



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

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Food Fraud – a global challenge

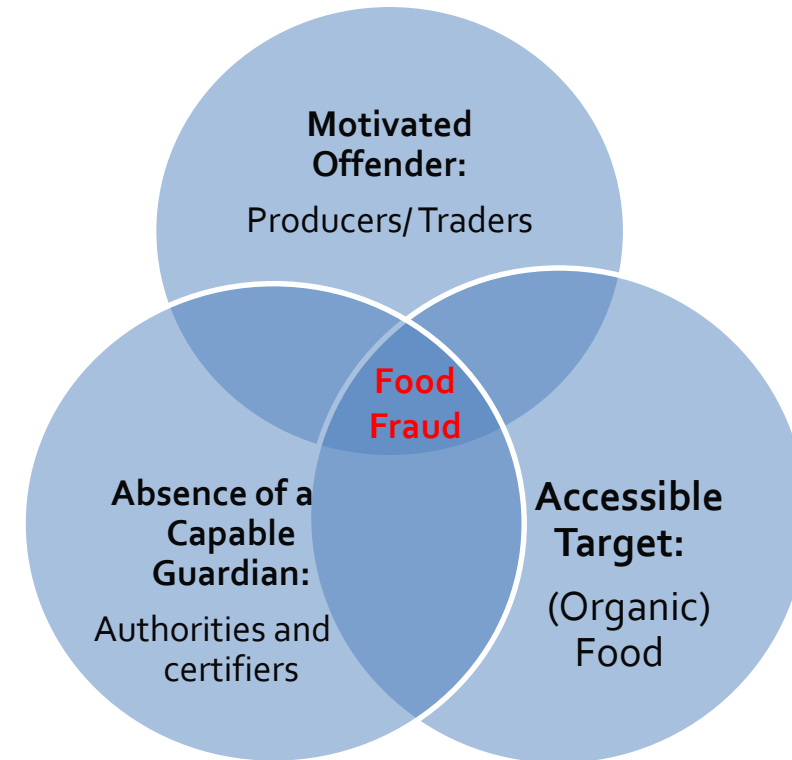
Food Fraud is estimated at 90 billion US\$ per year. Major commodities affected are:

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



Food Fraud: The Problem

Food Fraud Vulnerability is everywhere!





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

Integrity

Fraud vulnerability

Reliance on certificates

Government

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

Companies

Quality Management
Safety
Lab tests
Internal audits
Information

Companies/Sector

Supply Chain
Transparency
Traceability
Information

✓ **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.

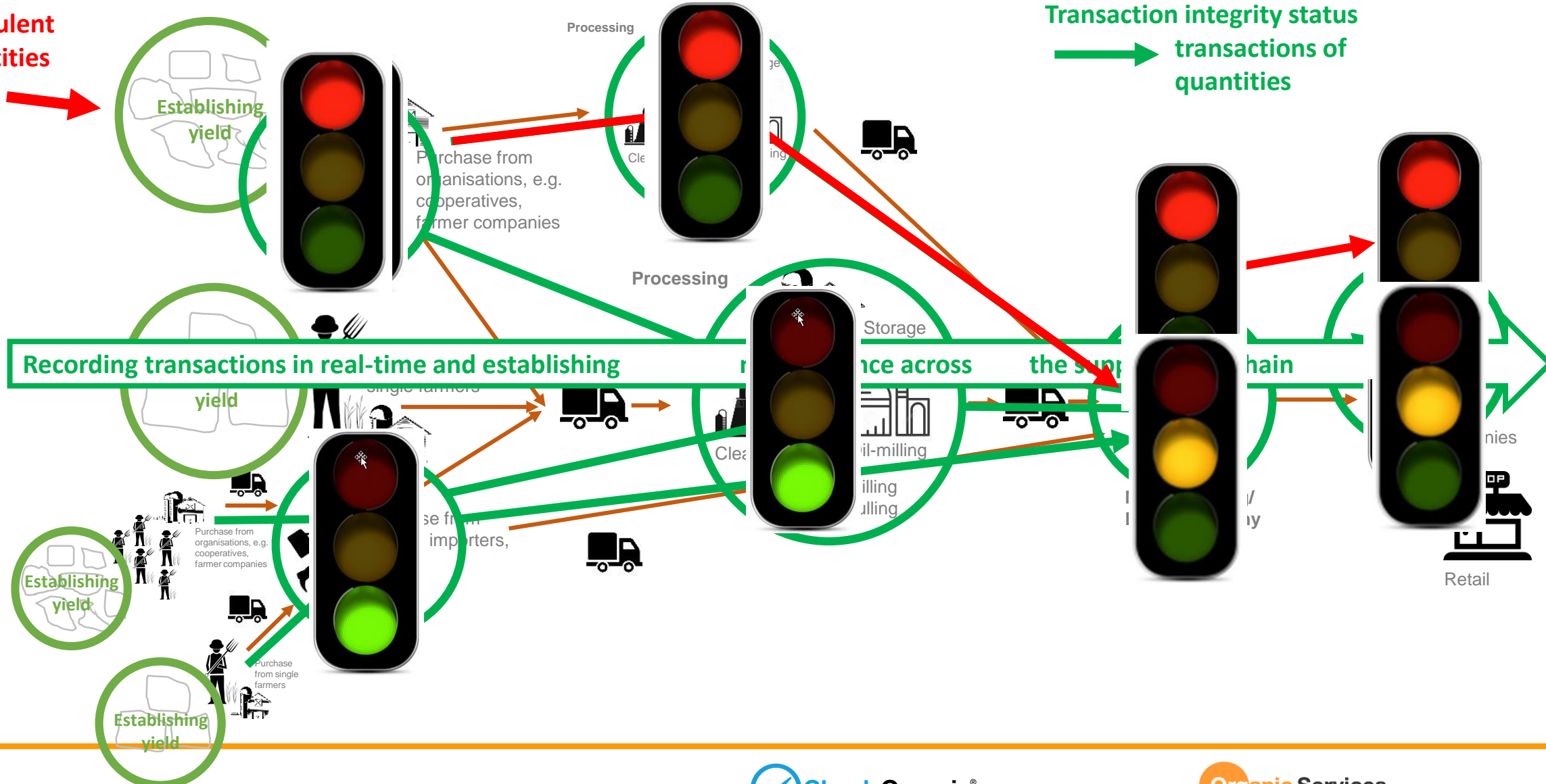
The applicable target: Beyaz Agro chose “Organic Food” as trade relies on certificates. Beyaz Agro chose “Organic Food” as the economic gain is substantial, in this case about 4.5 million US\$ of profit!

THE INTEGRITY DATABASE CHECK ORGANIC



Fraudulent quantities

Transaction integrity status
 → transactions of quantities



THE INTEGRITY DATABASE CHECK ORGANIC



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

Main menu | Infoportal | FA-012 : Moreno Barbara | Inspection workflow | anna | ECERT

Start → Preparation → **Checklist** → Sanction and deadline management → Certification → Documents → Validation → End

Save and Close | Save | Save and validate | Increase font size | Decrease font size | Refresh | Print

Search

Merge checklist: Multi-standard Checklist

- Multi-standard Checklist
- 1 Knowledge
 - 1.1 Does the farmer understand basic principles
 - 1.2 Does the farmer know basic organic farming
 - 1.3 Has the farmer participated in all training
 - 1.8 Is the farmer regularly visited by farm advisors?
- 2 Whole farm
 - 2.1 There is no parallel production of the same crop
 - 2.2 There are no fields with different certification status of
 - 2.4 The field history, including last use of non allowed

Multi-standard Checklist [C] [NC] [PC] [NA]

1 Knowledge [C] [NC] [PC] [NA]

1.1 (merged) Does the farmer understand basic principles and rules of organic farming? [C] [NC] [PC] [NA]
Comment:

1.2 (merged) Does the farmer know basic organic farming techniques? [C] [NC] [PC] [NA]
Comment:

1.3 (merged) Has the farmer participated in all training events organised by the group or certificate holder? (Indicate dates of training!) [C] [NC] [PC] [NA]
Comment:



Data Exchange Portal

Open	Category	Code	Crop	Main use	Used for other purposes	ha	m ²	acres	Field no.	Comment	Comment internal
	Cereals	0713.10	Pea	<input type="checkbox"/>	<input type="checkbox"/>	99.00	990,000	244.83			
	Field/Forageable	1001.97	Spelt	<input type="checkbox"/>	<input type="checkbox"/>	691.00	6,910,000	1,707.50			
	Cereals	1004.20	Vetch + oat	<input type="checkbox"/>	<input type="checkbox"/>	70.00	700,000	172.97			
	Cereals	1004.30	Australian pea + oat	<input type="checkbox"/>	<input type="checkbox"/>	99.00	990,000	244.83			
	Cereals	1004.40	Lupine	<input type="checkbox"/>	<input type="checkbox"/>	78.00	780,000	192.74			
	Cereals	1004.90	Oats	<input type="checkbox"/>	<input type="checkbox"/>	70.00	700,000	172.97			
	Field/Forageable	1008.10	Buckwheat	<input type="checkbox"/>	<input type="checkbox"/>	78.00	780,000	192.74			
	Cereals	1008.29	Millet	<input type="checkbox"/>	<input type="checkbox"/>	37.00	370,000	91.43			
	Field/Forageable	1008.90	Amaranth	<input type="checkbox"/>	<input type="checkbox"/>	0.00	0	0.00			

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

Check Organic logo and navigation menu (Main Menu, Company search, Sweet Dream Chocolate Company | Contact master data, ECERT user info).

Buttons: Save and Close, Save, Add address, Delete address.

Contact and address information

EU CB ID	<input type="text"/>	Company Address - Tutzing
US NOP CB ID	<input type="text"/>	<input checked="" type="checkbox"/> Default
Title	<input type="text"/>	Address <input type="text"/> GEO Code <input type="text"/>
Qualification	<input type="text"/>	Latitude <input type="text" value="47.9125100000"/>
Company name *	Sweet Dream Chocolate Company	Longitude <input type="text" value="11.2772700000"/>
First name	<input type="text"/>	Accuracy <input type="text" value="0.0000000000"/>
Additional info	<input type="text"/>	Directions <input type="text"/>
Trade Name	<input type="text"/>	
Created on	23/02/2016	
Organisation type	--	
Language	EN-GB	
Comment	<input type="text"/>	

Map/Satellite view showing a location on a map with a red pin. Includes 'Open in new window' link and Google logo.



Identification of plots in agriculture

Form Fields:

- Farm: BOLSA CAJAS
- Field code: [Empty]
- Name: Field 3
- Grids average: [Empty]
- Area based on GPS data: 0.252 ha
- Area of plots: [Empty]
- User name: [Empty]
- Country: Argentina
- Status: Plot

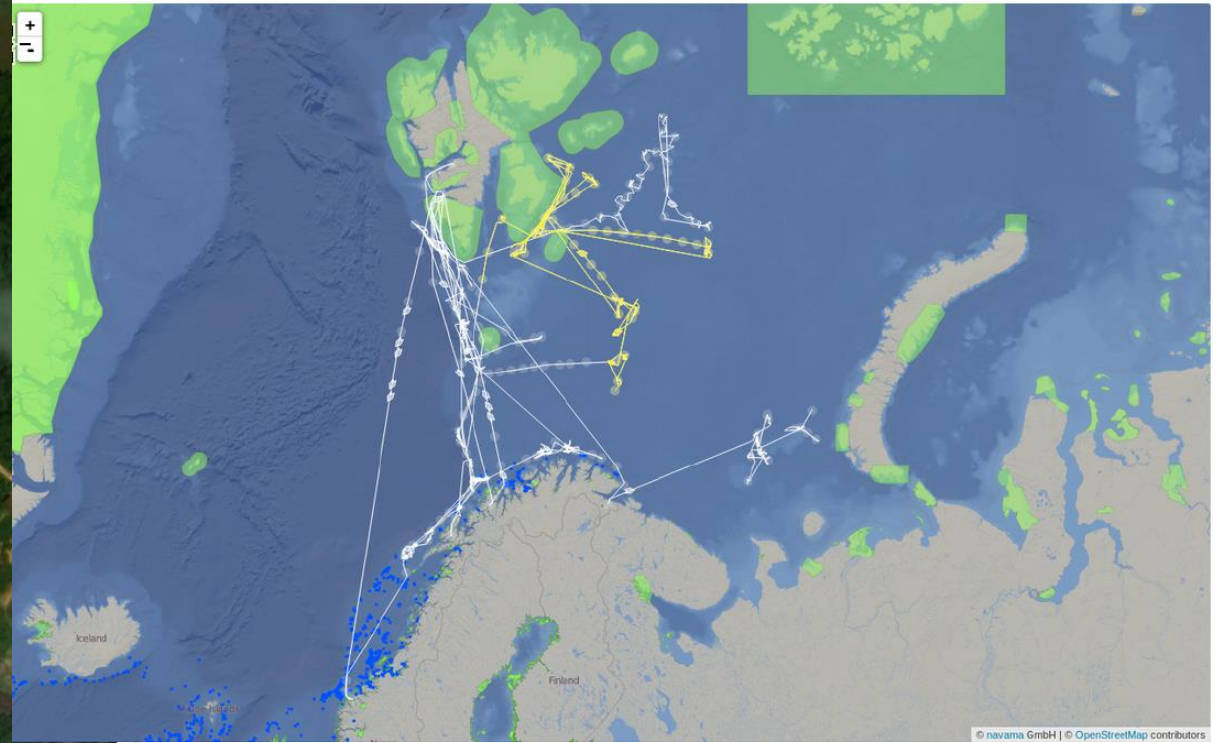
Map Tools: Draw polygon, Draw free area, Search across coordinates, Create all coordinates, Show nearby areas

Coordinates Table:

Country	Latitude	Longitude
Argentina	42.8624671	1.5582248
Argentina	42.8623871	1.5582779
Argentina	42.8617232	1.5582928
Argentina	42.8613841	1.5583038
Argentina	42.8612170	1.5583088
Argentina	42.8612287	1.5583084
Argentina	42.8612848	1.5583080
Argentina	42.8614278	1.5583219
Argentina	42.8613333	1.5583142
Argentina	42.8614180	1.5583076



Identification of area in wild collection and wild catch



Source: navama GmbH



Identification of plots in agriculture with additional information

Campagna: 2018 | Comune: CAMAIRAGO (LO)[098007 - B456] | + Aggiungi | Seleziona graficamente | Vedi sulla mappa

Particelle | Suolo | Piano colturale

Vedi sulla mappa

T	C...	Part.	G	M	R	A	Area
Foglio: 12 (2 Particelle)							
		1					125.825 m ²
		17					108.627 m ²
Foglio: 13 (2 Particelle)							
		1					131.751 m ²
Totale							1.210.086 m ²

Dettagli particella [Foglio: 12 - Particella: 17]

Conduzione:
COND. PROPRIETA'

Percentuale di conduzione:
100%

Gis:
Disponibile

Area:
108.627 m²

Mappa

Zoom + | Zoom - | Sposta la mappa | Zoom finestra | Misura | Disegna

Livelli

In editazione

Particelle incomplete / dichiarate in eccesso

x:555052.19 | y:5006451.59 | 1000 m

Source: ABACO Group



Enhanced GIS information – about crops

Campagna: 2018 | Comune: CAMAIRAGO (LO)[098007 - B456] | [Aggiungi](#) | [Seleziona graficamente](#) | [Vedi sulla mappa](#)

Particelle | **Suolo** | **Piano culturale**

Usi suolo | Lotti

Utilizzo suolo	Area
[603000] GRANTURCO (MAIS) DOLCE - (SEMINATIVO DA FOTOINTERPRETAZIO	352.250 m ²

Area del comune inutilizzata: 94.474 m² (8%)
 Area totale inutilizzata: 94.439 m² (8%)

Dettaglio particelle

	Foglio	Part.	Area	Quota
	13	1	199 m ²	199 m ²
	13	2	38.764 m ²	38.764 m ²
	4	21	47.403 m ²	47.403 m ²
	4	4	794 m ²	794 m ²
	4	5	1.692 m ²	1.692 m ²
	4	7	179.472 m ²	179.472 m ²
	Totale		352.250 m ²	352.250 m ²

Mappa

Livelli

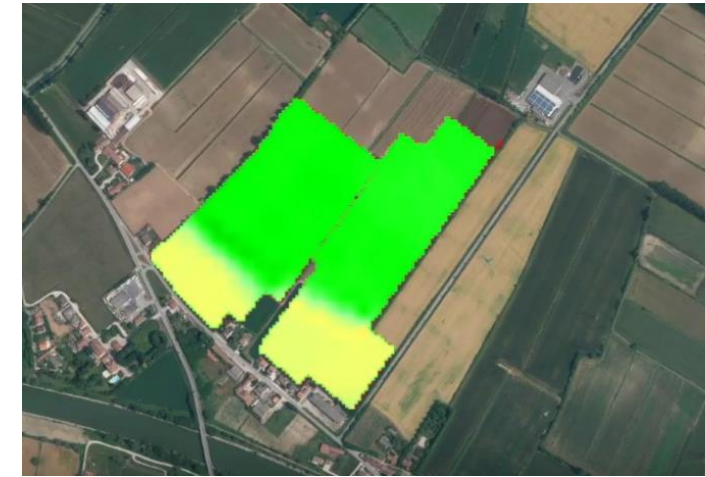
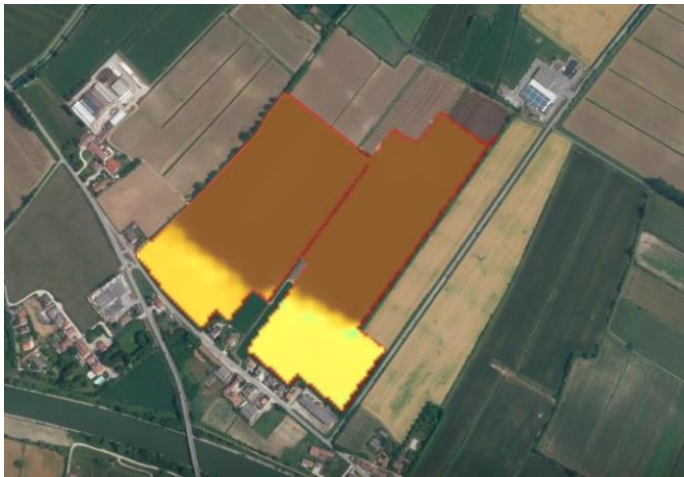
Strumenti

- In editazione
- Particelle incomplete / dichiarate in eccesso
- Copia campagna precedente
- Aggiungi / Modifica poligono
- Rimuovi poligono
- Taglia

x:555354,27 | y:5006758,79 | 1000 m

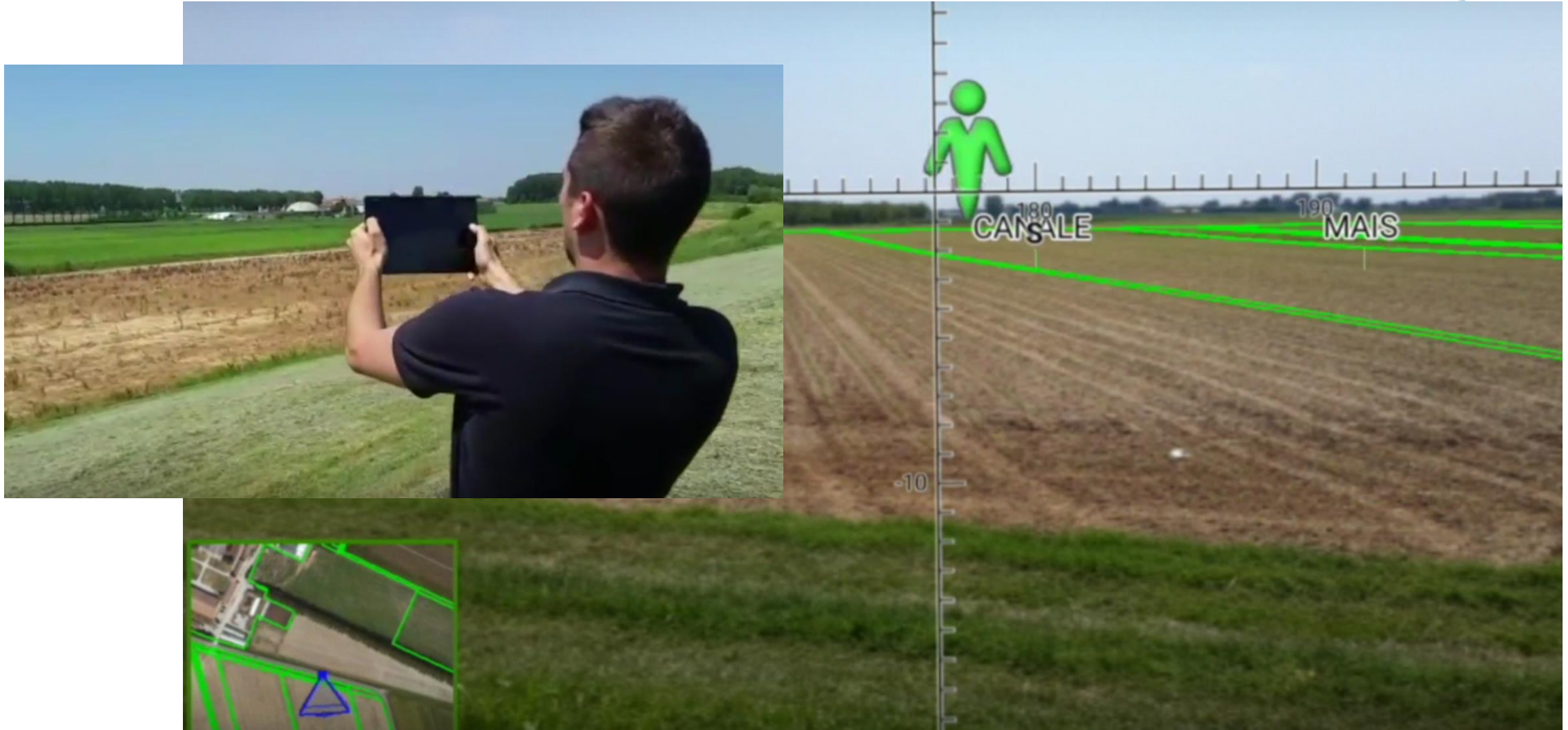
Source: ABACO Group

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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