Chain Level Dairy Innovation and Changes in Expected Recall Costs

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Introduction

- Food scandals happen: past – nowadays – future
- Notification of ‘wrong’ products is mandatory since January 1\textsuperscript{st} 2005
- Recalls are known to be expensive
- Almost no scientific literature on recall losses
- No scientific literature on strategies to reduce recall losses

Q: how fast is fast enough to reduce the losses?
Introduction

- **Focus:** consumption milk
- **Method:** using modeling techniques to investigate
- **This study:** a pilot to investigate whether modeling can help in studying the relation between recall losses and the speed of finding a contamination.
AIM

To study the relation between the recall moment of consumption milk, the recall size, the direct recall costs and the distribution along the milk supply chain.

- **Recall moment**: the time between the moment on which the milk left the farm tank and the moment the milk stream is stopped to be recalled.
- **Recall size**: batch size equals the size of the silo and only situations where the milk is contaminated at farm level or thereafter (so no feed contamination included)
- **Direct recall costs**: image damage, market losses, etc. are excluded
Milk Supply Chain

Diagram showing the flow of milk from farms, through tanks, trucks, silos, processing lines, packaging, distribution centers, trucks, retailers, and finally to consumers.
Table 1. The number of units, the amount of milk per unit, the sub-batch modelled and the descriptive values that describe the distribution of the length of stay of milk at each specific stage of the milk supply chain.

<table>
<thead>
<tr>
<th>Variable</th>
<th>#</th>
<th>Most likely(^1)</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck(^2)</td>
<td>8</td>
<td>3.0</td>
<td>1.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Silo</td>
<td>1</td>
<td>10.0</td>
<td>1.0</td>
<td>24.0</td>
</tr>
<tr>
<td>Processing lines</td>
<td>1</td>
<td>1.5</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Packaging stage</td>
<td>1</td>
<td>1.5</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Truck</td>
<td>15</td>
<td>3.0</td>
<td>1.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Distribution centre 1</td>
<td>20</td>
<td>8.0</td>
<td>1.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Distribution centre 2</td>
<td>20</td>
<td>4.0</td>
<td>1.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Truck</td>
<td>150</td>
<td>3.0</td>
<td>1.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Retail</td>
<td>1260</td>
<td>12.0</td>
<td>2.0</td>
<td>72.0</td>
</tr>
<tr>
<td>Consumer</td>
<td>50,000</td>
<td>12.0</td>
<td>0.5</td>
<td>72.0</td>
</tr>
</tbody>
</table>

\(^1\) We assumed a triangular distribution  
\(^2\) 3 trucks of 10,000 kg, 3 of 20,000 kg and 2 of 30,000 kg
Recall losses

- Partial budgeting approach
- For each recalled kilogram of milk located in a specific stage of the supply chain the following components were calculated:
  - additional costs
  - reduced returns
  - reduced costs
  - (additional returns were €0)
**Additional Costs**

- **Transport** (€0.01/kg - €0.05/kg)
- **Destruction** (€0.10/kg)
- **Cleaning** (€0.01/kg)
- **Costs for refunding purchase price** (€1.07/kg)

- **Media announcement** (€75,000)
  - Fixed costs conditional on that 1kg milk has passed pick-up location of DC
Reduced returns

- Selling price
  - Off factory for stages until packaging (€0.61/kg)
  - Off retail for stages from packaging until consumer (€0.67/kg)
Reduced costs

- **Manufacturing costs:** costs made at a specific stage of the chain before the milk is going to the next stage of the chain.
  - truck, silo, processing and packaging: product value at the end of the transport 1 minus product value at the former stage (€0.29, €0.27, €0.15, €0.07 / kg)
  - distribution centre 1, 2 and the retail: product value at the end of the retail stage - product value at the former stage (€0.08, €0.03, €0.03 / kg)
Results

E.g.
Recall moment: 12 hours
Recall costs:
Truck: €0
Silo: €53,000
Processing: €9000
Packaging: €8000
Distribution 1: €13,000
Distribution 2: €0,
Retail: €0
Consumer: €0
Results

[Graph showing recall moment (hours) on the x-axis and total direct recall costs on the y-axis. The graph includes a curve for the mean, a 5% percentile, a 95% percentile, and the amount of milk consumed.]
Thank you for your attention

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Ruud Huirne is professor of Farm Management at Wageningen University since January 1999. His major fields of research and teaching are farm management, supply chain management, animal health economics, decision support, risk analysis and risk management. Since January 2001, his professor chair was extended with the scientific field of ‘economics of animal health and food safety’.

Since April 1999, he is managing director of the Institute for Risk Management in Agriculture (IRMA). IRMA is an independent scientific institute, part of Wageningen University, focusing on risk assessment, risk management and risk financing in agriculture.

Since March 2004, he is general director of the Animal Sciences Group of Wageningen UR. The Animal Science Group performs academic and applied research in the field of animal sciences, in particular in the fields of infectious diseases, animal husbandry, fisheries and aquaculture. The group includes a staff of about 900 fte and has an annual turn-over of 90 million Euro.

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Industry perspectives on incentives for food safety innovation
Continuous food safety innovation as a management strategy
  Dave Theno, Jack in the Box, US
Economic incentives for food safety in their supply chain
  Susan Ajeska, Fresh Express, US
Innovative food safety training systems
  Gary Fread, Guelph Food Technology Centre, Canada

Organizational and technological food safety innovations
Is co-regulation more efficient and effective in supplying safer food?
  Marian Garcia, Dept. of Agricultural Sciences, Imperial College London
  Andrew Fearne, Centre for Supply Chain Research, University of Kent, UK
Chain level dairy innovation and changes in expected recall costs
  Annet Velthuis, Cyriel van Erve, Miranda Meuwissen, & Ruud Huirne
  Business Economics & Institute for Risk Management in Agriculture, Wageningen University, the Netherlands
Regulatory food safety innovations
Prioritization of foodborne pathogens
Marie-Josée Mangen, J. Kemmeren, Y. van Duynhoven, A.H. and Havelaar, National Institute for Public Health & Environment (RIVM), the Netherlands
Risk-based inspection: US Hazard Coefficients for meat and poultry
Don Anderson, Food Safety and Inspection Service, USDA
UK HAS scores and impact on economic incentives
Wenjing Shang and Neal H. Hooker, Department of Agricultural, Environmental & Development Economics, Ohio State University

Private market mechanisms and food safety insurance
Sweden’s decade of success with private insurance for Salmonella in broilers
Tanya Roberts, ERS, USDA and Hans Andersson, SLU, Sweden
Are product recalls insurable in the Netherlands dairy supply chain?
Miranda Meuwissen, Natasha Valeeva, Annet Velthuis & Ruud Huirne, Institute for Risk Management in Agriculture; Business Economics & Animal Sciences Group, Wageningen University, the Netherlands
Recapturing value from food safety certification: incentives and firm strategy
Suzanne Thornsbury, Mollie Woods and Kellie Raper
Department of Agricultural Economics, Michigan State University
Applications evaluating innovation and incentives for food safety
Impact of new US food safety standards on produce exporters in northern Mexico
Belem Avendaño, Department of Economics, Universidad Autónoma de Baja California, Mexico and Linda Calvin, ERS, USDA
EU food safety standards and impact on Kenyan exports of green beans and fish
Julius Okello, University of Nairobi, Kenya
Danish *Salmonella* control: benefits, costs, and distributional impacts
Lill Andersen, Food and Resource Economics Institute, and Tove Christensen, Royal Danish Veterinary and Agricultural University, Denmark

Wrap up panel discussion of conference
FSN section rep. – Tanya Roberts, ERS, USDA
AEM section rep. – Randy Westgren, University of Illinois
INT section rep. – Julie Caswell, University of Massachusetts
FAMPS section rep. – Jean Kinsey, University of Minnesota
Discussion of everyone attending conference
Note: speaker is either the 1st person named or the person underlined.

Thanks to RTI International for co-sponsoring the workshop.
Workshop objectives
- Analyze how new public policies and private strategies are changing economic incentives for food safety,
- Showcase frontier research and the array of new analytical tools and methods that economists are applying to food safety research questions,
- Evaluate the economic impact of new food safety public policies and private strategies on the national and international marketplace,
- Demonstrate how new public policies and private strategies in one country can force technological change and influence markets and regulations in other countries, &
- Encourage cross-fertilization of ideas between the four sponsoring sections.

Workshop organizing committee
Tanya Roberts, ERS/USDA, Washington, DC - Chair
Julie Caswell, University of Massachusetts, MA
Helen Jensen, Iowa State University, IA
Drew Starbird, Santa Clara University, CA
Ruud Huirne, Wageningen University, the Netherlands
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Darren Hudson, Mississippi State University, MI