

Supplementary Information: Risky Business: Modeling the Future of Jamaica's Coffee Production in a Changing Climate

Table S1. Major agroecological parameters governing coffee production and their data sources.

Agro-Ecological Parameters	Rationale	Absolute Range	Optimum Range	References	Data Source
Temperature	Plays an important role in plant development, especially at several critical physiological stages.	10° - 34°C	14° - 28°C	FAO EcoCrop; Mighty 2015; Cheserek and Gichimu 2012; Davis et al. 2012; DaMatta and Ramalho 2006; Budhlall 1986	Meteorological Service of Jamaica
Rainfall	Crop grows best with intermittent months of rainfall and dry periods; dependent on predictable seasonal rainfall with good distribution. Also important for flowering, fruit setting and fruiting.	750 - 4200 mm	1400 - 2500 mm	FAO EcoCrop; Mighty 2015; Haggard and Schepp 2012; DaMatta and Ramalho 2006; Budhlall 1986;	Meteorological Service of Jamaica
Elevation	Maintains relationship with temperature. High altitudes allow the slow maturation of the bean which contributes to taste and quality.	0 - 1700 m	350 – 1667.67 m	Mighty 2015; Avelino et al. 2005	USGS Earth Explorer
Soil Type	Facilitates nutrient enrichment, root	Clay-siliceous soils, alluvial	Deep, well-drained soils of volcanic origin	FAO EcoCrop; Mighty 2015; van der Vossen,	National Spatial Data Management Division

	development, yield, and unique flavour profile	soils, volcanic soils		Bertrand and Charrier 2015	
Soil pH	Facilitates nutrient enrichment and contributes to a unique flavour profile	4.3 - 8.4 (moderately acidic-moderately alkaline)	5.5 - 7 (slightly acidic to neutral)	FAO EcoCrop; Mighty 2015	National Spatial Data Management Division
Slope	Gently sloped areas at high elevations facilitate easy growth	0° - 35°	0° - 35°	Budhlall 1986	Derived from elevation dataset
Aspect	Crop grown on slopes are exposed to varying amounts of light intensity which influences growth, taste and quality	North, South and West facing slopes	North and South facing slopes	Avelino et al. 2005; Budhlall 1986	Derived from elevation dataset

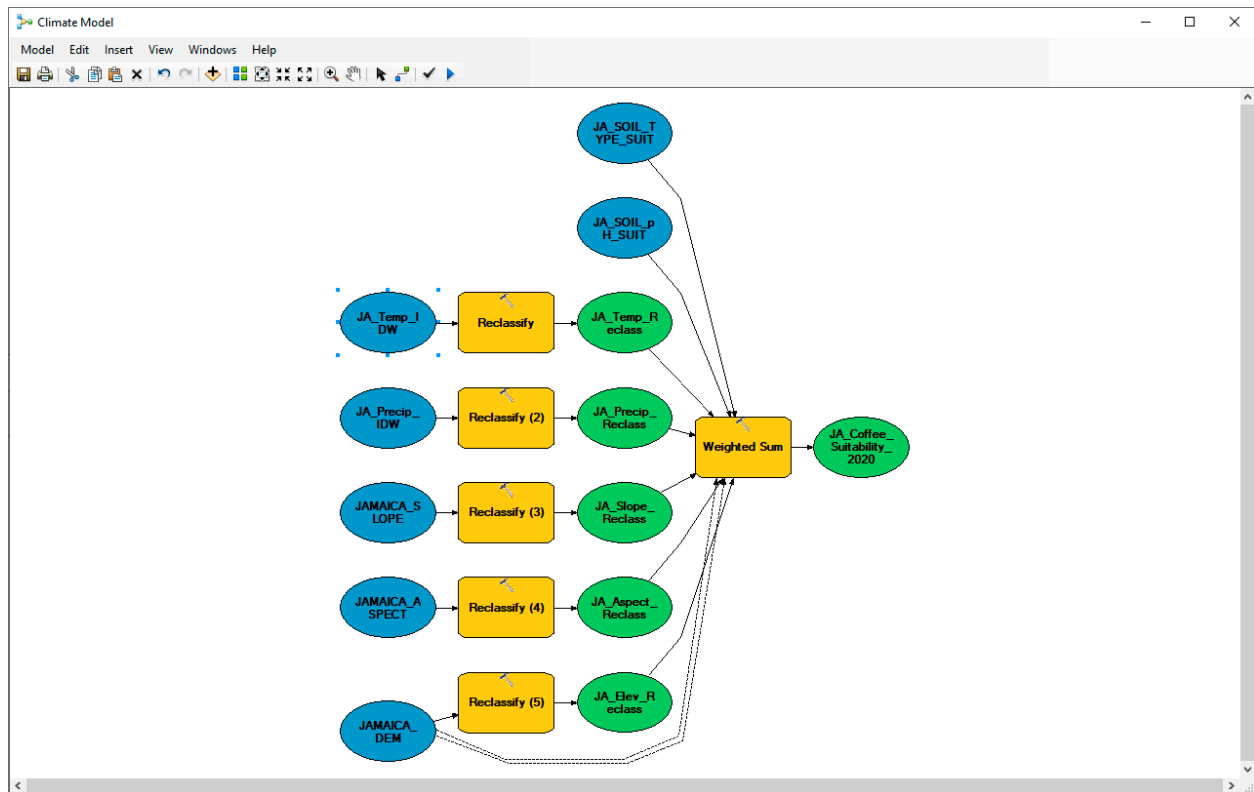


Figure S1. ModelBuilder representation of steps taken to execute the base 2020 coffee suitability model.

Almazroui et al. (2021) base period = 1995-2014

Our base period = 1970 - 2020

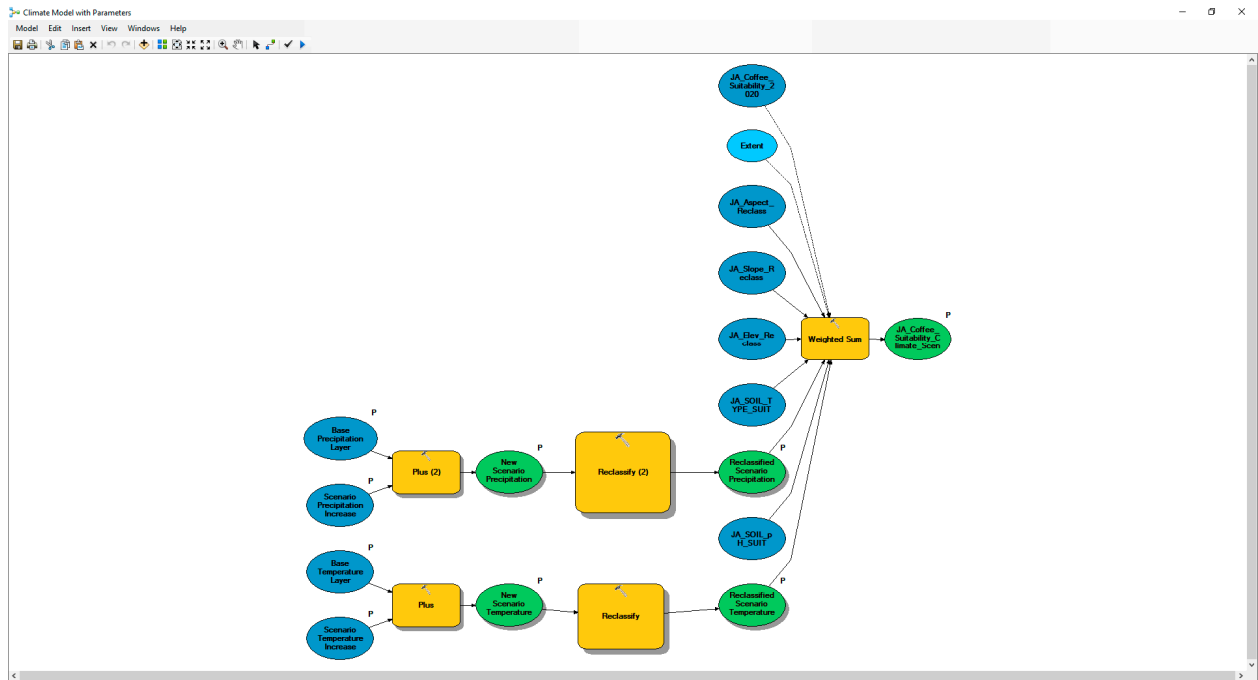


Figure S2. ModelBuilder representation of steps taken to execute temperature and precipitation changes for the various coffee climatic suitability scenarios.

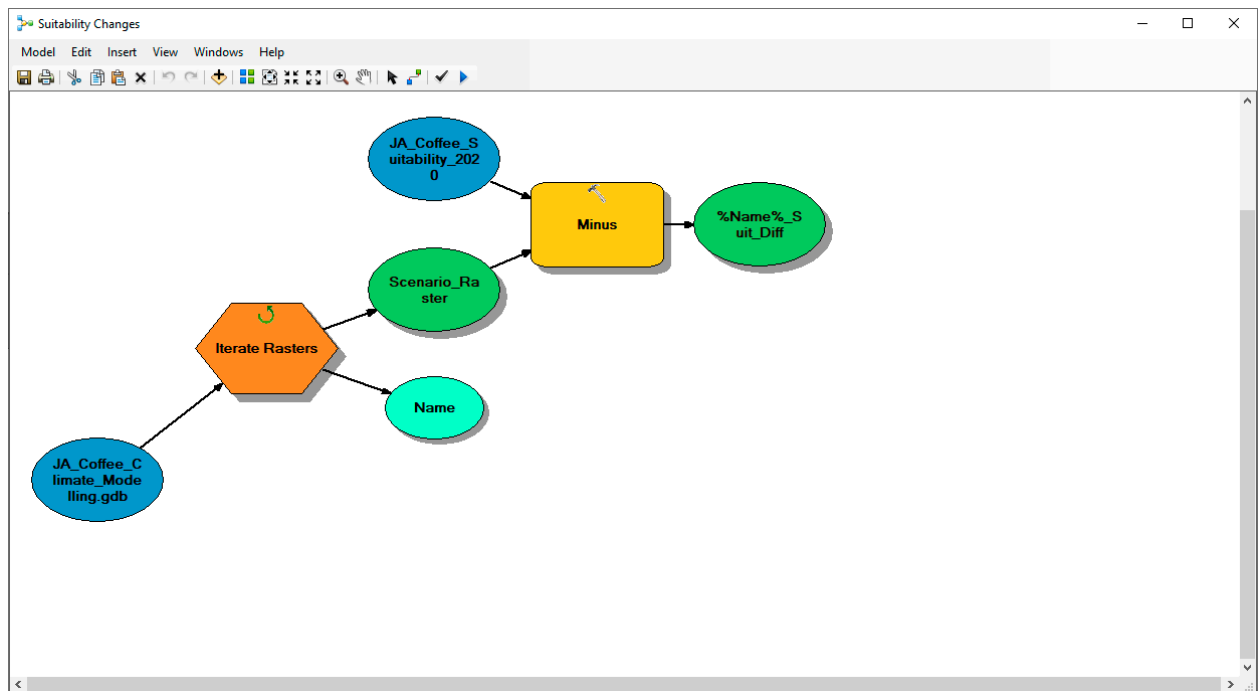
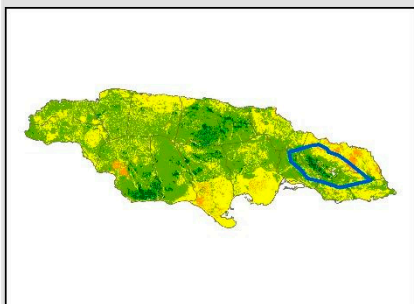


Figure S3. ModelBuilder representation of iterator used to calculate changes in coffee suitability due to impacts of temperature and precipitation.

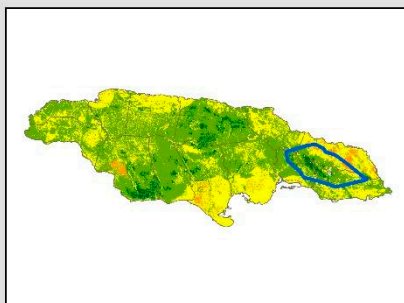
Coffee Climate Suitability Changes: 2021-2040



Original Coffee Suitability Model - 2020



Coffee Suitability - SSP1 2.6 2021-2040

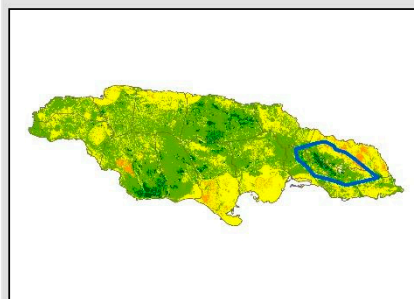


Legend

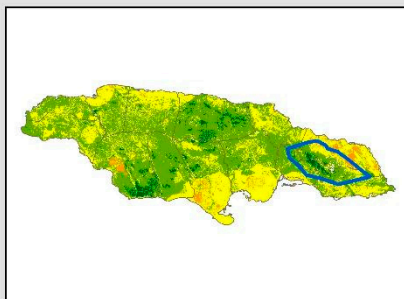
- BLUE MOUNTAIN COFFEE REGION
- JAMAICA PARISH BOUNDARIES

Coffee Suitability Model Ranges

- 1.960000038 - 2.51
- 2.510000001 - 3.06
- 3.060000001 - 3.61
- 3.610000001 - 4.16
- 4.160000001 - 4.72



Coffee Suitability - SSP2 4.5 2021-2040

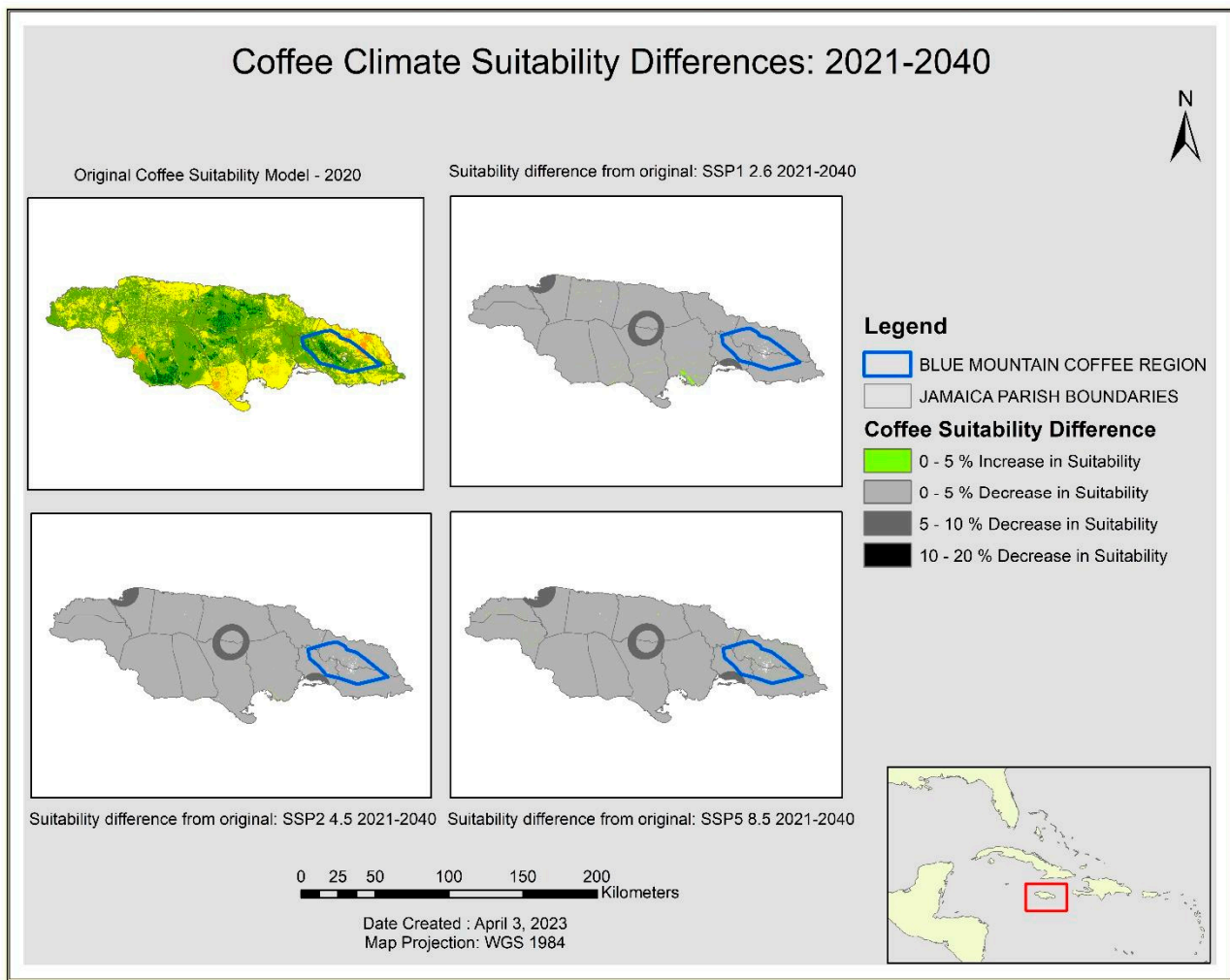


Coffee Suitability - SSP5 8.5 2021-2040

0 25 50 100 150 200
Kilometers

Date Created : April 3, 2023
Map Projection: WGS 1984





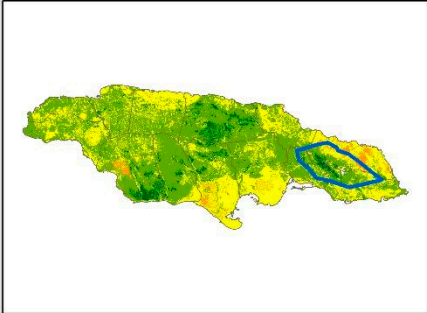
B

Figure S4. Changes in coffee suitability due to climate change for 2021-2040. A: Suitability models for each SSP scenario. B: Differences in suitability from the original suitability model for 2020.

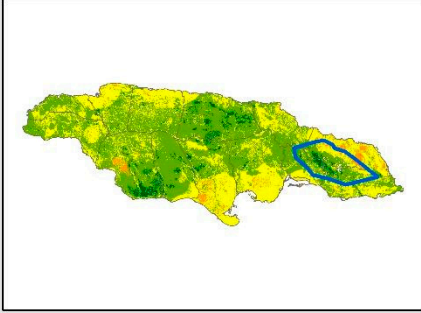
Coffee Climate Suitability Changes: 2041-2060



Original Coffee Suitability Model - 2020



Coffee Suitability - SSP1 2.6 2041-2060

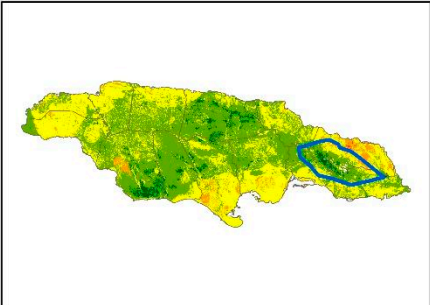


Legend

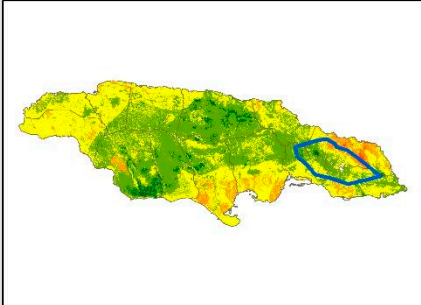
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Coffee Suitability - SSP2 4.5 2041-2060

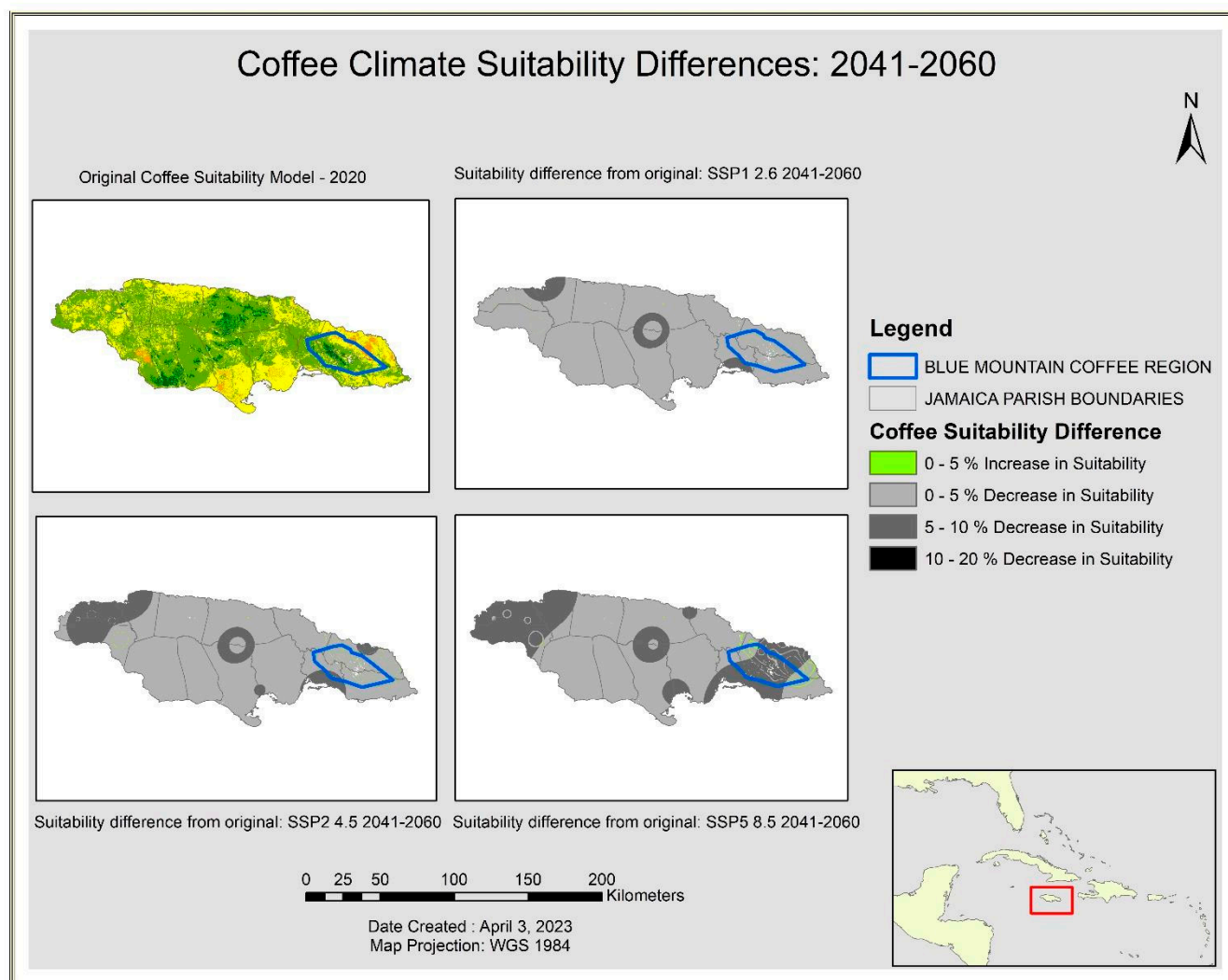


Coffee Suitability - SSP5 8.5 2041-2060



Date Created : April 3, 2023
Map Projection: WGS 1984





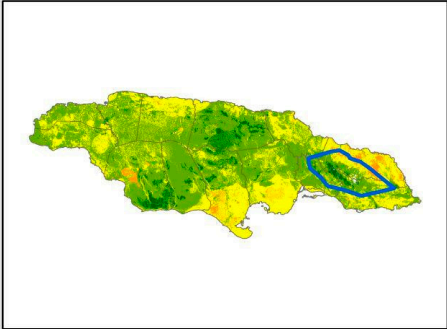
B

Figure S5. Changes in coffee suitability due to climate change for 2041-2060. A: Suitability models for each SSP scenario. B: Differences in suitability from the original suitability model for 2020.

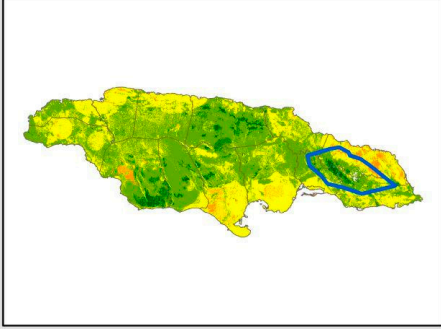
Coffee Climate Suitability Changes: 2081-2100



Original Coffee Suitability Model - 2020



Coffee Suitability: SSP1 2.6 2081-2100

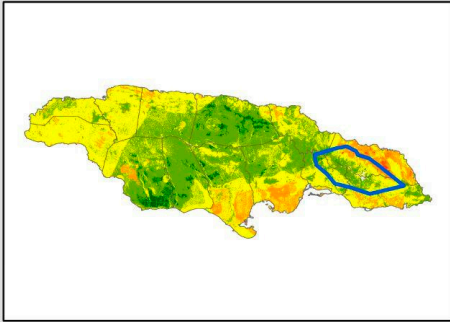


Legend

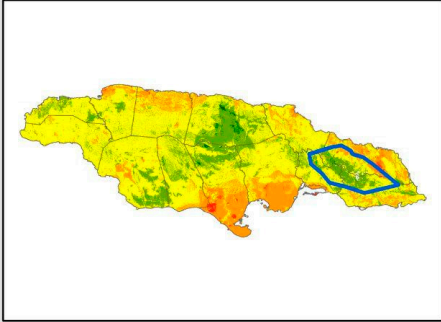
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Coffee Suitability: SSP2 4.5 2081-2100

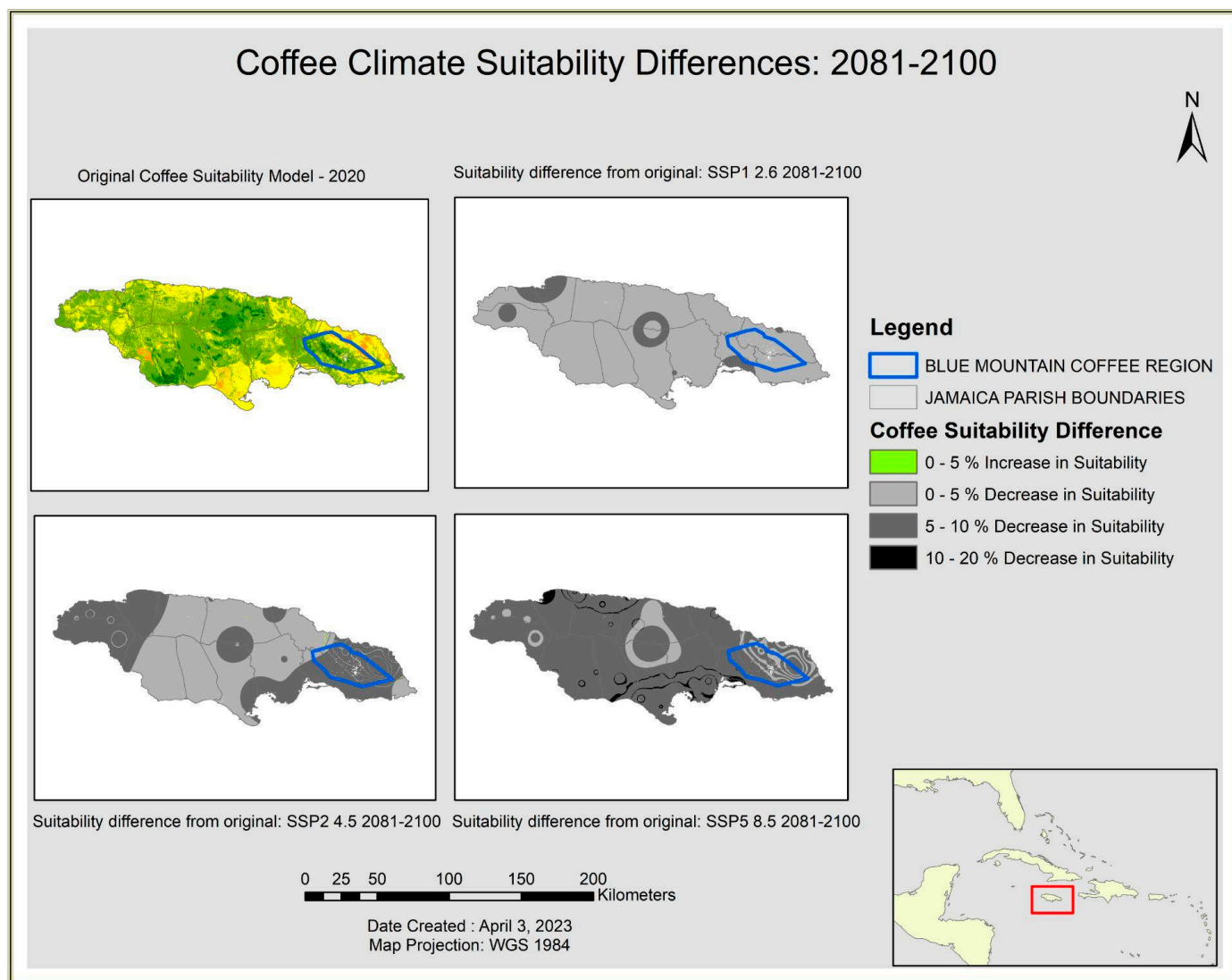


Coffee Suitability: SSP5 8.5 2081-2100



Date Created : April 3, 2023
Map Projection: WGS 1984





B

Figure S6. Changes in coffee suitability due to climate change for 2081-2100. A: Suitability models for each SSP scenario. B: Differences in suitability from the original suitability model for 2020.

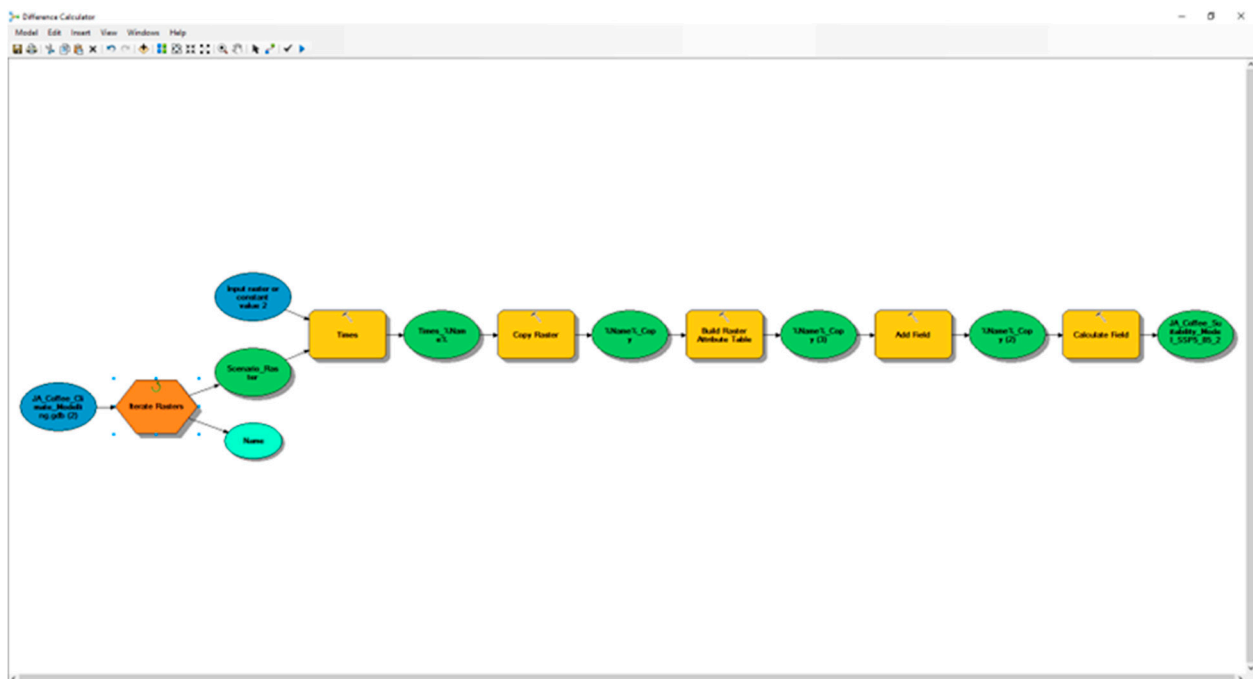


Figure S7. ModelBuilder representation of iterator used to calculate differences in coffee suitability vs. 2020 base model.

Location of Temperature Stations in Jamaica

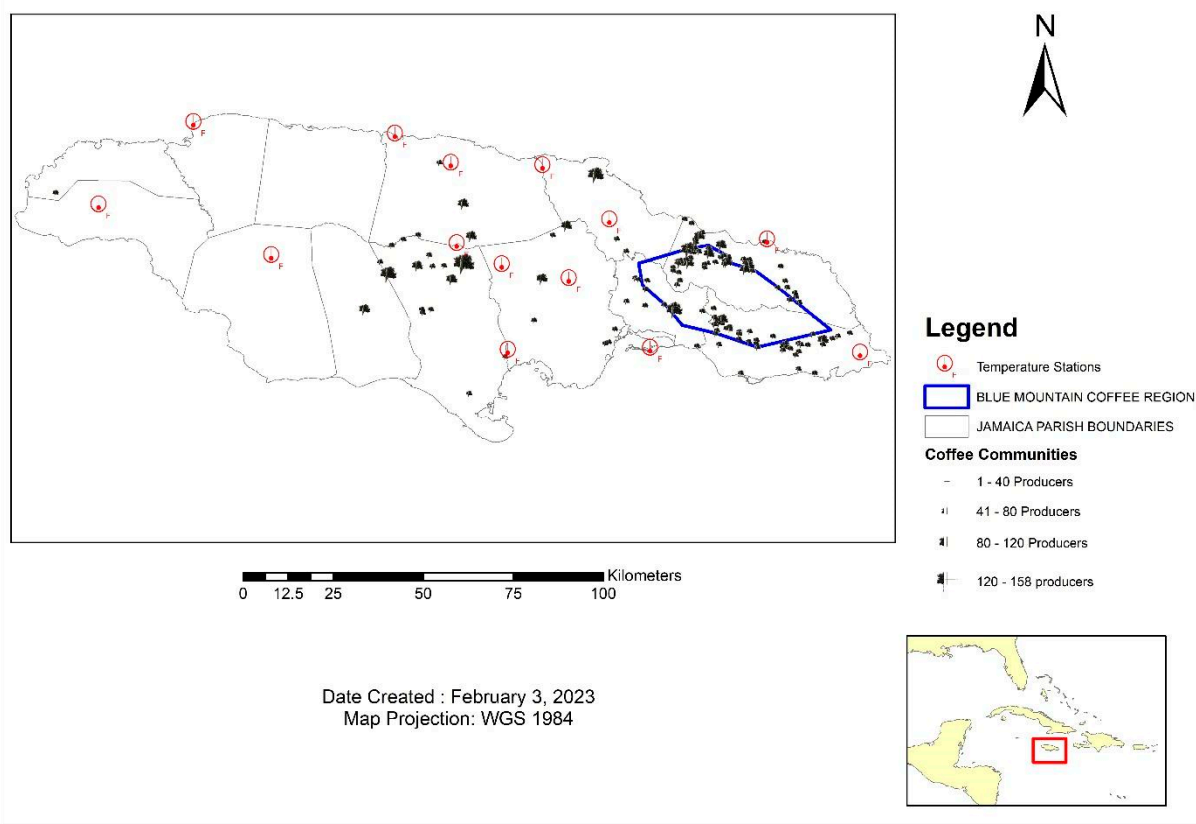


Figure S8. Spatial distribution of temperature measurement stations across the island of Jamaica.