Climate Impacts and Resilience in Caribbean Agriculture: Climate Proof Screen

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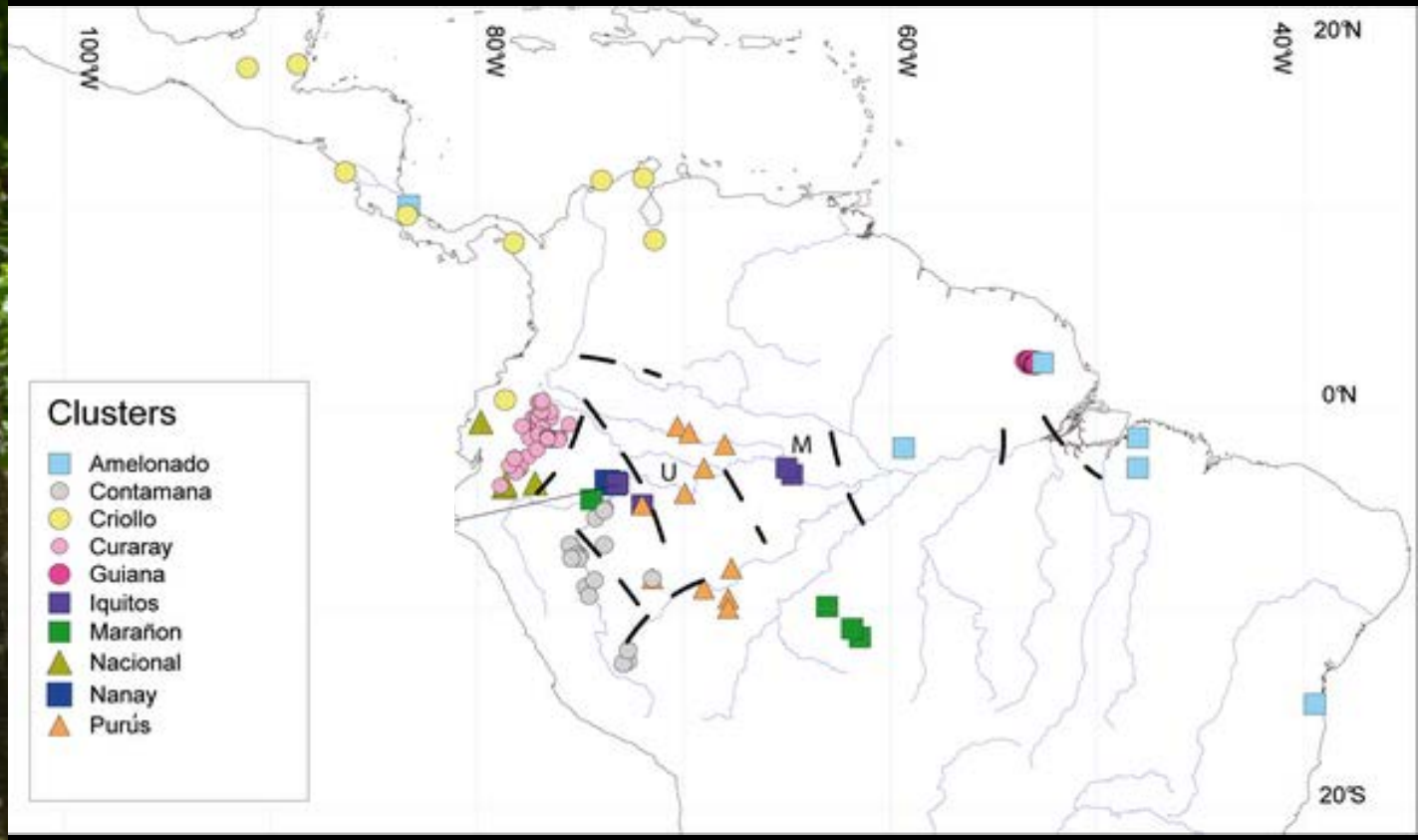
Harnessing genetic differences to increase cocoa resilience?

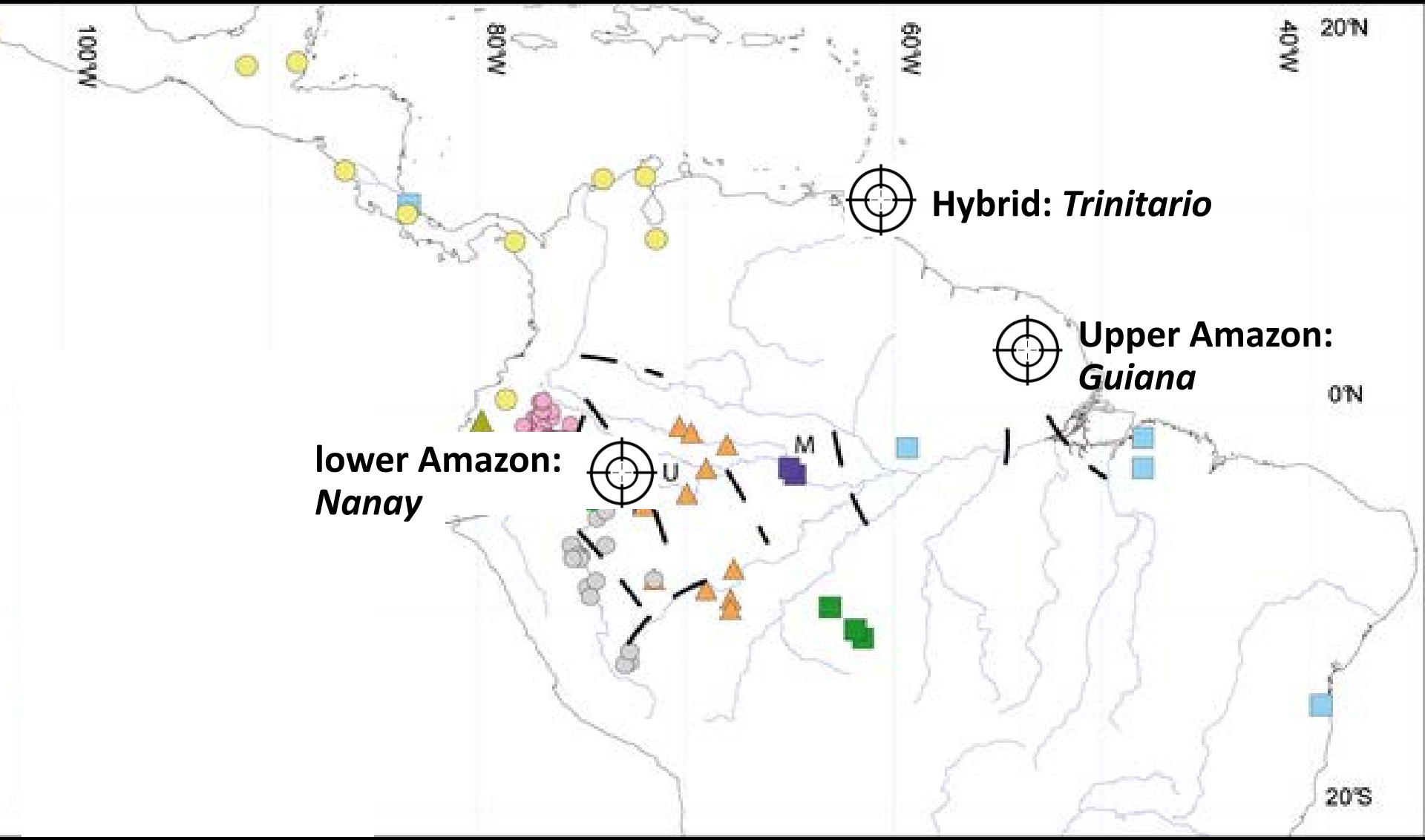


Motamayor et al. (2008) PLoS ONE 3(10): Different colours show different genetic groups

Aims of workpackage 1 : Climate Proof Screen

- Assess available methods for identifying differences in resilience to drought and heat stress
- Establish protocols for testing resilience and use these to compare three genetic groups
- Assess the potential impact of climate resilience on current and future cocoa crops (via workpackage 2 & 3)

Three groups: testing three accessions from each



Motamayor et al. (2008) PLoS ONE 3(10):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175
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DO NOT
WATER
DO NOT
WATER

Assessing ‘performance’ in the field and greenhouse

Leaf temperature: Infrared camera (FLUKE 410)

Transpiration: Porometer (SC-1 Decagon Devices)

Photosynthesis: Chlorophyll fluorescence (Walz MINI PAM)

Visual assessment of stress symptoms

0 %

10%

50%

70%

Membrane stability test: to assess tolerance to 'damage' using leaves from field and greenhouse

Leaf segments immersed in deionised water

Leaf segments exposed to:

30; 35; 40; 45; **55 Celsius**

or

0; -1.0; 2.0; **-3.0 Megapascals**

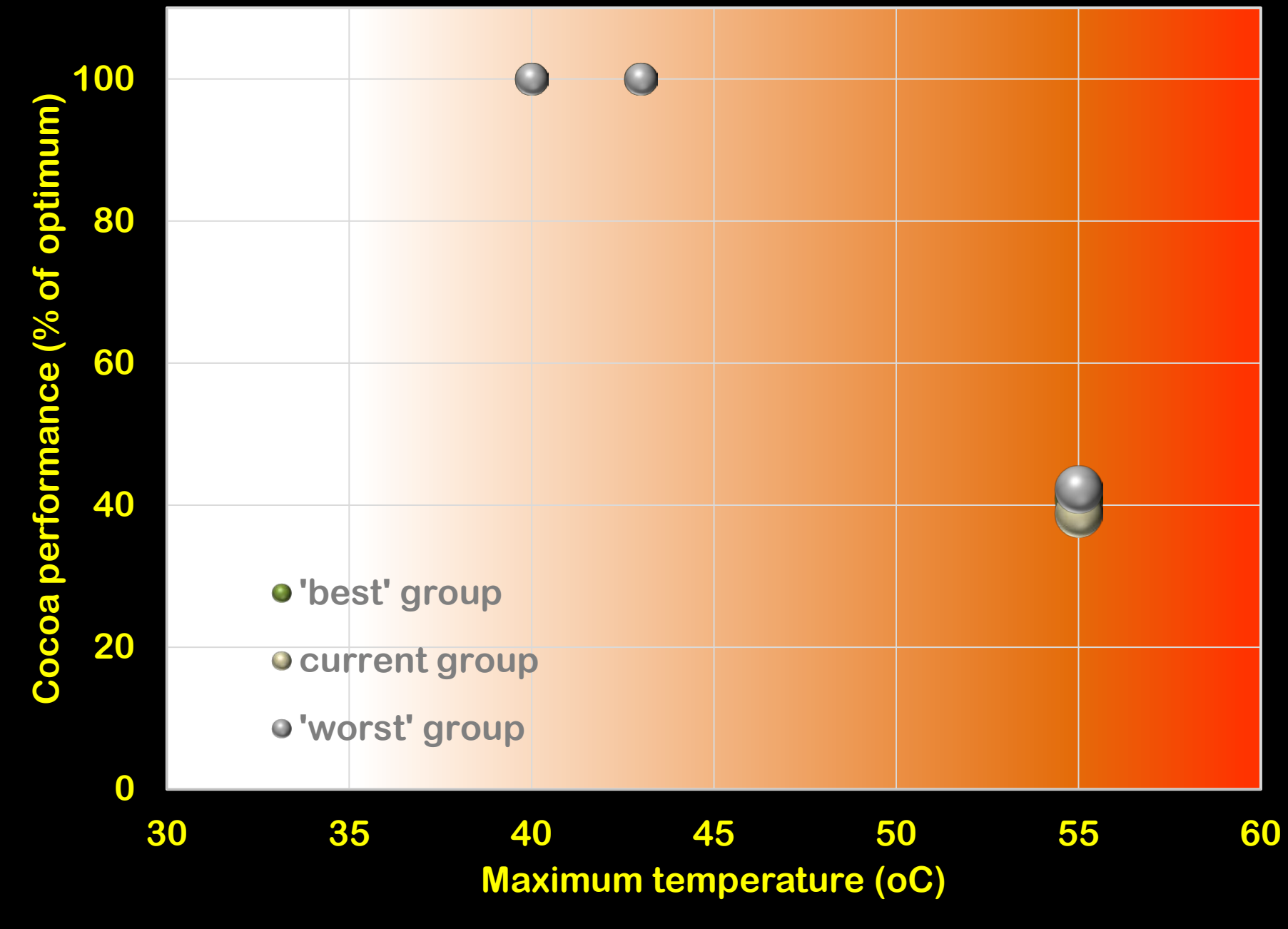
Then incubated overnight

High conductivity = low membrane stability

Best method for assessing differences in heat stress

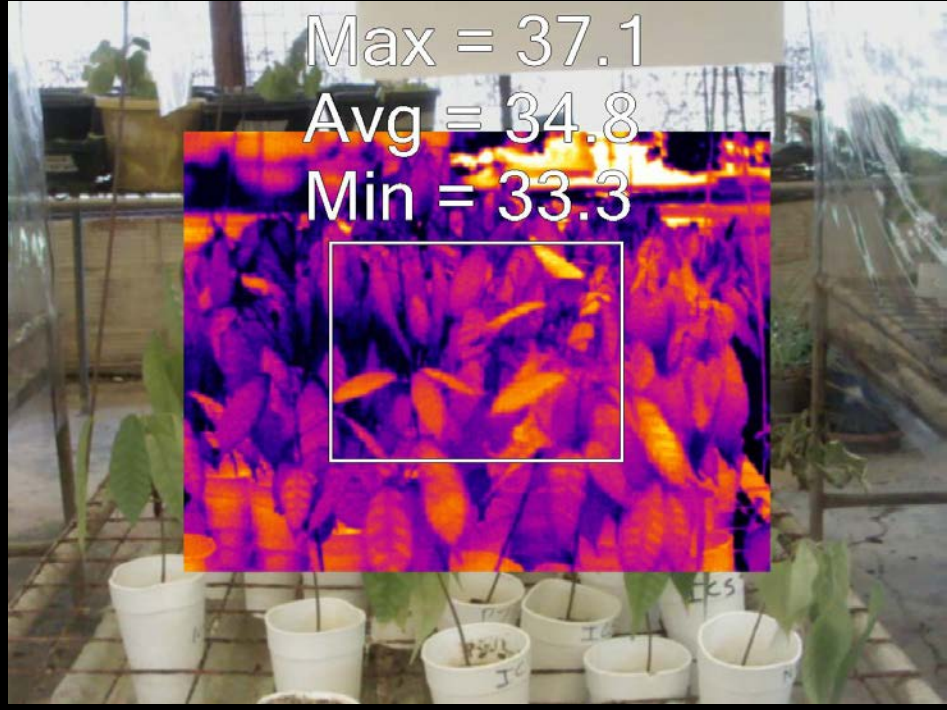
- **In the greenhouse**
- Max air temperatures were approx. 5 C higher
- Transpiration was consistently elevated
- Photosynthesis unaffected
- Visual assessment unaffected
- **Membrane stability test was consistent…**

The impact of temperature on membrane integrity



Best method for assessing differences in water stress

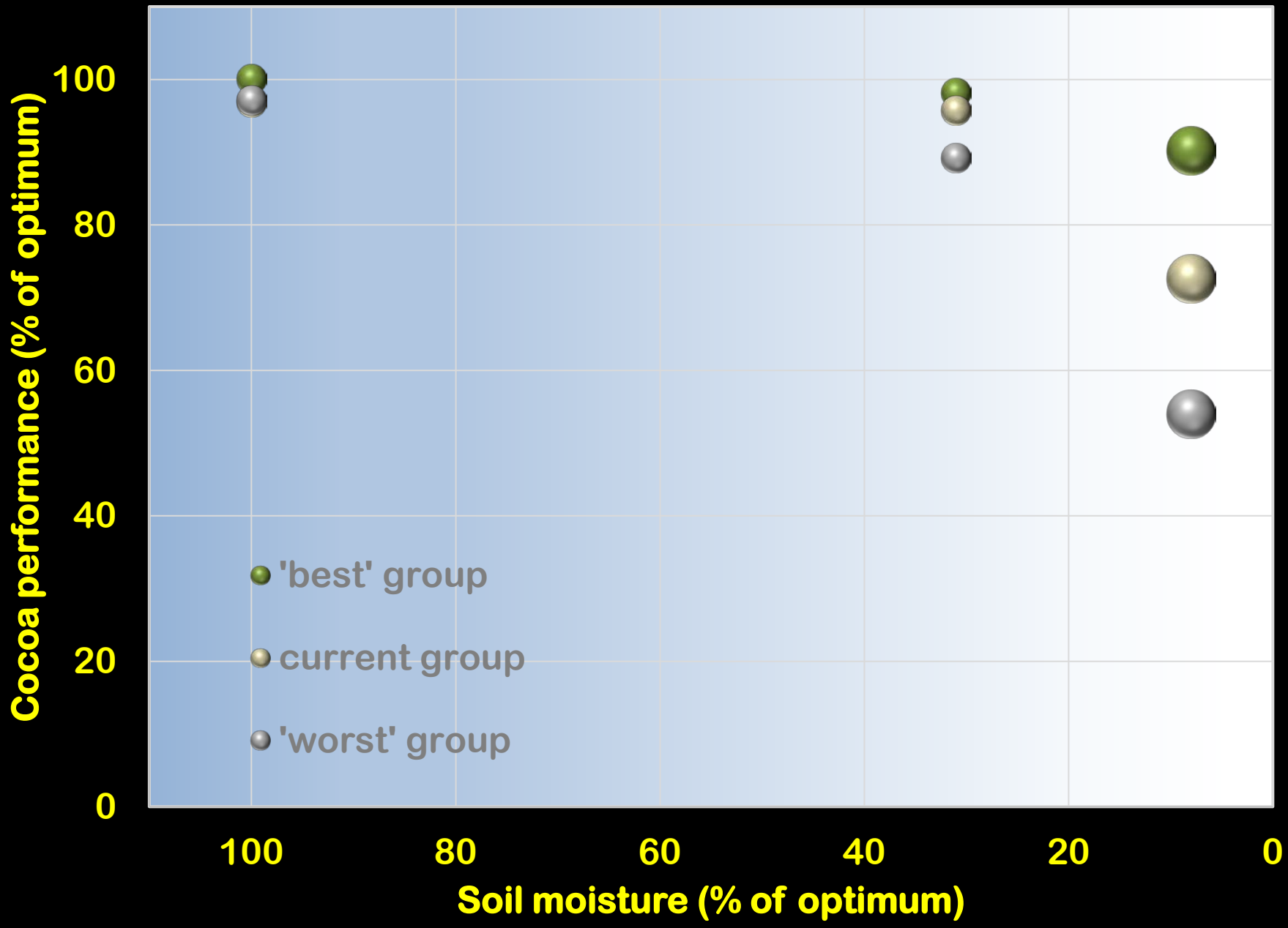
- **In the greenhouse**
- Stomatal conductance reduced
- Leaf temperature elevated
- Membrane stability test- inconsistent
- Visual index was reduced
- **Photosynthesis was reduced…**



Control Bench

Dry Bench

The impact of moisture content on photosythesis



Conclusions of workpackage 1 : Climate Proof Screen

Selection for resilience to drought stress has great potential

Several methods available, including low-tech methods that could be implemented through participatory selection

Acknowledgements

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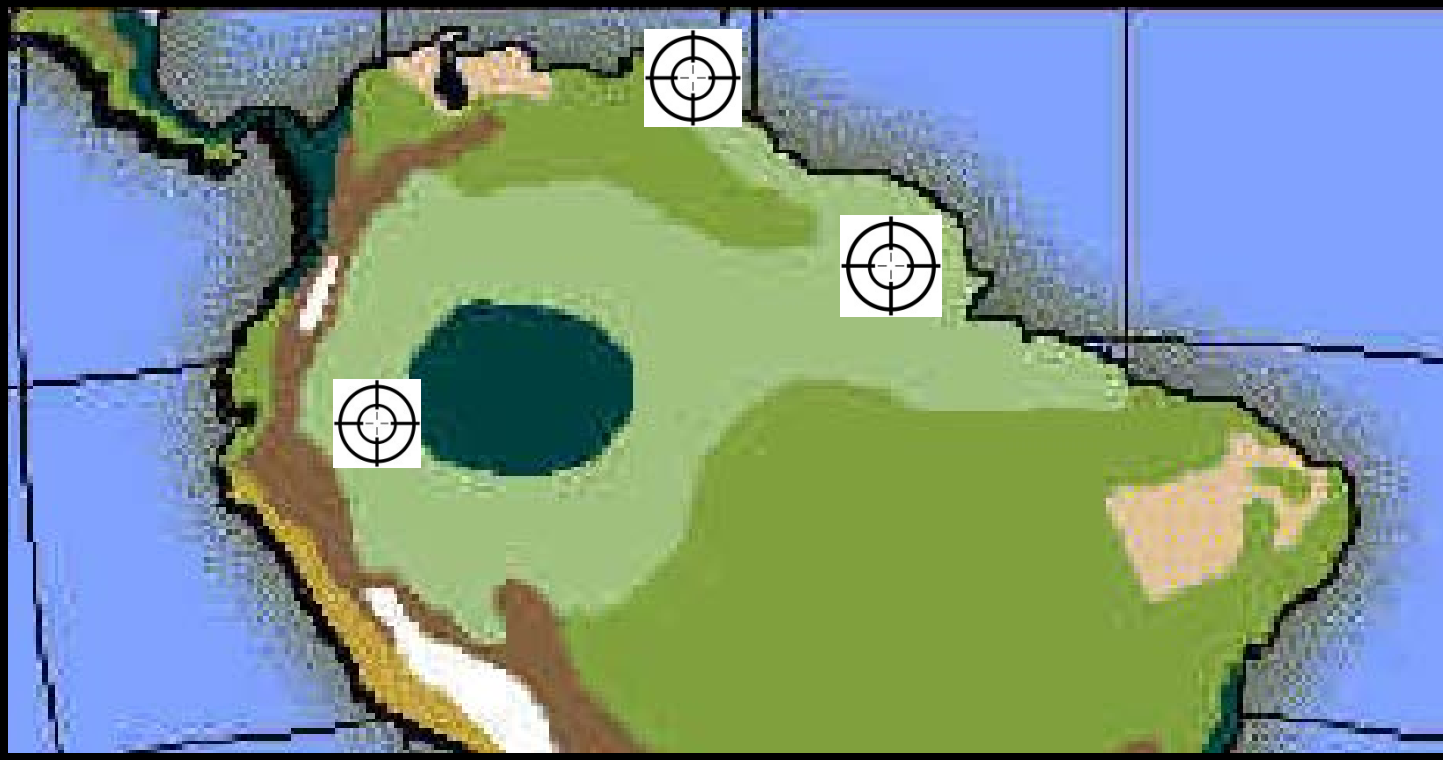
Figure 1. Localization of the origin of individuals analyzed; colors indicate the inferred genetic cluster to which they belong.



http://127.0.0.1:8081/plosone/article?id=info:doi/10.1371/journal.pone.0003311