Food Scares

How can we reduce the impacts?

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Plan of Presentation

- Introduction to food incidents and food scares
  - Supply chain complexity
  - Typology of scares
  - What turns a food incident into a food scare?
- Projects:
  - How can we reduce their frequency and severity?
    - Agent Based Model:
      - How can improved information flows along food supply chains reduce waste caused by food scares?
    - Food Incident Interactive Training Tool (FIITT)

One hamburger from Burger King can contain ingredients from approximately 200 suppliers located throughout the United States and around the world.

Scholl, 2005 cited in Choffnes et al (2012)

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The Complexity of a Cheeseburger - Ingredients

Global Supply Chain Complexity

bleached wheat flour
malted barley flour
thiamine
riboflavin
Niacin
folic acid
reduced iron
Water
corn syrup
sesame seeds
soybean oil
Yeast
Salt
calcium sulfate
calcium carbonate
calcium silicate

soy flour
baking soda
wheat gluten
calcium propionate
enzyme
mono- and diglycerides
diacetyl
tartaric acid
esters
ethanol
sorbitol
polysorbate 20
potassium propionate
sodium stearoyl lactylate
corn starch
ammonium chloride
ammonium sulfate
calcium peroxide
ascorbic acid
azodicarbonamide

Milk
milkfat
Water
cream
sodium citrate
salt
sodium phosphate
sorbic acid
artificial color

cheese culture
acetic acid
soy lecithin
Enzymes
starch

Cucumbers
water
Vinegar
Salt
calcium chloride
Alum
natural flavorings
polysorbate 80
turmeric

USDA inspected beef

Soybean oil
pickles
distilled vinegar
water
egg yolks
HF corn syrup
sugar

onion powder
corn syrup
spice
spice extractives
salt
xanthan gum

mustard flour
prop. glycol
alginate
sodium benzoate
potassium sorbate

mustard bran
garlic powder
hydrolyzed proteins
caramel color
paprika

Turmeric
calcium disodium EDTA

Grill Seasoning
Salt
Pepper

cottonseed oil
soybean oil

lettuce

dehydrated onions

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The Complexity of a Cheeseburger – Countries of Origin

Globalizing the Cheeseburger

Vinegar
Argentina
Australia
Austria
Belgium
Brazil
Canada
China
Chile
Colombia
Denmark
Dom. Rep
France
Germany
Greece
Hong Kong
Israel
Italy

Japan
S. Korea
Lebanon
Peru
Poland
Portugal
Serbia
Philippines
Russia
S. Africa
Singapore
Spain
Sweden
Turkey
Taiwan
U.K.

Garlic Powder
Brazil
Canada
China
Germany
India
Israel
Japan
S. Korea
Mexico

Tomatoes
Belgium
Canada
Colombia
Costa Rica
Dom. Rep.
Guatemala
Israel
Morocco
Mexico
Netherlands
New Zealand
Poland
Spain

Beef
Australia
Canada
Chile
Costa Rica
Honduras
Japan
Mexico
Nicaragua
New Zealand
Uruguay
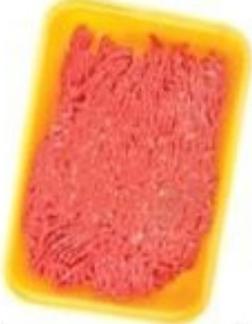
Wheat Gluten
Australia
Belgium
Canada
China
Czech Rep.
France
Germany
Kazakhstan
Lithuania
Netherlands
Poland
Russia
Switzerland
Thailand
U.K.

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Many actors interacting with many others across the food chain

Seed Growers — Many Small

Seed Consolidators / Brokers — Few Large

Sprout Growers — Many Small

Distributors — Few Small & Few Large

Retailers — Many Small & Many Large

Food Service Chains

Grocery Chains

Ind. Restaurants

Ind. Grocers

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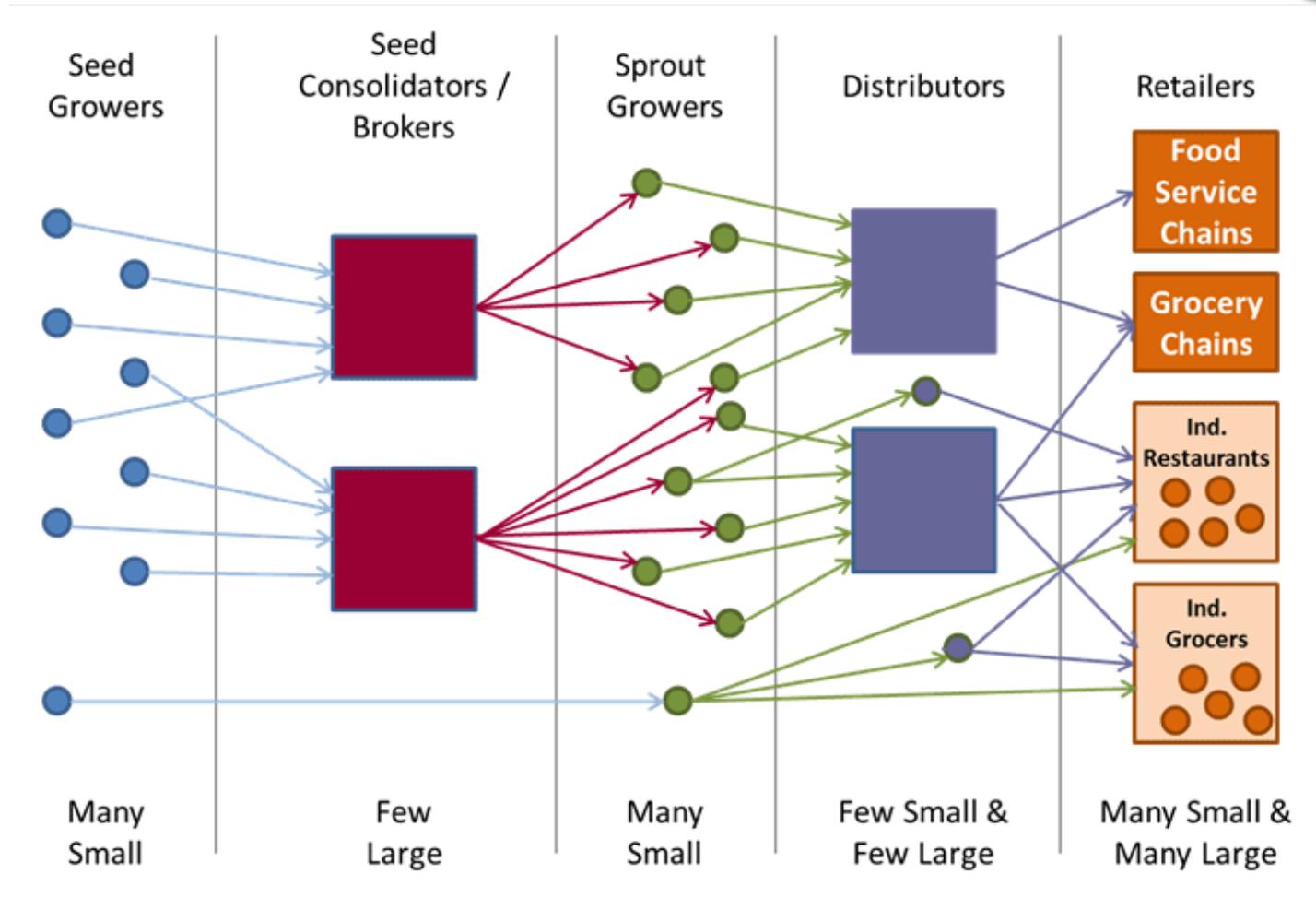
Examples of shocks in different parts of the supply chain

Farmer
- Animal disease
- Extreme events

Processor
- Contamination – microbiological/chemical/physical
- Allergens

Retailer
- Incorrect labelling

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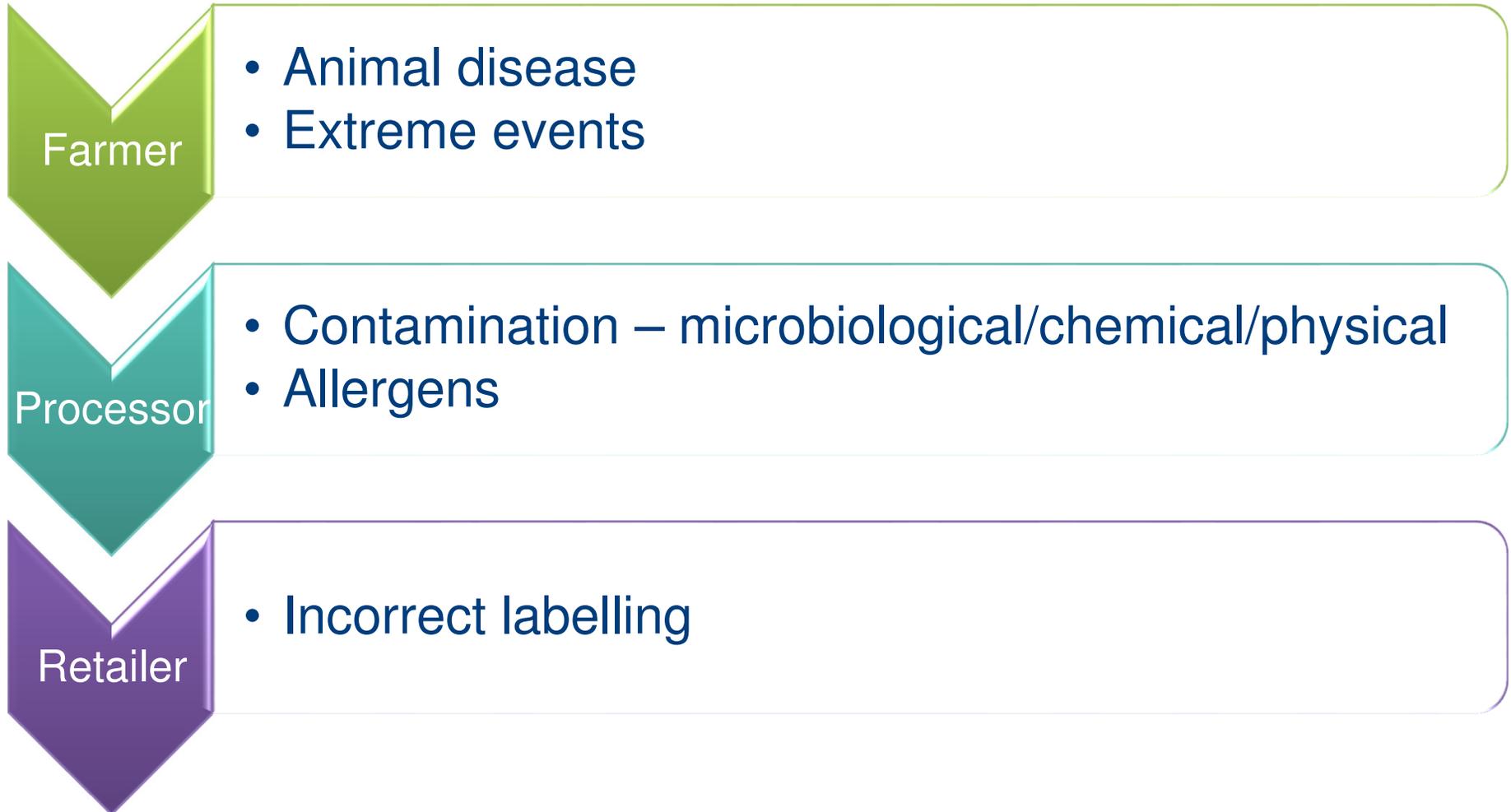
What is a food scare?

The definition of food scare that we use here is:

The response to a food incident (real or perceived) that causes a sudden disruption to the food supply chain and to food consumption patterns.

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In the past there have been many food scares

Poisoned food in shops for 3 WEEKS: supermarkets clear shelves of cakes and quiches containing contaminated eggs from Germany

China tainted milk scandal: Cadbury confirms melamine and 22 arrested

Japan bans Fukushima rice shipment due to contamination

Cucumber E.coli scare: UK shops reassure consumers as Spain demands compensation

Top supermarkets secretly sell halal: Sainsbury's, Tesco, Waitrose, and M&S don't tell us meat is ritually slaughtered

Horsemeat scandal: Don't dump meat, says food minister

BSE meat from foreign cattle may be ending up in burgers

Test reveals Fonterra milk powder didn't contain botulism bacteria

Traces of melamine found in US-made baby formula

New Zealand's Fonterra finds botulism bacteria in dairy ingredient

40 Tons of Tainted Pork Allegedly Sold in China

It's all Double Dutch at Tesco as 'British' pork chops come from overseas

Why do food scares matter?

Environment

Economy

Social
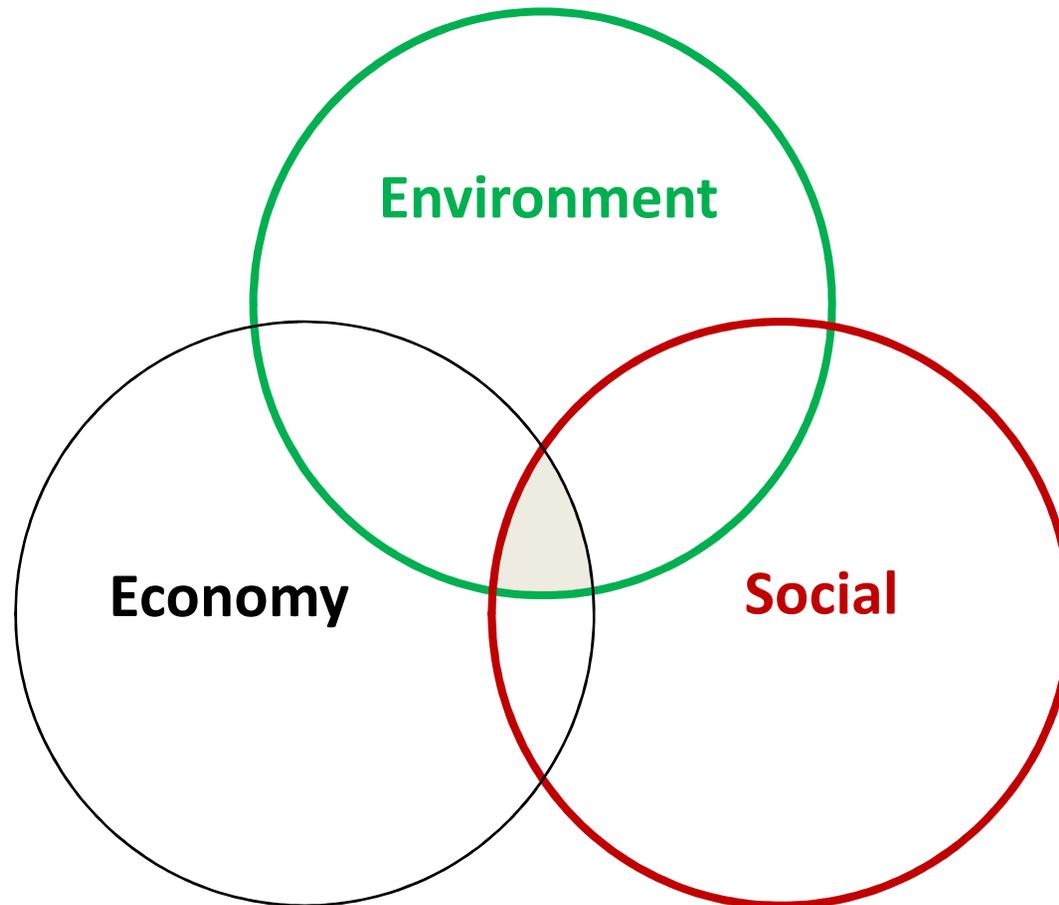
Food incidents: a classification

Chemical/Physical Contamination
Carcinogens, Foreign bodies, Chocolate moth

Terrorism, Dioxins, Melamine, Sudan red Horse meat

Allergens – e.g. Nuts

Hormones

Wilful Deception

GM
Organic

Transparency and Awareness Issues

Irradiation

Bio-terrorism

Salmonella

Microbiological Contamination
BSE, E Coli, Campylobacter, Tape worms, Toxoplasma, Hepatitis A, Listeria

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Contamination incidents investigated in the UK by the FSA

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Legend:
- 2006, 1344 incidents
- 2008, 1298 incidents
- 2010, 1505 incidents
- 2012, 1604 incidents
- 2013, 1562 incidents

Y-axis: Number of incidents (0 to 450)

X-axis categories: Allergen, Labelling / documentation, Physical, Microbiological, Natural chemical, Environmental, On-farm, Other

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Defra, 2014 – Food Pocket Notebook

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Food incidents happen all the time......
But what turns
an incident
into a scare?

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Media

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The media: reporting on horsemeat scandal

- First media report 16 Jan 2013
- Continues to present day
- Mainstream article 'mentions': >21,000

Volumes are based on a sample of mentions and do
not encompass all mentions

www.gorkana.com/measurement-matters/measurement-
matters/socialmediamonitoring/horsemeat-scandal/
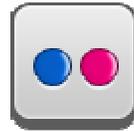
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Social Media

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Blogger

Delicious

Digg

Facebook

Flickr

Google+

LinkedIn

MySpace

Reddit

RSS

Stumble upon

Technorati

Tumblr

Twitter

You-tube

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Social Media

- Social Media has changed the way we:
  - Communicate
  - Access information
  - Whom we share information with
- Effect of scale and types of social media sources:
  - Receive information multiple times
  - Often contradictory

Social Media

Positive?

- Helps communicating a message globally
- Inform a specific community
- Announce updates

Negative?

- Increased customer power
  - Harder for companies to contain negative publicity.
- Difficult to track negative or misleading statements
- Accidental release of confidential information
- Unauthorized employees speaking on company's behalf

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How many mentions each supermarket received re horsemeat scandal in the media

TESCO **Tesco Customer Care** ✔ 🔍▾ 🐦 Follow
@UKTesco

It's sleepy time so we're off to hit the hay!
See you at 8am for more #TescoTweets

← Reply ⤺ Retweet ★ Favorite ••• More

2,169 **496**
RETWEETS FAVORITES

3:00 PM - 17 Jan 13 · Embed this Tweet
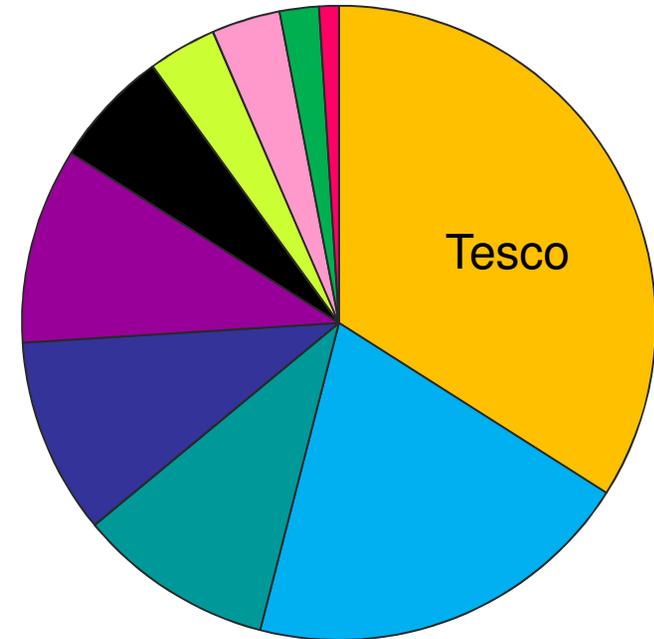
Tesco

Legend:
- Tesco
- Aldi
- Lidl
- ASDA
- Sainsbury's
- The Co-operative
- Morrisons
- Waitrose
- IKEA
- Marks and Spencer

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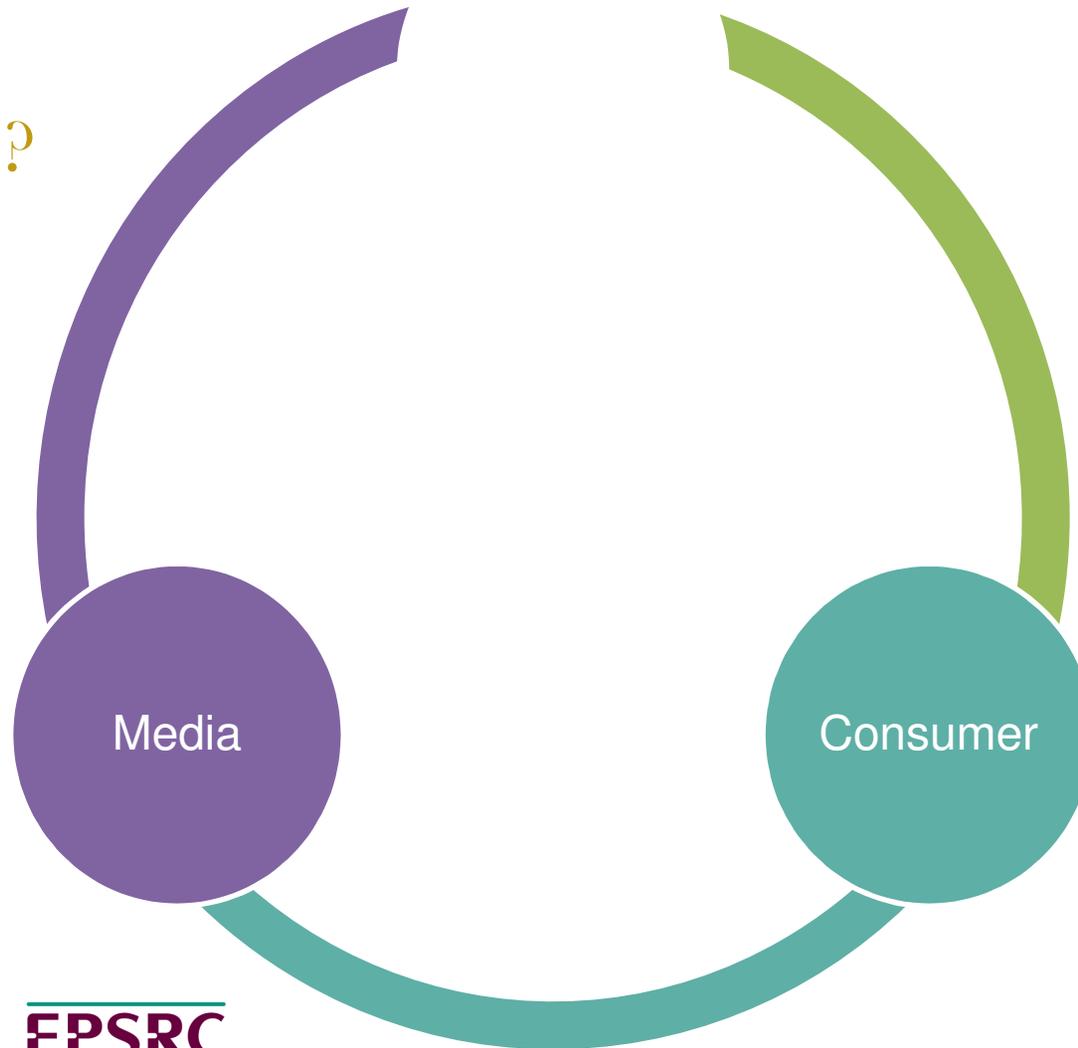
Consumers

- Perception by industry
  - Public are perceived as naïve and gullible
    - their responses are often deemed irrational
  - Beware of *who* it effects: pregnant women, elderly
- Important issues for consumers
  - What products affected?
  - Nature of the incident?
- Consumers' reaction
  - Who to trust?
    - Companies, news media, social media, government, specialist organisations?
  - Brand loss
    - Perceived frequency and severity of incidents

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Food incidents happen all the time......
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Food incident

Consumer

Media
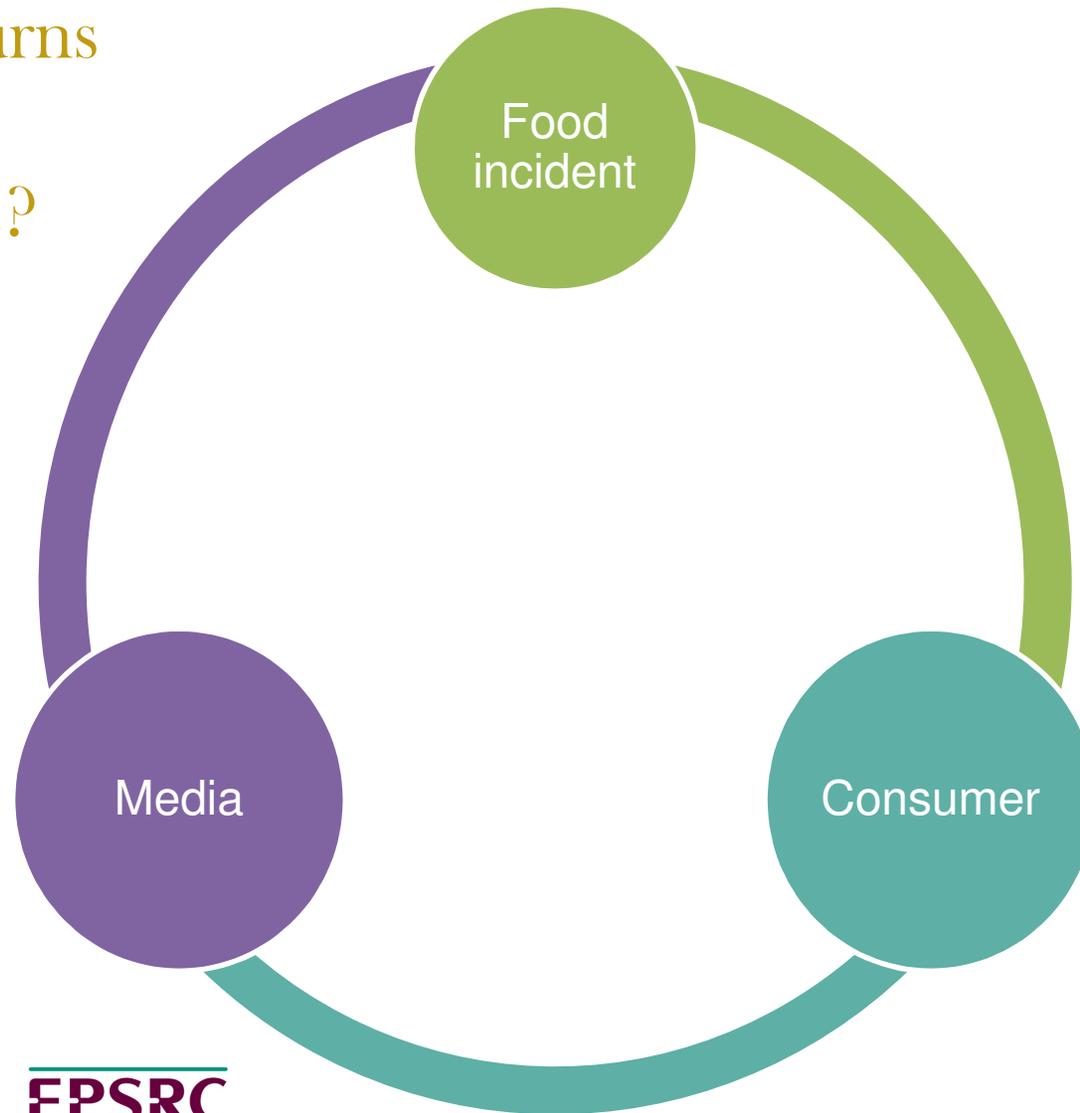
Dealing with food incidents

- Time is of the essence
- Information
  – Acquired quickly
  – Accuracy
  – Usable format
  – Educate the consumer
- Trust
  – Between industry stakeholders
  – Between industry and the public
    - *"It takes 20 years to build a reputation and five minutes to ruin it"* (Warren Buffet)
- Price wars
  – Cheap is not always best
- Media
  – There is a need for industry and government to improve their communication skills with the public

It is essential that consumer interests are put first, and that the relevant organisation counters the misinformation with clear and accurate content.

Sloan, Williams and Burnap. COSMOS Project, Cardiff University.
software.ac.uk/blog/2014-08-28-going-viral-social-media-networks-intercepted-misinformation?mpw

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The Policy Arena

- British Retail Consortium
- Cabinet Office strategy unit
- DEFRA
- European Commission
- European food safety authority
- Food and Agriculture Organisation of the UN
- Food and Drink Federation
- Food Standards Agency
- Foresight: Government Office for Science
- Soil Association
- WRAP
- ………………………………………………..

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Current Policy

- No area of policy is dedicated to either food incidents or information flow along the supply chains
- Promotion of more informative labelling for consumers
  - More informed choice but not direct supply chain info
- A new strategy for increasing integrity and assurance of the Food Supply Network
- Acknowledgement that:
  - Information is extensively collected in some areas; neglected in other areas
    - Depending on stage of the supply chain and type of food product
  - For there to be increased information there needs to be increased trust

Initiatives following the horsemeat scandal

- **Elliott Report**
  - 2013 - Review into the Integrity and Assurance of Food Supply Networks- Interim report
  - 2014 - Review into the Integrity and Assurance of Food Supply Networks- Final report
  - 2014 - Government response to the Elliott review of the integrity and assurance of food supply networks
- **Food and Drink Federation**
  - 2013 - Food Authenticity 5 steps to help protect your business from food fraud
- **Food Standards Agency**
  - 2013 - Review of Food Standards Agency response to the incident of contamination of beef products with horse and pork meat and DNA.
  - 2013- Report of the investigation by the Food Standards Agency into incidents of adulteration of comminuted beef products with horse meat and DNA

Plan of Presentation

- Introduction to food incidents and food scares
  - Supply chain complexity
  - Typology of scares
  - What turns a food incident into a food scare?
- ***Projects:***
  - ***How can we reduce their frequency and severity?***
    - ***Agent Based Model: Information Flows***
    - Food Incident Interactive Training Tool (FIITT)

How can improved information flows along food supply chains reduce waste caused by food scares?

- Development of an Agent Based Model
  - To be used as a tool to increase understanding
    - What information currently flows along supply chains?
    - What are the barriers to information flows?
    - What happens at the time of a food scare?
  - Initial focus: beef mince and horsemeat scandal
  - To explore policy and governance strategies
    - Based on Elliot Report recommendations

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3 specific Supply Chains

- **Meat**
  - Beef mince
- **Grain**
  - Bun
- **Vegetable**
  - Lettuce, tomato

# Assumptions and limitations of the model

- Simplification of the supply chain

- Mapping information flows
  - Qualitative and quantitative information

- Confidentiality issues

- The market : we are not taking account of price.
  - Assume all products are in a suitable price range for the buyer

- Indicator
  - Food waste

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Stakeholder engagement

- Expert interviews

- Workshops

Agents

Government, Insurers etc.

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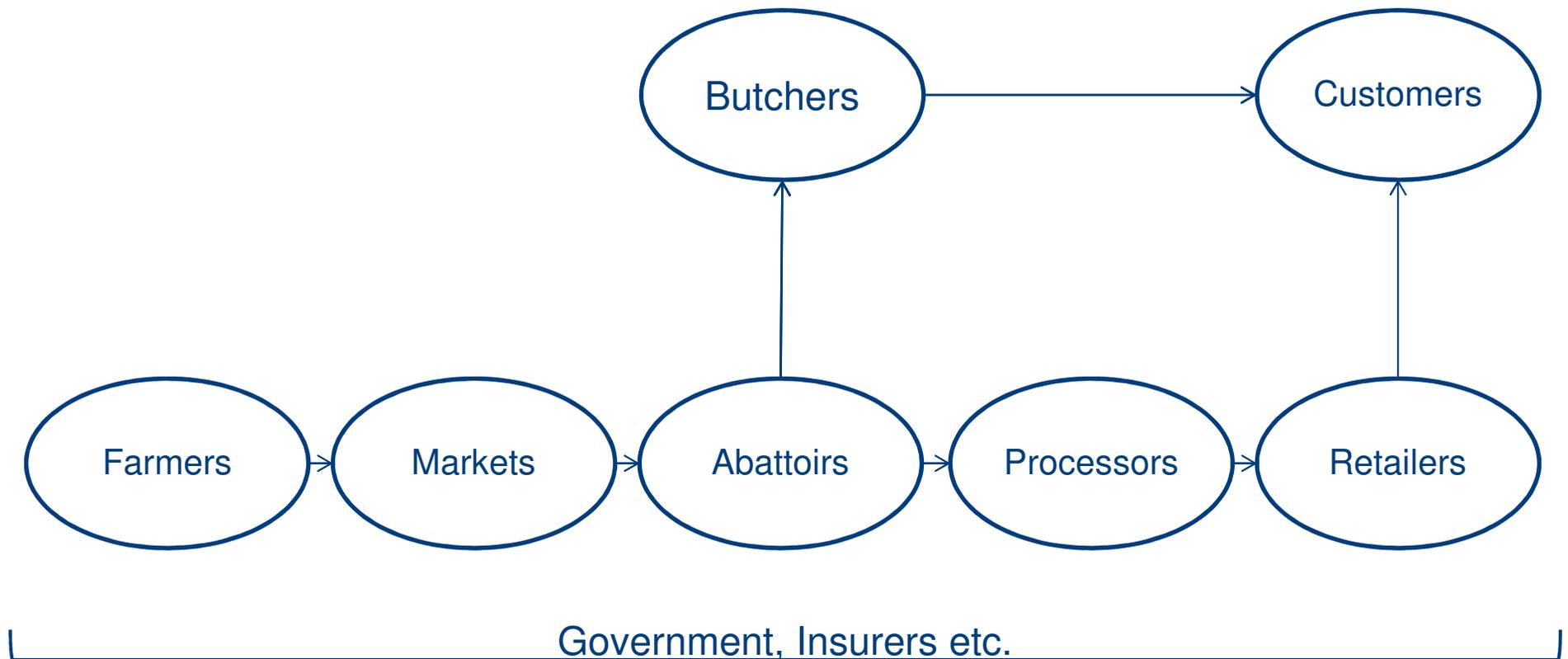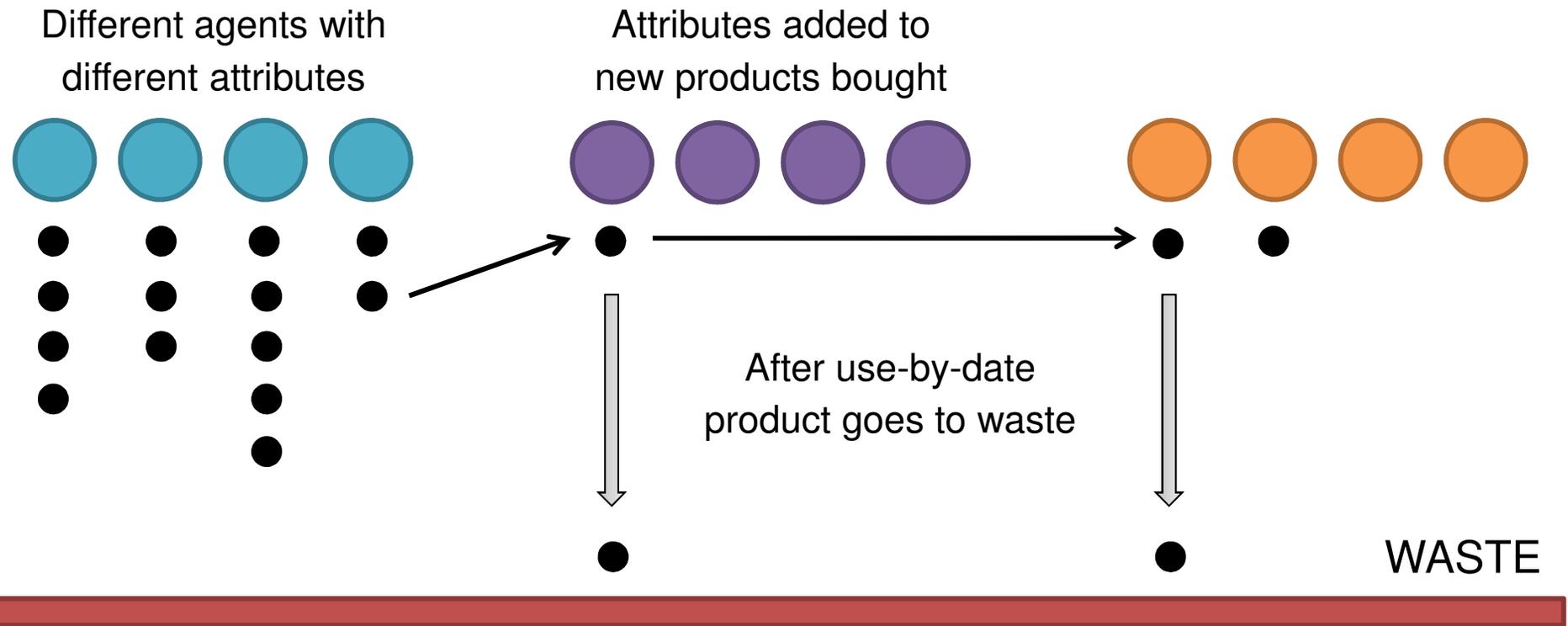
Global
Time
Shocks

Product
Sold and bought along supply chain

Information as Attributes
∗   Attributes are added along the supply chain
∗   If not consumed after period of time then goes to waste
∗   When shock wasted if matching attributes

Farmer
Sell to retailer → sells in bulk

∗   Add attributes to products
∗   Learn from information level
∗   Die if no stock for time period

Retailer
Sell product → customer individually
Buy from farmer → buys in bulk

∗   Buy if product has key attributes
∗   Add attributes to products
∗   Do not buy if sufficient stock
∗   More probable to buy from previous supplier
∗   Chooses whether to buy
∗   Learn from information level
∗   Die if no stock for time period

Customers

∗   Buy if product has key attributes
∗   Do not buy if sufficient stock
∗   More probable to buy from previous supplier
∗   Chooses whether to buy
∗   60% of products are eaten under normal circumstances
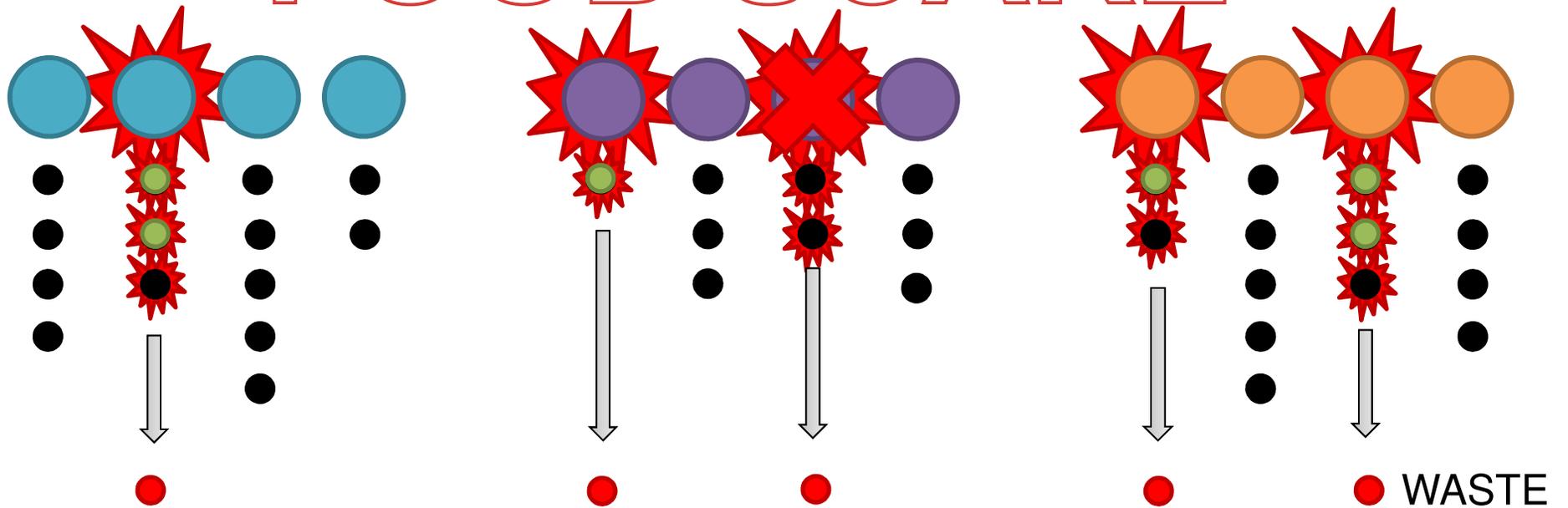
What is the effect of varying information along food supply chains?

Types of information (examples)

- Age / Date of Birth
- Animal feed type
- Animal Passport
- Certification type
- Country of origin
- Details (e.g. Name, address, licence) for Farmer, Market, Abattoir, Processor, Retailer, Butcher
- Electronic records
- Existing relationship with seller

- Fat content / Visible Lean
- Packaging
- Samples available
- Seller's audit frequency and type
- Slaughter date
- Slaughter method
- Storage
- Veterinary data

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Information issues

- Incorrect

- Missing

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Traceability Index

- How much information is available about the product as it passes along the supply chain?
  - Based on information about each organisation involved in the supply chain, e.g.
    - Implementation of management schemes
      (eg ISO22301 Business Continuity Standard)
    - Audit regimes
    - Compliance with recommendation of voluntary depositing of data in a central database (as recommended by Elliott 2014)
    - Use of electronic vs paper information systems
    - Availability of samples for testing
    - Investigations for food fraud

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ABM Model - NetLogo

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Setup | **Go** | **go**

file-close | **media_start**

percentage_wasted
40

num_product — 12
unsold — 2
max-age — 7 days
carcass_split — 3

media_magnitude
high

media_length
media_length_long

ticks: 541 | 3D

plot 1

41.3

0

0 — 571

- Products
- Dead turtles
- Media

initial-farmers — 14
initial-markets — 20
initial-abattoirs — 10
initial-processors — 20
initial-retailers — 20
initial-butchers — 11
initial-customers — 44

farmers
14

retailers
20

customer
44

Products
217

Wasted products
20616

Farmer Waste	Retailer Waste	Customer Waste
9871	8678	2067

dead-turtles-eat	dead_turtles_scare
291	21

percentage_same_buying_market — 40
percentage_same_buying_abattoir — 74
percentage_same_buying_processor — 70

percentage_same_buying_retailer — 48
percentage_same_buying_butcher — 51
percentage_same_buying_customer — 50

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What happens in the scenarios?

Audits

Check whether audits have been conducted and if not then the traceability is reduced

Can change the amount of sampling

Local Authority checks that companies are complying. Those who are not cannot sell

Mass balance and more focused audits are applied

Media

Embargo on press reports for a set period of time.

Suggested times: 2, 5, 10 days

Risk and response

Crime squad: if the stakeholder's traceability ratio becomes too low then they will be penalised

Information database - two levels: compulsory and voluntary. This affects the stakeholders' traceability

Each stakeholder has level of strategy which will affect their ability to sell in a scare.

Products

All products removed from sale until they are proven to not be contaminated

or

All products left on sale until they are proven to be contaminated

Media

When the scare occurs the customers in the model will waste a percentage of the customers' products according to the magnitude of the scare

Length

Customers affected (y-axis)
Time (days) (x-axis)
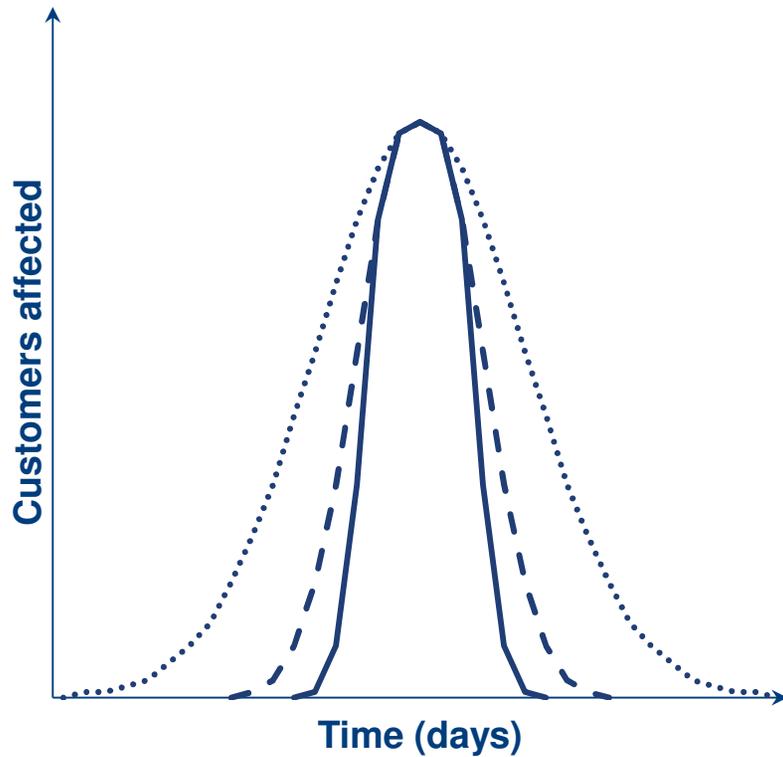
•••••• Long 33   – – Medium 17   —— Short 11

Magnitude

Customers affected (y-axis)
Time (days) (x-axis)
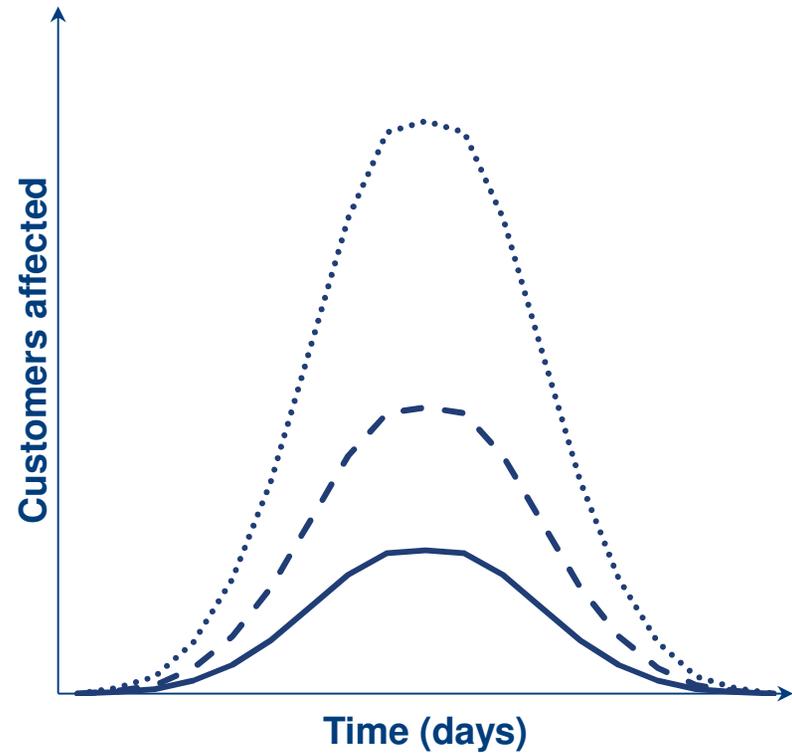
—— Low x1   – – Medium x2   •••••• High x4

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    - Agent Based Model: Information Flows
    - ***Food Incident Interactive Training Tool (FIITT)***

Food Incident Interactive Training Tool (FIITT)

A tool for use by companies to test out their plans for what to do in the case of a food incident, and for training staff.

– Balance between speed of taking action with accuracy of knowledge

– Dealing with the media

– Record keeping during incident

– Who to talk to during a food incident

– Implications of when decision is made to withdraw product

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Food Incident Interactive Training Tool (FIITT)

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Food Incident Interactive Training Tool

Day: 1
Scenario Status: FSA has received reports indicating salmonella found in bean sprouts.

Your organization

Status

Reputation: 10
Brand equity: 10
Revenue Loss: 0
Resources: 10

Available actions:

☒ Ask FSA for update (cost: 0)
☐ Consult lawyer (cost: 2)
☐ Release a press statement (cost: 1)

Time Limit: 00:01:00 **SUBMIT**

Public

News	Twitter

In-house quality control

(Message from quality control)

FSA

(Message from FSA)

Insurer

(Message from Insurer)

Trade Organisation

(Message from trade organisation)

Lawyer

(Message from Lawyer)

Food Incident Interactive Training Tool (FIITT)

Food Incident Interactive Training Tool

Day: 2
Scenario Status: First news reports about salmonella in bean sports.

Your organization

Status
Reputation: 10
Brand equity: 10
Revenue Loss: 1
Resources: 10

Available actions:

- ☑ Ask FSA for update (cost: 0)
- ☑ Consult lawyer (cost: 2)
- ☑ Inform crisis team (cost: 1)
- ☒ Perform test on product (cost: 2)

Time Limit: 00:00:45   **SUBMIT**

Public

News	Twitter
BBC: News at 10 - Salmonella in bean sprouts. Should you worry?	USER123: salmonella in bean sprouts! #scaredofsprouts #salmonellasprouts

In-house quality control

FSA

Still under investigation. Will update soon.

Insurer

Trade Organisation

Lawyer

Food Incident Interactive Training Tool (FIITT)

Food Incident Interactive Training Tool

Day: 3
Scenario Status: Mounting public concern over bean sprouts.

Your organization

Status

Reputation: 10
Brand equity: 10
Revenue Loss: 2
Resources: 8

Available actions:

- Ask FSA for update (cost: 0)
- Consult lawyer (cost: 2)
- Consult insurer (cost: 2)

Time Limit: 00:00:33   **SUBMIT**

Public

News	Twitter
Daily Mail: Salmonella in 10 states linked to raw sprouts	Sprouthead: Afraid to eat my favourite! What to do? #scaredandconfused#salmonellasprouts

In-house quality control

Initial test inconclusive. Retesting

FSA

Insurer

Trade Organisation

Lawyer

Link the ABM to the training tool

Food Incident Interactive Training Tool

Day: 1
Scenario Status: FSA has received reports indicating salmonella found in bean sprouts.

Your organization

Status
Reputation: 10
Brand equity: 10
Revenue Loss: 0
Resources: 10

Available actions:

- Ask FSA for update (cost: 0)
- Consult lawyer (cost: 2)
- Hold a press release (cost: 1)

Time Limit: 00:01:00   **SUBMIT**

Public

News	Twitter

Model output
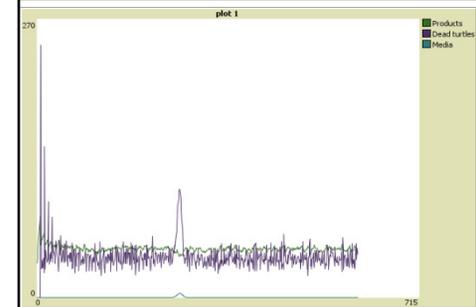
plot 1

Products
Dead turtles
Media

270

0

0   715

FSA
(Message from FSA)

Insurer
(Message from Insurer)

Trade Organisation
(Message from trade organisation)

Lawyer
(Message from Lawyer)

Food Incident Interactive Training Tool (FIITT)

- Co-design and build
  - aim
  - fit for purpose
  - sharing knowledge, data and information
  - appropriate indicators of performance
  - platform
  - situations and use
  - online testing and piloting
- Iterative process

Conclusion

- Participatory development of tools
- A better understanding of the dynamics of food scares
  - Classification
  - Role of information
- Testing policies to reduce disruptions due to food scares
  - Reduce frequency and severity
  - Reduce in food wastage and associated environmental burdens
  - Reduce wider economic and social losses