Dynamic agroforestry – a tool for successful smallholder-grown cocoa in times of climate uncertainty

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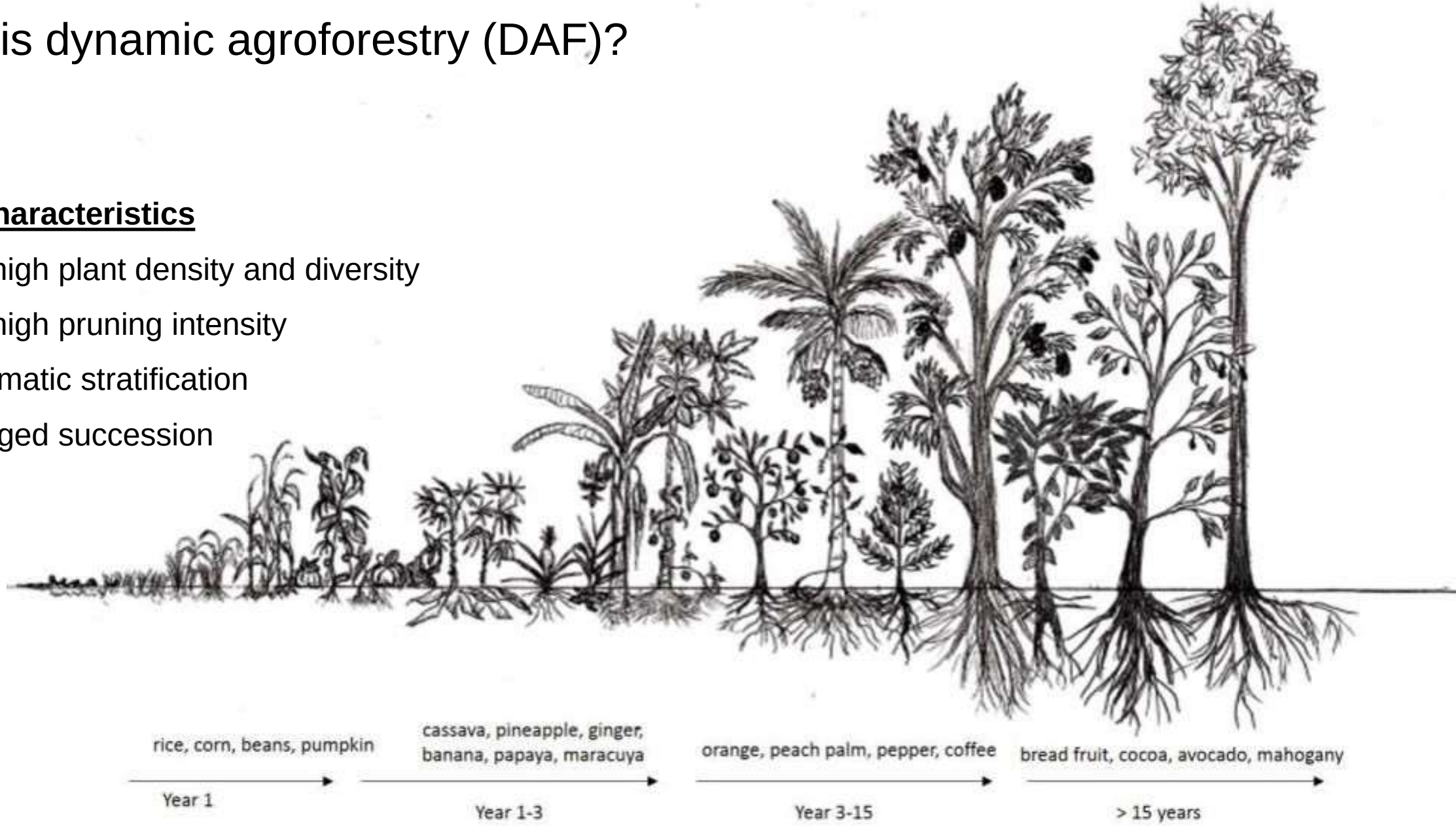
Dynamic agroforestry – Characteristics and claimed advantages

What is dynamic agroforestry (DAF)?

Main characteristics

- Very high plant density and diversity
- Very high pruning intensity
- Systematic stratification
- Managed succession

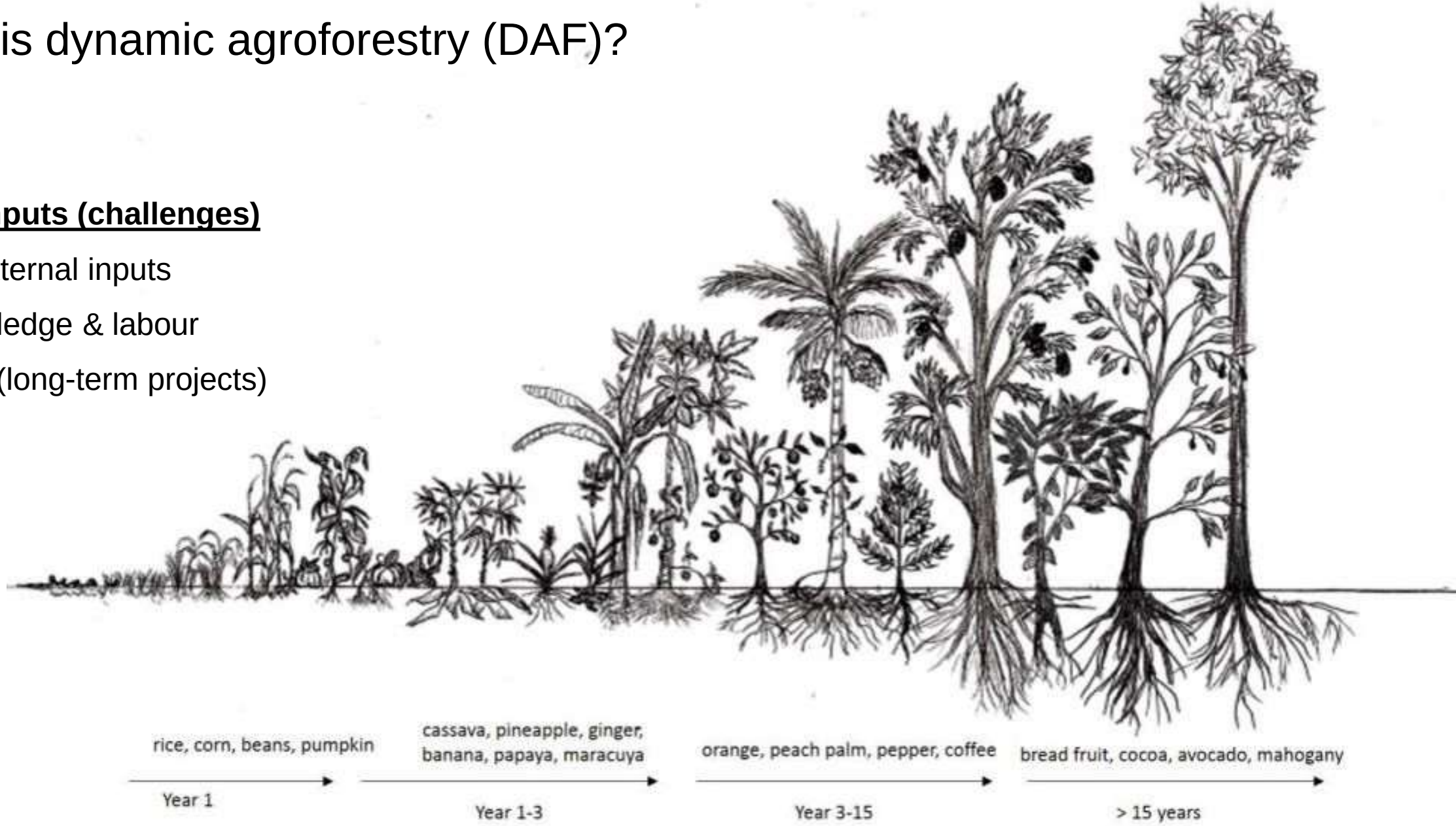


Andres *et al.* (2016)

What is dynamic agroforestry (DAF)?

Main inputs (challenges)

- No external inputs
- Knowledge & labour
- Time (long-term projects)



Andres *et al.* (2016)

Agroforestry ≠ DAF

Main difference to “normal” agroforestry (AF)

- AF mostly **spontaneous/natural** systems, established from secondary forests with relatively minor interventions by humans
- DAF mostly **systematic/intentional**, established from scratch with relatively major interventions by humans

Agroforestry ≠ DAF

Spontaneous/natural, often established from secondary forest

Agroforestry ≠ DAF

Systematic/intentional, often established from scratch

Claimed advantages of DAF

In addition to advantages of "normal" AF

- Substantial harvests of by-products during establishment phase
- Getting to a mature forest-like system much quicker

DAF research project

Systems compared („Treatments“)

Full-sun “monoculture”

Traditional farming practices (**T**)

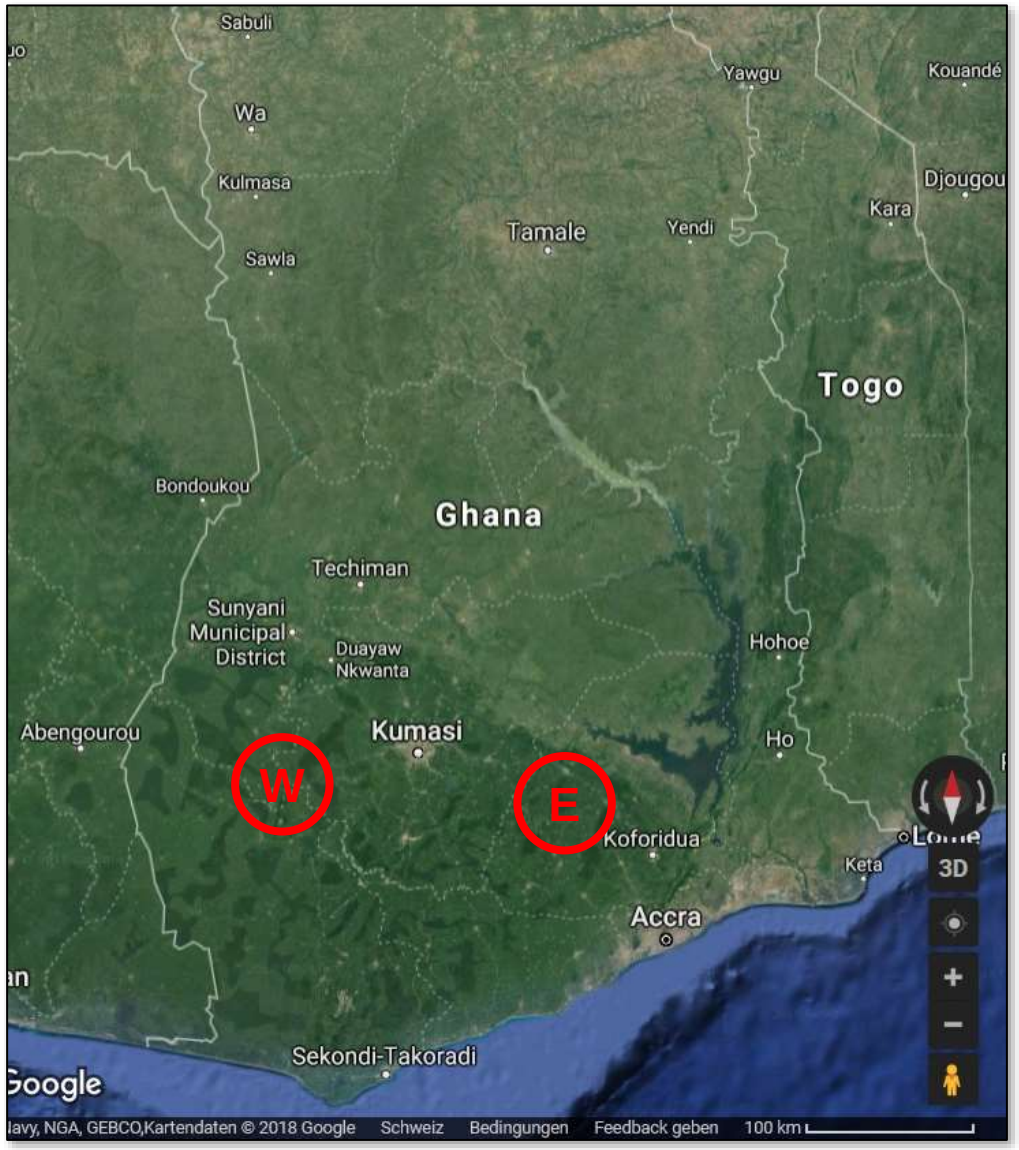
- Normal plant density, low diversity
- No stratification
- Low to no pruning
- Few external inputs
- Low inputs of knowledge and labour

Shaded agroforestry system

Dynamic agroforestry (**DAF**)

- High plant density and diversity
- Systematic stratification
- High pruning intensity
- No external inputs
- High inputs of knowledge and labour

Location of research plots

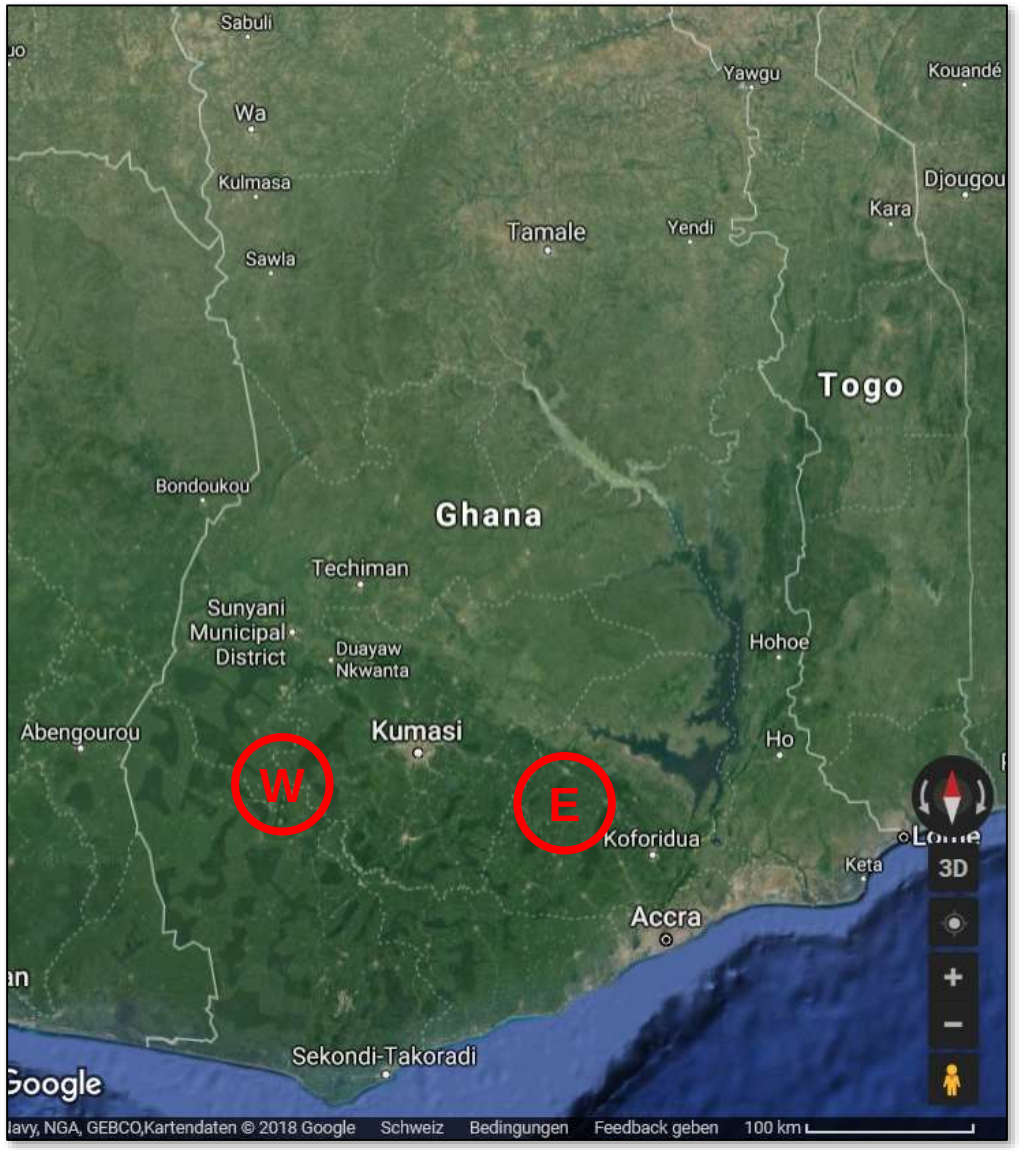


Project context

Western Region

- SANKOFA project setting up 400 hectares of on-farm DAF from 2019 – 2023, from scratch
- Some soils and microclimates marginal for cocoa
- Work on 40 DAF / T plots (mostly established in 2018)
- Small-scale, mainly resource-poor farmers

Location of research plots



Project context

Eastern Region

- Sronko Farms established 10 hectares of on-farm DAF since 2016, from secondary forest
- Soils and microclimate optimal for cocoa
- Work on 20 DAF / T plots (established in 2016 – 2018)
- One resourceful “large”-scale farmer

Methods

Parameters assessed

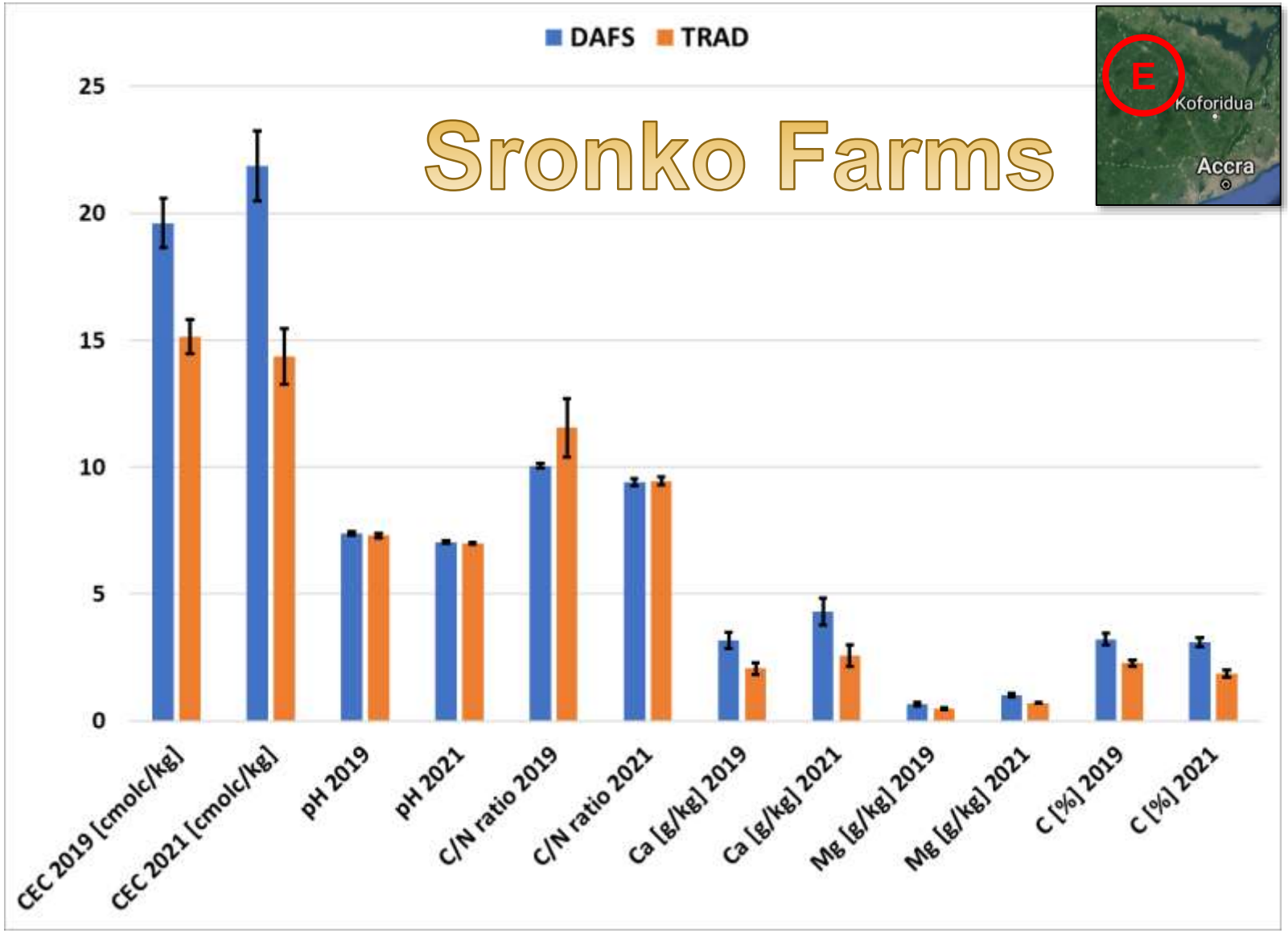
- Soil fertility
- Cocoa vigour and survival rate
- Local microclimate, soil moisture and temperature
- Productivity and profitability (preliminary)

Hypotheses

Bio-physical

- DAF improves soil health compared to traditional farming practices (T)
- DAF leads to better growing conditions and therefore higher vigour and survival rate of cocoa than T

Do DAF improve soil health compared to T?



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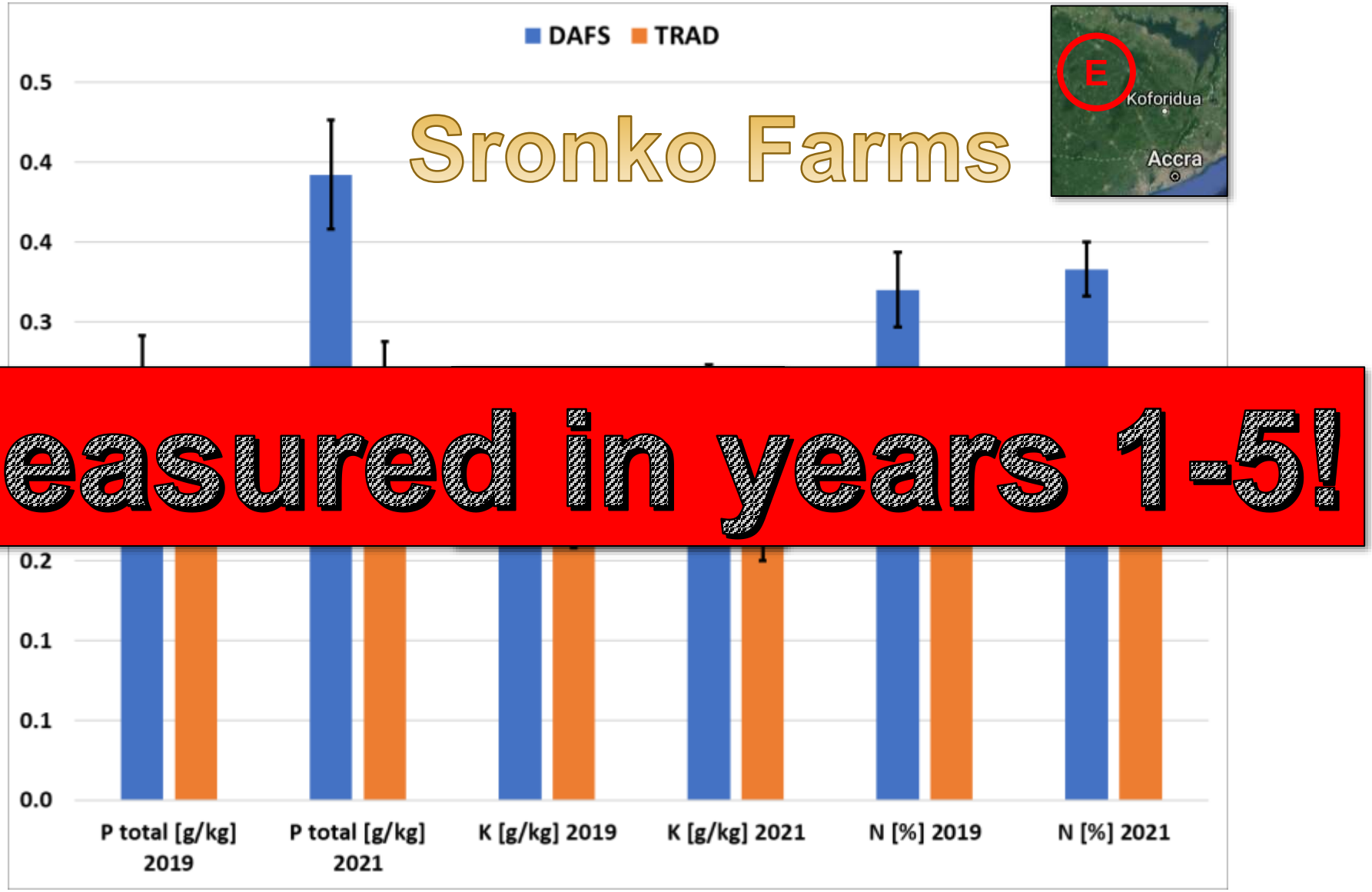
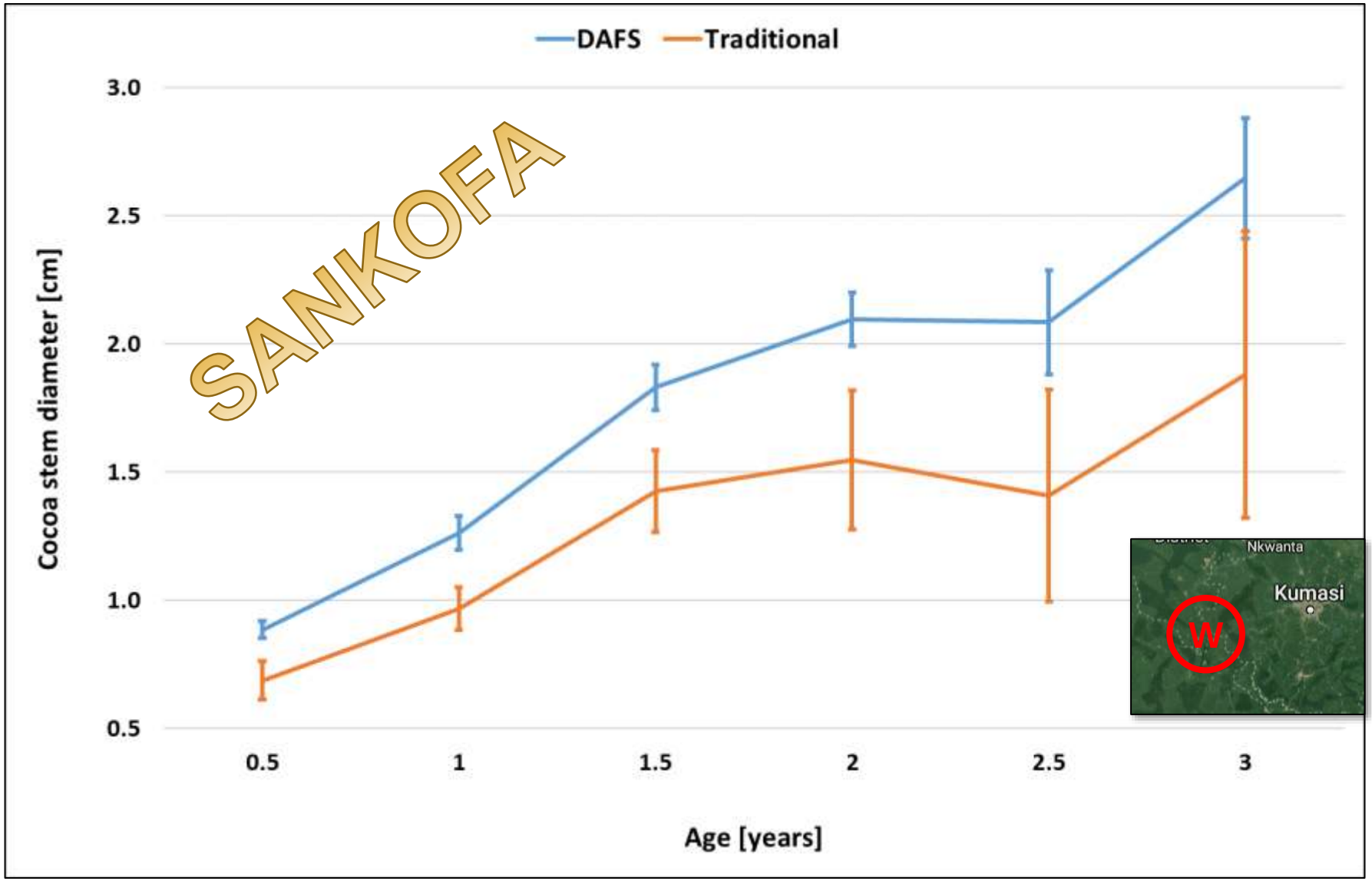


Better growing conditions cocoa vigour and survival rate in DAF than T?



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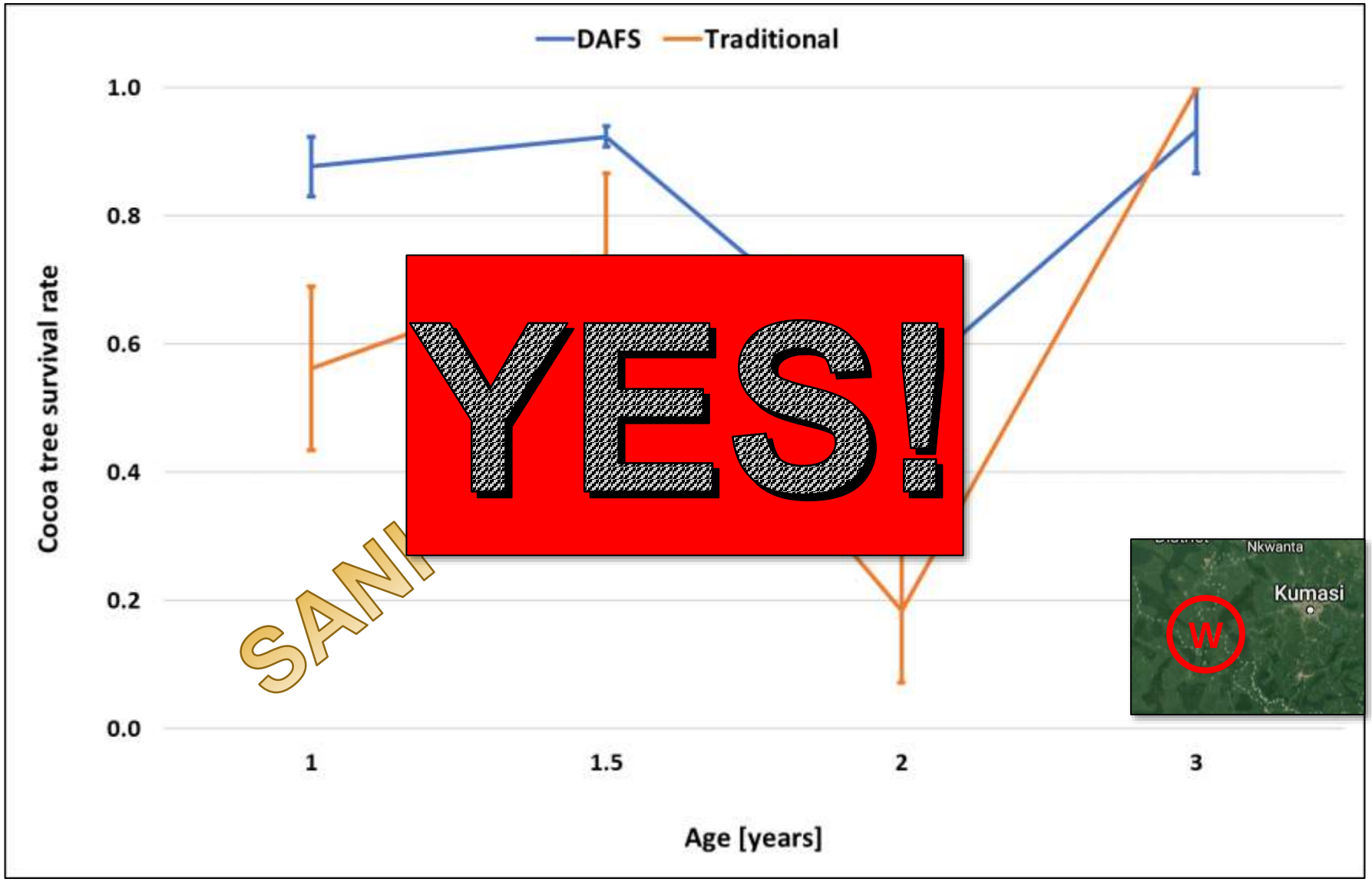

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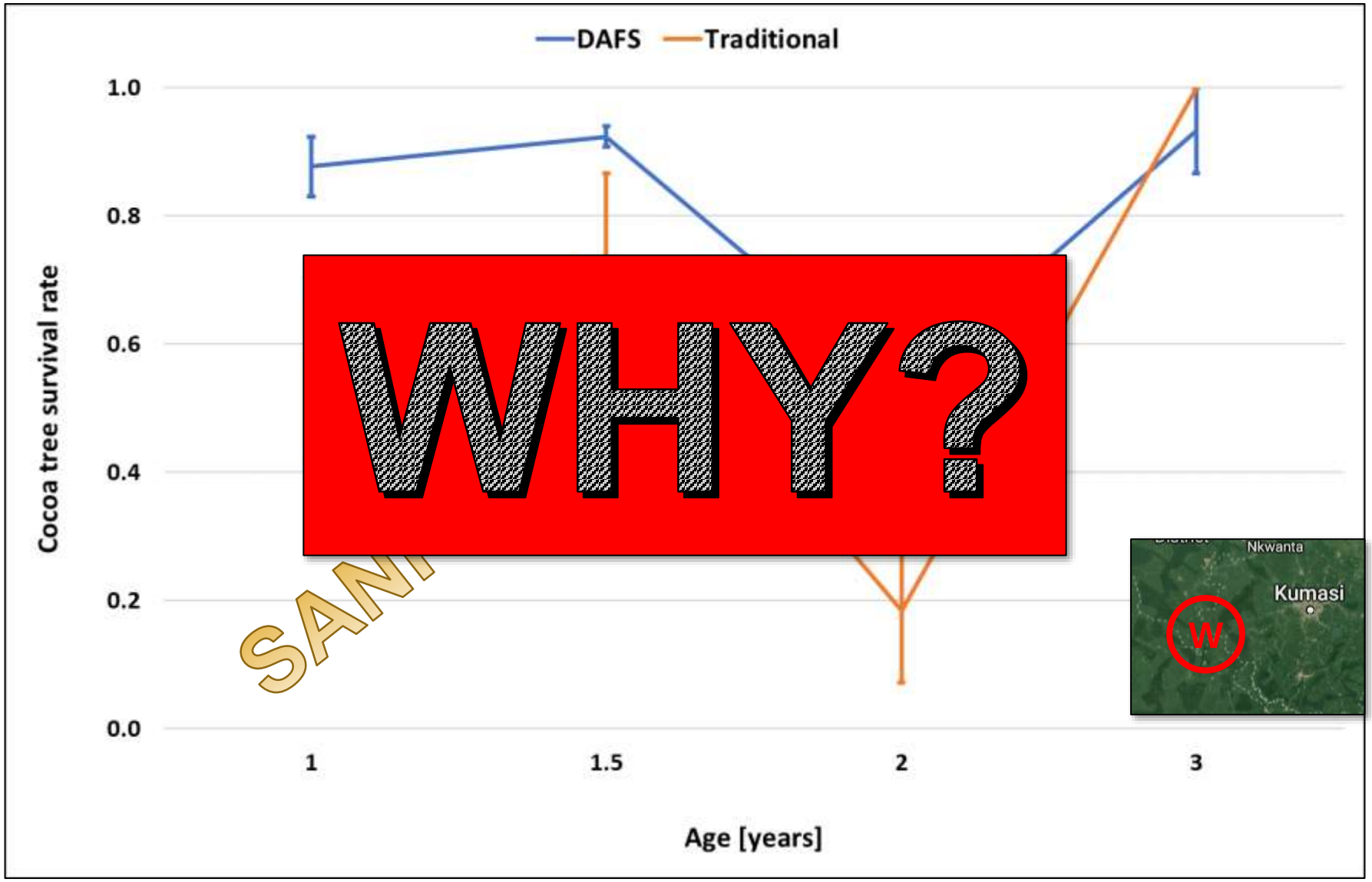

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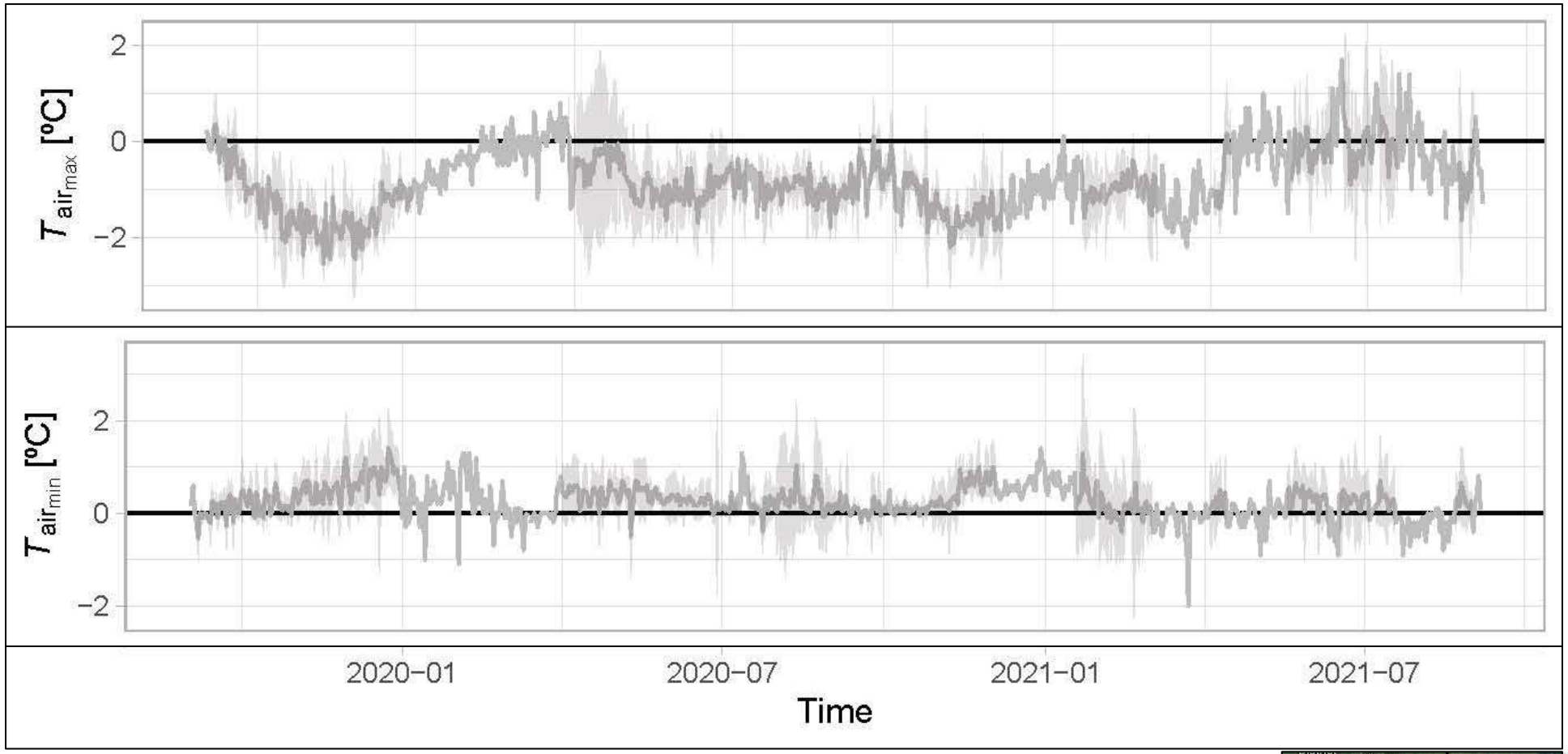
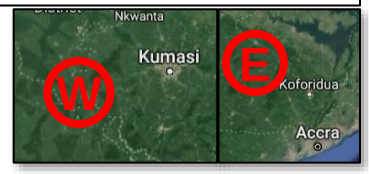
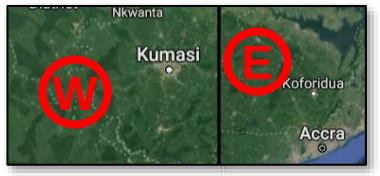
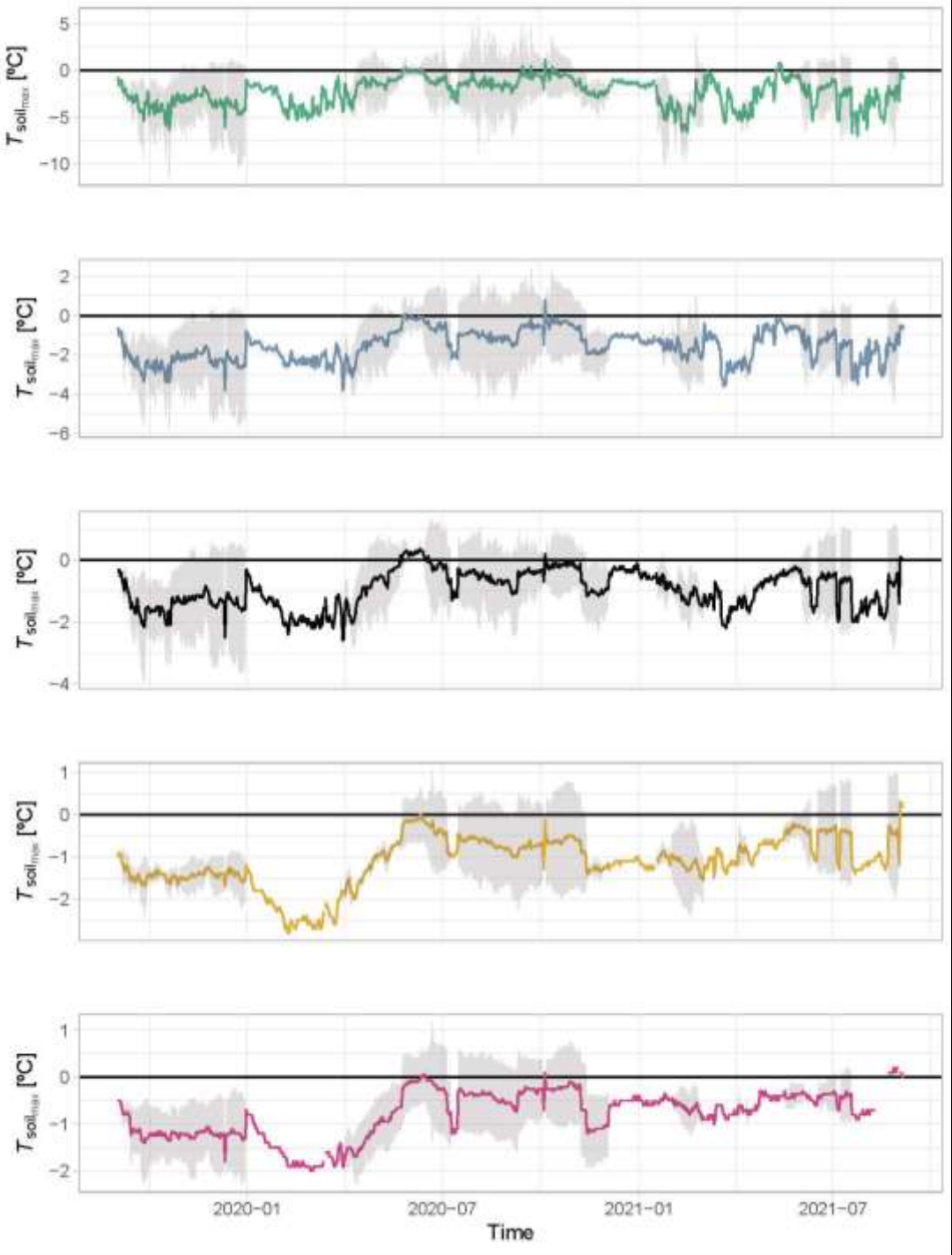


Lower air temperature amplitude in DAF 2019 - 2021





Lower max. soil temperature in DAF 2019 - 2021



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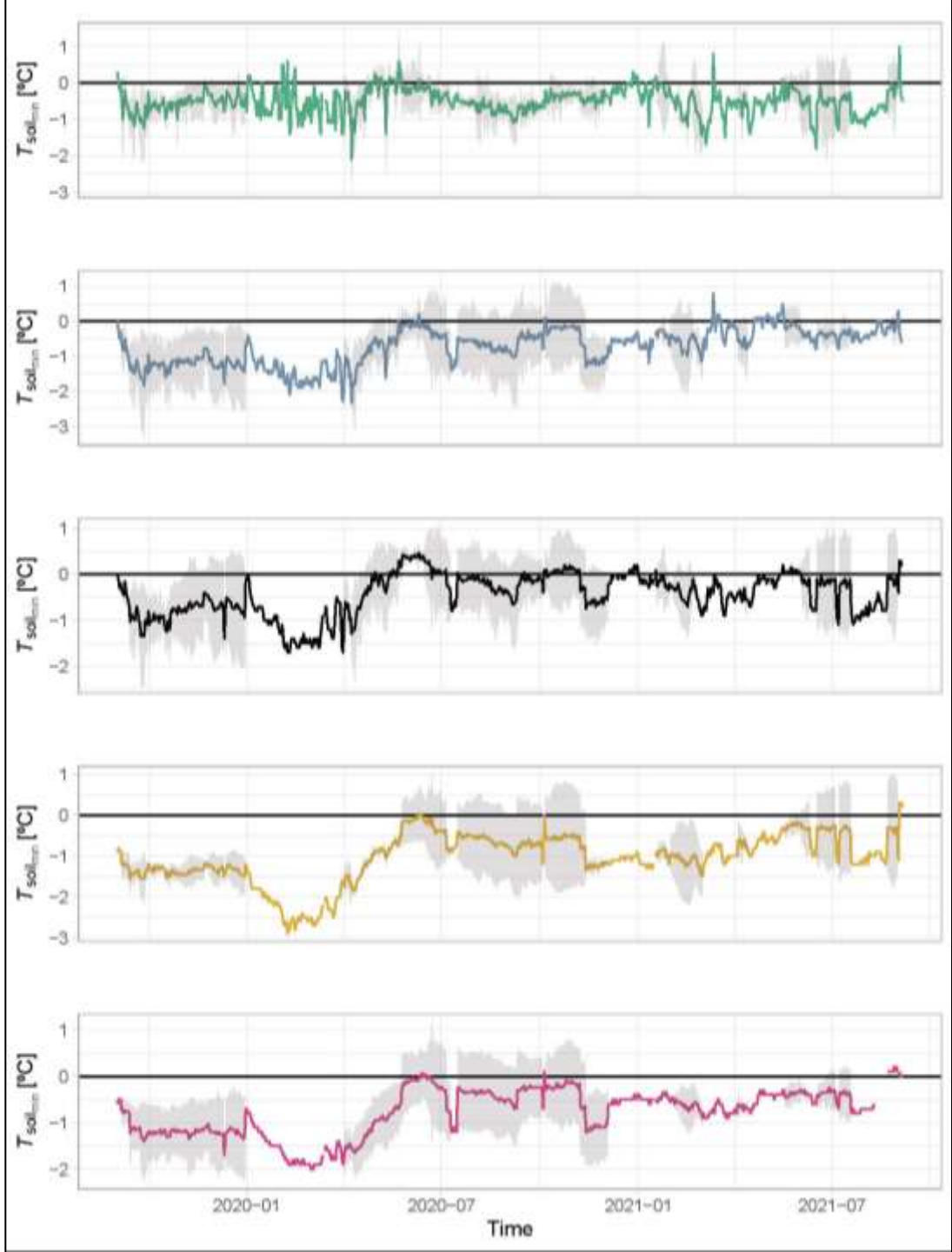
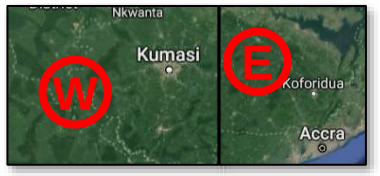
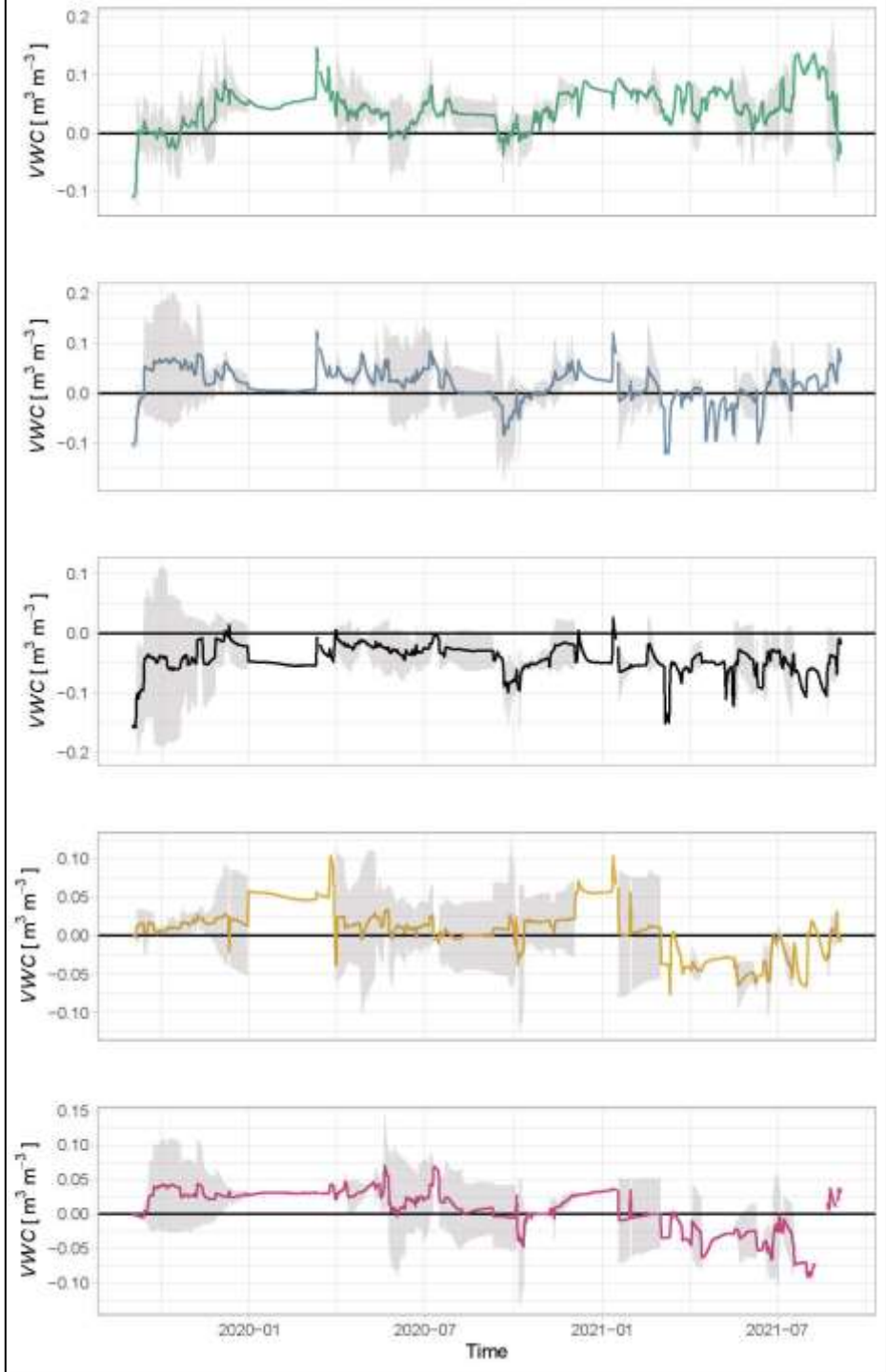




Higher soil moisture in DAF except at 25cm (most active root zone of cocoa) 2019 - 2021



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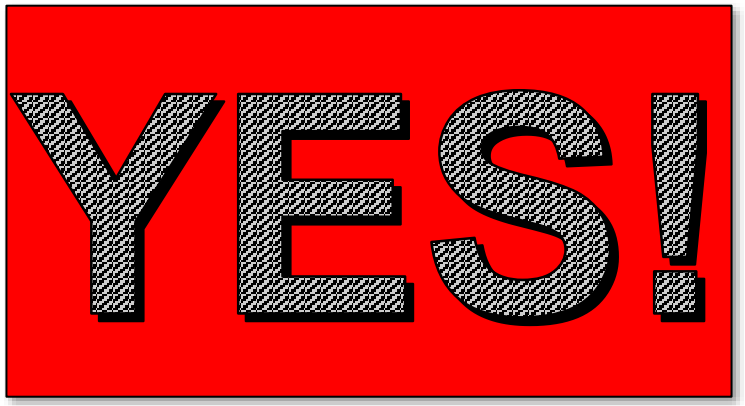


- Nice result for farmers to successfully establish cocoa in a challenging climate

Hypotheses

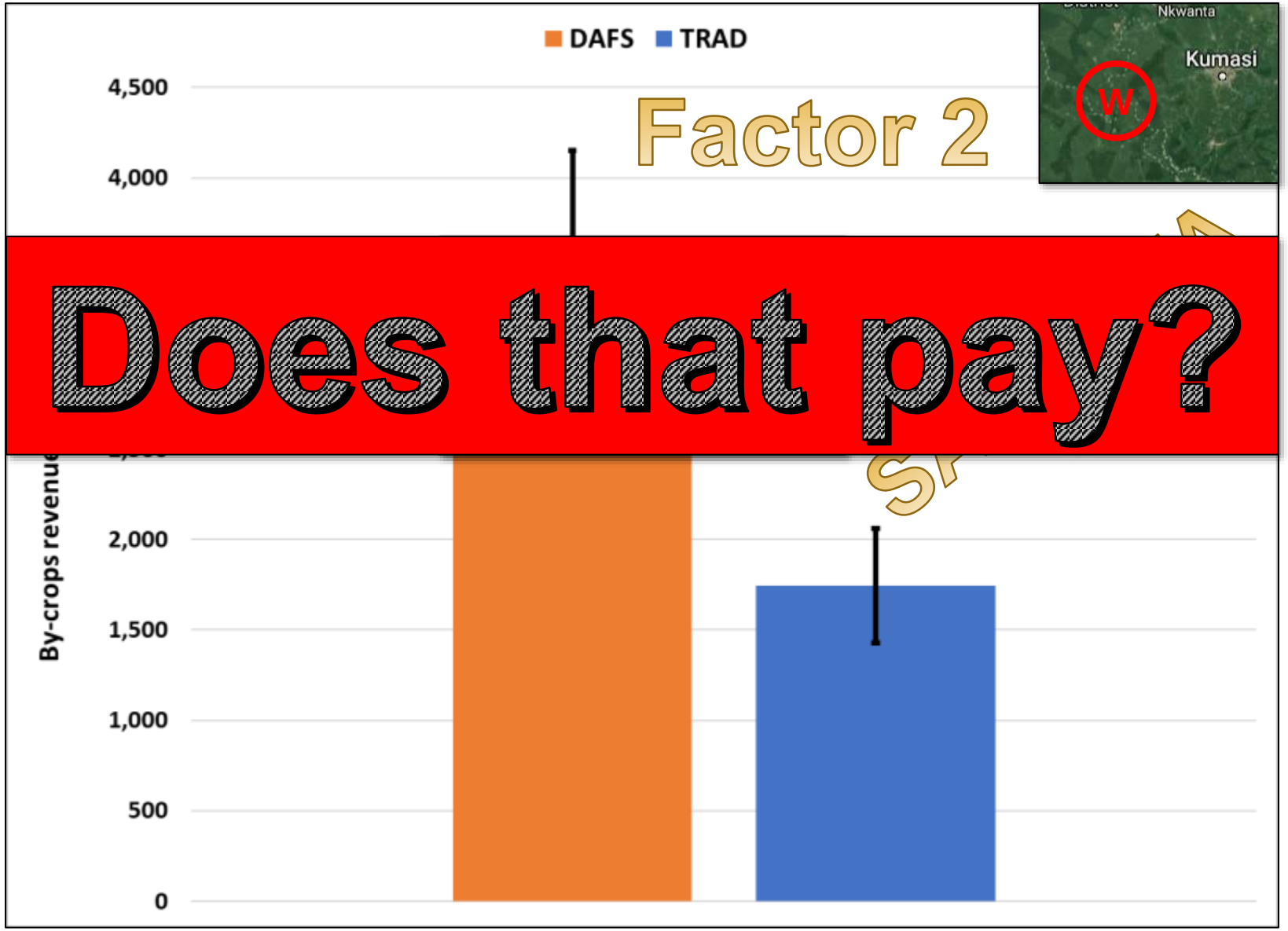
Bio-physical

- DAF improves soil health compared to traditional farming practices (T)
- DAF leads to better growing conditions and therefore higher vigour and survival rate of cocoa than T

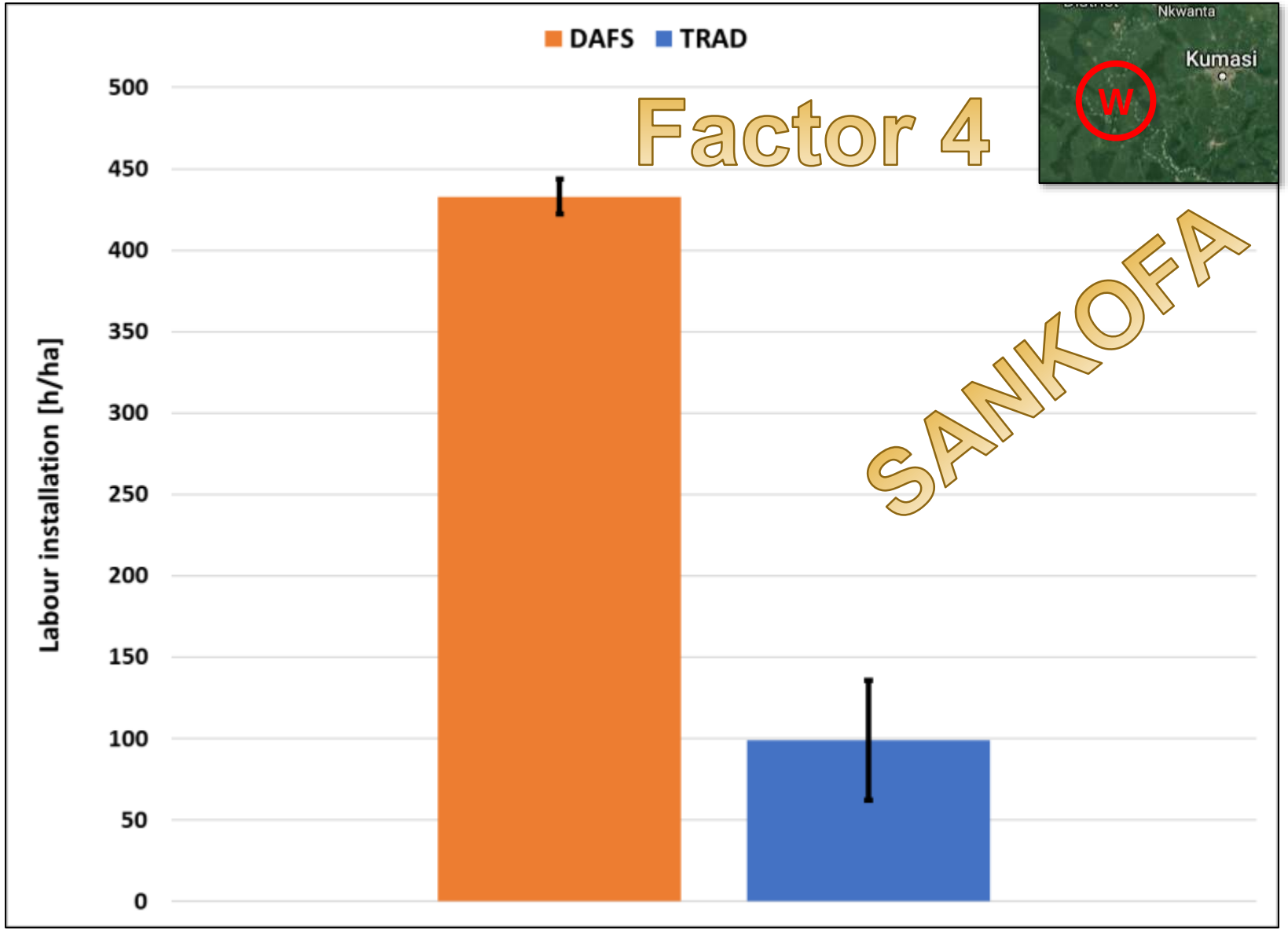
Socio-economic

- DAF leads to higher harvests of by-products during the establishment phase compared to T
- DAFS have a better economic performance (return on labour, gross margin) than T

Higher harvests of by-products during establishment in DAF than T?



Better economic performance in DAF than T?



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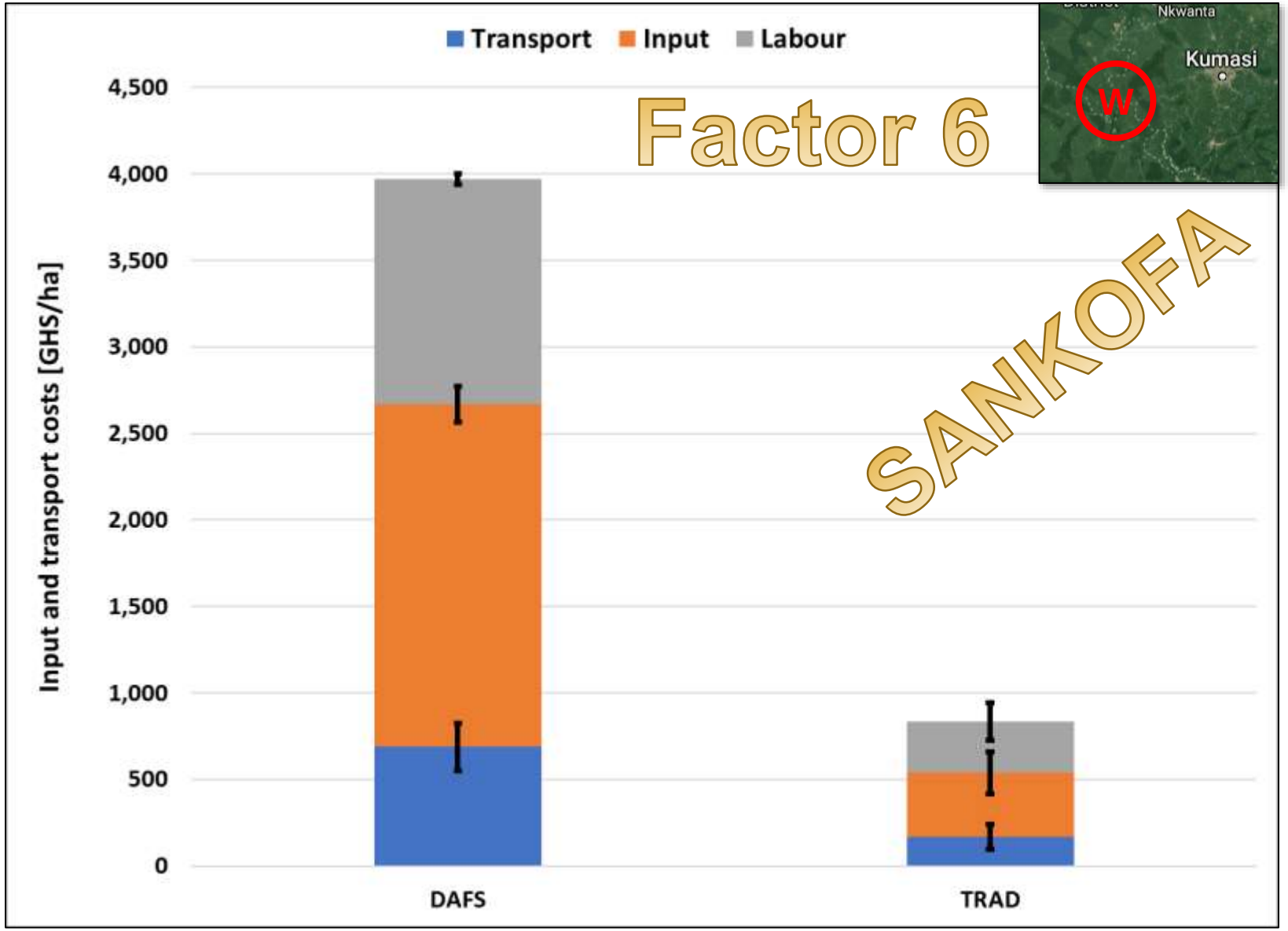

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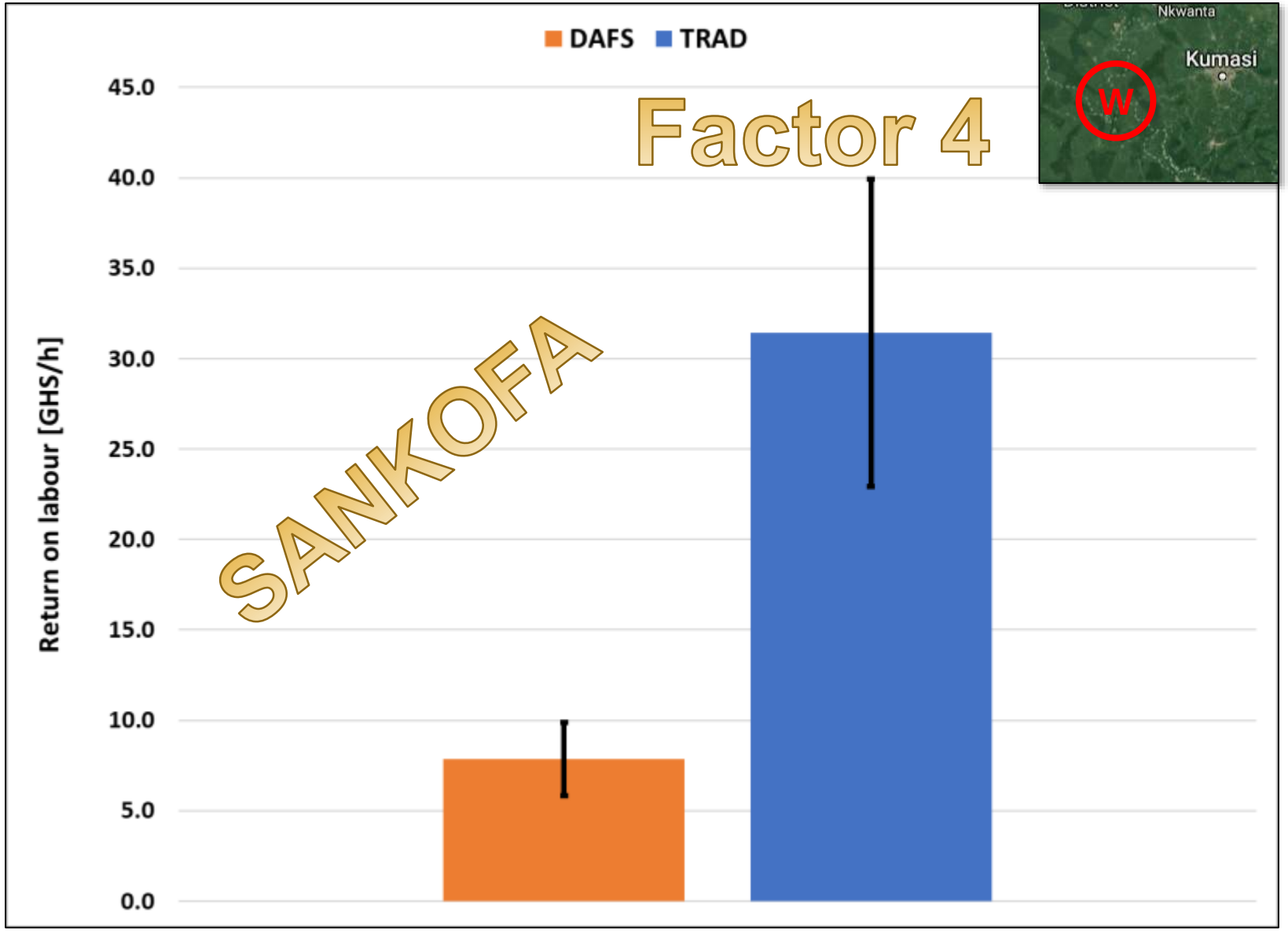

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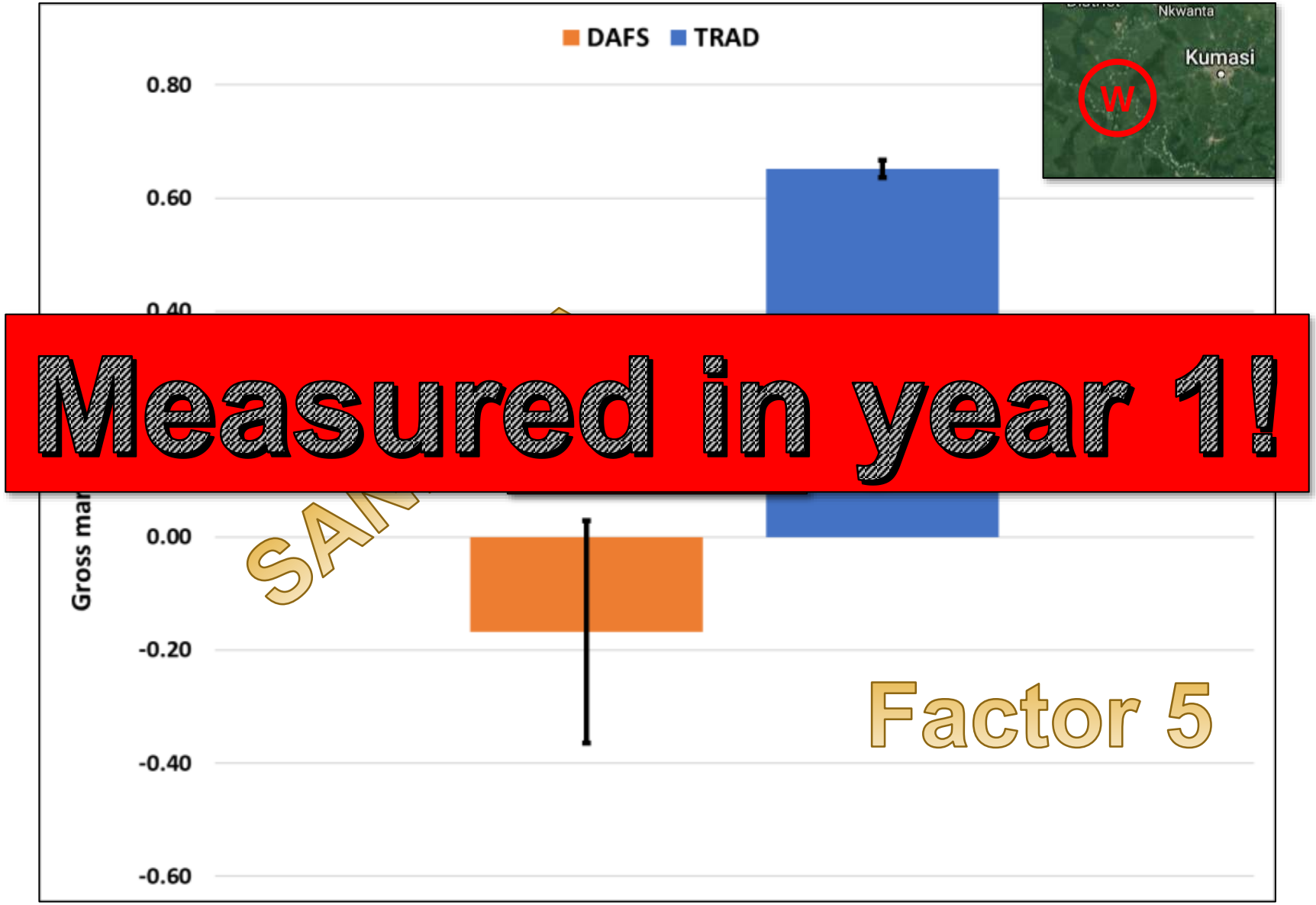

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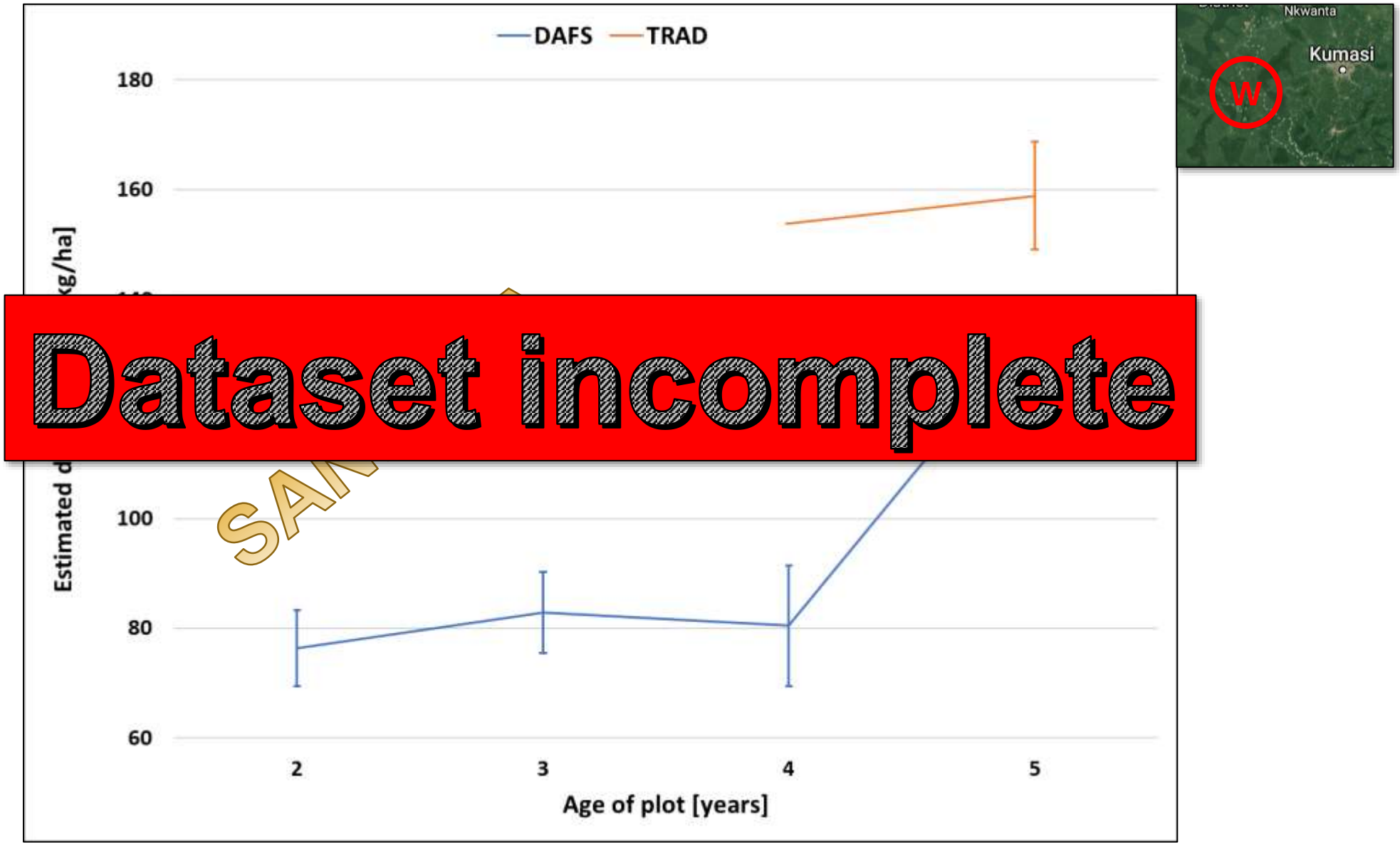

Conclusion

- DAF is a promising low-tech strategy for farmers to successfully establish cocoa in an uncertain climate, even in marginal cocoa growing regions, with a high potential to regenerate degraded lands
- More data is needed to draw conclusions about the productivity and profitability of DAF vs. T for cocoa farmers
- DAF needs a lot of support in the beginning (first three to five years)
  - Investment
  - Training
- Functioning DAF programs at national levels are needed for DAF to reach scale

Thank you for your attention!

Project partners:

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