Factors explaining differences in FSMS performance in fresh produce supply chains:

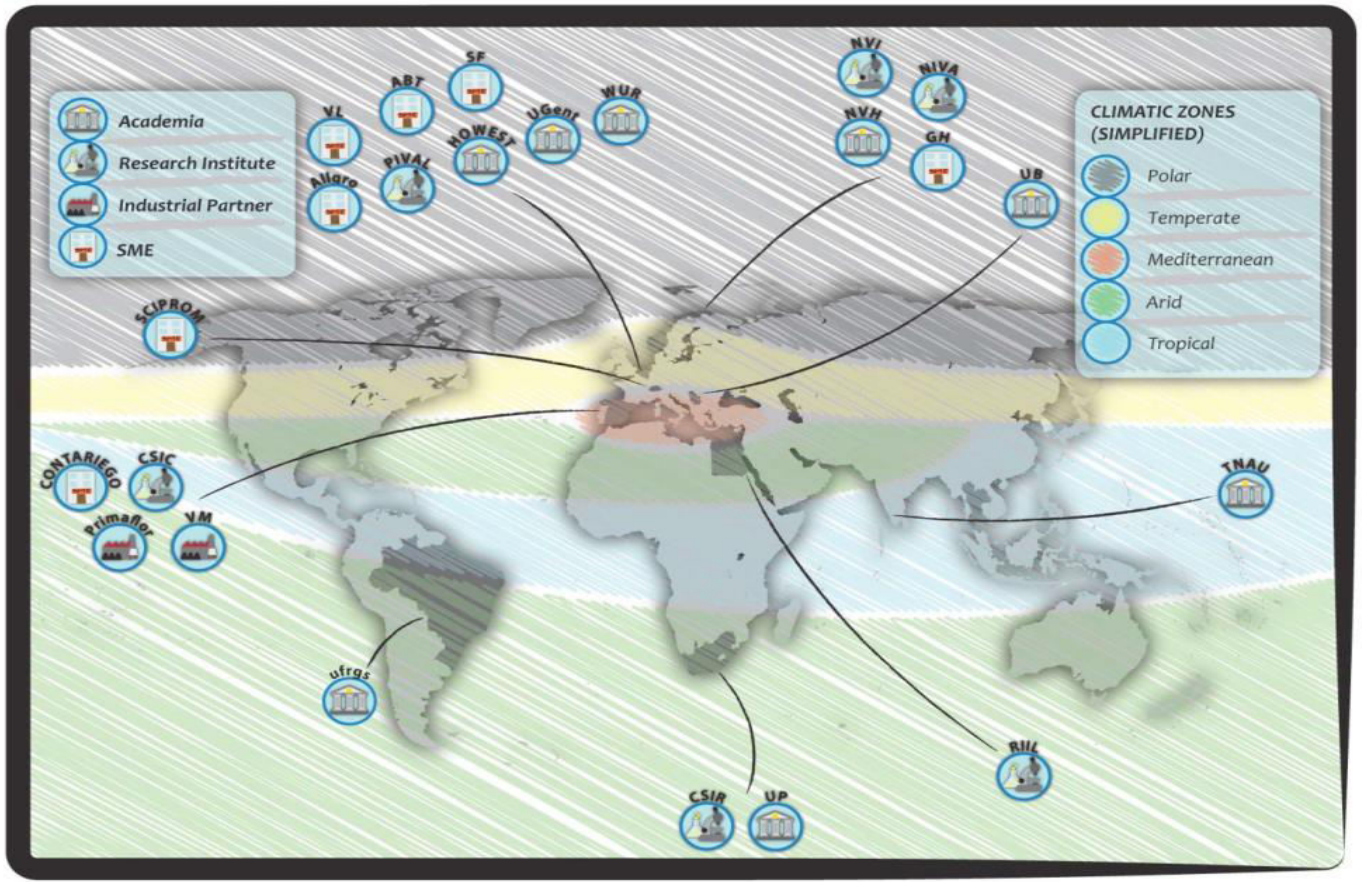
in Europe and beyond

August, 2015: Pieternel Luning, K. Kirezieva & L. Jacxsens

WAGENINGEN UNIVERSITY
WAGENINGEN UR

Veg-i-trade project

*"Impact of climate change and globalisation on **safety of fresh produce** – governing a supply chain of uncompromised food sovereignty"*

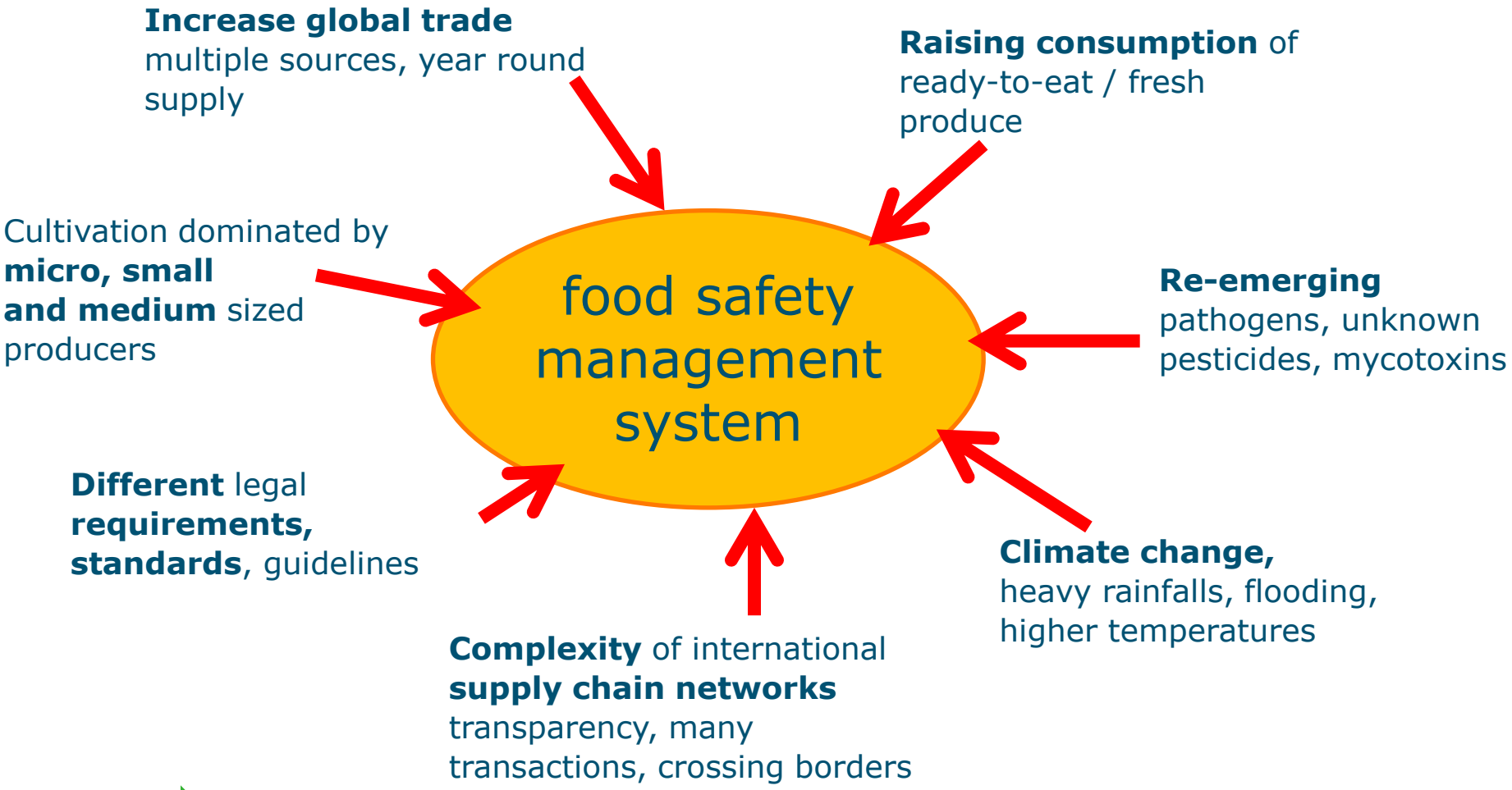


Veg-i-Trade unifies 23 international partners from - universities, research institutes, SMEs & large industrial partners

Topics of presentation

- Challenges hampering **f**ood **s**afety **m**anagement **s**ystems
- Diagnostic instrument for FSMS assessment from systems perspective
- Study on FSMS status in Europe and beyond
- Conclusions

Challenges managing fresh produce safety



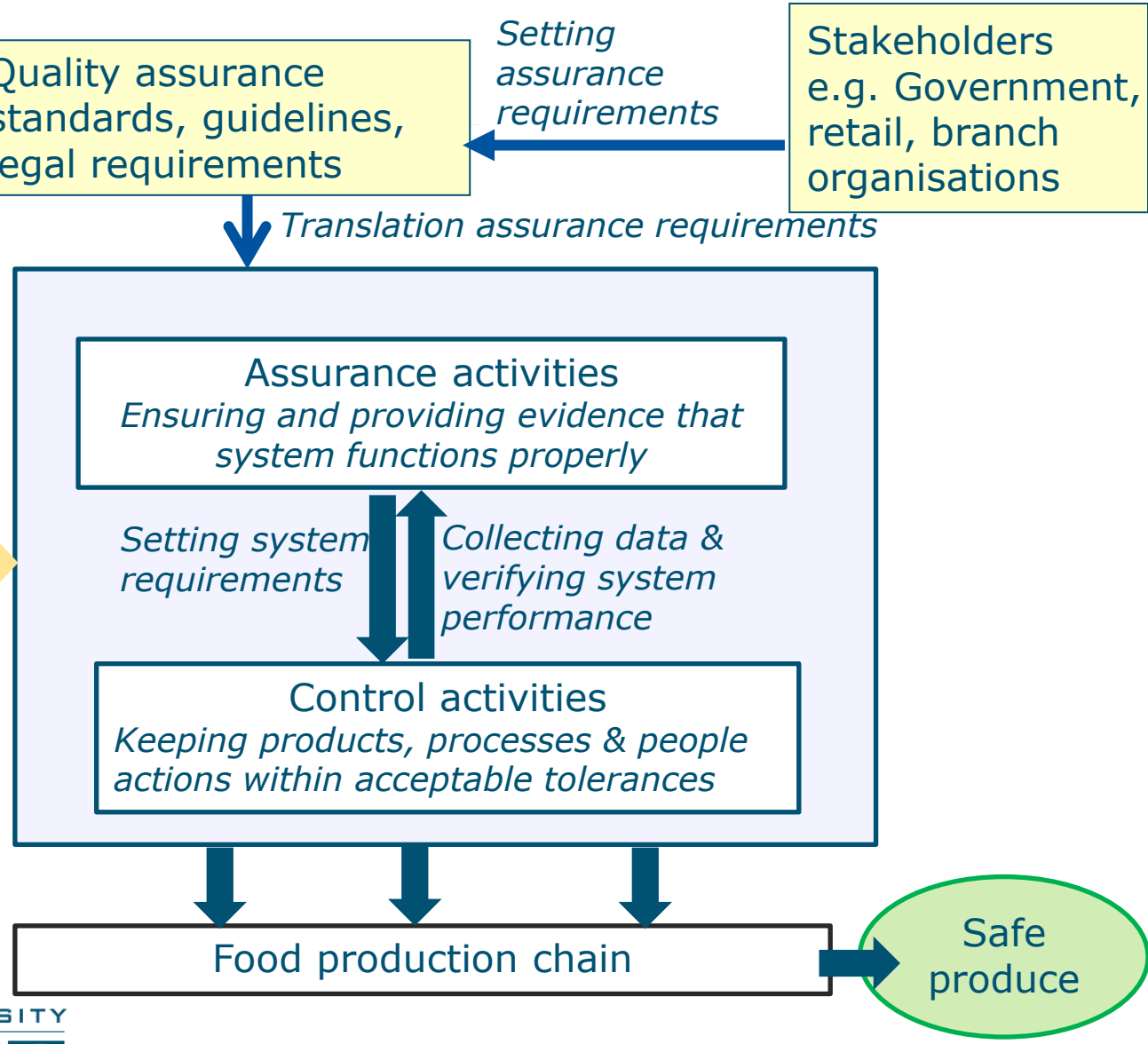
Understanding food safety management systems performance

WAGENINGEN UNIVERSITY
WAGENINGEN UR

Food safety management from systems' perspective

FSMS context characteristics:

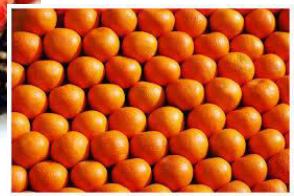
- Various
- Imply different initial risks
- Can affect system output
- Entail different demands on safety mitigation measures in FSMS



WAGENINGEN UNIVERSITY
WAGENINGEN UR

Luning et al, 2008, 2009, 2011

Specific context

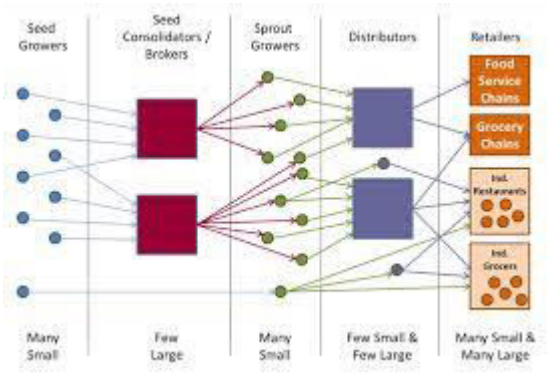


Product characteristics

Organisational characteristics

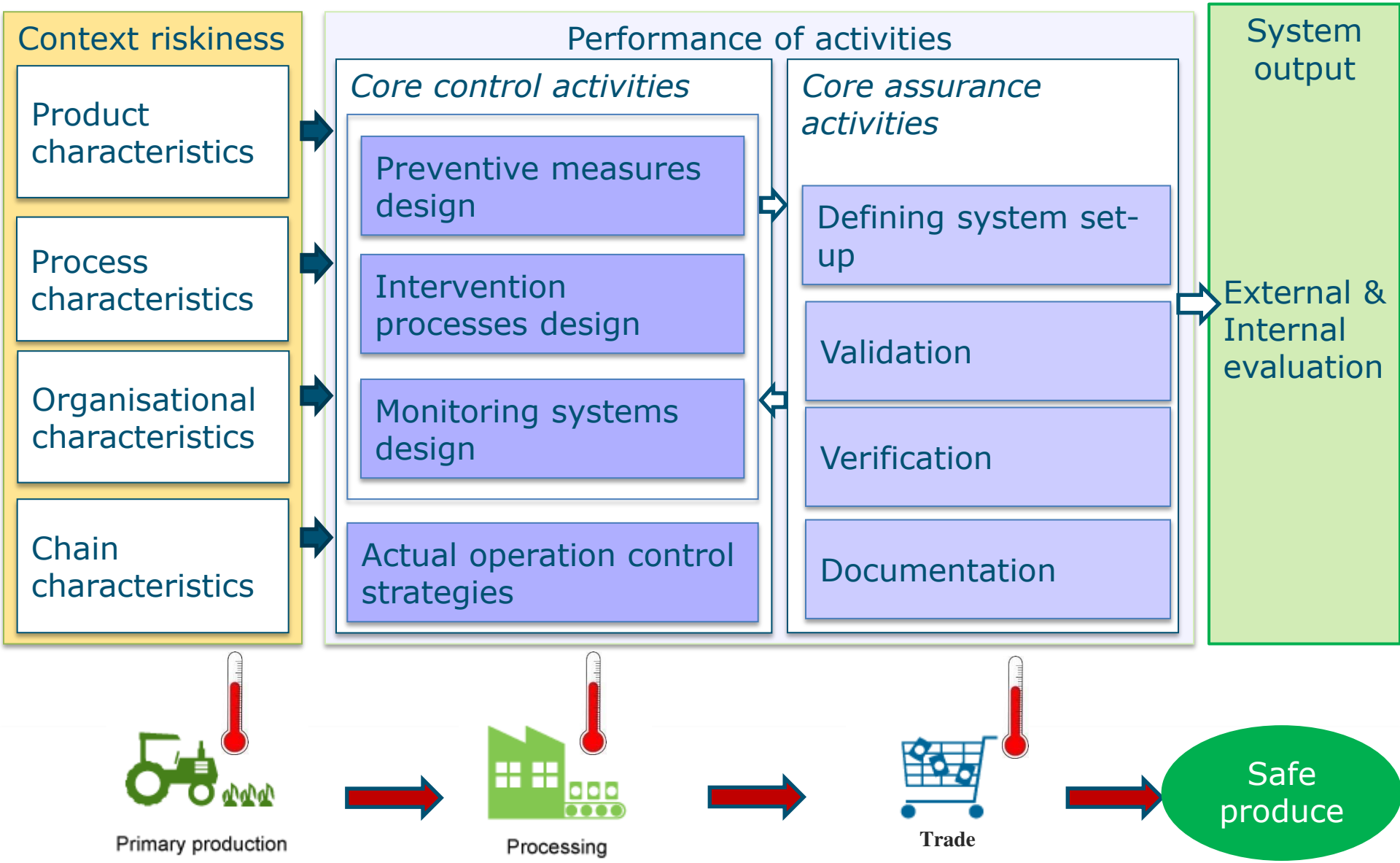
COMPANY specific FSMS

Production system characteristics

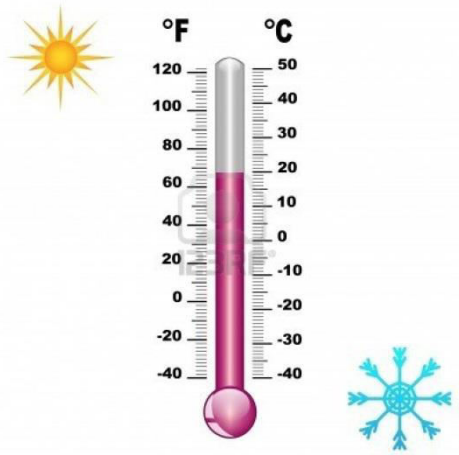


Supply chain characteristics

Elements the diagnostic instrument



How did we measure these elements?



For each context factor, core control and assurance activity → sets of indicators a grids were defined

- **Indicator** → essential aspect of a factor/activity that gives an indication about its situation; it is a way to get an overall idea based on restricted but crucial information
- **Grid** → for each indicator sets of descriptions have been made that represent typical situations; grids support in judging the actual situation

(Pictures from Google pictures)

Indicators to measure preventive measures in FSMS

Preventive measures design

- Sophistication hygienic design equipment & facilities
- Specificity of maintenance program
- Adequacy of storage facilities
- Specificity of sanitation program
- Extent of personal hygiene requirements
- Sophistication of initial material control
- Adequacy of packaging
- Sophistication of supplier control
- Sophistication of water control
- Specificity of fertilizer program
- Specificity of pesticide program
- Adequacy of irrigation method

Kirezieva et al, 2013a

Indicators to measure context riskiness

Organisational characteristics

- Presence of technical person
- Variability of workforce composition
- Sufficiency of operators' competence
- Extent of management commitment
- Degree of employee involvement
- Level of formalisation
- Sufficiency of supporting info system

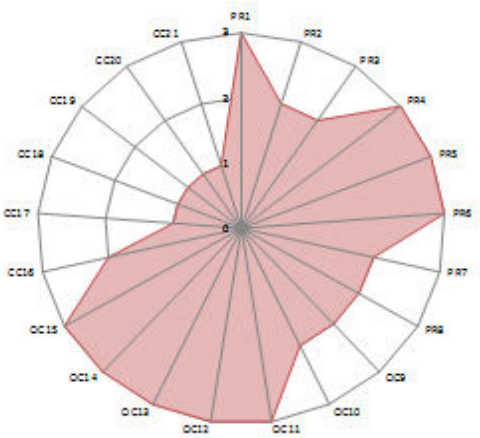
Kirezieva et al, 2013b

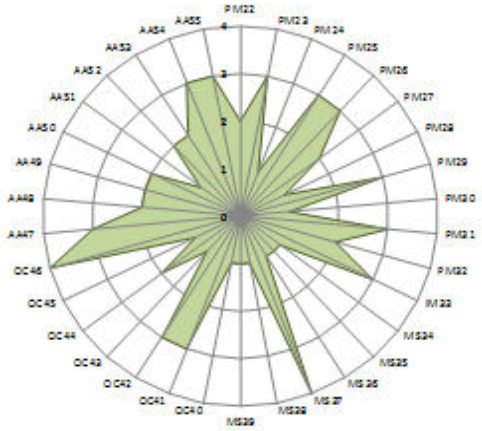
Judgement design cleaning program

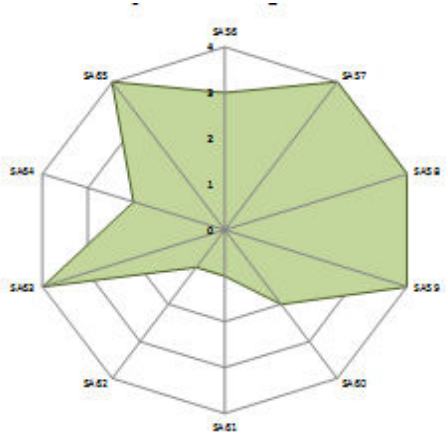
How is your **cleaning program** designed?

Situation 1	Situation 2	Situation 3	Situation 4
No specific sanitation programs in place	• Program not differentiated for specific equipment/facilities; • from information on label or company experience	• Program differentiated for equipment and facilities; • about use and frequency	• Program, tailored for different equipment & facilities, established in strict daily procedures; • frequency based on test results

Company FSMS profile







Context riskiness → Status of activities → Output

Topics of presentation

- Challenges hampering **f**ood **s**afety **m**anagement **s**ystems
- Diagnostic instrument for FSMS assessment from systems perspective
- Study on FSMS status in Europe and beyond
- Conclusions

Study design

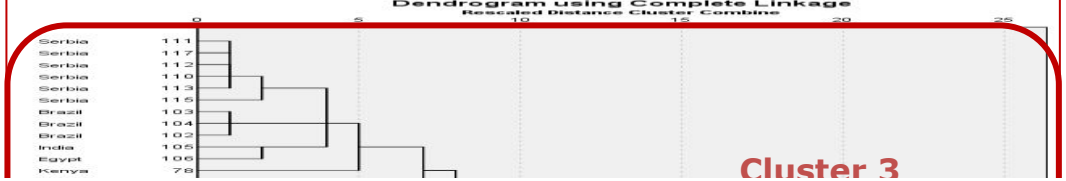
European Union (n=69)

Belgium		Norway		Spain		Netherlands
Lettuce	Berries	Lettuce	Berries	Lettuce	Berries	Mixed
6	11	6	4	13	4	25

Non-EU (n=89)

Kenya	Uganda	South Africa	Egypt[a]	India[a]	China[a]	Brazil	Serbia
French beans	Hot pepper	Fruits & lettuce	Berries	Mango	Apples	Lettuce	Berries
30	30	10	1	1	2	6	9

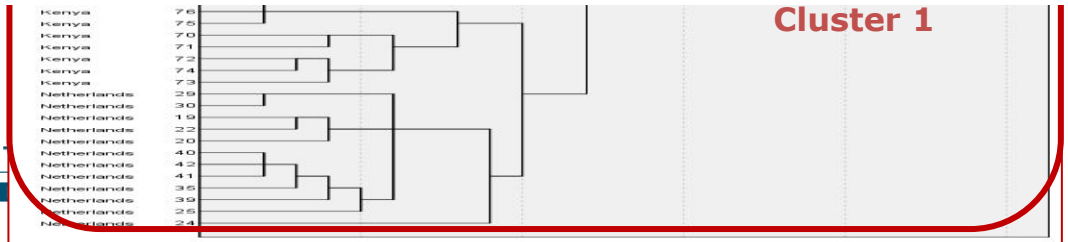
[a] Interview with expert in the sector



Cluster 3

Country	Product				Size				Standard				
	Leafy greens	Berries	Fruits	Other	Micro	Small	Medium	Large	National	Global GAP	BRC	ISO	Other
Cluster 1 (n=47)													
EU													
– Belgium (1)		1					1		1	1			
– Netherlands (17)	3	6	1	7	4	4	9			15	2		4
– Spain (16)	13	3				1	4	12	3	16	5	7	7
Non-EU													
– Kenya (9)				9		4		5	5	9		1	5
– South Africa (4)	3		1			1	3			4		5	3
Cluster 2 (n=42)													
EU													
– Belgium (14)	6	8			8	5	1		14	14			
– Netherlands (8)	4	3		1	4	4				8			
– Norway (10)	6	4			1	5	4		10	1			
– Spain (1)		1				1			1	1			
Non-EU													
– Serbia (3)		3			2		1			3			
– South Africa (6)		1	5			1	2	3		6			
Cluster 3 (n=29)													
Non-EU													
– Brazil (6)	6					6							
– China (2)			2				2						
– Egypt (1)		1				1							
– India (1)			1			1							
– Kenya (1)													
– Serbia (6)		6			1	5							
– Uganda (10)				10		10							
TOTAL	**41**	**37**	**10**	**27**	**20**	**49**	**27**	**20**	**34**	**78**	**7**	**10**	**16**

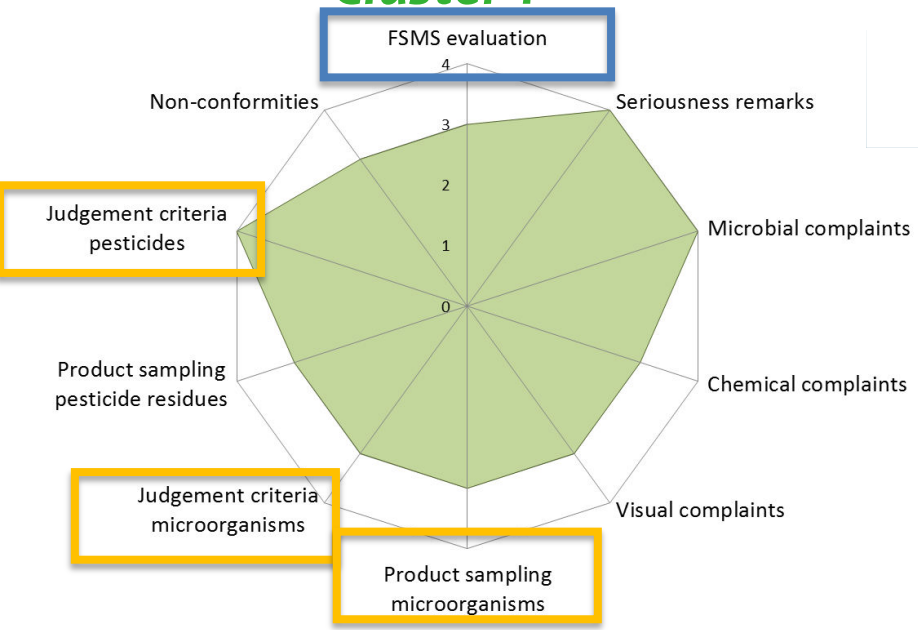
NONE



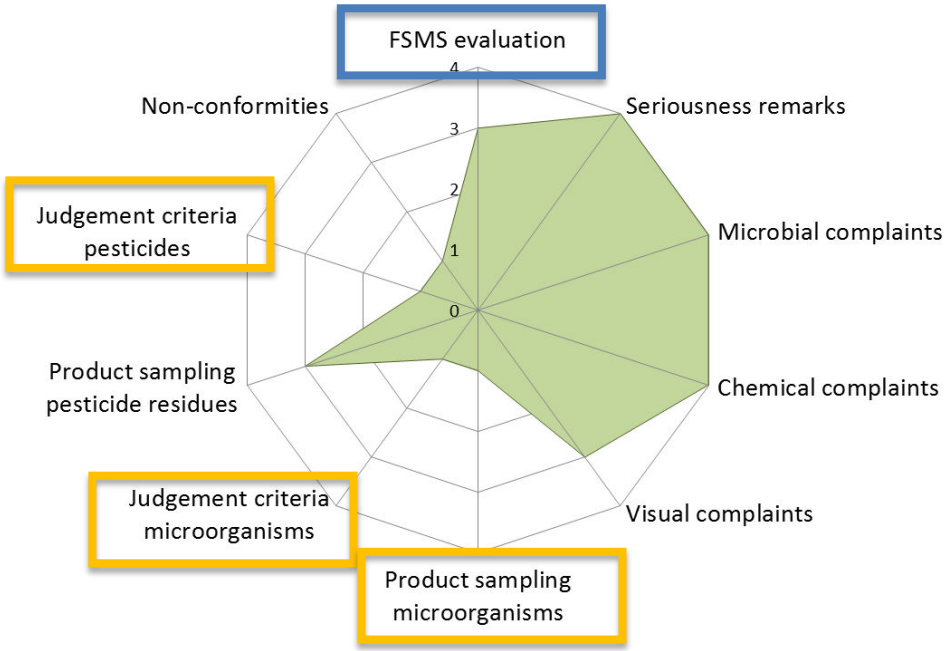
Cluster 1

Output of FSMS

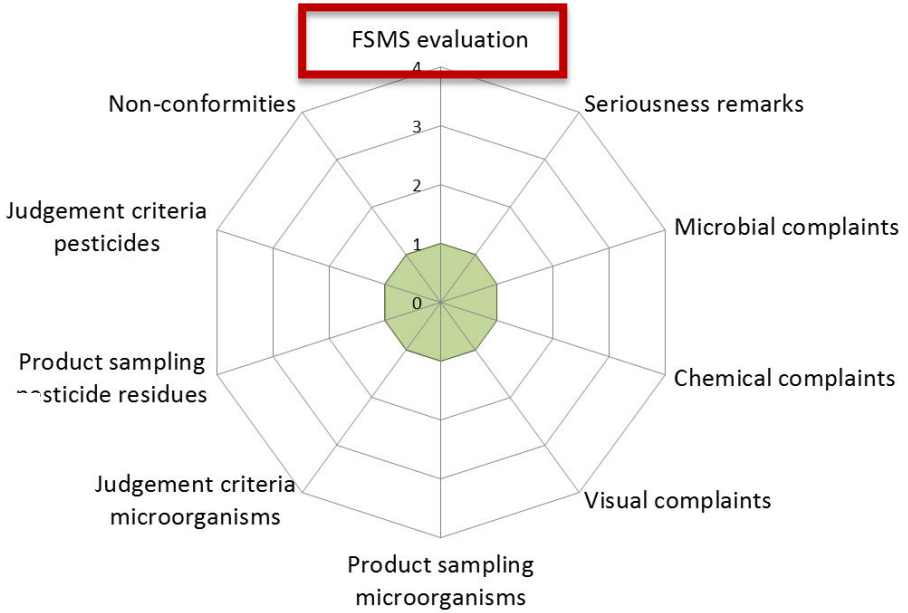
Cluster 1



Cluster 2



Cluster 3

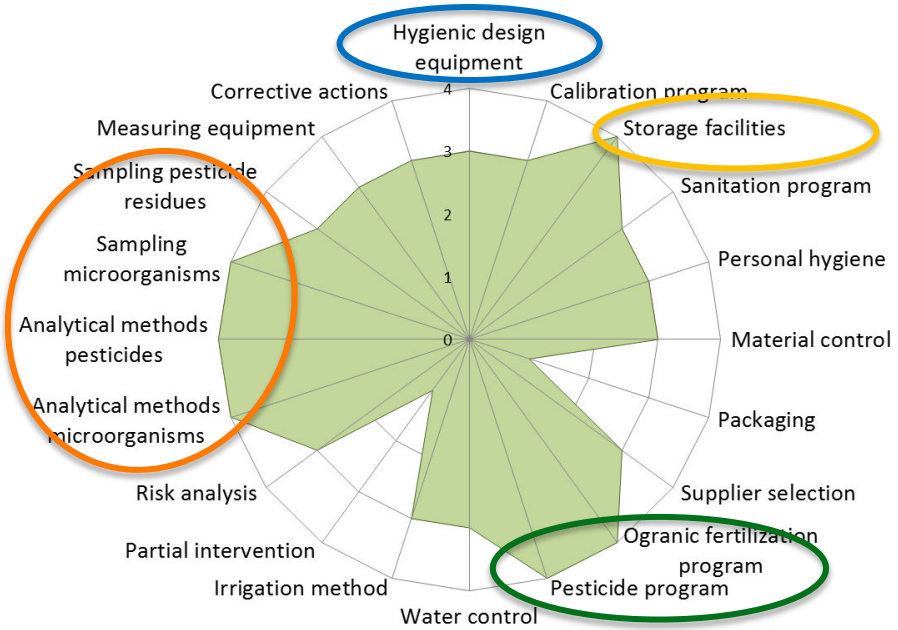


- More green spider-web → more information and better output of FSMS

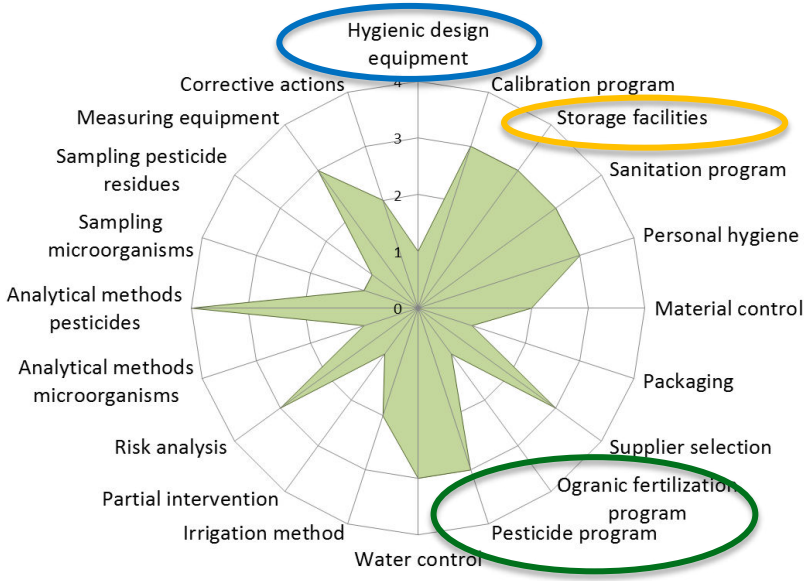
Kirezieva et al, 2015, Food Control

Design control strategies

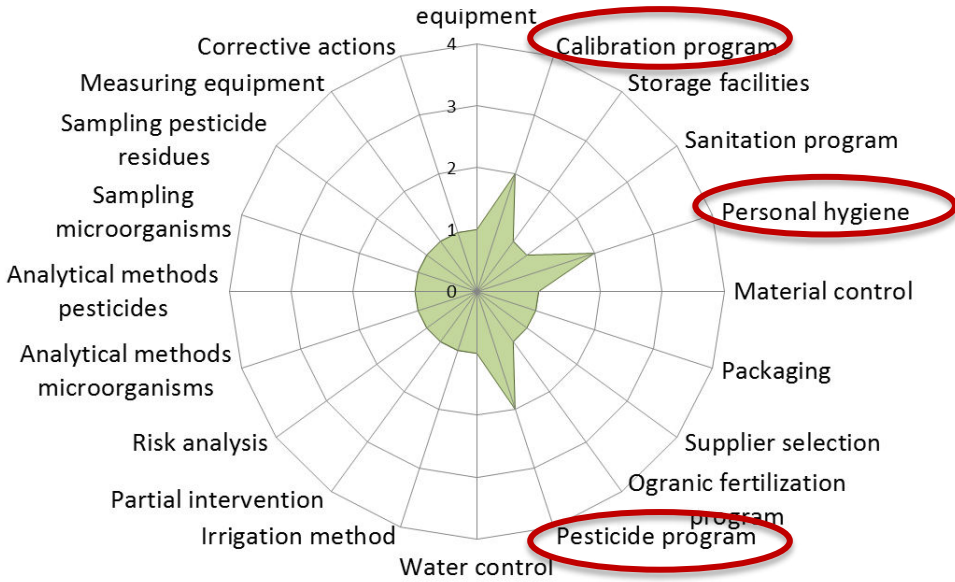
Cluster 1



Cluster 2



Cluster 3



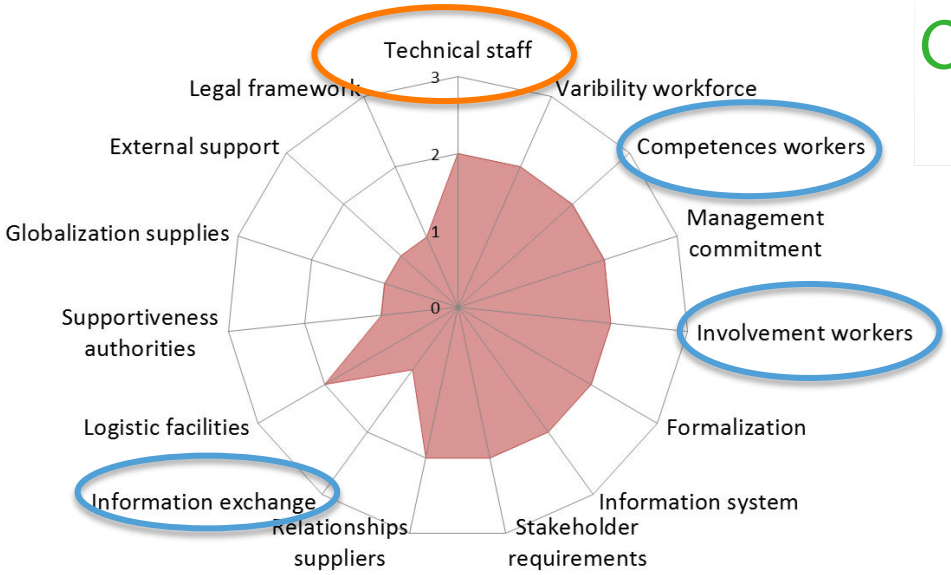
- More green spider-web → more advanced control activities

Kirezieva et al, 2015, Food Control

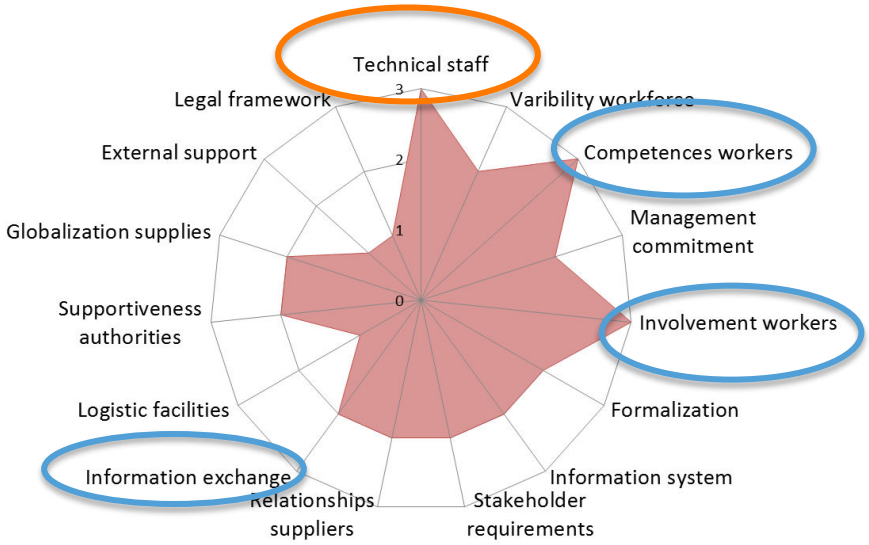
Context riskiness?

Organizational characteristics

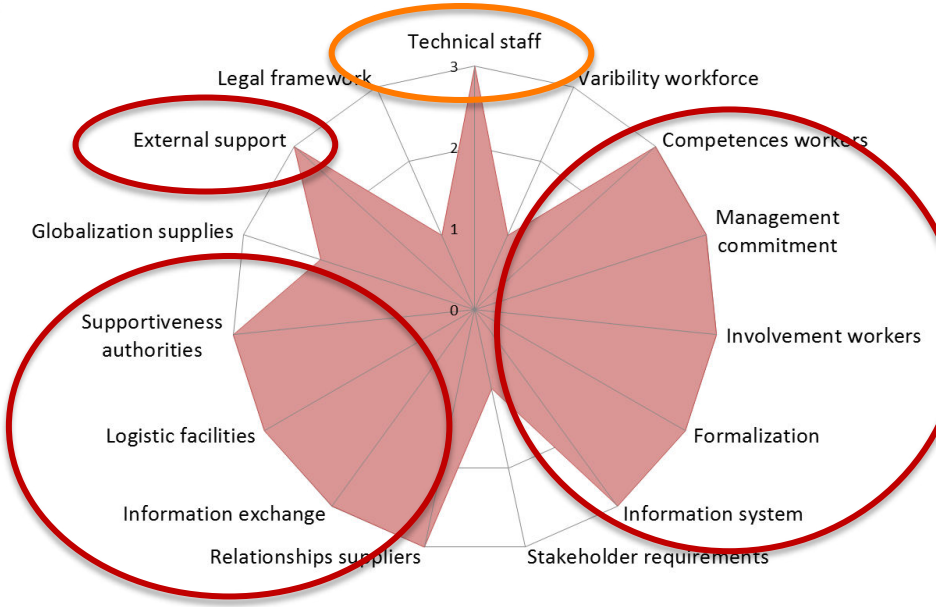
Cluster 1



Cluster 2



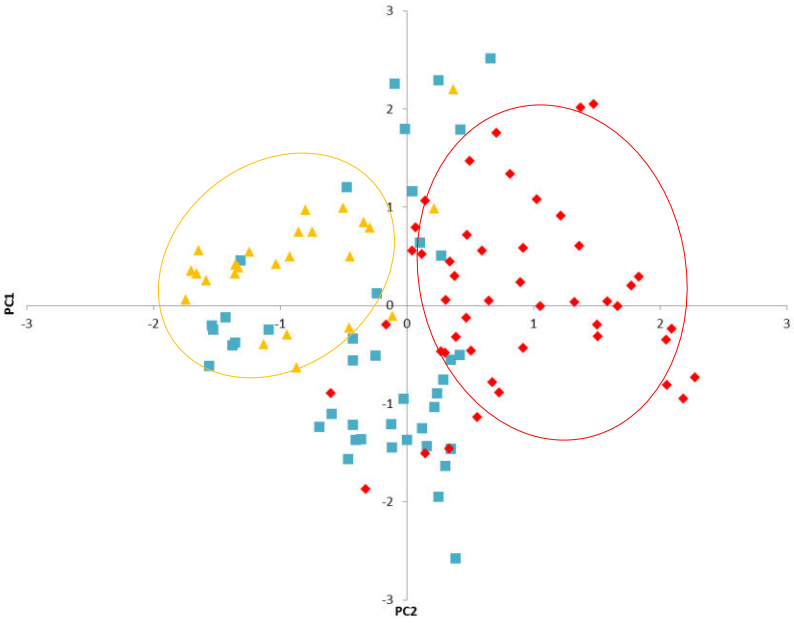
Cluster 3

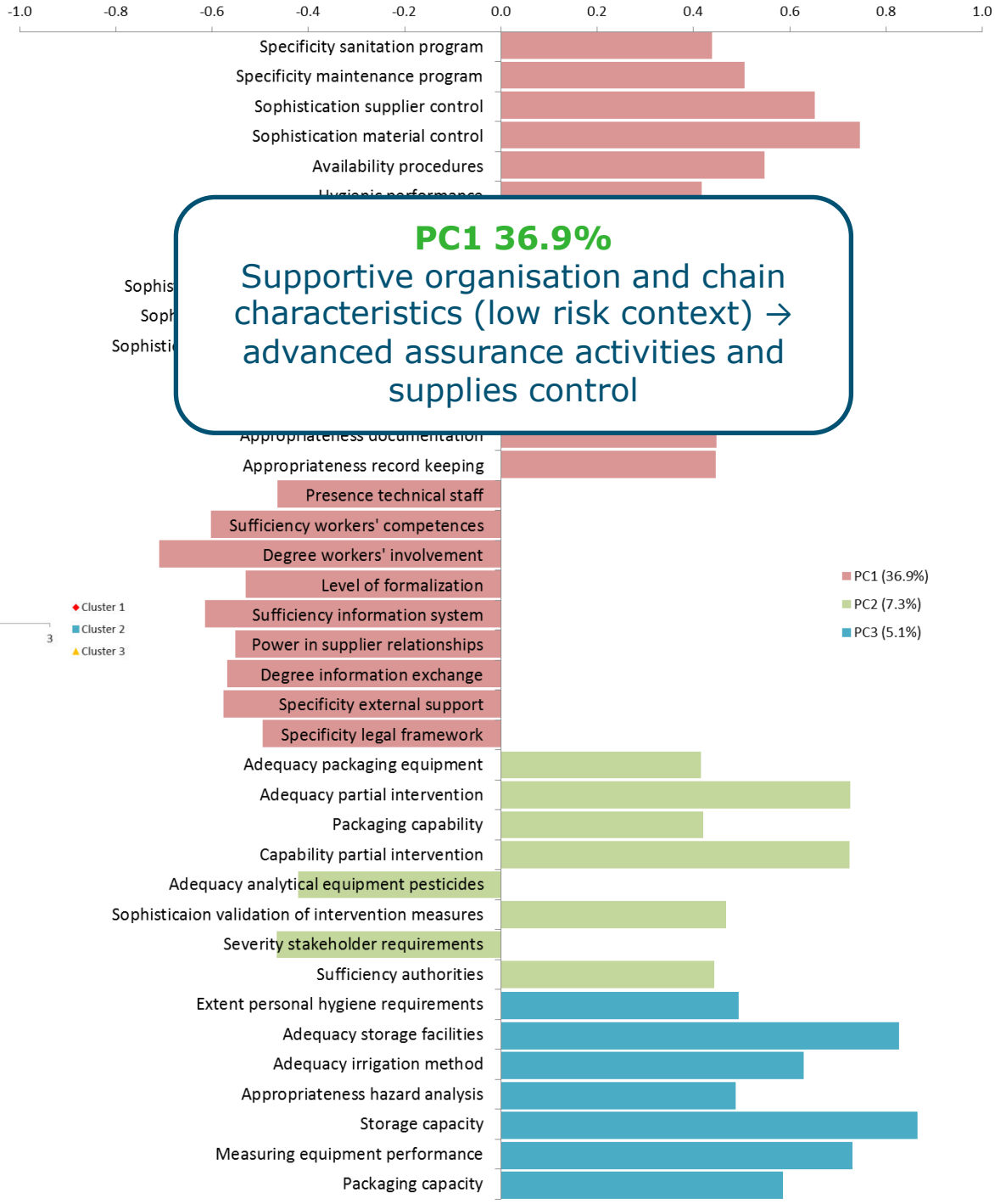


- More red spider-web => more risky FSMS context

Kirezieva et al, 2015, Food Control

Main Factors





PC1 36.9%

Supportive organisation and chain characteristics (low risk context) → advanced assurance activities and supplies control

WAGENINGEN UNIVERSITY
WAGENINGEN UR

Kirezieva et al, 2015, Food Control

Conclusions

Stringent private standards	+	Supportive supply chain	→	Advanced activities (adapted and tested for own production)
Baseline (public or private) standards	+	Lack of support from supply chain	→	Average activities (based on best available knowledge and equipment)
Lack of standards	+	Lack of support from supply chain	→	Few basic activities (based on own knowledge and experience)

Conclusions

- **Stringent** private **standards** and **supportive supply chains** led to **advanced** food safety management **activities**
- **SMEs** in both industrialised and developing countries **face challenges** with tailoring the requirements into their specific production and organisation when **supportive chain is lacking**
- Companies in **local market** in **developing countries** operate in **high risk context** due to **lack of chain support** and they lack even basic activities
- Need for **stratified measures** and policies according to the **supply chain** in which companies operate

Acknowledgements

This research would not be possible without the kind assistance of:

- Allende, A. (CEBAS-CSIC, Spain)
- Bender, R.J. (UFRGS, Brazil)
- El Tahan, F. (RIIL, Egypt)
- Gil, M.I. (CEBAS-CSIC, Spain)
- Heiberg, N. (Gartnerhallen SA, Norway)
- Holvoet, K. (Ghent University, Belgium)
- Johannessen, G. (NVI, Norway)
- Nottebaere, E. (Vegaplan, Belgium)
- Quaedvlieg, N. (Productschap Tuinbouw, the Netherlands)
- Rajkovic, A. (UB, Serbia)
- Smigic, N. (UB, Serbia)
- Tondo, E. (UFRGS, Brazil)
- Uyttendaele, M. (UGhent, Belgium)
- Van der Sypt, V. (Fresh Trade, Belgium)
- All the companies and researches involved in the regional studies

WAGENINGEN UNIVERSITY
WAGENINGEN UR

veg-i-trade
safe food for a changing world

Questions?

Thank you for your attention!

WAGENINGEN UNIVERSITY
WAGENINGEN UR

veg-i-trade
safe food for a changing world