

# THE FRUITS AND VEGETABLES INDUSTRY SERIES

29 October 2024

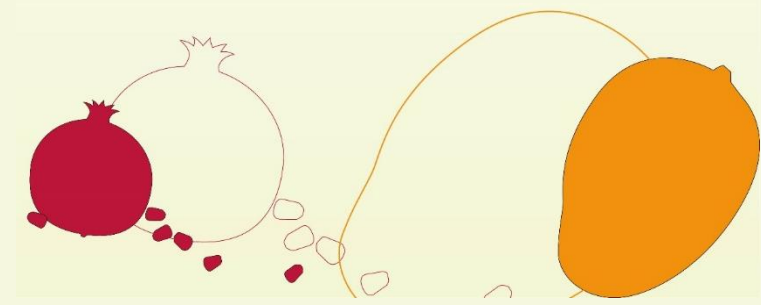


## Session n°8

### Market challenges and geopolitical issues affecting trade flows in Fruits and Vegetables (F&V)



FRUIT AND VEGETABLES SCHEME



# AgroFair

RIGHT FROM THE PRODUCER





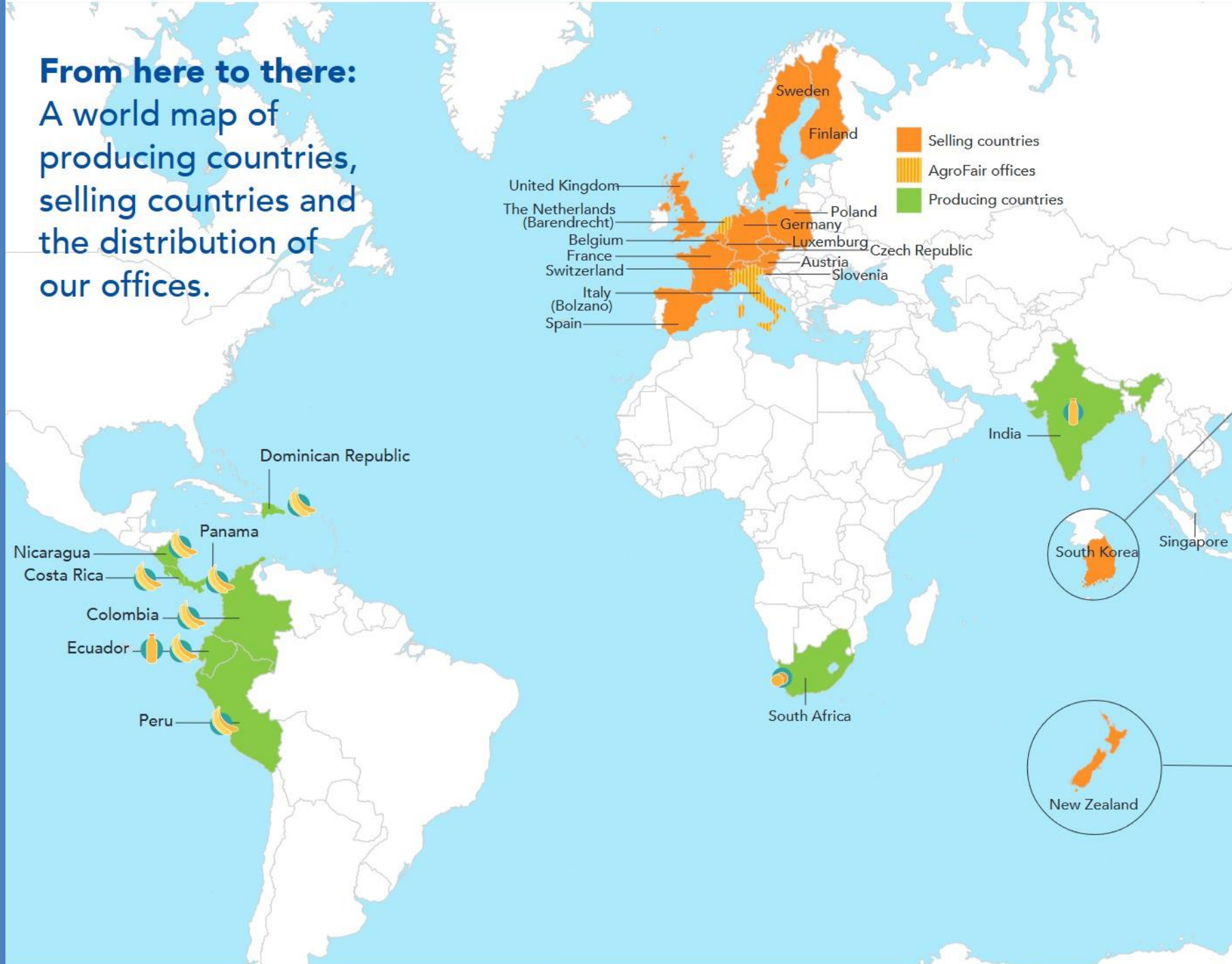
# Our supply chain



For more information:  
[www.agrofair.nl/supply-chain](http://www.agrofair.nl/supply-chain)



**From here to there:**  
A world map of  
producing countries,  
selling countries and  
the distribution of  
our offices.





# Challenges



- Geopolitical shocks: rising costs (fertilizer, transport, irrigation) -> lagging fertilization -> lower yield and quality (more than a year later) – some producers stopping.
- Climate change -> decreasing volume and quality, increasing pathogen pressure
  - Low rainfall in Panama : limits Panama canal capacity
- Labour shortage: low wages, high turnover -> affects quality and reliability
- Tightening of EU regulations: EU organic, deforestation, MRLs (maximum residue level), HRDD (Human Rights Due Diligence), CSRD (Corporate sustainability reporting) -> adding costs
  - favours low-regulation export destinations & local markets
  - disfavors small producers

# Climate change





# Costs of inputs





# Labour shortage and turnover





# Regulations





# Responses



- Contracts need to pass on price shocks to retailers e.g. by quarterly adjustment factors.
- Security of supply more important than lowest price – long-term partnerships producer-retailer
- Innovation: applying artificial intelligence / machine learning for predicting volumes & quality



# Long-term partnerships





# Include economic shocks in contracts





# Technology for better predictions and quality



## Does Controlled Atmosphere Reduce Crown Rot in Organic Bananas?

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### Conclusions

1. Crown rot (CR) susceptibility is related to **fruit age** – accumulated degree.days
2. A higher **pulp temperature (PT)** at arrival and a longer **transit time** are related to increased crown rot incidence. PT cause or effect? Or both?
3. Not using **Controlled Atmosphere (CA)** increases the incidence risk by 1.66 / 1.99 for mild and severe crown rot.
4. CA is useful in situations with **add** and **transit times** in **highest quartiles**.
5. Further research: Extend to other countries, predict CR with **machine learning** models.



### Introduction

1. Organic bananas are an important fruit category.
2. No synthetic chemicals – post-harvest anti-fungal protection of the crown is a challenge
3. Organic post-harvest products are prone to fraud (adulteration with quaternary ammonium compounds).
4. CA is reported to reduce crown rot in tests, but does it work on a commercial scale? Is it worth the additional cost?

### Experimental design

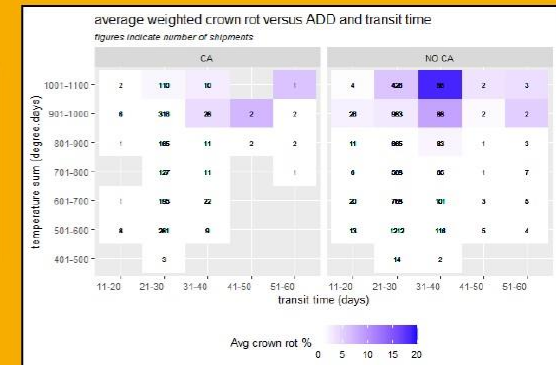
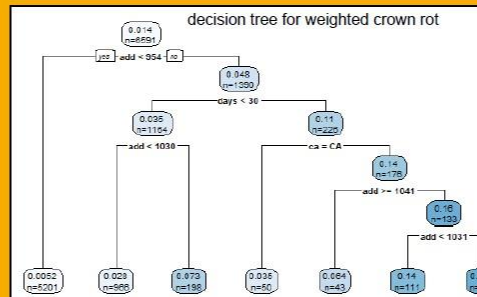
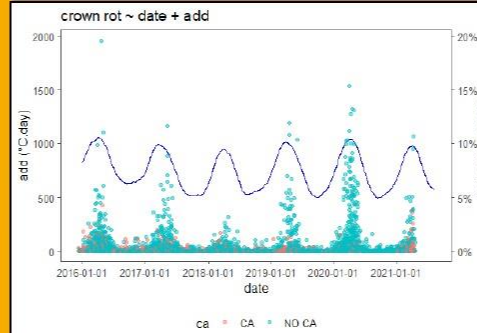
1. A data set of **6591** container shipments of organic bananas from Peru to Europe, 540 with CA, 6051 without CA.
2. Crown rot assessment according to **industry protocol**, with and without CA.
3. Weather data are retrieved from **meteostat.net** API, for Piura, Peru
4. **Accumulated degree days (add)** computed on a 77 day growing cycle with 13.5°C cut-off.
5. Many zero values in dependent variable: **hurdle regression**, a combination of a binomial model for the zeros and a zero-truncated negative binomial count model. (library *pscl*).
6. **Decision tree** on weighted variable ( $C = CR + 2 \cdot CRC$ ), (library *rpart*).



add : accumulated degree days > 13.5°C  
ADD : add/100  
ca : dummy variable for CA  
days : transit time between pack and discharge  
avggrade : average grade (girth) of the fruit  
maxtemp : maximum pulp temperature on arrival  
season : dummy variable for crown rot season (wk 8-25)  
Mild CR/ CRC : <20% of crown affected  
Severe CR / CRC : > 20 % of crown affected  
C : Weighted crown rot (CR + 2 \* CRC)  
theta = probability of drawing 0

### Results and discussion

Variable	N	Mean	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max
CR	6591	0.007	0.024	0	0	0	0.43
CRC	6591	0.004	0.017	0	0	0	0.410
C	6591	0.014	0.052	0	0	0	0.98
add	6591	796.477	178.113	498.7	597.484	935.423	1054.981
ca	6591						
CA	1316	20%					
NO CA	5275	80%					
days	6591	27.424	3.488	18	26	29	60
maxtemp	6591	14.826	0.562	0	14.5	15.1	23.5



HURDLE REGRESSION OUTCOMES		
	mild CR	severe CR
Count model: (Intercept)	-11.29 *** (1.18)	-11.37 *** (1.59)
Count model: ADD	0.34 *** (0.02)	0.41 *** (0.04)
Count model: caNO CA	0.51 *** (0.07)	0.69 *** (0.12)
Count model: days	0.05 *** (0.01)	0.02 *** (0.01)
Count model: avggrade	0.03 (0.02)	0.03 (0.03)
Count model: maxtemp	0.46 *** (0.04)	0.42 *** (0.06)
Count model: Log(theta)	0.41 *** (0.07)	0.32 *** (0.10)
Zero model: (Intercept)	-4.23 *** (0.25)	-5.61 *** (0.30)
Zero model: season1	1.97 *** (0.07)	2.31 *** (0.09)
Zero model: days	0.08 *** (0.01)	0.09 *** (0.01)
AIC	13568.10	7719.22
Log Likelihood	-6774.05	-3849.61
Num. obs.	6591	6591

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05 std.er in ()



## THE FRUITS AND VEGETABLES INDUSTRY SERIES

# Thank you



FRUIT AND VEGETABLES SCHEME



*The OECD-COLEAD Fruits and Vegetables Industry Series focuses on market access conditions and opportunities for the fruit and vegetable sector, especially for fruit and vegetables producers and exporters from ACP-countries. This activity is supported by the Fit For Market Plus programme, implemented by COLEAD within the Framework of Development Cooperation between the Organisation of African, Caribbean and Pacific States (OACPS) and the European Union.*