Food Traceability and Authenticity - Global Issues

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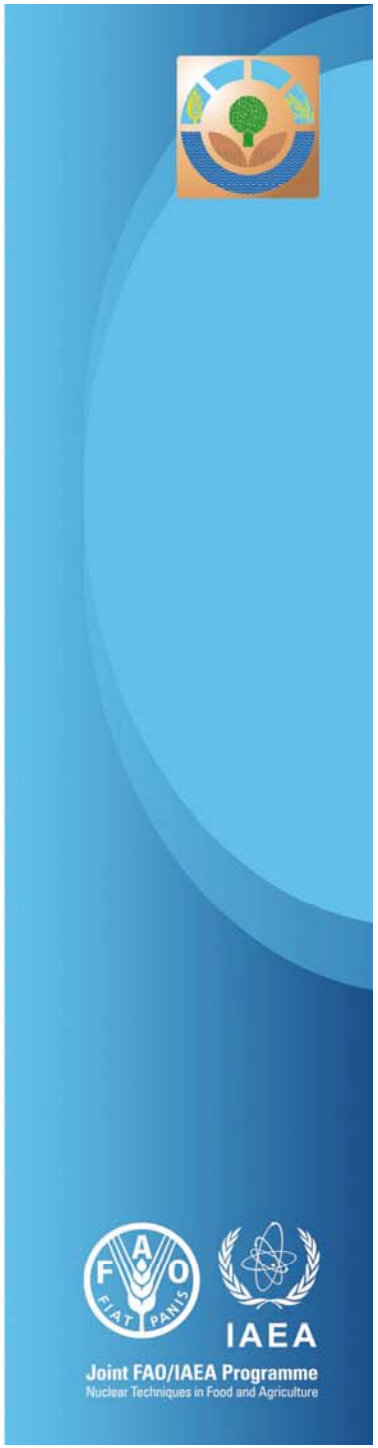

International Atomic Energy Agency

- Since 1957 - the world's foremost inter-governmental forum for scientific and technical cooperation in the peaceful use of nuclear technology
- Member States – currently 150
- Dept. of Nuclear Sciences and Applications
- 1964 - Joint FAO/IAEA Division of Nuclear Applications in Food and Agriculture established

www.iaea.org

Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

FAO/IAEA Programme - Nuclear Techniques in Food and Agriculture

Coordination & support of research

Development and capacity building

Laboratory support

Information dissemination

http://www-naweb.iaea.org/nafa/index.html

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Food and Environmental Protection

Objective –

To enhance Member States capabilities to reduce food safety hazards and protect the environment through nuclear and related techniques

http://www-naweb.iaea.org/nafa/fep/index.html

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FAO/IAEA Training and Reference Centre for Food and Pesticide Control

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IAEA Coordinated Research Project

Food Traceability and Authenticity through Isotope Ratio Techniques

- 5-year project, consultancy 2010, project commencing 2011
- ~10 developing country research contracts
- ~5 research agreement holders to provide advice and guidance.

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Meeting Consumers' Demands

- Increased global trade has made a wide variety of foods accessible to the European consumer
- Consumers now expect exotic foods to be available on their supermarket shelves

from langoustines….

to mangosteens

They also expect their foods to be safe and traceable

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What is food traceability?

- The ability to track any food, feed, food producing animal or substance that will be used for consumption, through all stages of production, processing and distribution *(EU)*
- The ability to follow the movement of a food through specified stage(s) of production, processing and distribution *(Codex Alimentarius)*

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Why do we need food traceability?

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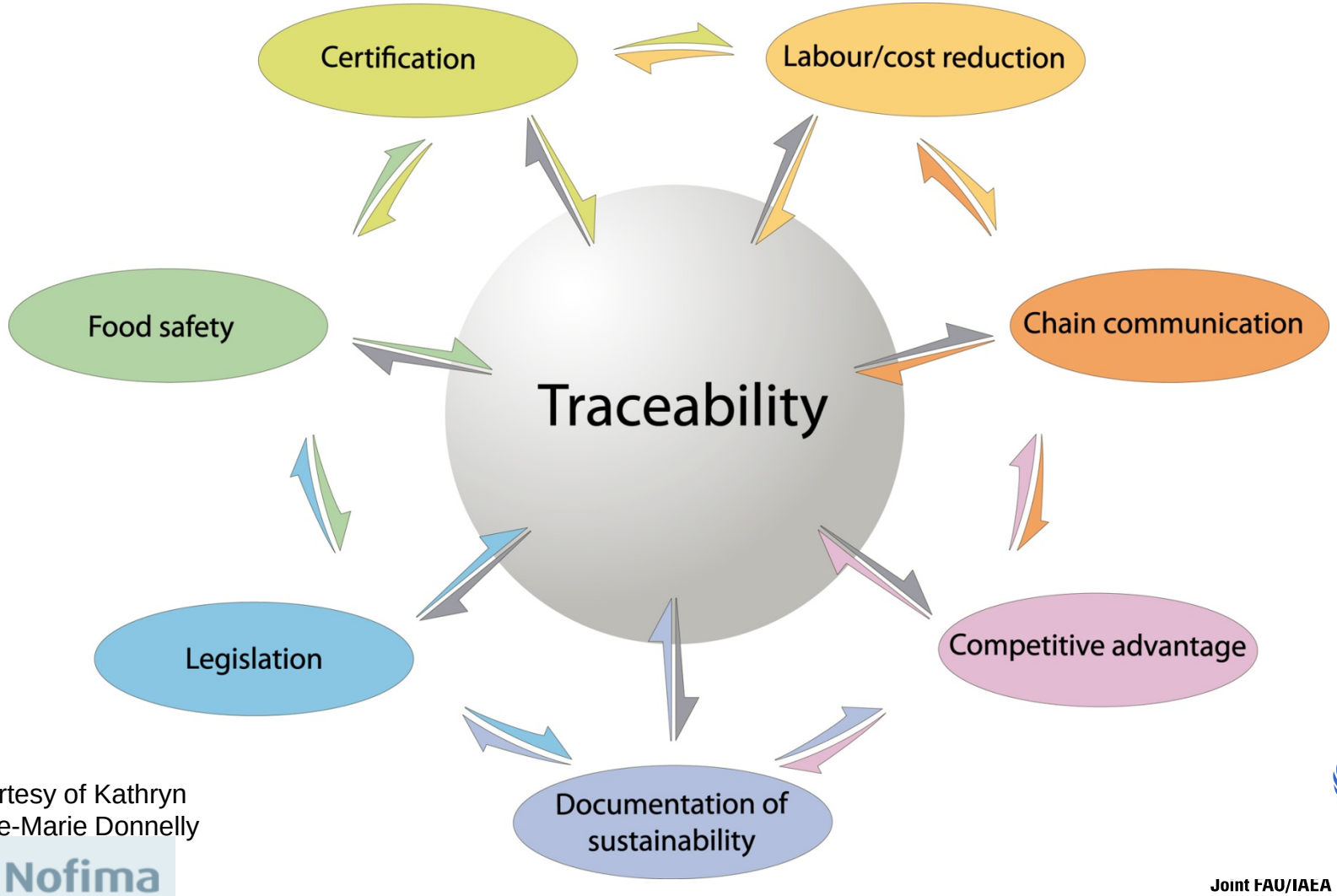
Drivers for traceability



Courtesy of Kathryn Anne-Marie Donnelly

Nofima

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Certification

- Many certification bodies/schemes require some form of documentation of product and process information:
  - Organic produce
  - Fair Trade
  - Food Miles

Cultural/Religious Issues

- Traceability to guarantee the provenance of Halal food
- World Halal Forum (Kuala Lumpur, 2008)
  - "Traceability will become crucial especially for companies looking to penetrate the sophisticated global market"

Supply Chain Management

- Enhanced by
  - Effective data/information exchange
  - Electronic systems
  - Standardisation
- Hampered by
  - Different information exchange protocols and formats

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Competitive Advantage

- Consumers expect food to be safe
  - If not, put responsibility and blame on product, producer and exporting country
- Want more information on their food
  - Including traceability information
- Can increase brand value

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Legislation

REGULATION (EC) No 178/2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 28 January 2002
laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety

- Covers all food & feed and all food & feed business operators and importers
- One step back – one step forward
- Protection of consumers – food safety
- Targeted withdrawal of foods
- Consumers provided with targeted and accurate information on implicated products

Legislation

REGULATION (EC) No 178/2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 28 January 2002
laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety

Some limitations:

- Operators do not have to establish an internal traceability link between incoming and outgoing products
- No requirements for transformation records (splitting and combining batches)
- The **business operator** decides upon the level of detail of the system – commensurate with the nature and size of the business

Codex Guideline CAC/GL 60-2006

Principles for traceability / product tracing as a tool within a food inspection and certification system

- One of a number of tools that may be used within a food inspection /certification system
- Importers should consider that food safety equivalence (same level of protection) may be provided without a traceability system
- Should not be mandatory for exporting country to replicate the importing country's traceability tool
- Traceability tool does not in itself improve food safety outcomes – must be combined with other measures
- Can protect consumers against deceptive marketing practices/fraud

Food Safety

A sampling of consumer product recalls since 2006 (source - IBM)

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Food Safety

- Dioxin contamination in pork & beef in Ireland, Dec 2008
  - Only 8% of pig herd exposed to contaminated feed, but accepted level of traceability in pork industry meant that all Irish pork & pork products from 1st Sept were recalled.
- Topps Meat – E. coli contamination resulted in total product recall (USA, 2008)
- Recall of PCA peanut products due to Salmonella contamination (2008-09)
- Salmonella contamination of peppers from Mexico exported to USA (2009)
- Packaged spinach contaminated with E. coli – 3 deaths, 100 hospitalised, 200 more sick (USA, 2006)
- Melamine in infant products (China)

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Food Safety

The New York Times

Business

Many Red Flags Preceded a Recall of Hamburger

Nicole Bengiveno/The New York Times

A retailer tried to distance itself from the Topps Meat scare over the summer that resulted in nearly 22 million pounds of beef being recalled.

Topps (USA)

- One or more receipts of beef trim contaminated with E. coli
- Traceability system ineffective – total production recall (21.7 million pounds of beef)
- Company goes bankrupt

Food Safety

Topps Timeline

First product positive

Recall Expanded

September
7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-29-29-30-1-2-3-4-5
October

First suspect illness occurred July 5th

Ground Beef Production Stopped

Topps Declares Bankruptcy

Courtesy of Shaun Kennedy

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FOOD PROTECTION AND DEFENSE
A HOMELAND SECURITY CENTER OF EXCELLENCE

PRIMARY PRODUCTION ➤ HARVEST ➤ TRANSPORTATION ➤ STORAGE ➤ PROCESSING ➤ DISTRIBUTION ➤ RETAIL/FOOD SERVICE ➤ CONSUMER

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Food Safety

Effective traceability is dependent on various factors, e.g.

- Epidemiology – identification of the food or component to be traced
- Availability of data “real time”
- Complexity of supply chains

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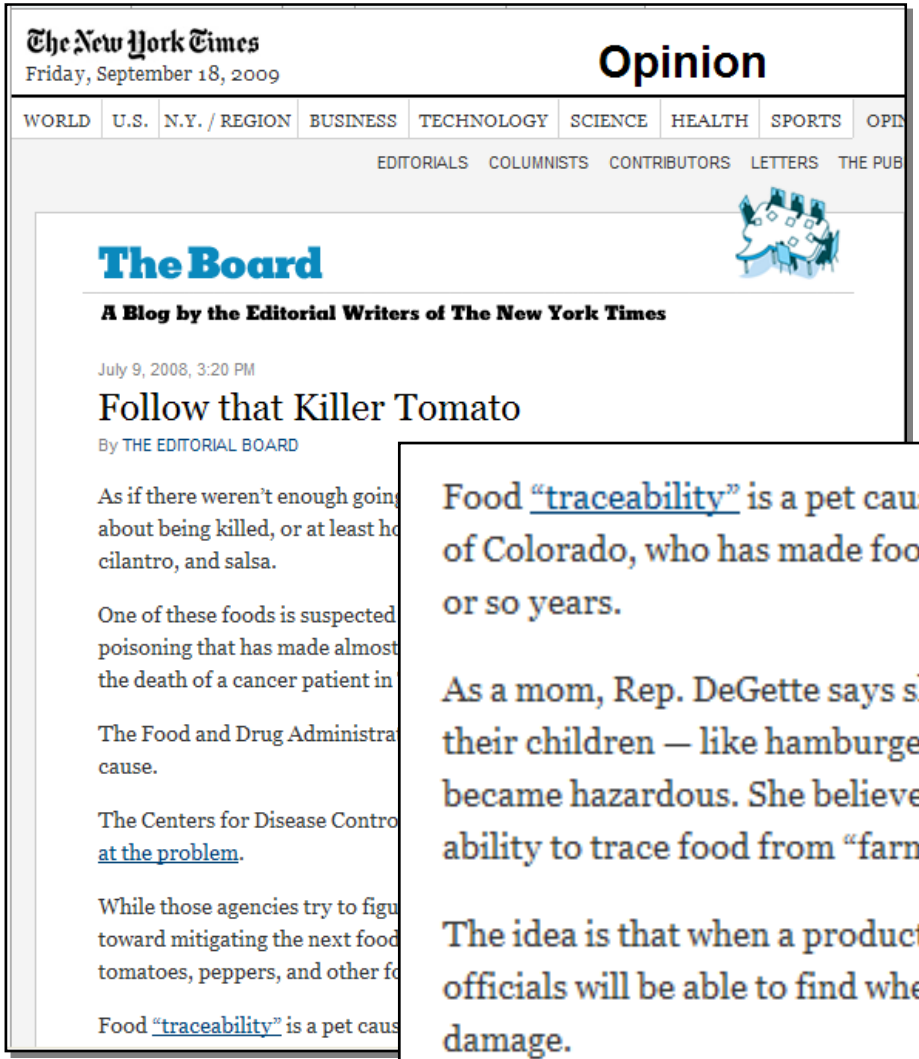
Food Safety



The New York Times
Friday, September 18, 2009

Opinion

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The Board

A Blog by the Editorial Writers of The New York Times

July 9, 2008, 3:20 PM

Follow that Killer Tomato

By THE EDITORIAL BOARD

As if there weren't enough goin
about being killed, or at least h
cilantro, and salsa.

One of these foods is suspected
poisoning that has made almost
the death of a cancer patient in

The Food and Drug Administra
cause.

The Centers for Disease Contro
at the problem.

While those agencies try to figu
toward mitigating the next food
tomatoes, peppers, and other f

Food "traceability" is a pet caus

Food "traceability" is a pet cause of Representative Diana DeGette, Democrat of Colorado, who has made food safety something of a mission in the last five or so years.

As a mom, Rep. DeGette says she grew alarmed when food that parents feed their children — like hamburgers, tomatoes, even spinach — suddenly became hazardous. She believes that the key to limiting the damage is the ability to trace food from "farm to fork."

The idea is that when a product goes bad and makes people sick, health officials will be able to find where it came from quickly — and to limit the damage.

Salmonella in tomatoes?

peppers?

Food Safety

Salmonella – tomatoes or peppers?

- Inconclusive epidemiology
- Limited traceability systems
- Complicated supply chains
- Private sector, production & import data not consistent with presumptive epidemiology data
- Initial alert/restrictions cost the domestic tomato industry at least $100 million

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Food Safety

Complex Supply Chains

> 500 producers in Mexico supplied peppers to U.S.

>320 importers in Mexico supplied peppers to U.S.

>340 consignees received peppers from Mexico

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Food Safety

Complex Supply Chains

Consignees of Mexico Sourced Peppers March - June 2008

Courtesy of Shaun Kennedy NCFPD

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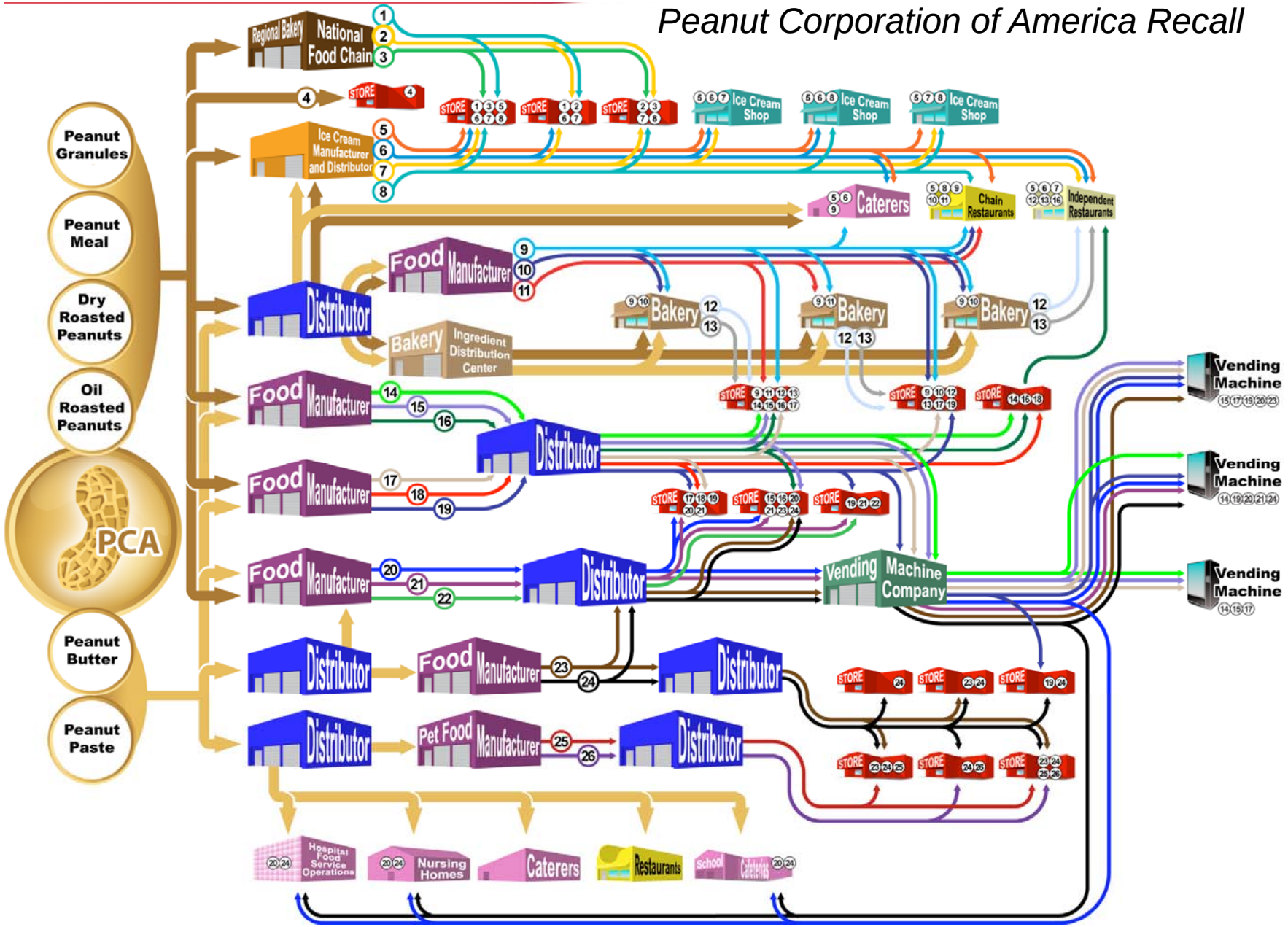
Food Safety

Complex Supply Chains –

- *Salmonella* typhimurium Outbreak due to contaminated peanut products
- Largest recall in U.S. history
- Most expensive recall in U.S. history
  - ~360 recalling firms
  - ~3900 individual sku's
- Kellogg's alone recalled 7 million cases of products worth $65 million
- Industry estimates of total costs in billions

Peanut Corporation of America Recall



Courtesy of Shaun Kennedy NCFPD

Food Safety

Food Safety Performance World Ranking 2008

Research Network in Food Systems, Canada

- Ranked 17 OECD countries over 4 categories
  - *Consumer affairs*
  - *Biosecurity*
  - *Governance and recalls*
  - *Traceability and management*
- EU performance uneven between countries
- UK – “superior” ranking in traceability and recall areas
- Ireland – “poor” ranking in traceability and recall areas, “superior” for biosecurity and “average” for consumer affairs

Traceability

- Clearly an international as well as a domestic issue
- Is it truly a global issue?

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A Multinational Loaf

INGREDIENTS:

- **Wheat gluten**
- **Honey**
- **Calcium proprionate**
- **Guar gum**
- **Flour enrichments**
- **Beta-carotene**
- **Vitamin D3**

Amy Schoenfeld: New York Times, June 15 2007

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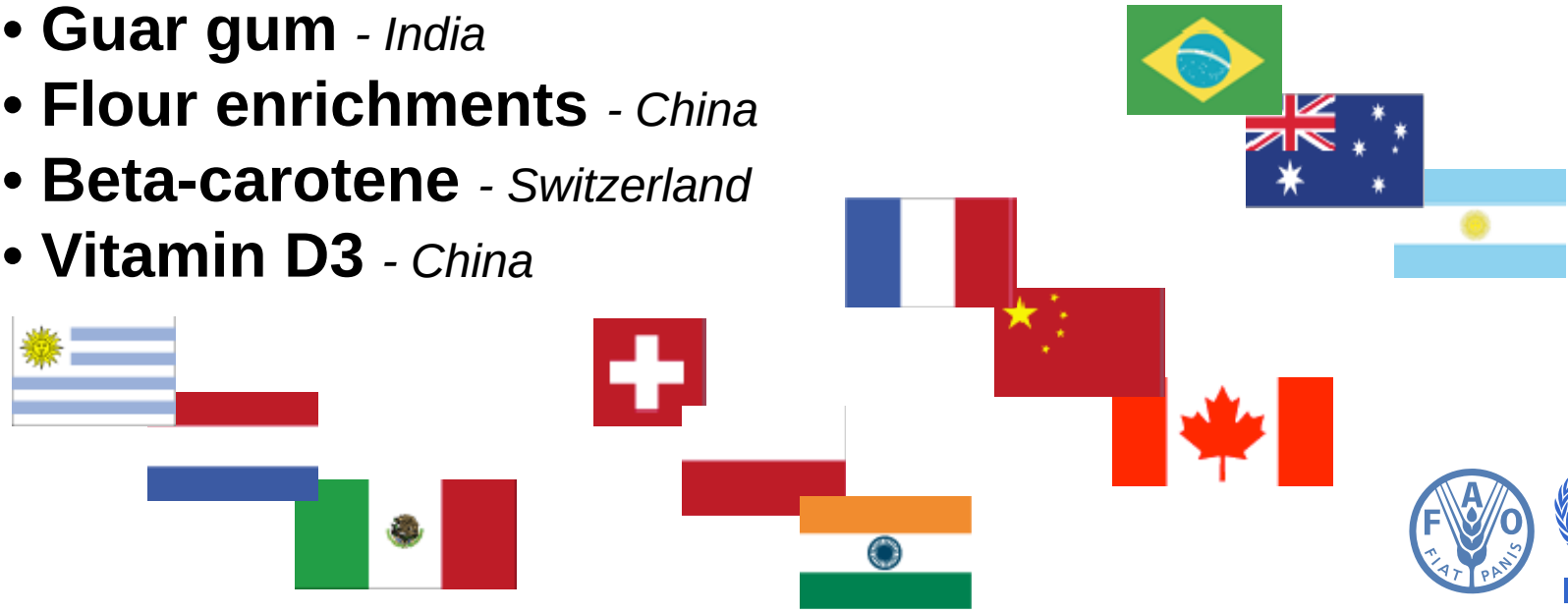
A Multinational Loaf

INGREDIENTS:

- **Wheat gluten** - *France, Poland, Russia, Netherlands, Australia*
- **Honey** - *China, Vietnam, Brazil, Uruguay, India, Canada, Mexico, Argentina*
- **Calcium proprionate** - *Netherlands*
- **Guar gum** - *India*
- **Flour enrichments** - *China*
- **Beta-carotene** - *Switzerland*
- **Vitamin D3** - *China*



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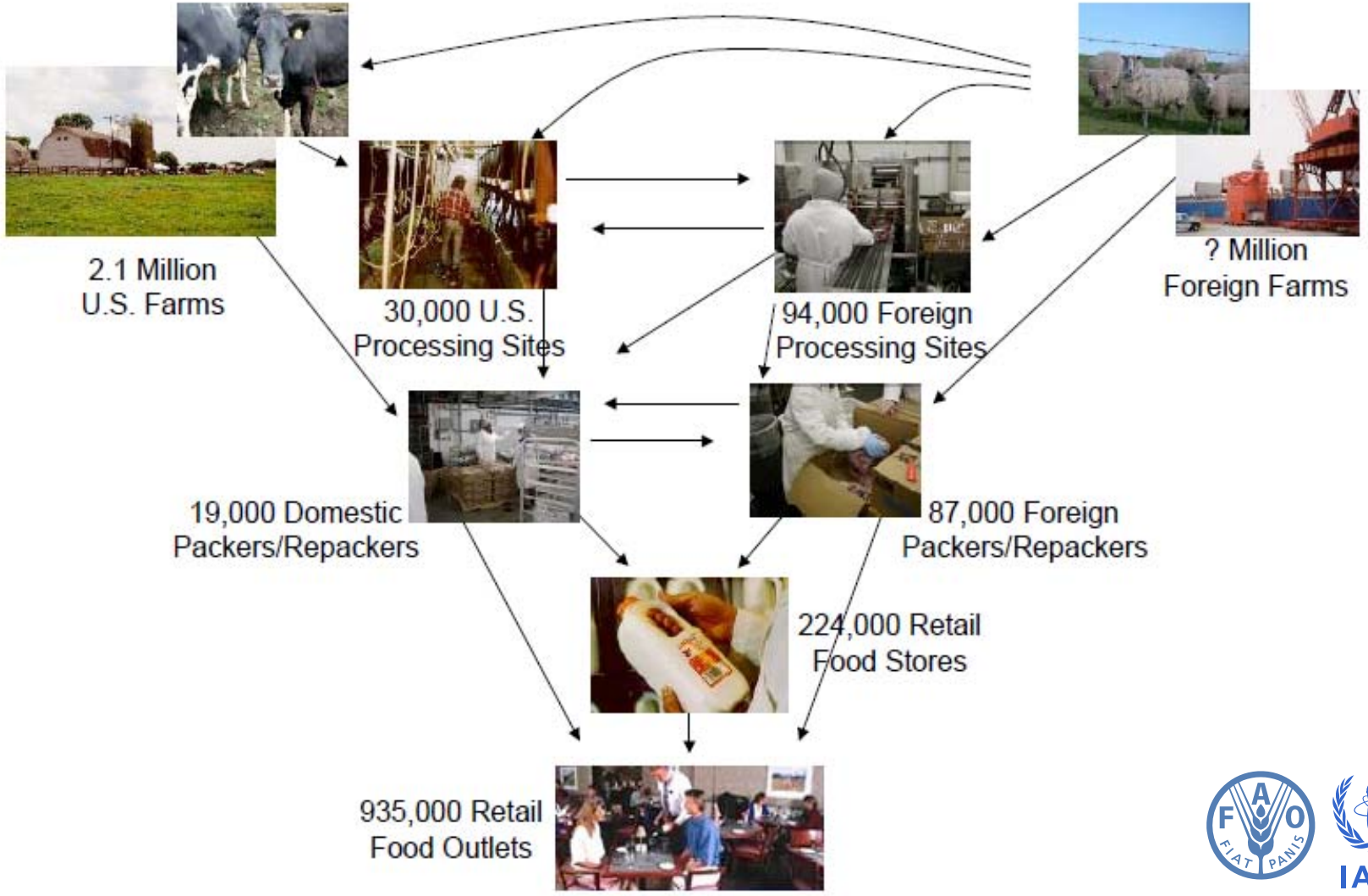
A Multinational Loaf



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and one American burger…

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
enzymes
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
Water
sodium citrate
sodium phosphate
artificial color
acetic acid
Enzymes

milkfat
cream
salt
sorbic acid
cheese culture
soy lecithin
starch

USDA inspected beef

Special Sauce
Soybean oil
distilled vinegar
egg yolks
sugar
corn syrup
spice extractives
xanthan gum
prop. glycol alginate
potassium sorbate
garlic powder
caramel color
Turmeric
EDTA

pickles
water
HF corn syrup
onion powder
spice
salt
mustard flour
sodium benzoate
mustard bran
hydrolyzed proteins
paprika
calcium disodium

Cucumbers
water
Vinegar
Salt
calcium chloride
Alum
natural flavorings

Grill Seasoning
Salt
Pepper
cottonseed oil
soybean oil

lettuce

dehydrated onions

Courtesy of Shaun Kennedy, NCFDP

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Traceability

- The complexity of supply chains makes this a global issue
- The need for traceability systems is well recognised throughout the world

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Latin America

- Argentina –
  - implementing “Patagonia Traces” benchmarking program for fruit traceability
  - GlobalGAP certification
- Brazil – investing in improvements to beef traceability system (Sisbov)
- Paraguay – expanding livestock traceability system to include export crops

To meet EU (& other) traceability standards

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IAEA Project in Nicaragua

“Determining Drug Residues in Bovine Meat Exports”

- Strengthening of technical capacities helped achieve exports:
  - Meat (60 000 000 metric tons)
  - Shrimps (10 000 tons)
  - Honey (300 tons)
  - Peanuts (72 000 tons)

US$ 360 million

But….

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IAEA Project in Nicaragua

- National traceability legislation passed in 2008
- Competent authorities slow to publish implementing regulations
- Systems and technologies not yet developed
- **Ability to capitalize on Nicaragua's free-trade accords with USA, EU and Japan limited – lost revenue**

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Asia

- India –
  - traceability system implemented for grapes (exports $7.2 million)
  - similar system being implemented (2009) for pomegranate, mango, banana etc. for traceability of origin and level of pesticide residues

S. E. Asia

Asia Food JOURNAL

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Event Review: Farm to Fork Traceability

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BY TANIDA DISYABUT, WRITER

IBM ASEAN held a seminar to educate Thai food and beverages companies on food traceability. Tanida Disyabut reports from Bangkok, Thailand.

1 August 2009

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IBM ASEAN and FXA, an enterprise software solution that delivers traceability of safety, quality and origin of products, organized a seminar in Bangkok, Thailand on May 27 this year. Entitled "Food Traceability and Safety Power", the seminar aimed to increase the awareness of food safety and the availability of traceability solutions among food and beverage companies. The seminar is one of four that were held in Malaysia, Singapore and Vietnam.

At the seminar, Randy Sng, IBM ASEAN industry manager, said food safety is a global issue and food suppliers have to assume full responsibility to ensure safe food. "Food producers have the responsibility to ensure safe sources of ingredients and processes for the next generation."

Events held in Thailand, Malaysia, Singapore, Vietnam

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S. E. Asia

- Japan
  - Consumer concerns over food safety, E.coli, BSE, avian flu, mislabelling (eels)
  - Government imposing traceability requirements
  - Private sector acting to develop and implement traceability systems (e.g. TRACERT)
- China
  - Traceability system in place in response to food safety/contamination issues (melamine, clenbuterol..) and authenticity issues (legal provenance of fish catch)

Africa

- Needs of the East African Community
  - Analytical laboratories
  - Accreditation
- January 2010 – food safety and traceability regulations for foodstuffs traded within the EAC

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Certification bodies

- Proliferation of companies providing solutions
- Good – but still no standardisation!

GLOBALG.A.P.

TRACERT Traceability Private Certification
Aquaculture

TraceAssured

TRC Japan

World Food Trace, Inc.
Global food traceability at Internet speed.

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How do we implement traceability?

- “Papertrail” system (electronic!)
- One step forward, one step back – not always effective
- Animal ear tags, passports
- Labelling
- Electronic labelling (RFID)

How do we implement traceability?

- A traceability system based on these, mainly essential, elements should work well

However

- **Analytical techniques** for products and their components are also essential:
  - Provide feedback to prove the system is working
  - Troubleshoot and identify weaknesses
  - Provide traceability data where there is a breakdown in the chain
  - Effective internationally
  - Help prevent fraud, confirm product authenticity

Analytical techniques

There are many techniques available and emerging that can provide traceability information. Especially when used in combination, these can provide extremely powerful forensic, investigative & regulatory laboratory tools; e.g.

- Stable isotope measurements (IRMS, WSCRDS)
- Spectroscopic techniques (FT-MIR, NIR, FT-NIR, Raman, UV-VIS etc.)
- Chromatographic techniques (GC, LC)
- MS techniques (LC-MSMS, DART-TOF)
- DNA-PCR
- Chemometrics

Summary

- International trade in food commodities will continue to increase
- Complex food supply chains makes traceability a technical, logistical and financial challenge
- Traceability is an issue at both domestic and global level
- Traceability can help improve food safety, benefit consumers and the food industry
- There is no magic solution – effective systems must comprise a number of key elements

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