



Universidad
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Forecasting and managing tool in microbiological safety using network analysis

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Detailed trade matrix from FAOSTAT



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Detailed trade matrix

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Detailed trade matrix

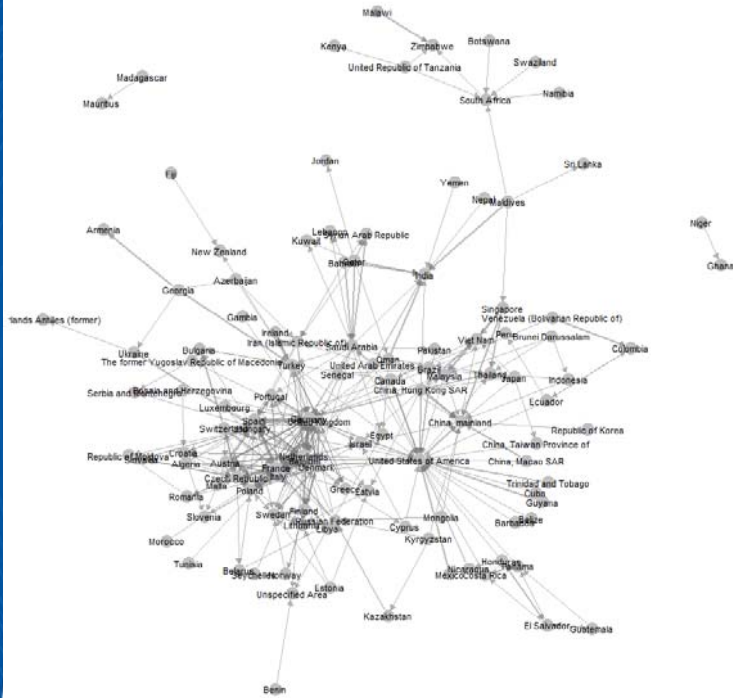
The food and agricultural trade dataset is collected, processed and disseminated by FAO according to the standard International Merchandise Trade... [Show More](#)

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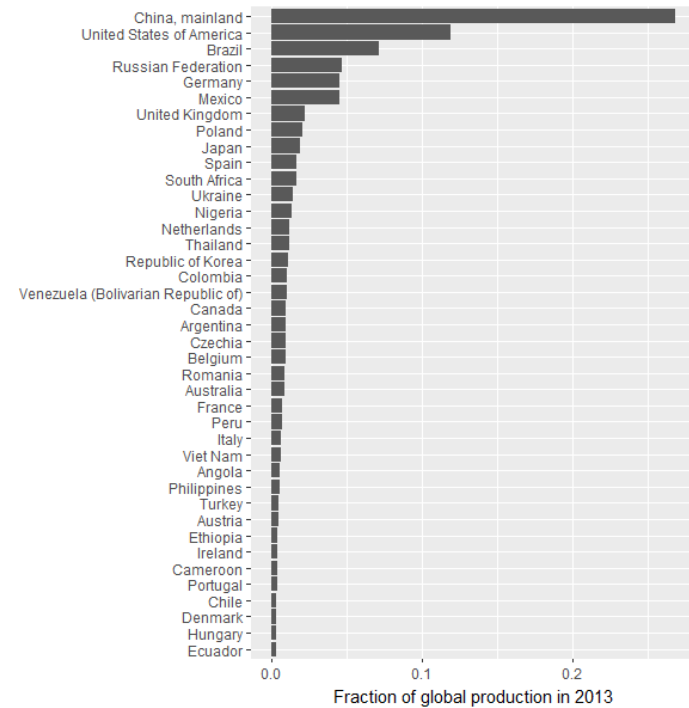


Detailed trade matrix from FAOSTAT

Trade flows

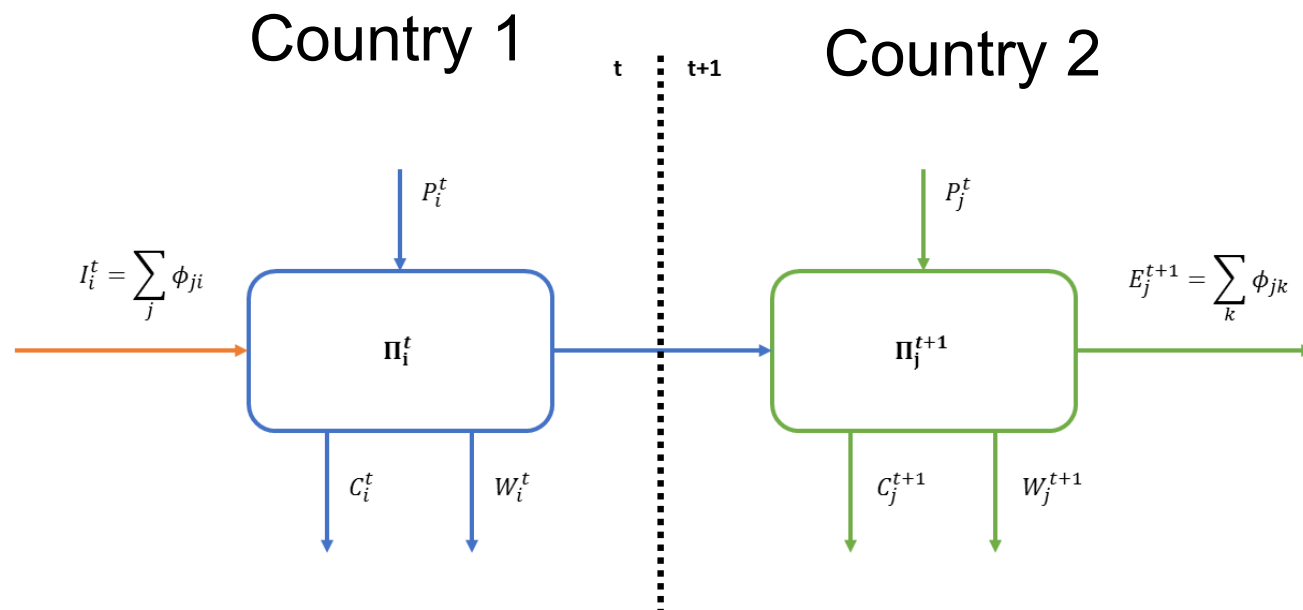


Production & Consumption





Structure of the food spread model



Contaminated (or fraudulent)
fraction of consumption

Production: P
Consumption: C
Exports: E
Waste: W
Imports: ϕ



Model proposed to predict food spread

Assumption of mass conservation:

$$P_i^t + I_i^t = C_i^t + W_i^t + E_i^t \text{ (Eq. 1)}$$

where P_i^t , C_i^t , I_i^t , E_i^t and W_i^t are, respectively the national production, consumption, imports, exports and amount of food waste

Simulation of the spread of contaminated products:

$$\alpha_i^{t+\Delta t} = \frac{\tau_i^{t+\Delta t} P_i + \sum_j \alpha_j^t \phi_{ji}}{C_i + E_i + W_i} \text{ (Eq. 2)}$$

α_i^t fraction of contaminated food, τ_i fraction of the national production that is contaminated, ϕ_{ji} trade flux



Application using a real outbreak in the EU



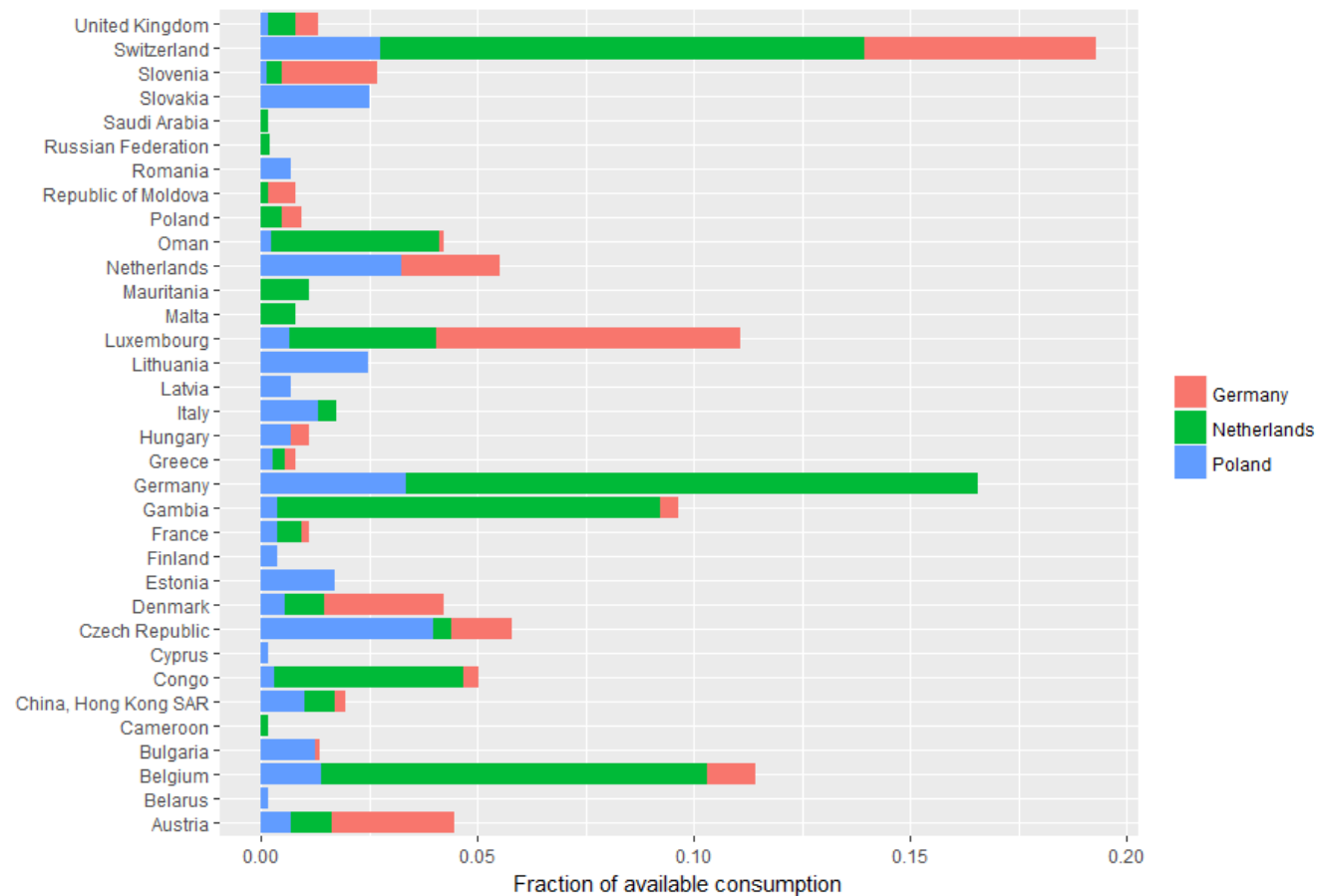
Reported in 14 different countries

What is the most likely origin?



Prediction of potential risk

Countries where a potential risk exists can be predicted





CONCLUSIONS

- The model can narrow down the possible origins of the contamination.
- It uses data already available. Hence, it can be applied rapidly.
- It can detect countries at risk of being contaminated.
- The simulations can be updated, as more information is available (reports in new countries), refining the results.



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