Comparing food safety management systems between food processing companies

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Introduction

Food Safety Requirements:
EU Legislation, Belgium legislation, CODEX, PRP/GMP, HACCP, BRC, ISO22000, ...

Development and implementation of a Food Safety Management System in a specific SME/industrial company in the agri-food chain

Safe food products?
Introduction

EU Research project PathogenCombat (www.pathogencombat.com)

Diagnostic instrument (FSMS-DI) for food processing companies to measure:
- the performance of current FSMS (core control activities and core assurance activities)
- the performance of food safety output
- in relation to the context of a company
- standing apart from auditing/inspection of implemented commercial QA standard/legislation!

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<table>
<thead>
<tr>
<th>CONTEXT</th>
<th>FSMS = Control + Assurance</th>
<th>Food safety output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product characteristics</td>
<td>Core assurance activities</td>
<td>Product safety</td>
</tr>
<tr>
<td>Process characteristics</td>
<td>Setting system requirements</td>
<td>Validation</td>
</tr>
<tr>
<td>Organisational characteristics</td>
<td>Verification</td>
<td>Documentation and record keeping</td>
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<tr>
<td>Environmental characteristics</td>
<td>Core control activities</td>
<td>Preventive measures design</td>
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<tr>
<td></td>
<td></td>
<td>Intervention processes design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring system design</td>
</tr>
<tr>
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<td>Operation control strategies</td>
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</table>

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Introduction - hypothesis

INTRODUCTION

- FSMS-DI – content (58 indicators)

Part I: Introductory section for Food Safety Management System (FSMS)
A. Introduction questions (1-11)
B. Selection of Representative Production Unit (RPU) for self-assessment (12-20)

Part II: assessment of contextual factors
A. Assessment of product characteristics (A1-3)
B. Assessment of process characteristics (B4-6)
C. Assessment of organisation characteristics (C7-13)
D. Assessment of chain environment characteristics (D14-17)

Part III: assessment of core safety control activities
E. Assessment of preventive measures design (E18-23)
F. Assessment of intervention processes design (F24-27)
G. Assessment monitoring system design (G28-34)
H. Assessment of operation of preventive measures, intervention process and monitoring systems (H35-41)

Part IV: assessment of core assurance activities
I. Assessment of setting system requirements activities (I42-43)
J. Assessment validation activities (J44-46)
K. Assessment of verification activities (K47-48)
L. Assessment of documentation and record-keeping to support food assurance (L49-50)

Part V: assessment of food safety performance
M. EXTERNAL Food Safety Performance (M51-54)
N. INTERNAL Food Safety Performance (N55-57)
Introduction

• FSMS-DI – indicators translated into grids

1. In which situation would you place the risk of your raw materials in your RIPU representative production unit?

<table>
<thead>
<tr>
<th>Situation 1</th>
<th>Situation 2</th>
<th>Situation 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Raw material is not associated with high initial microbial levels and pathogens.</td>
<td>- Raw material is not associated with high initial microbial levels and pathogens, which potentially can affect safety of final product.</td>
<td>- Raw material is not associated with high initial microbial levels and pathogens, which potentially can affect safety of final product.</td>
</tr>
<tr>
<td>- Storage at or below room temperature conditions.</td>
<td>- Storage on or below room temperature, but not specific microbial requirements.</td>
<td>- High requirements on storage conditions and shelf control.</td>
</tr>
</tbody>
</table>

Supporting information for differentiating situation 2 and 3:
- When your raw material are associated with high initial microbial levels and/or pathogens, and if they are stored below room temperature and not specific microbial requirements.
- Crucial for level 3 are the high requirements on storage are crucial for prevention of undesired growth of microorganisms (including pathogens).

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Introduction

• Indicators are organised in spiderwebs
• Results can be applied as internal audit
• Short/mid/long term improvements of FSMS

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Introduction

- FSMS-DI:
  - Tool available for PROCESSING FOOD INDUSTRY
  - On line [www.pathogencombat.com](http://www.pathogencombat.com) – on paper
  - Dutch, French, English, Spanish, Greek
  - Data companies in database of WU
  - Profiling countries – sectors – interventions – …
  - Applied in Belgium study (june 2010 – october 2010)
  - Cooperation FAVV – UGent – WU

Belgian study

- Quantitative study in Belgian food/feed processing companies
- Different sectors - different size
- With/without certified self checking systems: can we see a difference in level of food safety and level of implemented FSMS?

- 200 companies invited → 82 respondents
- 50% certified for self checking
- 90% certified for commercial system (BRC, IFS, GMP+, etc)
- Only 3 companies without any certificate …
Belgian study

BIAS in our study …

- Difficult to get companies involved
- Involved companies assumed to have higher level in FSMS due to (multiple) certification
- Involvement of non certified companies?

Questions:

- Can we identify clusters/profiles in FSMS performance in food processing companies in Belgium?
- Do we see a difference in level of performance of food safety output (low – moderate – good)?
- Do we see a difference in level of performance of actual implemented FSMS (basic – generic – tailored/scientific underpinned)?

Characterisation of respondents

<table>
<thead>
<tr>
<th>Production sector</th>
<th>Micro and small (2-9 &amp; 10-49)</th>
<th>Medium (50-249)</th>
<th>Large (&gt; 249)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self checking system</td>
<td>Not certified</td>
<td>Certified</td>
<td>Not certified</td>
<td>Certified</td>
</tr>
<tr>
<td>Meat products</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Red meat</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Slaughterhouses/cutting</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Poultry</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ready-to-eat meals</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Dairy</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fish processing</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vegetables, fruits, potatoes</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Industrial bakery</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Brewery</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Feed</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Others</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>15</td>
<td>10</td>
<td>20</td>
</tr>
</tbody>
</table>
Results - database

Etc….

Results - Food safety output?

- Overall: moderate (overall score 2) to good (overall score 3) performance of FS output for all Belgian food/feed processing companies

<table>
<thead>
<tr>
<th>n</th>
<th>Overall score for food safety output</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 (18%)</td>
<td>Good</td>
</tr>
<tr>
<td>57 (70%)</td>
<td>Moderate-good</td>
</tr>
<tr>
<td>9 (11%)</td>
<td>Moderate</td>
</tr>
<tr>
<td>1 (±1%)</td>
<td>Moderate-low</td>
</tr>
</tbody>
</table>
Results - Clusters?

- Individual database
- Hierarchical cluster analysis
- Dendograms
- 5 clusters could be defined

Results - identification of clusters

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Number of companies</th>
<th>% certified for self checking</th>
<th>Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster I</td>
<td>38</td>
<td>60</td>
<td>Animal products</td>
</tr>
<tr>
<td>Cluster II</td>
<td>7</td>
<td>71</td>
<td>Non animal products (FVP, candies, brewery, feed, bakery)</td>
</tr>
<tr>
<td>Cluster III</td>
<td>15</td>
<td>20</td>
<td>Animal products</td>
</tr>
<tr>
<td>Cluster IV</td>
<td>18</td>
<td>44</td>
<td>Mixture of companies but no intervention possible in process</td>
</tr>
<tr>
<td>Cluster V</td>
<td>4</td>
<td>50</td>
<td>Mixture</td>
</tr>
</tbody>
</table>

73% of all companies and 76% certified SC
Cluster I: 97% commercial, 60% self checking

Cluster III: 90% commercial, 20% self checking

* Cluster I and Cluster III: all animal products

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Belgian results in the European context

- Survey also conducted in Spain, Greece, the Netherlands
- Outside Europe Japan, Philippines

- Differences with Belgium?
  - Lower food safety output ➔ internal evaluation of food safety output (e.g. product sampling, judgement criteria, non conformities) ➔ more severe internal judgement by Belgian companies
  - Core assurance activities (validation and verification) ➔ elaborated at higher level in Belgian companies
  - Belgian companies high level of performance of FSMS (more advanced, tailored and scientific underpinned)
  - Awareness of importance of food safety and FSMS?
  - Drive of legislation / self checking systems?

Example of lowest cluster in European study (no Belgian companies...)

<table>
<thead>
<tr>
<th>Food Safety output</th>
<th>Product and process characteristics</th>
<th>Organisational and chain characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design of control activities</th>
<th>Actual operation of control activities</th>
<th>Assurance activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
</tbody>
</table>
Conclusions

- Overall Belgian food processing companies demonstrated good performance of food safety output and rather advanced level of food safety management systems

- To be continued…
  - Extended to other actors in the chain (e.g. primary production)
  - Context ➔ aspect of globalisation will be included
  - Focus also on mycotoxins and pesticide residues
  - Veg-i-Trade
    - www.veg-i-trade.org

Acknowledgements

- FAVV : Jacques Inghelram, Herman Diricks
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- Sector organisations

- Responding companies !!