Use of Remote Sensing Imagery for GeoTraceability in Agriculture

STEREO & VEGETATION Workshop
6 May 2004 - Brussels

CENTRE WALLON DE RECHERCHES AGRONOMIQUES
Biometry, Data management and Agrometeorology Unit
buffet@cra.wallonie.be – krafft@cra.wallonie.be
oger@cra.wallonie.be - tychon@ful.ac.be
Presentation

- **Traceability concept**
  (Basic concepts and approach)

- **Traceability Context**
  - Legislation (EU-CAP, National...)
  - IACS/LPIS

- **GeoTraceability concept**

- **Opportunities/Potentialities of RS**
Traceability concept

- **Traceability in agriculture:**
  Ability to document, trace and follow a food or feed product through all stages of its life, from its creation (production) up to its consumption (distribution).

- **Tracing:**
  Determining the « history » throughout the agri-food chain.

---

GeoTraceAgri

Service Societies

- **Field**
  - Production
  - Transformation
  - Distribution
  - Table
  - Supply – Transport – Stock management

- **Upstream Traceability**
- **Downstream Traceability**

- Producers
- Consumers
GeoTraceability concept

Legislation

CAP
EU/Nat. standards
(1rst & 2nd pillars…)

Consumers

Meet society’s requirements
(Healthy, Safety & Quality insurance
Environmental protection…)

Minimise risks
(Healthy, Safety…)

Food-chain

Minimise risks
(Healthy, Safety…)

Farmers

Food & Products claim
(labels, certifications…)
Help farmers
(Farm management…)

TRACEABILITY

Meet society’s requirements
(Healthy, Safety & Quality insurance
Environmental protection…)

Food & Products claim
(labels, certifications…)
Help farmers
(Farm management…)

Minimise risks
(Healthy, Safety…)

SSTTC STEREO & VEGETATION Workshop - 6 May 2004 - Brussels
Traceability context: CAP orientations

- **Actual CAP**
  - Management and control of agricultural area based subsidies
  - IACS concept

- **CAP Reform**
  - Market orientation (consumer driven)
  - Quality initiative & Food Safety
  - Environment protection
  - Rural development
  - LPIS concept

Traceability scheme
Traceability context: LPIS

- Main purpose of the LPIS are to provide
  - An unique parcel identification number
  - A geographic location
  - An area for any agricultural parcel

- In 2000: Reg 1593/00 make compulsory digital LPIS and GIS
  - Digital maps
  - Orthophotos

- Jan 2005: LPIS/GIS fully implemented

In practice, the LPIS provides a reference system at the parcel level, allowing the identification and the cross checks of all the parcels declared in a given campaign.
GeoTraceability concept

GeoTraceability because:

- Traceability at the parcel level (IACS/LPIS). Recording and monitoring all the field operations.

- Traceability entails the measurements of both, the environmental and climatic conditions occurring naturally, that may affect the food safety (risk, standards...).
Potentialities of Remote-Sensing

- **Temporal RS potentialities** (Multi-temporal)
  - Crops
  - Decade
  - Event

- **Spatial RS potentialities** (Multi-scale)
  - Environment
  - Region

- **Spectral RS potentialities** (Multi-spectral)
  - Characteristics
  - Climate
  - Multi-Seasonal
  - Event
  - Parcel
  - Season
  - Soil
EO capacities have already been used intensively for monitoring agriculture (MARS-EU, B-CGMS, SAGRIWATEL...)

To calculate Geo-indicators that complement the LPIS
- Fixed time interval
- Fixed perodes / dates
- Covering large territories
- For parcels and farm surroundings
GeoTraceability concept

Legislation
- CAP
- EU/Nat. standards (1\textsuperscript{st} & 2\textsuperscript{nd} pillars...)
- Minimise risks (Healthy, Safety...)

Consumers
- Meet society's requirements (Healthy, Safety & Quality insurance, Environmental protection...)

Food-chain
- Minimise risks (Healthy, Safety...)

Farmers
- Food claim (labels, certifications...)
- Help farmers (Farm management...)

TRACEABILITY

Meet society’s requirements (Healthy, Safety & Quality insurance, Environmental protection...)

Minimise risks (Healthy, Safety...)

Food claim (labels, certifications...)

Help farmers (Farm management...)

SSTTC STEREO & VEGETATION Workshop - 6 may 2004 - Brussels
Opportunities of Remote-Sensing (cont.)

- Control of declarations in the traceability process:
  - Reduce *in situ* control process
  - Contribute to cross-checks

- Check of agricultural land-use declaration
- Check of parcel acreage declaration

Overlay IACS with geo-corrected SPOT-XS or IKONOS images
Opportunities of Remote-Sensing (cont.)

- Control of declarations in the traceability process:
  - Reduce *in situ* control process
  - Contribute to cross-checks

- Check of agricultural land-use declaration.

- Check of parcel acreage declaration

- Control specific EU/Nat. standards for:
  - *certifications*, *labels*...

Buffer zones
Opportunities of Remote-Sensing (cont.)

- Control of declarations in the traceability process:
  - Reduce *in situ* control process
  - Contribute to cross-checks

- Check of agricultural land-use declaration.

- Check of parcel acreage declaration

- Control specific EU/Nat. standards for:
  - certifications, labels…
  - environnemental protection (AEMs)

One IACS parcel but
Lower part = normal practice
Upper part = late cutting (AEM)
Opportunities of Remote-Sensing (cont.)

- Historical information for GeoTraceability process:
  - New declared parcel
  - New EU/Nat. legislation/standards

- No declarative information available, so if new information is needed we can expect to find it in archive imagery.

- Land-Cover / Land-Use change e.g. Forest ↔ Crops
Opportunities of Remote-Sensing (cont.)

- GeoTraceability for food & products promotion:
  - Characterisation of the environment of the parcel
  - Surrounding parcels

- Characterisation of parcels environment as part of the certification
  - Generic indicators

- Spatial analysis and diagnosis of the parcel according to surrounding parcels
  - Proximity indicators

SPOT XS – 05/30/1997
Opportunities of Remote-Sensing (cont.)

- GeoTraceability for food & products promotion:
  - Agri-Environmental Measures
  - Farm-management

- Indicators related to agricultural and agri-environmental practices during the season:
  - fertilisation,

Agri-environmental indicators
Opportunities of Remote-Sensing (cont.)

- **GeoTraceability for food & products promotion:**
  - Agri-Environmental Measures
  - Farm-management

✓ Indicators related to agricultural and agri-environmental practices during the season:
  - fertilisation,
  - length of the growing period,
  - biomass and yield
  - ...

Agri-environmental indicators

---

SPOT-XS, 30 May 1997

SPOT-XS, 6 August 1997
Opportunities of Remote-Sensing (cont.)

- GeoTraceability for food safety promotion:
  - Diseases
  - Contamination risks

CASISWIR spectroradiometers

Lacks / Heterogeneity inside the field

Unharmed crop parcel
Opportunities of Remote-Sensing (cont.)

- GeoTraceability for food quality promotion:

  ![Graph showing reflectance spectra for different vegetation stages and soil conditions.](image)

  - Reflectances for:
    - Dry matter
    - Protein
    - Cellulose
    - Sugar
    - VEM
    - VEVI
    - DVE
    - OEB
    - Height
    - Biomass
    - Wet matter

  - Wavelength (nm) range from 400 to 2600 nm.
To summarize

The support of remote sensing in geotraceability can be summarised as follow:

• To complement and reinforce the diagnosis at parcel & farm level.
• To better focus field inspections related to traceability.
• To better support the update process of LPIS.
• To complement the analysis of the impact of agricultural production on the surrounding of the parcel & farm.

= Geo-Traceability system in the new CAP
Conclusion

- IACS/LPIS = reference database system for traceability
  - Provides exhaustive information on parcels for all agricultural parcels in Europe.
  - Gives information on the parcel practices

- Remote-Sensing is a complementary tool
  - Capture non declarative and periodic information.
  - On large territories.
  - Give information on practices carried out on surrounding parcels.
  - To provide and to facilitate the calculation of complementary GeoTraceability indicators.

- GeoTraceAgri project (FP5-IST)
  CRA-W (Belgique), FUL-ULg (Belgique), CDER Informatique (France), CCI Gers (France), CIRAD (France), U-Laval (Canada)

- GTIS-CAP (FP6-SSP)
  CRA-W (Belgique), FUL-ULg (Belgique), CIGEST (Belgique), SPOT (France), CCI Gers (France), ACTA (France), CDER Informatique (France)