



Objective measuring tools for general food safety in Belgium : the barometers of the safety of the food chain

19-06-2012

Food Safety Management 2012 Conference

Dr. Ir. L. Jacxsens, Ghent University

Prof. Dr. Ir. M. Uyttendaele (Sci Com FASFC, Ghent University)

Dr. X. Van Huffel, Dr. Ir. W. Claeys, Dr. P. Depoorter, Ir. O. Wilmart,
Dr. H. Diricks (FASFC)

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Introduction

Last decade major changes concerning the management of safety of the food chain in Belgium



- Business plan of **FASFC** identified the need to measure and monitor overall level of food safety
- **Advisory Committee** of FASFC reflected on the impact of efforts taken by stakeholders to assure food safety



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Introduction

Also to situate within **current time frame/trend** of using indicators, score systems, measurable objectives, etc, ...

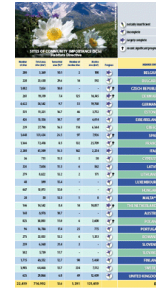


Evangelista
Torricelli
barometer
(UGent)



Traffic barometer

Natura
Barometer
on
biodiversity



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Approach

- Working group of Scientific Committee (WG SciCom) activated (April 2009) & Working group meetings
- Consultation of SciCom / FASFC Management / Advisory Committee of FASFC
- Data collection to construct “food safety barometer”



- Advice 28 - 2010 of the SciCom FASFC on concept of tool to measure food safety
(www.favv-afsca.fgov.be/scientificcommittee/advices/)

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Publication and implementation

- Presentation of a tool to measure food safety on the international symposium on Measuring Food Safety and comparing self checking systems

(<http://www.favv.be/selfcheckingsystems/17/11/2010>)



- Scientific paper in Food Research International 44 (2011) 940–950



- Documentation in the annual report of the FASFC

(http://www.favv-afscs.be/publications-en/ documents/FF2010_En_S.pdf)

Food Research International 44 (2011) 940–950

Journal homepage: www.elsevier.com/locate/foodres

Measuring the safety of the food chain in Belgium: Development of a barometer
 Katrien Baert^a, Xavier Van Huffel^{a,b}, Olivier Wilmaert^c, Liesbeth Jacobsens^{d,e}, Dirk Berkeens^d,
 Herman Durckx^f, André Hugghebaert^g, Mieke Ouytendaele^h

^a Department of Food Safety and Food Quality, Ghent University, Ghent, Belgium
^b Department of Food Safety and Food Quality, Ghent University, Ghent, Belgium
^c Department of Food Safety and Food Quality, Ghent University, Ghent, Belgium
^d Department of Food Safety and Food Quality, Ghent University, Ghent, Belgium
^e Department of Food Safety and Food Quality, Ghent University, Ghent, Belgium
^f Department of Food Safety and Food Quality, Ghent University, Ghent, Belgium
^g Department of Food Safety and Food Quality, Ghent University, Ghent, Belgium
^h Department of Food Safety and Food Quality, Ghent University, Ghent, Belgium

ARTICLE INFO

ABSTRACT

The paper describes the development of a concept to measure the safety of the food chain in Belgium based on the Pressure-State-Response model. The concept is based on the measurement of a set of 50 food safety indicators (FSIs) in the food chain. The indicators are grouped into three categories: food safety, food quality and food safety. The indicators are grouped into three categories: food safety, food quality and food safety. The indicators are grouped into three categories: food safety, food quality and food safety.

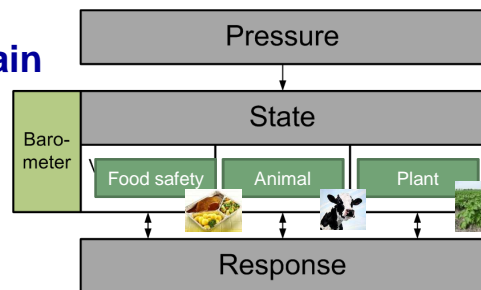
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Concept – Measuring food safety

- Pressure – State – Response concept
- Developed in 1980's by OECD to classify environmental indicators

FASFC 'scope is
Safety of the Food Chain

3 aspects
 =
 3 barometers



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Concept – Measuring food safety

“Barometer “



State →

Measure of status for “food safety” during the selected time period of measuring. Information on status is systematically collected by control activities of FASFC



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Concept – Measuring food safety



Pressure →

Pressures exerted by general forces, processes or mechanisms operating within society and which impact the food chain and may possibly modify its state (and its food safety)



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Concept – Measuring food safety



Response



Refers to preventive and corrective measures that are taken by respective stakeholders within the food chain to react to pressure on the food chain, as well to the overall safety status, in order to maintain or improve its safety.



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Concept – Measuring food safety



Pressure

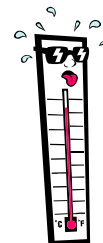


State



Response

3 Tools
to
Measure



State : three barometers 'food safety', 'plant health', 'animal health'



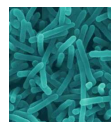
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Case study – state “Barometer Food Safety”

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Step 1 : Definition scope “Food Safety”

- Food and Health: nutritional aspects
 - Energy-intake (eg. obesitas)
 - Nutritional composition (eg. cardio-vascular diseases?)
 - Healthy diet (eg. cancer prevention?)
 - ...
- Food safety
 - Biological hazards
 - Chemical hazards
 - Physical hazards



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Step 2 : Selection of food safety indicators



- Quantitative measurement
- Available in databases of FASFC
- Direct or indirect relation with food safety
- NOT complete picture of all hazards in the food chain & NOT risk assessment



Selection of set of indicators to provide information on the overall situation of food safety



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Selection of food safety indicators



Set of 30 Food safety indicators (FSI's)

- Throughout the food chain ("farm to fork")
- Belgian production chain, intracommunity trade & import of third countries
- Animal and plant production / products
- Product controls (biological & chemical hazards)
- Process controls (inspections)
- Preventive approach (self-checking systems, notification, traceability)
- Public health issues (*restricted to foodborne diseases by biological hazards*)



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Selection of food safety indicators

- Preventive approach : Notification by stakeholders

FSI1: Notification

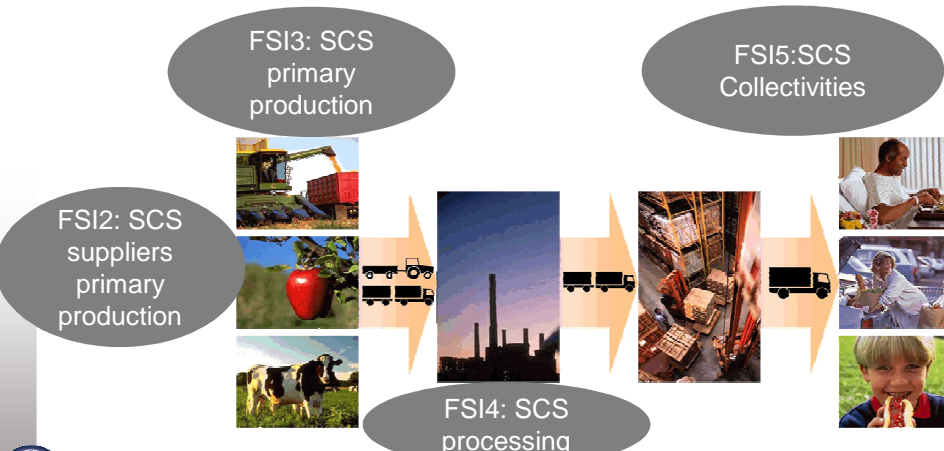


The diagram illustrates the food chain process with four stages: 1. Primary production (represented by images of a tractor, a red apple, and a cow); 2. Processing (represented by a factory silhouette); 3. Distribution (represented by a warehouse with a forklift and a truck); 4. Consumption (represented by images of a chef, a family eating, and a child eating). Arrows indicate the flow from left to right between these stages.

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Selection of food safety indicators

- Preventive approach : Self-checking systems




The diagram shows the same food chain flow as the first slide, but with four specific Self-Checking Systems (SCS) identified at each stage:

- FSI2: SCS suppliers primary production** (at the start of the primary production stage)
- FSI3: SCS primary production** (at the end of the primary production stage)
- FSI4: SCS processing** (at the end of the processing stage)
- FSI5: SCS Collectivities** (at the end of the consumption stage)

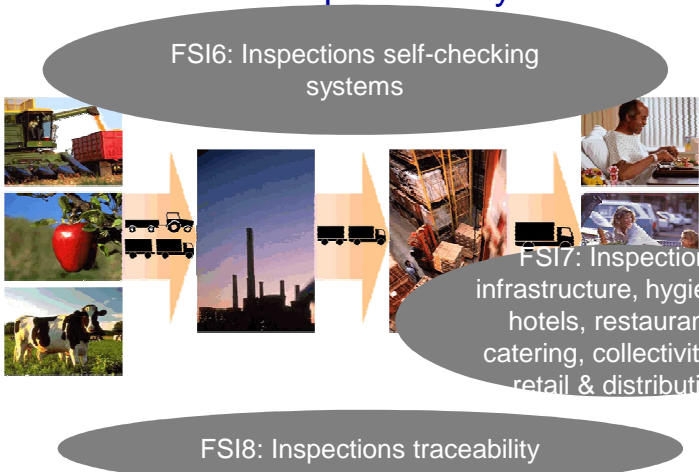
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Selection of food safety indicators



- **Proces control : Inspections by FASFC**

FSI6: Inspections self-checking systems

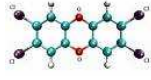


FSI7: Inspections infrastructure, hygiene in hotels, restaurants, catering, collectivities & retail & distribution

FSI8: Inspections traceability

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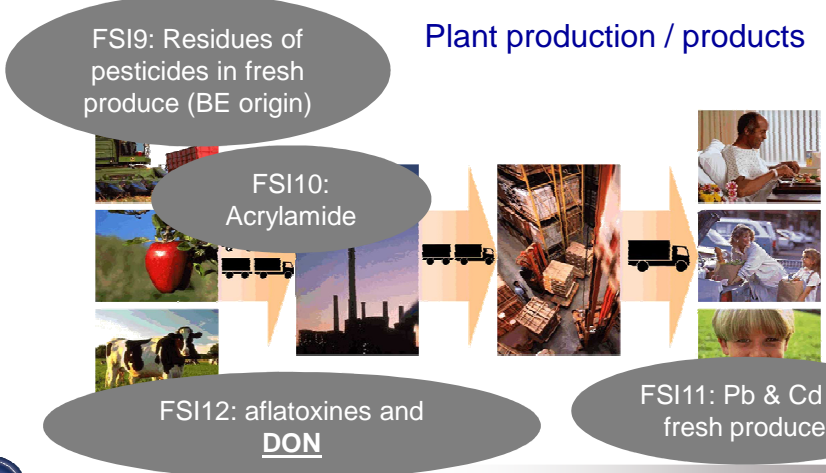
Selection of food safety indicators



- **Product controls: Chemical hazards**

Plant production / products

FSI9: Residues of pesticides in fresh produce (BE origin)



FSI10: Acrylamide

FSI11: Pb & Cd in fresh produce

FSI12: aflatoxines and DON

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Selection of food safety indicators

- **Product controls: Chemical hazards**

FSI13: Unauthorized substances & veterinary drugs used in cows and pigs



Animal production / products

FSI14: sulfite in minced meat



VVI15: Dioxins & DL-PCB's in dairy and eggs



VVI16: Hg in fish, molluscs, crustaceans






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Selection of food safety indicators


- **Product controls: Chemical hazards**

FSI17: Residues of pesticides in fresh produce (EU and third countries)




Import & suppliers to food chain

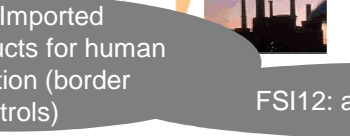
FSI18 : Unauthorised colorants




FSI20: Dioxins & DL-PCB's in feed




FSI19: Imported animal products for human consumption (border controls)



FSI12: aflatoxines and DON



FSI21: Contact-materials



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Selection of food safety indicators



- Product controls: Biological hazards

VVI22: *Salmonella* spp. in meat pigs



VVI24: *Salmonella* spp. in carcasses and cut meat



VV23: *Salmonella* spp. in layer hens



VVI27: *L. monocytogenes* in foods



VVI25: *E. coli* in carcasses and cut meat



VVI26: *E. coli* in foods






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Selection of food safety indicators



- Public health






FSI28: Food borne outbreaks



FSI29: Salmonellosis



FSI30: Listeriosis





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Selection of food safety indicators

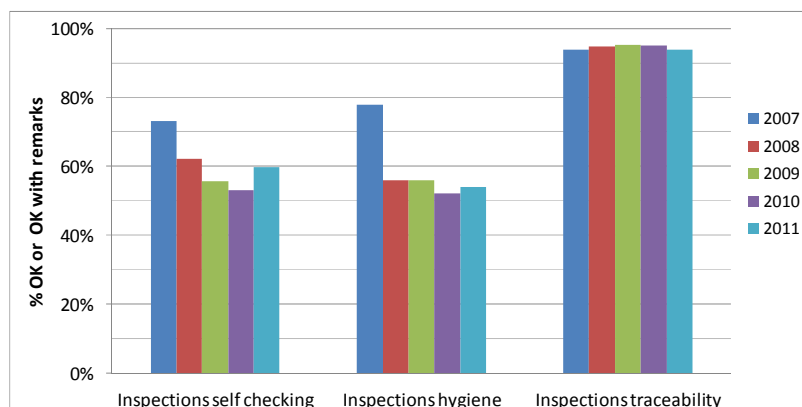
Set of 30 indicators from “farm to fork”

Part in the Food Chain	Number of FSI's
Suppliers to the food chain	7
Primary plant production	10
Primary animal production	14
Processing	15
Distribution	12
Consumer	3
Import	8
Storage & transport	7
Services & contract work	2

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Step 3 : Measurement of food safety 2007-2011

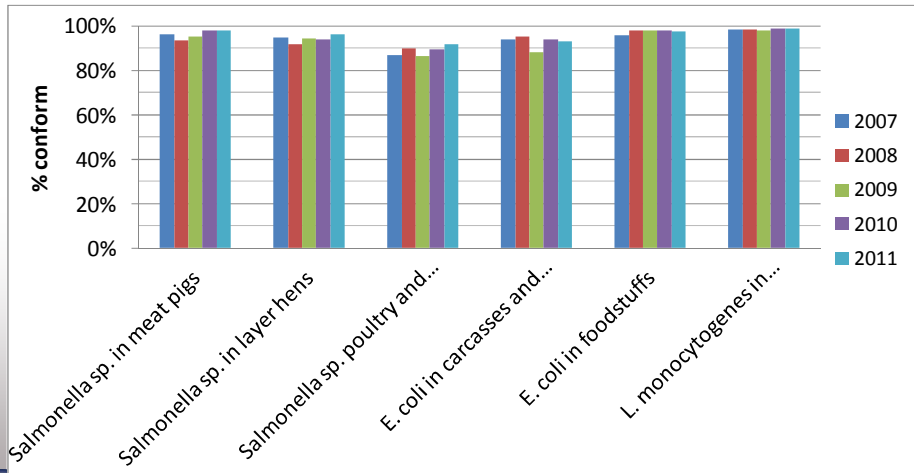
Inspections by FASFC



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Measurement of food safety 2007-2011

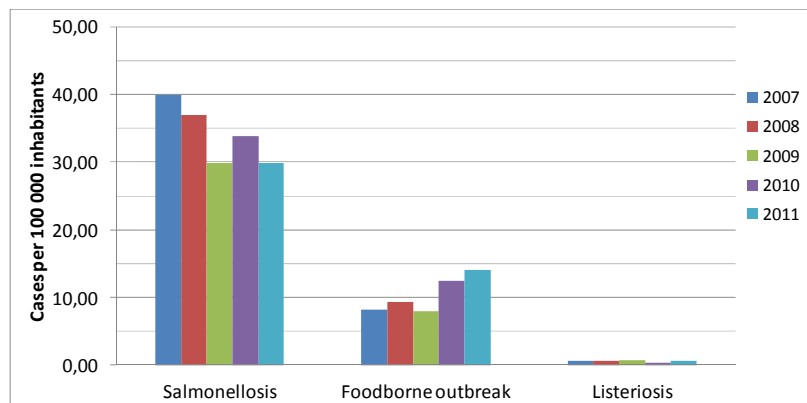
Product analysis : biological hazards



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Measurement of food safety 2007-2011

Foodborne outbreaks and reported cases



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Step 4 : Prioritization of the 30 indicators in their impact to measure food safety

- perceived by various stakeholders



- assigning a weight to each indicator by expert opinion:

SciCom & Advisory Com & Dir Com FASFC

- using Las Vegas method :

- assigning 20 chips to 30 indicators

- multiple chips/indicator – total 20 chips



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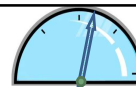
Prioritization of Food safety indicators

10 indicators with highest (perceived) relevance

- FSI6: Inspections self checking in the food chain 2,06
- FSI7: Inspections infrastructure, hygiene in the sectors of distribution, hotels and catering and community kitchens 1,88
- FSI19: Chemical and **microbiological hazards in imported animal products** intended for human consumption 1,73
- FSI8: Inspections traceability within the food chain 1,65
- FSI13: Substances with an anabolic action, unauthorized substances and veterinary drugs for cows and pigs 1,50
- FSI28: Foodborne outbreaks 1,46
- FSI17: Residues from pesticides in vegetables and fruit from other EU-countries and third countries 1,39
- **FSI29: Salmonellosis in humans** 1,28
- FSI1: Compulsory notification in food safety 1,16
- FSI4: Self checking systems in the transformation sector 1,16



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Prioritization of Food safety indicators

10 indicators with lowest (perceived) relevance

- FSI3: Self checking systems in the primary production sector 0,71
- FSI26: *E. coli* in foodstuffs 0,71
- FSI25: *E. coli* in carcasses and cut meat 0,68
- FSI21: Contact materials 0,64
- FSI16: Mercury in mollusks, crustaceans and fish 0,53
- FSI18: Forbidden colorants 0,53
- FSI22: *Salmonella* sp. in meat pigs 0,49
- FSI23: *Salmonella* sp. in layer hens 0,49
- FSI10: Acrylamide 0,41
- FSI14: Sulfite in minced meat 0,38



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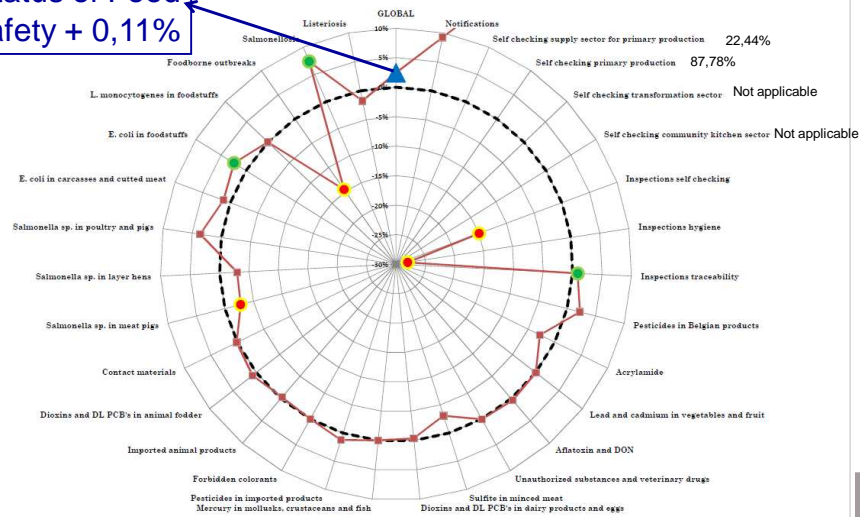
Food Safety Indicators: from 2007 to 2011

FSI	title	2007	2008	2009	2010	2011	Weight factor	weighted result				
								2008/2007	2009/2008	2010/2009	2011/2010	2011/2007
FSI1	Notifications	357	390	367	350	356	1,16	10,7%	-6,9%	-5,4%	2,0%	-0,3%
FSI2	Self checking supply sector for primary production	43,6%	53,3%	68,3%	49,8%	50,7%	0,90	20,2%	25,2%	11,8%	1,6%	14,8%
FSI3	Self checking primary production	6,2%	11,7%	21,5%	31,6%	39,6%	0,71	62,5%	59,1%	47,7%	17,9%	380,6%
FSI4	Self checking transformation sector	0,6%	1,8%	5,7%	6,9%	10,1%	1,16	215,7%	260,3%	84,8%	52,8%	549,6%
FSI5	Self checking community kitchen sector	0,0%	0,1%	0,4%	0,6%	1,0%	0,79	506,5%	186,8%	40,9%	53,9%	5185,7%
FSI6	Inspections self checking	73,1%	62,2%	55,6%	53,1%	59,8%	2,06	-30,9%	-21,7%	-9,5%	26,2%	-37,5%
FSI7	Inspections hygiene	77,8%	56,0%	56,0%	51,8%	54,1%	1,88	-52,5%	0,1%	-14,0%	8,2%	-57,1%
FSI8	Inspections traceability	93,9%	94,7%	95,3%	94,8%	93,9%	1,65	1,5%	1,1%	-0,9%	-1,5%	0,1%
FSI9	Pesticides in Belgian products	94,2%	96,3%	95,5%	96,7%	94,9%	0,98	2,2%	-0,8%	1,1%	-1,8%	0,7%
FSI10	Acrylamide	91,6%	89,0%	91,9%	93,0%	94,5%	0,41	-1,2%	1,3%	0,5%	0,7%	1,3%
FSI11	Pb and Cd in vegetables & fruit	100,0%	100,0%	100,0%	98,8%	99,1%	0,75	0,0%	0,0%	-0,9%	0,2%	-0,7%
FSI12	Aflatoxin & DON	99,3%	99,7%	99,7%	99,5%	100,0%	0,90	0,4%	0,0%	-0,2%	0,4%	0,6%
FSI13	Unauthorized substances and veterinary drugs	99,8%	99,9%	99,9%	99,9%	100,0%	1,50	0,1%	0,0%	0,1%	0,0%	0,2%
FSI14	Sulfite in minced meat	94,0%	91,1%	93,3%	96,9%	97,2%	0,38	-1,2%	0,9%	1,5%	0,1%	1,3%
FSI15	Dioxins and DL PCB's in dairy products & eggs	99,5%	99,2%	100,0%	100,0%	100,0%	0,98	-0,4%	0,8%	0,0%	0,0%	0,5%
FSI16	Hg in mollusks, crustaceans & fish	100,0%	100,0%	100,0%	99,5%	99,1%	0,53	0,0%	0,0%	-0,3%	-0,2%	-0,5%
FSI17	Pesticides in imported products	91,2%	92,3%	93,1%	94,0%	93,4%	1,39	1,7%	1,1%	1,3%	-0,8%	3,4%
FSI18	Forbidden colorants	100,0%	100,0%	100,0%	99,7%	99,7%	0,53	0,0%	0,0%	-0,1%	0,0%	-0,1%
FSI19	Imported animal products	99,3%	99,0%	96,8%	97,3%	97,3%	1,73	-0,5%	-3,8%	0,8%	0,0%	-3,6%
FSI20	Dioxins and DL PCB's in animal fodder	99,2%	100,0%	100,0%	99,8%	99,6%	0,94	0,8%	0,0%	-0,2%	-0,1%	0,4%
FSI21	Contact materials	95,7%	95,8%	96,2%	96,7%	97,7%	0,64	0,1%	0,2%	0,3%	0,7%	1,3%
FSI22	<i>Salmonella</i> sp. in meat pigs	96,1%	93,5%	95,1%	97,8%	98,1%	0,49	-1,3%	0,8%	1,4%	0,1%	1,0%
FSI23	<i>Salmonella</i> sp. in layer hens	94,7%	91,8%	94,4%	94,1%	96,1%	0,49	-1,5%	1,3%	-0,2%	1,0%	0,7%
FSI24	<i>Salmonella</i> sp. in poultry and pigs	86,6%	89,8%	86,5%	89,7%	91,7%	0,98	3,5%	-3,5%	3,5%	2,2%	5,7%
FSI25	<i>E. coli</i> in carcasses & cutted meat	93,9%	95,0%	88,0%	93,9%	93,1%	0,68	0,8%	-5,0%	4,5%	-0,6%	-0,6%
FSI26	<i>E. coli</i> in foodstuffs	95,5%	97,8%	97,8%	97,9%	97,6%	0,71	1,7%	0,0%	0,1%	-0,2%	1,6%
FSI27	<i>L. monocytogenes</i> in foodstuffs	98,2%	98,2%	97,7%	98,6%	99,0%	0,90	0,0%	-0,4%	0,8%	0,3%	0,8%
FSI28	Foodborne outbreaks	8,6	9,4	7,9	12,4	14,1	1,46	-21,3%	21,0%	-63,8%	-61,2%	-105,2%
FSI29	Salmonellosis	37,6	37,0	29,8	33,8	29,9	1,28	9,4%	23,4%	3,5%	14,0%	32,1%
FSI30	Listeriosis	0,5	0,6	0,7	0,4	0,6	1,09	-1,9%	-28,0%	40,0%	-9,3%	-7,4%
Global								0,11%	11,26%	3,73%	1,82%	27,03%

State: 2008 versus 2007



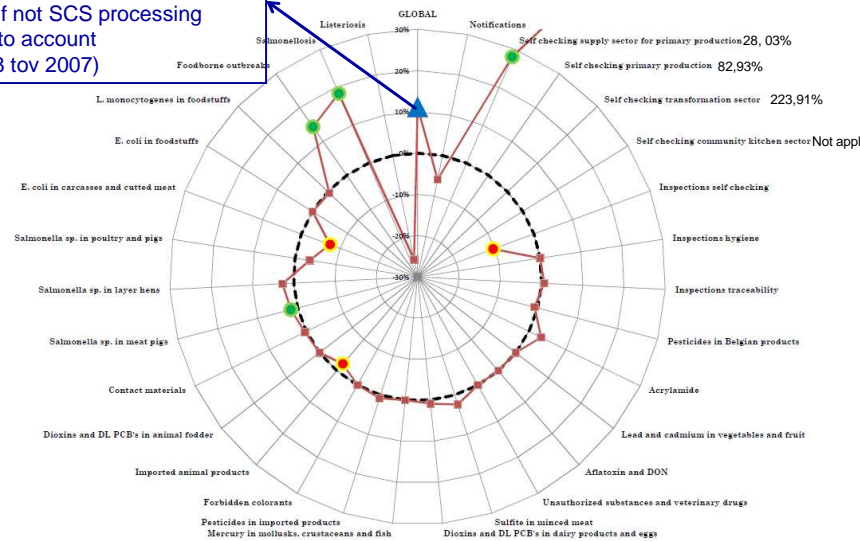
Status of Food Safety + 0,11%

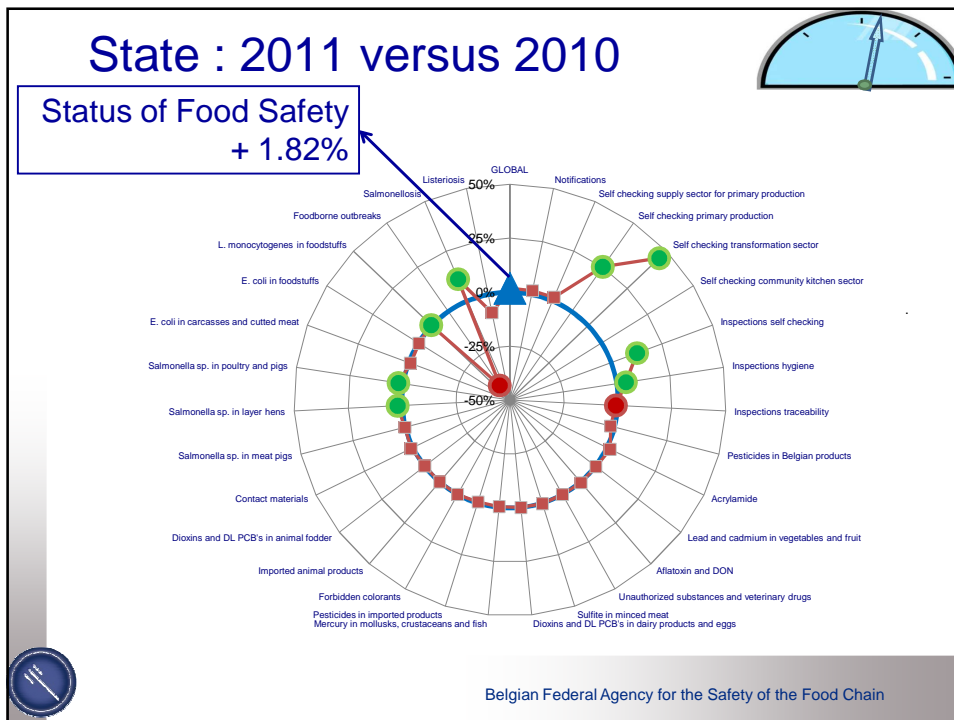
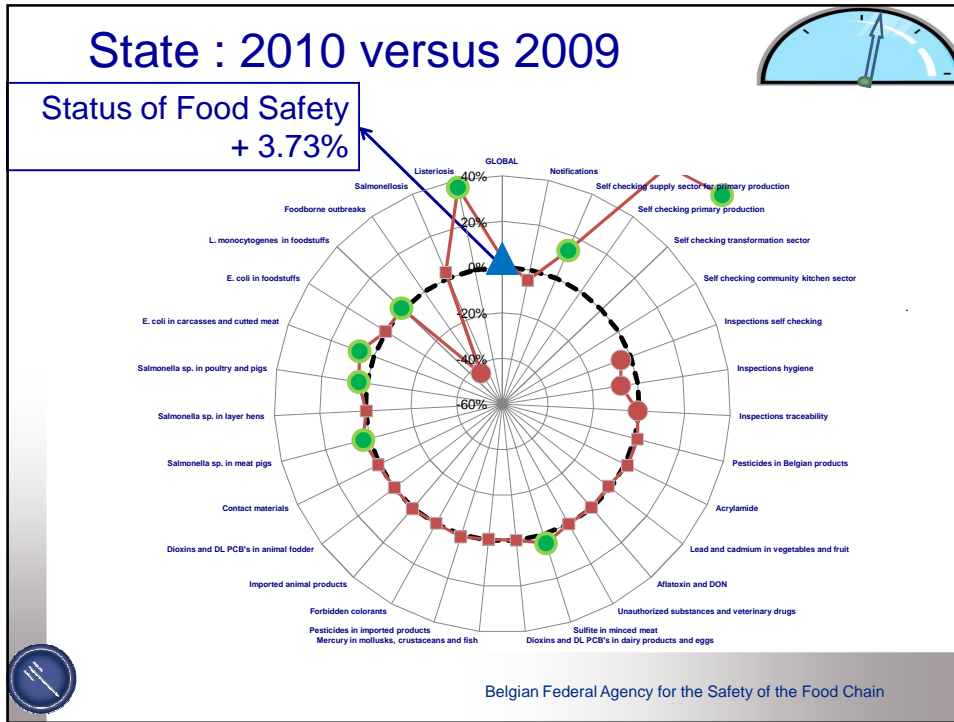


State : 2009 versus 2008

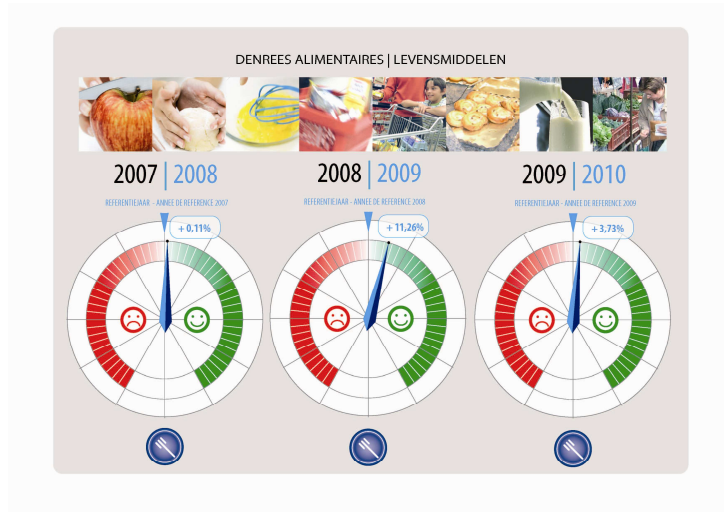


Status of Food Safety + 11,26%
(2,37% if not SCS processing taken into account cfr. 2008 tov 2007)





Food Safety Barometer

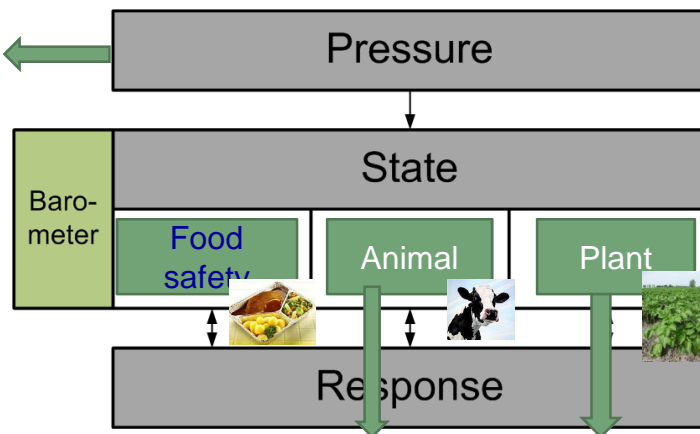


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Further follow-up

Measuring Pressure & Response :

Food Research International 48 (2012) 257-264



Barometer for status Animal & Plant Health

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The top 4 pressures

- Economic
 - financial crisis /limitation of resources
 - price of raw materials
- Political
 - complexity of legislation
- Social
 - media and perception of food safety
 - eating habits



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Responses : five main strategies

- Communication and networking
- Training
- Participation in working groups and elaboration of research programs
- Legislation, control and monitoring plans by government
- no or limited response
 - In general, the link of a specific response to a specific perceived pressure was difficult to demonstrate



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Conclusions

- **Measuring Food Safety is a complex : need for 30 food safety indicators!**
- **Indicators** → **General Food Law** (integrated systematic approach from “from farm to fork” to assure food safety)
- **Product controls** : various indicators show a **high level of food safety** (>95% compliance)
- Results of **inspection** : **prone to improvements**
- **Certified self checking systems** have a **positive influence** on food safety barometer
- Overall **trend to improvement of food safety**
 to follow-up in coming years

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Lessons to be learnt

- Food safety barometer = to communicate in an intelligible, comprehensible manner to stakeholders
- Food safety indicators = basis for trend analysis – to set in due time quantitative objectives ?
- Food safety barometer
 - = helicopter view, may trigger further study
 - = links to function of control agency & acceptance by operators & general public
 - Complementary to annual report
 - Complementary to risk assessment (hazard/commodity)

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Further reading



Measuring the safety of the food chain in Belgium: Development of a barometer

Katleen Baert ^a, Xavier Van Huffel ^{a,b}, Olivier Wilmart ^a, Liesbeth Jacxsens ^{b,c}, Dirk Berkvens ^{c,d}, Herman Diricks ^a, André Huyghebaert ^{d,e}, Mieke Uyttendaele ^{b,d}

^a Directorate Central Policy, Federal Agency for the Safety of the Food Chain, Brussels, Belgium
^b Laboratory of Food Microbiology and Food Preservation, Department of Food Safety and Food Quality, Faculty of Bioscience Engineering, Ghent University, Ghent, Belgium
^c Department of Animal Health, Institute of Tropical Medicine, Antwerp, Belgium
^d Scientific Committee, Federal Agency for the Safety of the Food Chain, Brussels, Belgium
^e NutrIFOODchem unit, Department of Food Safety and Food Quality, Faculty of Bioscience Engineering, Ghent University, Ghent, Belgium



Measuring the perceived pressure and stakeholders' response that may impact the status of the safety of the food chain in Belgium

Katleen Baert ^{a,1}, Xavier Van Huffel ^{a,b}, Liesbeth Jacxsens ^{b,c}, Dirk Berkvens ^{c,d}, Herman Diricks ^a, André Huyghebaert ^{d,e}, Mieke Uyttendaele ^{b,d}

^a Directorate Central Policy, Federal Agency for the Safety of the Food Chain, Brussels, Belgium
^b Laboratory of Food Microbiology and Food Preservation, Department of Food Safety and Food Quality, Faculty of Bioscience Engineering, Ghent University, Ghent, Belgium
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^d Scientific Committee, Federal Agency for the Safety of the Food Chain, Brussels, Belgium
^e NutrIFOODchem unit, Department of Food Safety and Food Quality, Faculty of Bioscience Engineering, Ghent University, Ghent, Belgium



Acknowledgements



FASFC



Scientific Committee of the FASFC

- Internal experts of the FASFC
- External experts: dr. ir. Liesbeth Jacxsens (UGent)
- Advisory Committee of FASFC

