A climate storyline approach to cross-border climate risks

Cacao production in Ivory Coast and Ghana

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Agriculture in RECEIPT project

Potential implications to the EU

- Food security perspective
- Economy perspective
- Supply-chain perspective

Import dependency > 25%
Cacao imports and EU economy

- Europe is the world's largest chocolate manufacturer.
- Industry with confectionary valued at €46 billion (2020) (10% of total agri-food).
- World’s largest chocolate exporter, 76% of global sales.
- Around 250,000 jobs.
CACA story line

Crop: Cacao
Hotspot area: Ivory Coast and Ghana
Climate: Drought
- RCP 2.6 and 8.5 scenarios (climate change)
  - 2030: 2020-2040
  - 2050: 2040-2060
  - 2085: 2070-2090
Local impacts: Yield losses
- Production losses
- Extreme year
- 20 year average (future)
Impacts to the EU: Trade volume
- Cacao price

Bio-physical modeling: ISIMIP

R2WATER research and consultancy

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Cacao Storyline - Modeling approach

1- Cacao yield: soil moisture deficit (proxy):
   - T, P (historical, future periods)
   - FAO water production function \( \left(1 - \frac{y_a}{ym}\right) = Ky \)
   - Evapotranspiration (SPHY model, water balance model)

3- Economic impacts GRACE model (GCE)
Cacao Storyline

Two policy options:

(i) No policy on deforestation

(ii) Trade ban on cacao produced in protected land area.
Production areas

Green areas are protected land

(Abu et al, 2021)
Cacao Yield - historic vs future (loss)
Yield change ($\Delta Y$). 2041-2060 (RCP 8.5)
Cacao production - historic vs future

- Loss in cacao production (only climate change)
  - Ivory Coast: 11% (RCP 8.5), extreme year 16.5% (RCP 8.5)
  - Ghana: 47% (RCP 8.5), extreme year 66% (RCP 8.5)

- Additional loss in cacao production (no import from protected land)
  - Ivory Coast: 24%
  - Ghana: 16%
Trade flow - historic vs future

Change in trade flow (%)

-20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0

RCP2.6_2030  RCP2.6_2050  RCP2.6_2090  RCP8.5_2030  RCP8.5_2050  RCP8.5_2090

Business as usual  No deforestation

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Cacao prices - historic vs future
Cacao prices - historic vs future

annual expense of 10 billion euros for the