33 %**

Total P2O5: **10 – 146g/100g**

Total K2O: **12 – 86g/100g**

Olsen P2O5: **7 – 198 ppm**

Ca: **2.8 – 50.7 cmol/kg**

Mg: **0.8 – 7.0 cmol/kg**

K: **0.1 – 1.7 cmol/kg**

N: **0.1 – 1.0 cmol/kg**

CEC: **9 – 46 cmol/kg**

BS: **59 – 97 %**

pH water: **5.5 – 7.2**

pH KCL: **4.7 – 6.1**



North Halmahera, (Doc. Yiyi Sulaeman)

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Mixed Garden

Organic carbon: **0.6 – 3.4 %**

Total N: **0.05 – 0.25 %**

Total P₂O₅: **11 – 342g/100g**

Total K₂O: **18 – 100g/100g**

Olsen P₂O₅: **4.5 – 82.5 ppm**

Ca: **5.4 – 37.0 cmol/kg**

Mg: **1.5 – 17.8 cmol/kg**

K: **0.3 – 2.6 cmol/kg**

Na: **0.1 – 12.3 cmol/kg**

CEC: **11.9 – 55.3 cmol/kg**

BS: **65 – 100 %**

pH water: **5.1 – 7.2**

pH KCL: **4.7 – 5.5**



Crop: water apple, coconut, clove, jackfruit, banana, corn, cassava, orange, teak, Albizia

Soil:

Haprendolls (Lithic)

Hapludolls (Lithic, Typic, Vitrandic, Fluventic, Pachic)

Argiudolls (Typic, Lithic, Andic, Vertic)

Haplustolls (Lithic, Entic, Fluvent, Pachic, Typic)

Argiustolls (Lithic, Pachic, Typic, Vertic)

Morotai, (Doc. Yiyi Sulaeman)

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Savanah

Organic carbon: **0.7 – 2.2 %**

Total N: **0.07 – 0.23 %**

Total P₂O₅: **235 – 461g/100g**

Total K₂O: **17 – 18g/100g**

Olsen P₂O₅: **51 – 164 ppm**

Ca: **14.03 – 27.933 cmol/kg**

Mg: **1.95 – 21.62 cmol/kg**

K: **0.21 – 2.01 cmol/kg**

N: **0.19 – 2.84 cmol/kg**

CEC: **24.43 – 47.69 cmol/kg**

BS: **85 – 87 %**

pH water: **6.5 – 7.0**

pH KCL: **5.4 – 5.9**

Soil:

Paleustolls (Entic)

Haplustolls (Fluvaquentic, Lithic)

Argiustolls (Lithic)

Argiustolls (Typic, Vertic)

Hapludolls (Typic)



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Forest

Organic carbon: **0.78 – 5.32 %**

Total N: **0.08 – 0.48 %**

Total P₂O₅: **23 – 197g/100g**

Total K₂O: **29 – 248g/100g**

Olsen P₂O₅: **8 – 93 ppm**

Ca: **10.1 – 39.3 cmol/kg**

Mg: **2.7 – 12.6 cmol/kg**

K: **0.4 – 2.9 cmol/kg**

N: **0.2 – 3.9 cmol/kg**

CEC: **12.3 – 95.4 cmol/kg**

BS: **60 – 100 %**

pH water: **6.4 – 8.1**

pH KCL: **5.1 – 7.1**

Evergreen forest, rainforest, savanna forest, karstic forest

Soil:

Hapludolls (Andic, Lithic, Typic)

Haplustolls (Lithic, Pachic, Typic, Udic, Vertic)

Haprendolls (Lithic)

Argiustolls (Pachic, Typic, Udic)

Argiustolls (Typic)



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Shrubs and Bush

Organic carbon: **0.7 – 5.6 %**

Total N: **0.05 – 0.40 %**

Total P2O5: **11 – 51g/100g**

Total K2O: **11 – 39g/100g**

Olsen P2O5: **5 – 101 ppm**

Ca: **10.27 – 45.21 cmol/kg**

Mg: **1.21 – 13.61 cmol/kg**

K : **0.07 – 3.06 cmol/kg**

N: **0.05 – 2.88 cmol/kg**

CEC: **11.44 – 47.63 cmol/kg**

BS: **82 – 100 %**

pH water: **6.2 – 8.6**

pH KCL: **4.7 – 7.6**

Secondary forest, lower wood stand <5m, crop canopy cover <10%

Soil:

Hapludolls (Lithic, Pachic, Typic)

Haplustolls (Lithic, Pachic, Ruptic- Lithic, Typic)

Haprendolls (Lithic, Rhodic)

Argiudolls (Pachic, Typic)

Argiustolls (Pachic, Typic)

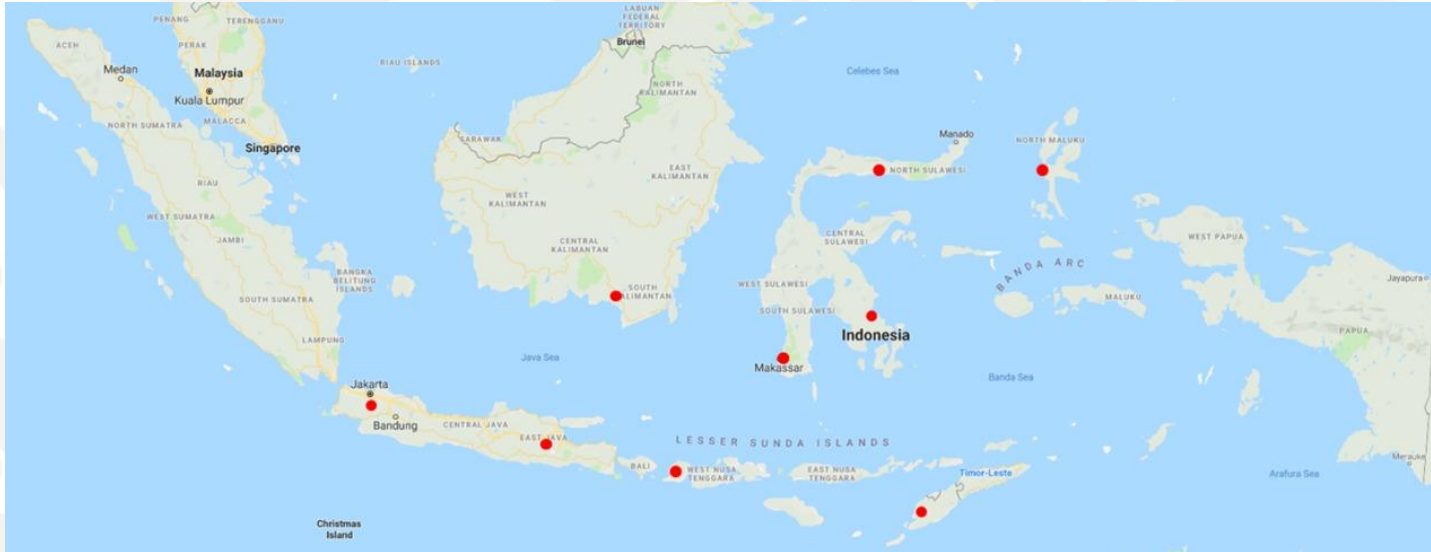


Research Need

1. The challenge of maintaining soil moisture status during plant growth (crops) in dry climate agroecosystems.
2. Monitoring changes in landuse on black soil.
3. Identification and characterization of the chemical, physical, and mineralogical of black soil on the islands of Java and Nusa Tenggara, Indonesia.
4. Increased productivity of black soil in dry climate dry land.
5. Assessing land suitability on black soil in order to diversify and look for alternative crops (corn and sorghum).

What's next

- Develop a national level black soil research consortium (BRIN, universities, farmer groups, NGOs, relevant stakeholders).



- Fund raising to carry out research related to black soil.
- Public awareness related to the conservation and use of black soil.
- Capacity building of human resources that are related to the management of black soil in Indonesia.
- ASEAN black soil map engagement at regional level.

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