Belgian Federal Agency for the Safety of the Food Chain

Measuring Food Safety

Development of a tool for a general measure for food safety

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Terms of Reference: Measuring food safety

Last decade major reforms concerning the management of safety of the food chain

- Business plan of FASFC identified 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.
Terms of Reference: Measuring food safety

To situate within **current time frame/context** of indicators, assessments, score systems, quantification, measurable objectives, etc, …

![Barometers](image)

**Approach**

- Working group of Scientific Committee (WG SciCom) activated (April 2009)
- Working group meetings
- Workshop of SciCom on November 27th 2009
- Occasional consultation of SciCom / FASFC Management / Advisory Committee of FASFC
- Data collection to construct “food safety barometer”
- Presentation of a tool to measure food safety
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

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
Concept – Measuring food safety

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

Concept – Measuring food safety

Pressure → Pressures exerted by general forces, processes or mechanisms operating within society and that impact the food chain and may possibly modify its state (and its 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.
Part 1 : State

Case study
“Barometer Food Safety”

Selection of food safety indicators

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

Set of indicators to provide information on the overall situation of food safety
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)
- The preventive approach (self-checking systems, notification, traceability)
- Public health issues (restricted to biological hazards)

Selection of food safety indicators

- Preventive approach

FSI1: Notification
Selection of food safety indicators

• Preventive approach: Self-checking systems
  - FSI2: SCS suppliers primary production
  - FSI3: SCS primary production
  - FSI4: SCS processing
  - FSI5: SCS Collectivities

• Control of processes: Inspections
  - FSI6: Inspections concerning self-checking systems
  - FSI7: Inspections infrastructure, hygiene in hotels, restaurants, catering, collectivities & retail & distribution
  - FSI8: Inspections concerning traceability

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Selection of food safety indicators

- Product controls: Chemical hazards

FSI9: Residues of pesticides in fresh produce (BE origin)
FSI10: Acrylamide
FSI11: Pb & Cd in fresh produce
FSI12: aflatoxines and DON

Plant production / products

 FSI13: Unauthorized substances & veterinary drugs used in cows and pigs
FSI14: sulfite in minced meat
VVI15: Dioxins & DL-PCB’s in dairy and eggs
VVI16: Hg in fish, molluscs, crustaceans

Animal production / products

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Selection of food safety indicators

• Product controls: Chemical hazards
  
  FSI17: Residues of pesticides in fresh produce (EU and third countries)
  
  FSI18: Forbidden colorants
  
  FSI19: Imported animal products for human consumption (border controls)
  
  FSI20: Dioxins & DL-PCB’s in feed
  
  FSI21: Contact-materials
  
  FSI12: aflatoxins and DON

Selection of food safety indicators

• Product controls: Biological hazards

  VVI22: Salmonella spp. in meat pigs
  
  VVI25: Salmonella spp. in carcasses and cut meat
  
  VVI23: Salmonella spp. in layer hens
  
  VVI24: Salmonella spp. in carcasses and cut meat
  
  VVI26: E. coli in foods
  
  VVI27: L. monocytogenes in foods
Selection of food safety indicators

- Public health

FSI28: Food borne outbreaks
FSI29: Salmonellosis
FSI30: Listeriosis

Set of 30 indicators from “farm to fork”

<table>
<thead>
<tr>
<th>Part in the Food Chain</th>
<th>Number of FSI's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suppliers to the food chain</td>
<td>7</td>
</tr>
<tr>
<td>Primary plant production</td>
<td>10</td>
</tr>
<tr>
<td>Primary animal production</td>
<td>14</td>
</tr>
<tr>
<td>Processing</td>
<td>15</td>
</tr>
<tr>
<td>Distribution</td>
<td>12</td>
</tr>
<tr>
<td>Consumer</td>
<td>3</td>
</tr>
<tr>
<td>Import</td>
<td>8</td>
</tr>
<tr>
<td>Storage &amp; transport</td>
<td>7</td>
</tr>
<tr>
<td>Services &amp; contract work</td>
<td>2</td>
</tr>
</tbody>
</table>
Measurement of food safety 2007-2009

Notifications

Year

Number

0,00

0

100,00

100

200,00

200

300,00

300

400,00

400

2007

2008

2009

SCS suppliers prim prod

SCS primary production

SCS processing

SCS collectivities

% validated

0%

20%

40%

60%

80%

100%

2007

2008

2009
Measurement of food safety 2007-2009

Inspections

% OK or OK with remarks

Inspections self checking | Inspections hygiene | Inspections traceability

- 2007
- 2008
- 2009

Product analysis: chemical hazards

% conform

- 2007
- 2008
- 2009
Measurement of food safety 2007-2009

Product analysis: biological hazards

Measurement of food safety 2007-2009

Foodborne outbreaks and reported cases
Prioritization of the 30 indicators in their impact to measure food safety

impact variable 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

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
- FSI11: Compulsory notification in food safety 1,16
- FSI4: Self checking systems in the transformation sector 1,16
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

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
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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Part 2 : Pressure and Response

**Food safety**
- Animal
- Plant
Concept – Measuring food safety

Pressure

State

Barometer

Food safety

Animal

Plant

Response

Pressures

Various type of “Pressures” formulated

– Political / Legal
– Technological
– Economical
– Environmental
– Social

assigning a weight to “Pressures” by expert opinion:
SciCom & Advisory Committee & Dir Com FASFC

Using Las Vegas method:
- assigning 20 chips to 30 indicators
- multiple chips/indicator – total 20 chips
Pressures

impact variable - perceived by various stakeholders

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Type</th>
<th>Impact score</th>
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</thead>
<tbody>
<tr>
<td>Financial-economic</td>
<td>Econ.</td>
<td>3,000</td>
</tr>
<tr>
<td>Complexity legislation</td>
<td>Legal</td>
<td>2,316</td>
</tr>
<tr>
<td>Media &amp; perception</td>
<td>Social</td>
<td>2,289</td>
</tr>
<tr>
<td>Eating habits</td>
<td>Social</td>
<td>1,974</td>
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<tr>
<td>Adaptation/resistance</td>
<td>Technol.</td>
<td>1,868</td>
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</table>

Pressures: Socio-economic aspects!

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Pressures

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Type</th>
<th>Impact Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>International trade</td>
<td>Ec</td>
<td>1,316</td>
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<tr>
<td>Environm./ welfare</td>
<td>Env</td>
<td>1,211</td>
</tr>
<tr>
<td>(new) analytical methods</td>
<td>T</td>
<td>1,184</td>
</tr>
<tr>
<td>(lack of) harmonisation</td>
<td>P/L</td>
<td>1,026</td>
</tr>
<tr>
<td>Society (demographics..)</td>
<td>S</td>
<td>1,000</td>
</tr>
<tr>
<td>Climate change</td>
<td>Env</td>
<td>0,763</td>
</tr>
<tr>
<td>Pressure from authorities</td>
<td>P/L</td>
<td>0,605</td>
</tr>
<tr>
<td>Technology / Processing</td>
<td>T</td>
<td>0,553</td>
</tr>
</tbody>
</table>
Response

Inquiry by open questions
Results grouped in “keywords” that reflect “response”

communication - consultation - dialogue with regard to issues on food safety
between authorities / industry associations / individual companies (at national and European level)

To inform – give guidance/training to inspectors / food business operators

Participation to (inter)national advisory forums and/or working groups

Response

Putting in place/ modification of legislation
Adaptation of control and monitoring program

Clarify, increase awareness, put into context emerging issues

To keep up to date and follow-up research & development
initiate and implement research

Limited or no response

 ➡️ Generic response – linked to inquiry of associations, organisations/ institutes’ representatives
Conclusion

• Food safety encompasses many aspects
• Complexity of the food chain (and related legislation) is a challenge for continuously assuring food safety
• Registration of results is important for trend analysis (retrospective and in the future !)
• “Food safety” (and the pressures on the food chain) is difficult to define and perceived differently depending upon the actor of the food chain

Conclusion

• Food safety is dynamic & part of the society as a whole
  ➔ demands continuous efforts to monitor also socio-economic changes that might impact food safety and lead to emerging issues / need response

communication and networking is essential between competent authorities – food business operators – scientists (on national and international level) to keep food safe.
Acknowledgements

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- Advisory Committee of FASFC