Training of Trainers Workshop on Trade Facilitation and Paperless Systems for Agrifood Products

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Advantages and obstacles of electronic traceability

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STAKEHOLDER BENEFITS
Traceability drivers in the food sector

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Some drivers for chain food information management

- Sustainability
  - Stakeholder involvement
  - Key indicator calculation

- Trade and efficiency

- Marketing and brand assurance
  - Authenticity
  - Claims management

- C-FiM (Chain Food Information Management)

- Compliance to standards and regulations

- New business models
  - Carbon indexed ingredients
  - Dynamic shelf life
Our clients want traceability because...

- Market differentiation by documentation of certain practices of social, religious nature such as fair trade, Halal, or adherence to certain standards
- Production of “local” foods, i.e. foods which originate in a certain area ("Made in ...") or are prepared in a certain fashion ("Taste of ...")
- Internal performance improvements such as stock reduction
- Calculation of parameters related to sustainability, such as food miles, carbon foot print, fossil energy savings etc
- Performance feedback, especially for the feed – animal – food chain
- Fraud prevention
Food safety

What
• Connection “one up, one down”
• Transport of critical parameters (e.g. additives, shelf-life, temperature, etc)
• Interconnection with eHACCP

Experiences
• e-Sporing (Norway)
• M-FIT (Malaysia)
• Smallholder traceability for aquaculture (Vietnam and Indonesia)
• ESIT (Greece)

Benefits
• Institutional: disaster management, accountability of FBOs, statistics
• Industry: brand risk management, reduced recalls, shelf-life optimisation, compliance
• Consumers/Citizens: reduced health risk, improved decisions

Challenges
• Industry buy-in
• Consumer/citizen interest
• Smallholder integration
• Standardisation
• Governance
Sustainability

What
- Calculation of key environmental sustainability parameters along the supply chain, such as $\text{CO}_2\text{eq}$, water usage,
- Transport of key social sustainability parameters, such as legal compliance, worker/aboriginal rights, child labour

Experiences
- (social only) UTZ Certified
- (legal compliance) IUU fishing
- (in preparation) Roundtable for Sustainable Palm Oil and some retailers/manufacturers
- (for biofuels) ISCC

Benefits
- Institutional: Enforcement aid, accountability of FBOs, monitoring of management goals
- Industry: brand risk management, legality of supply chain, monitoring of mgmt goals
- Consumers/Citizens: informed decisions, peace of mind

Challenges
- Technical complexity; in some case unclear science
- Industry commitment
- Consumer/citizen push
- Standardisation, in particular of calculation methods
**Trade**

**What**
- Exchange of electronic information for trade relevant purposes (trade permissions, customs, goods shipped notices)
- Single window for traders
- Legality, security, safety of shipments
- Electronic handling of incidences
- Electronic handling of fees

**Experiences**
- ASYCUDA (World)
- eCustoms (Europe)
- Animal passports (Europe)
- ePermit and ePermit1 (Malaysia)

**Benefits**
- Institutional: More robust trade processes, accountability of institutions, increased visibility of trade bottlenecks; statistics
- Industry: reduction of trade-related bureaucracy; streamlined processes
- Consumers/Citizens: fresher products

**Challenges**
- International standardisation
- Interdepartmental collaboration
- Economic sustainability of systems
The role of

LAWS AND REGULATIONS
“I’ve often said that I don’t believe government has the answer to every problem or that it can do all things for all people. We are a nation built on the strength of individual initiative. But there are certain things that we can’t do on our own. There are certain things only a government can do. And one of those things is ensuring that the foods we eat, and the medicines we take, are safe and don’t cause us harm. “

President Barack Obama
Food Safety Modernization Act (FSMA)

• FSMA was signed into law in January 2011
  see http://www.fda.gov/food/foodsafety/fsma/default.htm
  – Importer accountability—For the first time, importers have an explicit responsibility to verify that their foreign suppliers have adequate controls in place to ensure that the food they produce is safe.
  – Third-party certification—It establishes a program through which qualified third parties can certify that foreign food facilities comply with U.S. food safety standards. This certification may be used to facilitate the entry of imports.
  – Certification for high-risk foods—FDA has the authority to require that imported foods that are at high risk of contamination have a credible third-party certification or other assurance of compliance as a condition of entry into the U.S. The “third party” could be a private company or a governmental entity.
  – Voluntary qualified importer program—FDA must establish a voluntary program for importers that provides for expedited review and entry of foods from participating importers. Eligibility is limited to, among other things, importers offering food from program-certified facilities.
  – Authority to deny entry—FDA can refuse entry into the U.S. of food from a foreign facility if the agency is denied inspection access by the facility or the country in which the facility is located.

• Requirement for electronic submission of data
The famous “one step forward and one step back” system

Actually a Chain of Custody system, not a traceability system

Little to no enforcements in spite of repeated food scares
One step forward and one step back?

- Chain of custody systems bring little benefit to the supply chain.
- Linking the physical product flow to the information flow makes the system very vulnerable to breakdowns.
- Main sources of return of investment on traceability:
  - Improved inventory management
  - Improved quality management
- But: *information* about food can be an additional commodity
  - Example: sustainable vegetable oils
    - Sold as oil
    - Sold as certified sustainable oil with accrediting data (and a premium!)
• Illegal, unreported and unregulated (IUU) fishing
  – depletes fish stocks
  – destroys marine habitats
  – distorts competition
  – puts honest fishers at an unfair disadvantage
  – weakens costal communities, particularly in developing countries.

• Only marine fisheries products validated as legal by the relevant flag state or exporting state can be imported to or exported from the EU

• A European black list has been drawn up covering both IUU vessels and states that turn a blind eye to illegal fishing activities

• EU operators who fish illegally anywhere in the world, under any flag, face substantial penalties proportionate to the economic value of their catch, which deprive them of any profit.

• The new EU regulation to prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing entered into force on 1 January 2010.

Losses due to IUU fishing are estimated to be between US$10 billion and US$23.5 billion per year, representing between 11 and 26 million tonnes of fish

Source: Pirate Fishing Exposed, Environmental Justice Foundation
• With little information captured huge benefit for the fishing community and society in general
  – Improved control over catch composition gives indication to real fish stocks
  – Less illegal, unregulated and unreported fishing gives fishermen access to all the resource
  – Better knowledge of catch composition helps reduce discards and wastage
  – More effective controls provide benefits to those doing it right
  – Automation of subsidies, export and IUU certificates streamlines business
  – Better statistics helps fishermen to benchmark themselves and fishermen’s association to improve the management of resources

• Automation of paperwork (landings, taxes, IUU certificates, subsidy applications etc) provides an excellent payback for the small burden of data capture
Catch data and its use

Science
- [BIOLOGY] Catch composition as stock indicator
- [BIOLOGY] Catch location as fish bank indicator
- [ECONOMY] Days at sea as management instrument
- [ECONOMY] Landing prices for modelling economic sustainability

Public Authority
- Control of catch/landing volumes
- Data to fulfil obligations as Competent Authority (CA)
- Taxes and tax breaks (fuel, ...)
- Border and export control

Certifiers
- Auditable data for MSC certification
- Dolphin Safe certification
- Other certification schemes
- Import requirements (e.g. US)

Importers
- Catch certificate for export to EU
- Traceability requirements JP/US/EU
- Export/import “paperwork”
- Business data on products and quality

Src: afishblog.com
Making use of the data

- **Ministry Of Fisheries**
  - Quota and control
  - Environmental/stock control

- **Ministry Of Finance**
  - Tax and tax breaks
  - Automated subsidy application

- **Economic Planning Units**
  - Economic indicators for sustainable fishing

- **Law enforcement**
  - Control at sea
  - Border control

- **Regional Statistics**
  - National or regional fishery statistics

- **FAO**
  - International fishery statistics

**Fisheries Public authority**
- Catch
  - GPS coordinates
  - Catch composition
  - Landing
  - Fuel consumption
  - Days at sea

--- Traceability-enabled cumulative product and quality data

- **Vessel** → **Port** → **Auction** → **Processor** → **Exporter** → **Importer** → **Retailer** → **Consumer**

- Legality check Anytime!
- Export certificate
- IUU certificate

- Certificate validity
- Importing nation
• Parties to the Nauru Agreement are the Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands and Tuvalu
  – Control 30% of the worldwide tuna supply

• States agreed on a common traceability system ensuring the sustainable catch of tuna in their catch areas
  – Vessels have to be registered and licensed to each fishing area
  – The person responsible for the operation of a licensed vessel has to record catch location (via electronic position monitoring), accumulated catch volume, daily catch volume and catch timespan

• The data is submitted via reports (after 14 days preliminary report and final report after 45)

• In 2011, as a result from PNA’s traceability efforts, the PNA skipjack tuna certified by the Marine Stewardship Council as sustainable
The Australian PigPass consists of two elements

- A three letter farm tatoo (in SA), applied to the animal’s shoulder and identifying the origin of the finisher
- A set paper of forms recording data called a “National Vendor Declaration” or NVD, which is part of the National Quality Assurance programme. The form is filled upon sale and records data about the seller, the transporter and the receiver. Forms are available on paper or electronically.

Mandatory only in some states.
Is RFID the solution to all problems?

• Malaysia pushed for RFIDing all cattle
  – Cost of tags are still too high, especially for smaller operations
  – Immediate plans are to enforce RFID for cross state movements
  – RFID used for disease control and fraud control

• Unique identification very positive, but farmers are worried about cost
  – UHF tags at 10% cost of HF tags have not materialised
Animal passports and their challenges

- Estonian cattle passport: within approximately 10d of life, all cattle have to be tagged with a double plastic ear tag
  - Recorded is: Owner, farm, movements between farms, use, cattle type, end of life (slaughter, death etc)

- Bovine identification in Europe is regulated in regulation EC/911/2004. The regulation sets a framework for identification, but leaves member states to provide more detailed regulations
  - As a result, Estonia uses a 10-digit code as do Germany and France, Denmark uses 11 digits and the UK 12 digits.

- Passports are re-issued at border ("nationalising" the cattle)
• Most European countries, like Germany, built a centralized database for cattle management. Some countries (again like Germany) operate similar systems e.g. for pigs.

• The German database HIT ("origin information system" in German) includes information about every cattle’s birth, owner history, death/slaughter and movements.

• Cattle merchants, farmer, slaughterhouses and operators of collection points, exhibitions and markets have to report to HIT, transporting companies are excused.

• Farmers can register information via web for a small fee paid jointly with the ear tags; they can also register information via postcard and telephone for an extra charge.

• Usage of HIT is permitted to registered cattle owners, slaughterhouses, state authorities and veterinary authorities. Veterinaries play the role of the independent verifier. Any irregularities have to be reported by the vets and vets failing to comply with this task risk losing their operating license.
• Letra Q is a government supported traceability system for raw cow milk in Spain.
  – Established to ensure traceability and quality of Spanish milk and fulfilment of the General Food Law

• The Letra Q system is an electronic traceability system. The system is web-based and has two software modules:
  – The traceability module covers movements of raw milk from farm to transformer, including information about operators, establishments, containers and all actors and institutions involved in the production, collection, transportation, storage and processing of milk.
  – The quality module allows insight in the results of mandatory quality-tests, keeps track of mixing of raw cow milk from different origins and ensures the quality standard of the milk.
• Japanese law requires a full traceability system only for domestic beef.

• For other foods, Article 3 of Japan's Food Sanitation Law requests that each operator keep records to identify all their suppliers and customers
  – However, record keeping is only recommended and is not compulsory

• Japanese regulations do require labeling of the place of origin for fresh food and minimally processed food, not only at retail level but also at wholesale level.
  – A record-keeping system to verify origin area by providing documentation such as delivery slips and/or invoices is only recommended, not legally required, per Article 3 of the Food Sanitation Law.

• Additionally, the Beef Traceability Law requires the construction of a dissemination system for cow's individual identification number, date of birth, and sex, breeding ground, those who breed, date of movement and slaughter, mother's individual identification number.
Malaysia has a well-developed Halal regulation and a single Government institution that is allowed to certify Halal (JAKIM).

Halal certification requires a chain of custody system,
- FBOs have to disclose exact list of ingredients of a food item and the (Halal certified) providers of each ingredient.
- A change of provider requires a formal process with the certification authority, because it makes the certificate invalid.

All food that wants to be sold to Muslim consumers has to be certified as Halal, including food service.

Non-Halal food service establishments are disallowed to serve Muslim customers under severe fines and the danger of losing their license.

Certificate fraud does exist in Malaysia, largely because a certificate is not numbered on consumer or other packaging and therefore the verification process is complicated.
- Regulation for fishery product traceability since 2008
  - Reference to the obligation of “*developing and implementing a trace system with the principle “one step back, one step forward”*, but no electronic traceability
  - The regulation implements a national system for “approval” codes (i.e. establishment identifiers), but does not follow any international standard and is not globally unique

- Decision no 178/1999/QD-TTg: Imported, to-be-exported or within the country circulating merchandise must be labeled with names and addresses of business operators up to the current phase of the supply chain.

- Circular 74/2011/TT-BNNPTNT: Producers and traders of food of plant origin or terrestrial animal origin (including processors) have to establish a traceability system based on the one step back- one step forward principle and store the data.
  - This “distributed” traceability system will be inspected by a governmental agency
  - Produce has to be relabeled at each stage of the chain to ease identification
  - Paper-based and electronic traceability systems are equally legal
The role of regulations in the establishment of paperless systems

• Regulations play a vital role in the adoption of food traceability systems
  – Legal framework of all-electronic transactions (incl. validity of e-signatures)
    • Place electronic transactions at the same level as paper transactions
    • Specifically incentivise the submission and management of electronic information
    • Regulate data confidentiality and security and make offenses liable
  – Definition of data sets for specific purposes
    • Such as food safety, disease control, legality of trade, origin determination etc
  – Support for globally unique identification
    • Mostly by fomenting the use of globally unique identifiers and avoiding the creation
      of country-wide (or even ministry-specific) identification schemes
  – Support for international standards for data exchange
    • Recognising the need to exchange information in an automated fashion
    • Support for international schemes and push for standardisation by e.g. ISO
COSTS AND BENEFITS
Beyond food safety

- Adoption of traceability systems for purpose of food safety and disease control has only been possible by mandate
  - Industry unhappy
  - Complaints about unfair competition of exporting nations
  - Unclear cost-benefit relationship

- Insistence on food scares has led to perception of traceability as a cost
  - Cost benefit studies are difficult, but there are clear indications that

- There is a shift away from traceability as a purpose of its own to traceability as an enabling technology

- Traceability as a marketing tool is still under “evaluation”

- In the following, two examples for potential services
### Cost-benefit analysis food safety

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Pathogen</th>
<th>Maximum Illnesses Prevented</th>
<th>Percent of Total Illnesses Prevented</th>
<th>Average Economic Impact per Day Reduction</th>
<th>25% ↓ Time</th>
<th>50% ↓ Time</th>
<th>75% ↓ Time</th>
<th>Maximum Economic Benefit (+100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cantaloupe (2008)</td>
<td>Salmonella Litchfield</td>
<td>1</td>
<td>2%</td>
<td>1,053</td>
<td>$18K</td>
<td>$18K</td>
<td>$18K</td>
<td>$18K</td>
</tr>
<tr>
<td>Raw alfalfa sprouts (2009)</td>
<td>Salmonella Saintpaul</td>
<td>73</td>
<td>31%</td>
<td>$23,758</td>
<td>$465K</td>
<td>$806K</td>
<td>$1.2M</td>
<td>$1.3M</td>
</tr>
<tr>
<td>Red and black pepper spice (2010)</td>
<td>Salmonella Montevideo</td>
<td>47</td>
<td>17%</td>
<td>$16,496</td>
<td>$286K</td>
<td>$573K</td>
<td>$716K</td>
<td>$841K</td>
</tr>
<tr>
<td>Unspecified Mexican food (2010)</td>
<td>Salmonella Baildon</td>
<td>2</td>
<td>3%</td>
<td>$1,377</td>
<td>$0</td>
<td>$0</td>
<td>$18K</td>
<td>$36K</td>
</tr>
<tr>
<td>Shell eggs (2010)</td>
<td>Salmonella Enteritidis</td>
<td>120</td>
<td>3%</td>
<td>$268,500</td>
<td>$537K</td>
<td>$1.1M</td>
<td>$1.6M</td>
<td>$2.1M</td>
</tr>
<tr>
<td>Ground turkey* (2011)</td>
<td>Salmonella Heidelberg</td>
<td>17</td>
<td>13%</td>
<td>$16,016</td>
<td>$72K</td>
<td>$125K</td>
<td>$179K</td>
<td>$304K</td>
</tr>
<tr>
<td>Fresh cantaloupe (July 2011)</td>
<td>Listeria monocytogenes</td>
<td>28</td>
<td>19%</td>
<td>$153,440</td>
<td>$219K</td>
<td>$384K</td>
<td>$493K</td>
<td>$767K</td>
</tr>
</tbody>
</table>

*FSIS regulated product

**Source:** [IFT](https://ift.org), Pilot Projects for Improving Product Tracing along the Food Supply System – Final Report
## Perceived benefits

<table>
<thead>
<tr>
<th>Recordkeeping Benefits</th>
<th>Growers (n=2)</th>
<th>Processor (n=6)</th>
<th>Distributors (n=8)</th>
<th>Retailers (n=4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved Brand Reputation</td>
<td>100%</td>
<td>33%</td>
<td>62%</td>
<td>50%</td>
</tr>
<tr>
<td>Increased Consumer Confidence</td>
<td>0%</td>
<td>67%</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Expanded Markets</td>
<td>50%</td>
<td>33%</td>
<td>50%</td>
<td>25%</td>
</tr>
<tr>
<td>Improved Supply Chain Management</td>
<td>50%</td>
<td>67%</td>
<td>62%</td>
<td>100%</td>
</tr>
<tr>
<td>Insurance Cost Reduction</td>
<td>50%</td>
<td>33%</td>
<td>12%</td>
<td>0%</td>
</tr>
<tr>
<td>Supply Chain Confidence</td>
<td>0%</td>
<td>83%</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Decreased Spoilage</td>
<td>50%</td>
<td>67%</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Process Improvement</td>
<td>100%</td>
<td>33%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: IFT
Put on your watchlist!

Benefit Breakdown
The following table illustrates the potential benefits of traceability that can be achieved. Click any of the table rows to view or edit the corresponding assessment.

<table>
<thead>
<tr>
<th>Edit</th>
<th>Assessment</th>
<th>Annual Benefit</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Handling/Quality</td>
<td>$56,250</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Information Management</td>
<td>$10,120</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Lawsuits and Liability Insurance</td>
<td>$6,050</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>New Markets</td>
<td>$500,000</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Misc. Cost Factors</td>
<td>$0</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Recalls</td>
<td>$3,450</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Scrap/Waste/Shrink</td>
<td>$345,000</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>$920,880</td>
<td></td>
</tr>
</tbody>
</table>

https://seafoodtraceability.org
Thank you for your attention!

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