Assessing crop-specific climate risks

A cross-border case study of agri-food trade between Türkiye and NL

Tijmen Schults

Potsdam Institute for Climate Impact Research, 17-10-2023

FutureWater

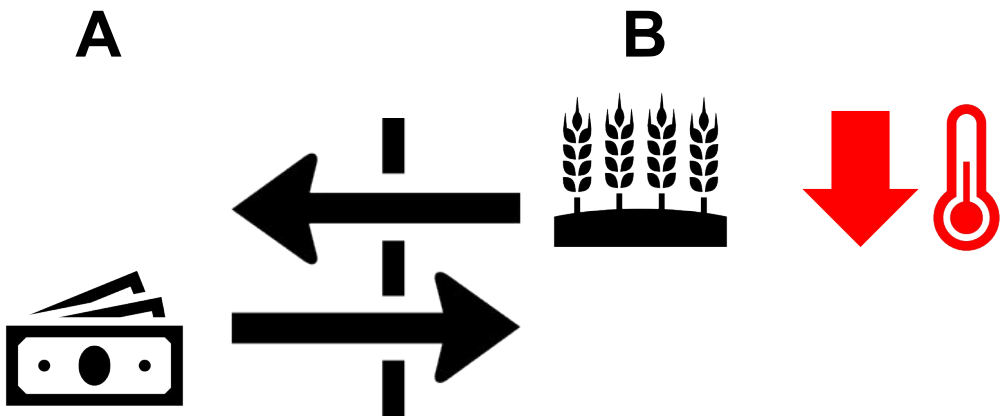
1. Introduction

Context

- FutureWater
- CREATE: Cross-Border Climate Vulnerabilities and Remote Impacts of Food Systems of the EU, Türkiye and Africa
- Ministry of Agriculture, Nature and Food Quality of The Netherlands
- Collaboration with Ankara University and R2Water
- Unsubmitted, work in progress

Introduction

- Climate change impacts on agriculture
- Regions are interconnected through global trade
- Climate impact in one country presents cross-border risk
- Dependency on agri-food trade
  - Import / Export
- Cross-border vulnerability



Introduction

- A crop-specific cross-border climate risk framework that integrates:
  - Crop-specific climate risk on food production
  - Climate suitability mapping
  - Import-export dependency
- Case study between Türkiye and The Netherlands
  - Extend to include EU
- Key crops: apricot, figs, grape, and hazelnut
- Define priorities and develop adaptation strategies

2. Methods and Data

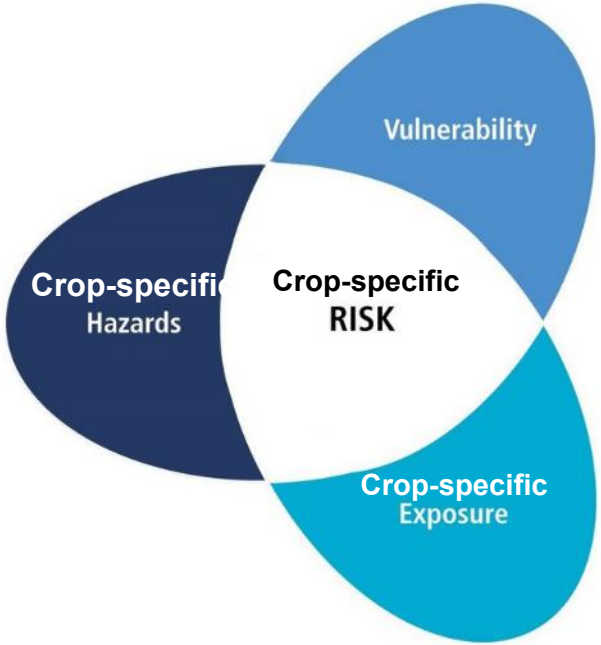
Climate Risk Framework

- Risk = *"The potential loss of assets that could occur to a system, society, or a community in a specific period, determined probabilistically as a function of **hazard**, **exposure,** and **vulnerability"*** (UNDRR, 2020)

- Climate Risk Framework:
  - Hazard
  - Vulnerability
  - Exposure

- Risk of climate change on reductions of **key crop production**

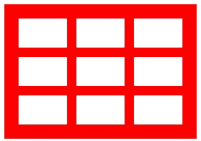
- Crop-specific climate risk!



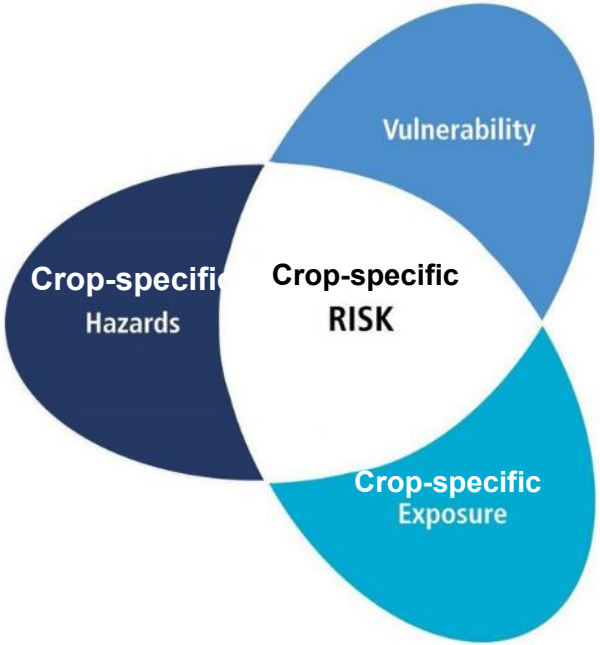
(IPCC, 2018)

Crop-specific climate risks

- Crop-specific indicators of potential climate change impact
  - CMIP6 model ensemble
    - SSP2-4.5
    - SSP5-8.5
  - Reference period (1990-2019)
  - Future time horizon 2050 (2035-2064)



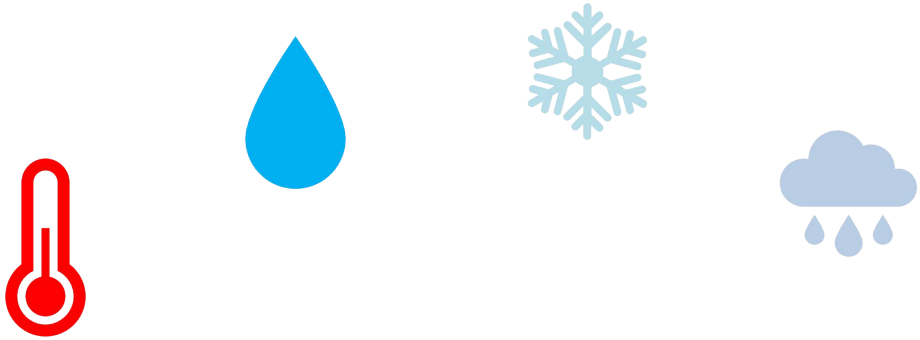
- Socio-economic datasets
- Physico-geographic datasets
- Global water resources model output



- Agricultural production maps

FutureWater

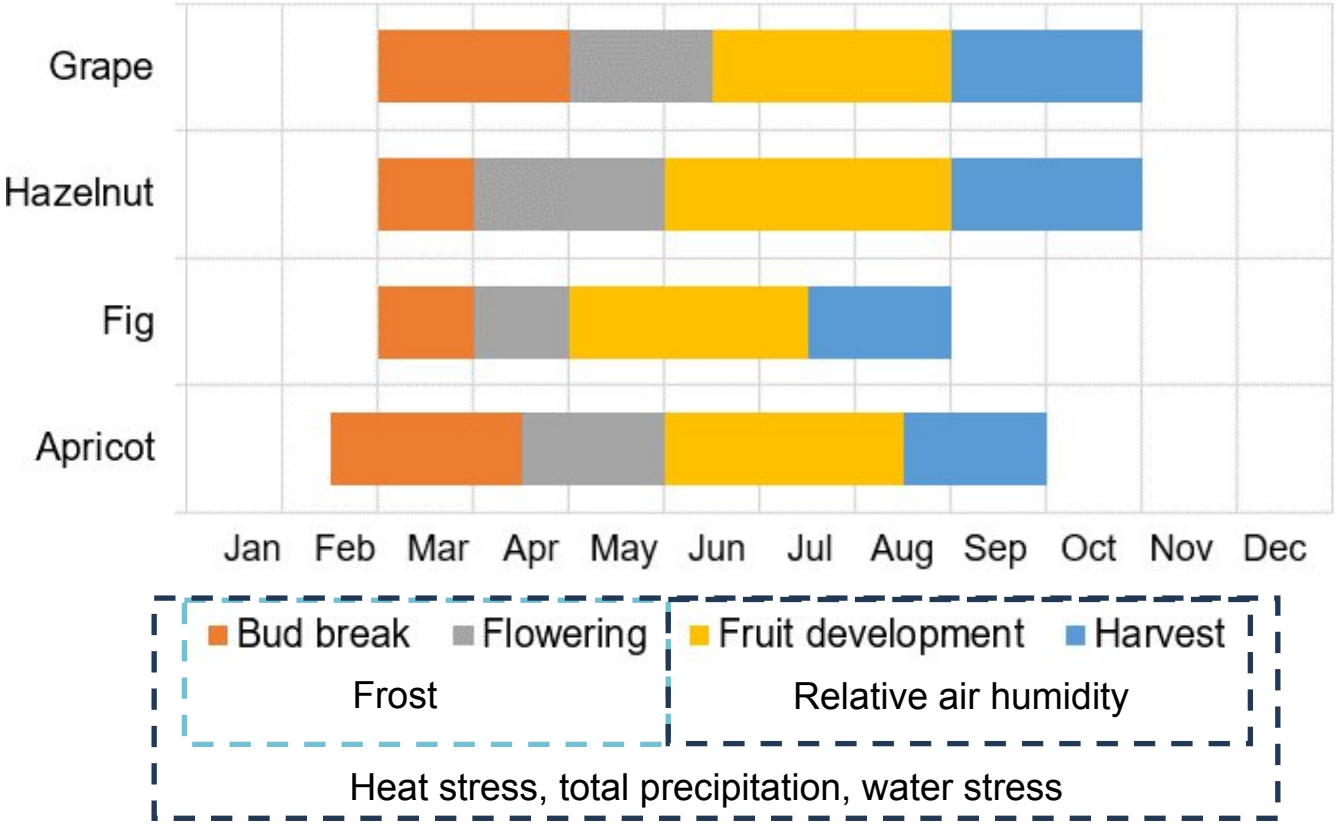
Crop-specific climate hazard



- Indicators of potential climate change impacts:
  - Δ Heat stress [days]
  - Δ Air humidity stress [days]
  - Δ Frost [days]
  - Δ Total precipitation [mm]
  - Δ Chilling requirements [CU]
- Relative or absolute change in indicators scaled between 0 and 1
- Different stress thresholds for each crop
- Fine-tuned with stakeholders

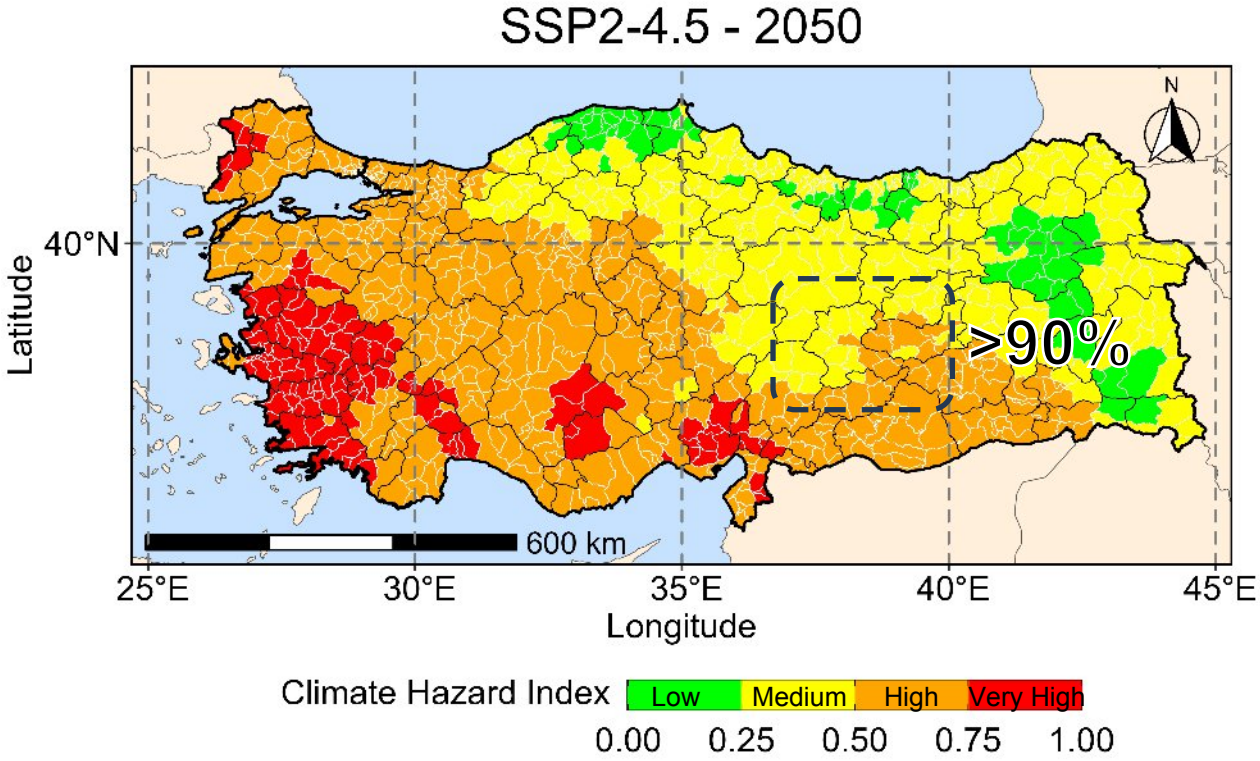
Crop-specific climate hazard

Phenological stages of key crops in Türkiye: stress threshold + temporal window

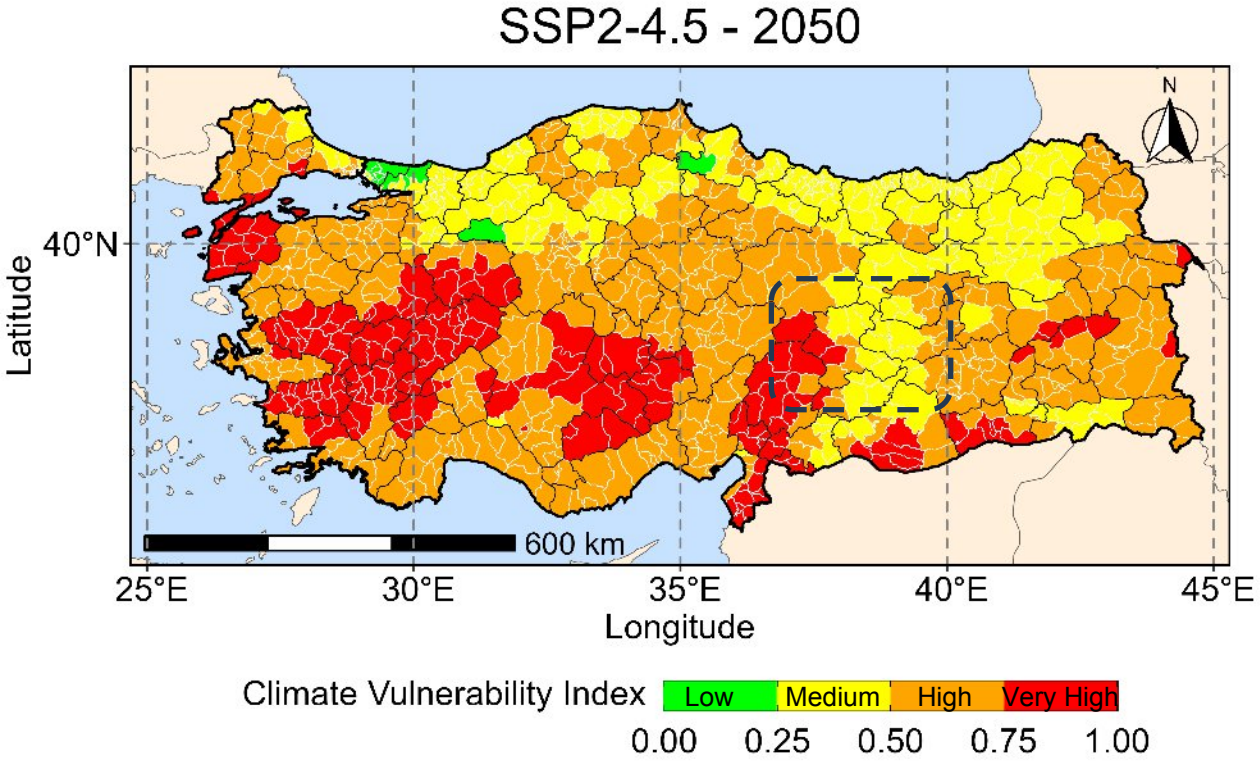


3. Results

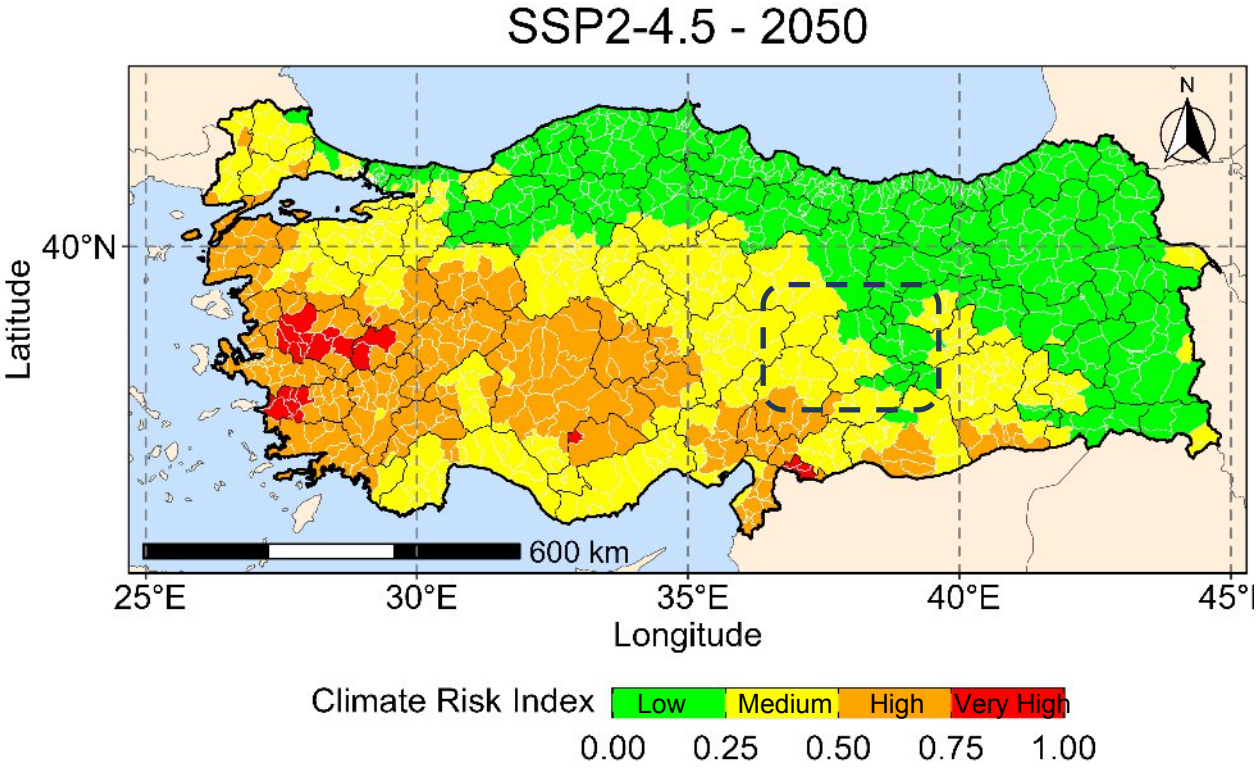
Climate Hazard – Apricot Production



Climate Vulnerability - Apricot Production

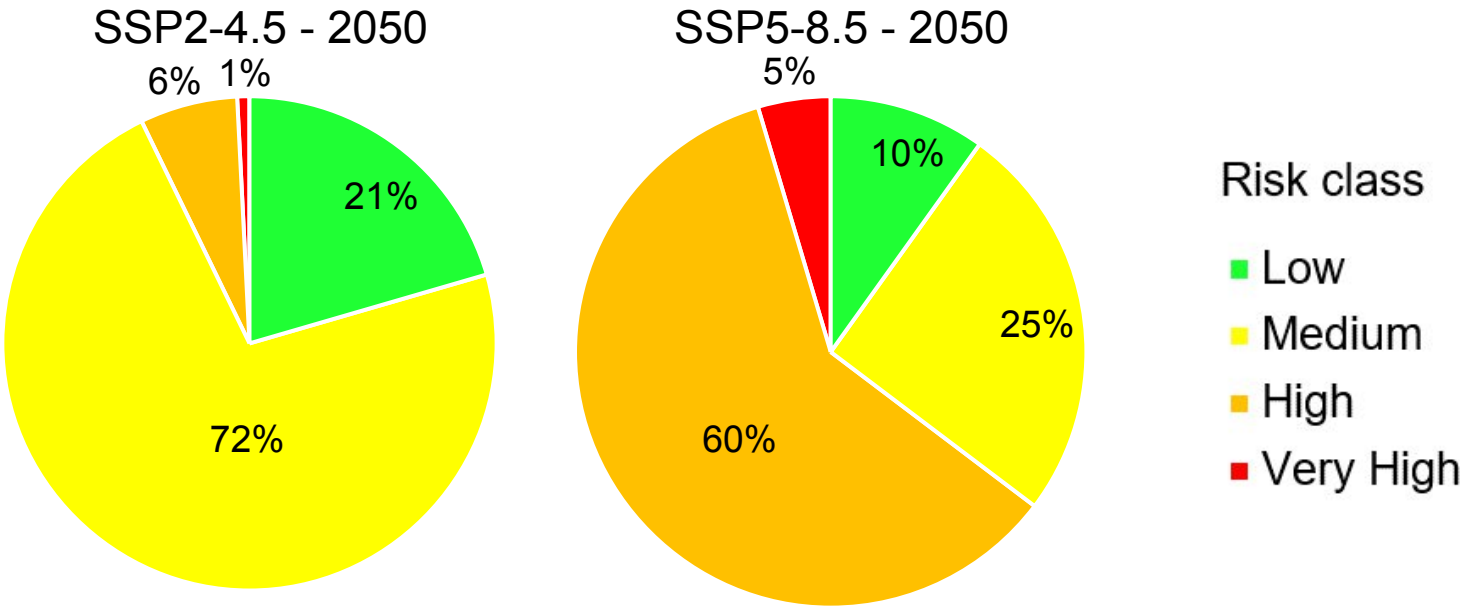


Climate Hazard x Vulnerability - Apricot Production

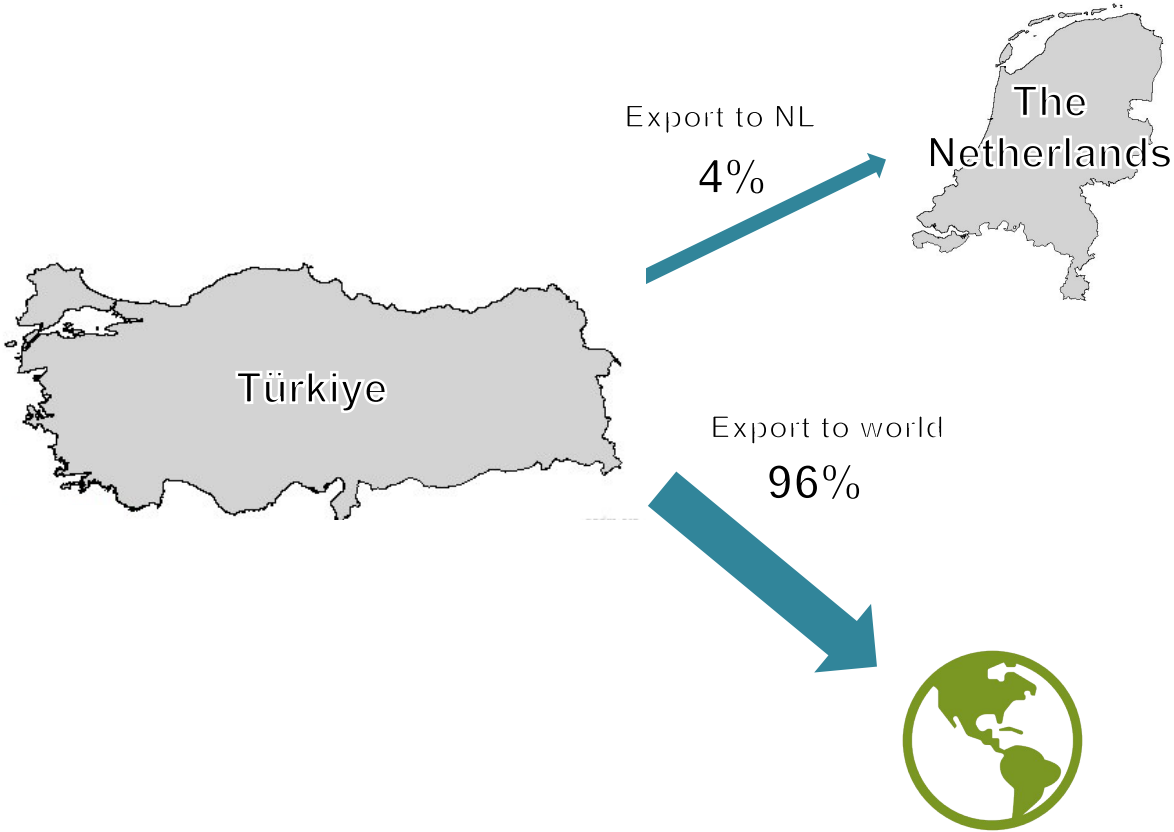


- Overlay with crop production map

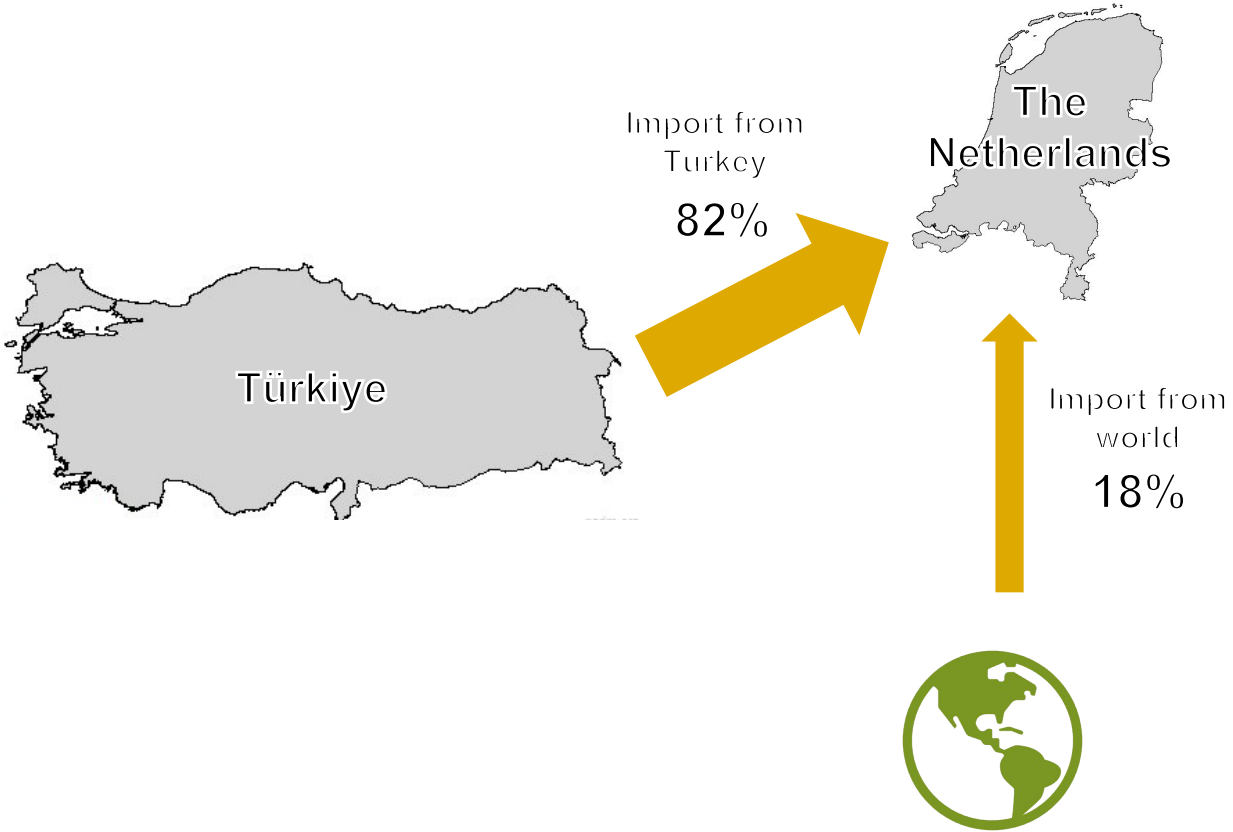
Share of national apricot production per risk class



Apricot trade flow - Export from Turkey



Apricot trade flow - Import to The Netherlands



Export / Import Vulnerabilities between NL and Türkye

Crop	Export	Export Vulnerability	Import	Import Vulnerability
Grapes	8%	Low	9%	Low
Apricot	4%	Low	82%	Very High
Hazelnut	2%	Low	70%	High
Figs	4%	Low	46%	Medium

- When incorporating rest of EU, the export dependency is very likely to increase!

Export / Import Vulnerabilities + Production Risk

Apricot

Risk Class	Prod. % SSP2-4.5	Prod. % SSP5-8.5	I	E
Low	20%	10%	Very High	Low
Medium	72%	25%		
High	6%	60%		
Very High	2%	5%		

I = Import vulnerability E = Export vulnerability

- Netherlands is import dependent
- SSP2-4.5: 72% of imported apricots are likely to come from medium risk areas
- SSP5-8.5: 60% of imported apricots are likely to come from high-risk areas

4. Conclusion

Conclusion

- Netherlands depends heavily on Türkiye for imports of selected crops
- Climate change is likely to disrupt agri-food trade between Türkiye and NL
- Varying degrees of climate risk for production of different key crops
- Crop-specific climate risk varies in space
- Adaptation strategies and policies should be focused on specific crops
- Collaborative efforts, innovation, and sustainable practices will be crucial to maintaining stable trade relations and ensuring food security

Thank you!

> Q & A

Tijmen Schults
t.schults@futurewater.nl

www.futurewater.eu