Enhanced fraud prevention through combining supply chain and satellite information – a pilot project for Kazakhstan

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Food Fraud – a global challenge

Food Fraud is estimated at 90 billion US$ per year. Major commodities affected are:

- Milk
- Meat
- Honey
- Spirits
- Juices
- Organic
- ...

Food Fraud – a global challenge
Food Fraud: The Problem

Food Fraud Vulnerability is everywhere!

- Substitution
- Dilution
- Mislabelling
- Concealment

Motivated Offender: Producers/Traders

Accessible Target: (Organic) Food

Absence of a Capable Guardian: Authorities and certifiers

Sale of a Less Valuable Product as a More Valuable Product
Ensuring the Integrity of the European food chain
Work Package 16 (FP7, five year project)

Feasibility Study: Can the integrity management solution Check X that was developed for the organic sector help prevent fraud in food supply chains with food fraud vulnerability?

• Analysis:
  – Interviews conducted with experts and supply chain actors at different parts of the supply chain
  – Targeted Industries: Olive Oil, Organic Grain, Captured Fish, Meat, Honey, Fresh/Processed Fruits and Vegetables
  – Olive Oil, (Organic) Grain, Honey, Fish finalized as part of the Food Integrity study

• Results:
  – Big picture: Check X’s combination of real-time certification data with real-time product transaction information on one platform can significantly contribute to fraud prevention in commodity based supply chains (mass balance).
  – Suitable for all commodities – food and non-food (wild catch needs definition of catchment area)
  – Detail: Functionality of traffic light system most intuitive
  – Savings on staff time and other administrative expenses
The three dimensions of Integrity

- Government
- Companies
- Companies/Sector

**Integrity**

- Regulatory and private standard systems:
  - 2nd and 3rd party certification
  - Information

- Quality Management
  - Lab tests
  - Internal audits
  - Information

- Supply Chain
  - Transparency
  - Traceability
  - Information

**Fraud vulnerability**

- Volume check
  - Mass balance based on acreage, yield and recording of transactions

**Communication and transparency!**
Organic Food Fraud: From Ukraine through Turkey to the United States

The motivated offender: Beyaz Agro, a Turkish trader falsified the documents on suppliers from Ukraine (certificates and other evidence). The Ukraine producers were not fraudulent: they had produced conventional and sold as conventional for the market price.

The absence of a capable guardian: The external certifier checked the documents provided by Beyaz Agro and found them to be correct. The certifier issued a valid certificate. The certifier could have checked whether the producer certificates were valid by contacting the certifier of the producer – but this is not mandatory.

The applicable target: Beyaz Agro chose “Organic Food” as trade relies on certificates. Beyaz Agro chose “Organic Food” as the economic gain is substantial, in this case about 4.5 million US$ of profit!
Combination of Certification Data with Product Transaction Data

- **Certification data**: Certification data is provided by external certification bodies or by internal audit schemes

- **Preventing and Detecting Food Fraud**: Mass Balance approach – establish connection between produced volume and traded volume across the supply chain, including export and import

- **Advantages of Mass Balance Approach over batch traceability**:  
  - Less cumbersome, less effort, less data needed:  
    - not every batch must be identified at every step of the supply chain  
    - relatively low effort per company that participates – effort shared among the group/ the system  
  - Includes entire supply chain or “system”, no gaps  
  - Combination with certification or registration system is key
https://www.youtube.com/watch?v=_6NTnWq01n8
The FAO project Organic integrity and traceability Kazakhstan

From the Terms of Reference of the project:

... 

A joint Central Asian system for organic agriculture, built around a rigorous traceability system, offers immense opportunities for the sub-region in term of income earnings from organic agriculture. Considering Kazakhstan’s larger land area, this country will be used as a model from which the other countries will learn, on their path towards establishing a trusted organic guarantee system.

...
Kazakhstan – what are the issues?

- Regulation passed, but no finalized and implemented organic guarantee system
- No domestic organic certifier yet, services provided by international (EU, NOP) accredited certifiers
- No public cadastre system available
  - Farm sizes of several ten thousand hectares
  - Identification of plots is difficult with maps and on-site only
- Satellite maps combined with GPS tracker information (polygon data) is a solution for the identification of plots
- No data, no data management
Satellite, IoT and GIS information to counter vulnerabilities in organic certification

- Identification of plots through satellite and GIS maps will make drawn and printed maps obsolete – inspectors find plots easily and the size of plots is accurate
- Estimation of yield is more accurate – as basis for the mass balance calculation (in case no weighed yield/ data from precision farming is available)
- Crops can be identified – as basis for surveillance of crop rotation and farming activities (building historical knowledge systems)
- Farming activities may be supervised with satellite pictures (vegetation, water and other indices), e.g. through high resolution multispectral satellite image data to 50cm
- Internet of Things sensors provide for additional functionality:
  - Precision farming (yield measurement as basis for mass balance calculation)
  - ...
- Use of camera as geo-pointer and for aerial surveillance (farmer delivers information to certifier for proof of crops grown), drones, etc.
Audit management/ checklists
A Certification Body using the system can allow certified operators to see all details that are the basis for certification.

In case of operators using the system, they can allow the suppliers to upload documents.
Identification of operators head office/ farm
Identification of plots in agriculture
Identification of area in wild collection and wild catch

Source: navama GmbH
Identification of plots in agriculture with additional information

Source: ABACO Group
Enhanced GIS information – about crops

Source: ABACO Group
Identification of crops and phenological data (comparison across crop rotation, years and different times during the year)

Source: ABACO Group
Use of camera as geo-pointer and for aerial surveillance in augmented reality

Source: ABACO Group
Benefits for farmers and supply chain actors

- Inspection and certification procedures are improved and complemented with new tools
  - The revised EU Organic Regulation foresees intensified risk assessment (lower <-> higher)
  - The revised EU Organic Regulation foresees the possible reduction of 1 inspection per year to 1 inspection in three years – satellite, IoT, GIS can contribute to deliver field identification and proof of organic production to certifiers who may, with access to these tools, reduce risk assessment of operators
- Supply chain actors provide full transparency of transactions with proof of provenience, speeding up inspection time
- The Traffic light system of Check Organic reduces staff time spent for assessing suppliers and each transaction
- Vulnerabilities in organic certification are reduced, fraud prevented, trustworthy supply promoted and bureaucracy as well as costs reduced
- ...
Conclusions for the application of Check Organic mass balance

- Needs audited quality criteria/standards
  - may be simple
  - internal and external
- 100% of commodity covered from “farm to fork”
  - company supply chains
  - whole sector, country, topic (e.g. Geographic Indications) solutions
- Suitable for all commodities – food and non-food
  - if production area can be defined (not fully possible for wild catch)
- Highly economic solution due to low costs and internal savings, e.g. in staff time
- Allows for application of (predictive) algorithms and forensic data evaluation
- Enhanced transparency for various parties, while protecting confidential business information through data exchange portal
- Should be complemented by analytics for surveillance and risks (rather than using testing for basic fraud detection)
- Allows for the integration of satellite data, IoT and GIS systems for reducing vulnerabilities
Thank you for your attention

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