Remote sensing: A suitable technology for crop insurance?

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Agenda

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1. Challenges using RS technology in crop insurance
2. Initial situation ï Dominance of NDVI
3. Potential applications
4. Outlook

Challenges using RS technology in crop insurance

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1. Heterogeneous farm types with significant differences in the size of the insured area (plots): rule of thumb: 0.5ī 5 ha in the smallholding sector

   Approx. 100 ha+ in large-scale farms

   Ÿ Relatively high spatial resolution required to cover whole ag sector

2. Vegetation period: 3 to 10 months

   Ÿ Medium temporal resolution required, cloud cover in vegetation period can be a critical success factor for optical sensors

   Ÿ High temporal resolution required if RS is to be used after a specific loss event

3. Historical data required (minimum 10 to 20 years)

4. Biomass Í yield

5. Ground truth data essential for calibration and validation Ÿ reliable yield data

Initial situation ï Dominance of NDVI

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- Most agriculture-related RS applications are focused on monitoring the vegetation status using the NDVI (Normalized Difference Vegetation Index)
- Advantage of NDVI: daily recording by different sensors and time-series of up to 30 years.
- Disadvantages of NDVI:
  - Biomass Í yield
  - Inaccuracies as a consequence of such factors as background reflectance and the three-dimensional structure of the canopy.

    Ÿ Alternative indices are currently being developed: FAPAR (Fraction of Absorbed Photosynthetically Active Radiation), VHI (Vegetation Health Index) and LAI (Leaf Area Index).

    For more information, see Meroni et. al., 2013 and Rojas et. al., 2013.

Potential applications of RS technology

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Potential applications
Plot identification

Relevant topics:

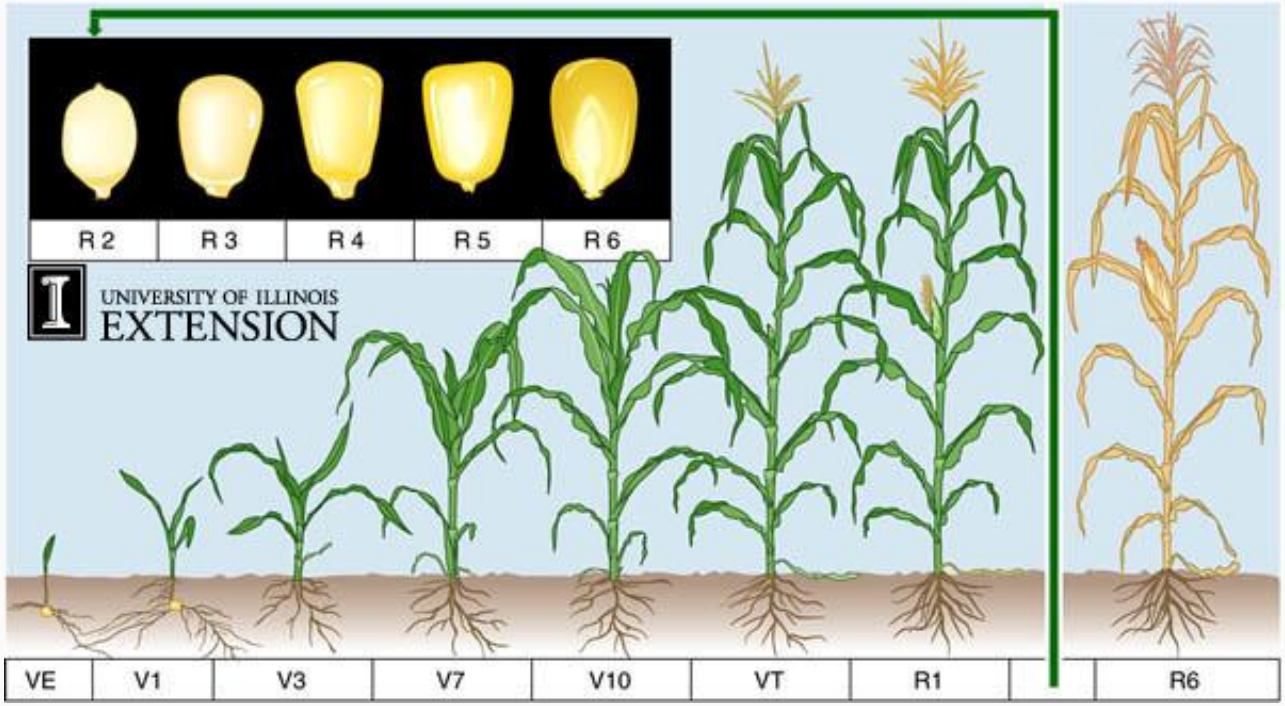
Å Agricultural use?
Å Boundaries of plot
Å Size of plot

Potential applications
Crop identification

Relevant topics:
Å Which crop/crop type?

Auxiliary factors:
Å Sowing/planting date
Å Ripening date
Å Harvest date
Å Phyllotaxy
Å Leaf area in relation to soil area in different growing stages

Potential applications
Monitoring of crop progress



Alternatively:

- Soil preparation
- Sowing
- Emergence
- Closing of rows
- Tasseling/Flowering
- Ripening
- Harvesting

Potential applications
Yield estimations

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Approaches for yield forecasts

1. Satellite information as primary source (unifactorial tool):
   - NDVI or alternative vegetation indices like FAPAR (Fraction of Absorbed Photosynthetically Active Radiation), VHI (Vegetation Health Index) and LAI (Leaf Area Index)
   - Rainfall estimates
   - Soil water index (SWI)
   - Evapotranspiration index

2. Crop growth models as a multifactorial tool, using satellite information e.g. on the biomass as input factor, as well as other factors such as weather conditions (e.g. precipitation, temperature), soil type and management factors

Potential applications
Loss event monitoring

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Applications

- Crop insurance
- Disaster management (state authorities)

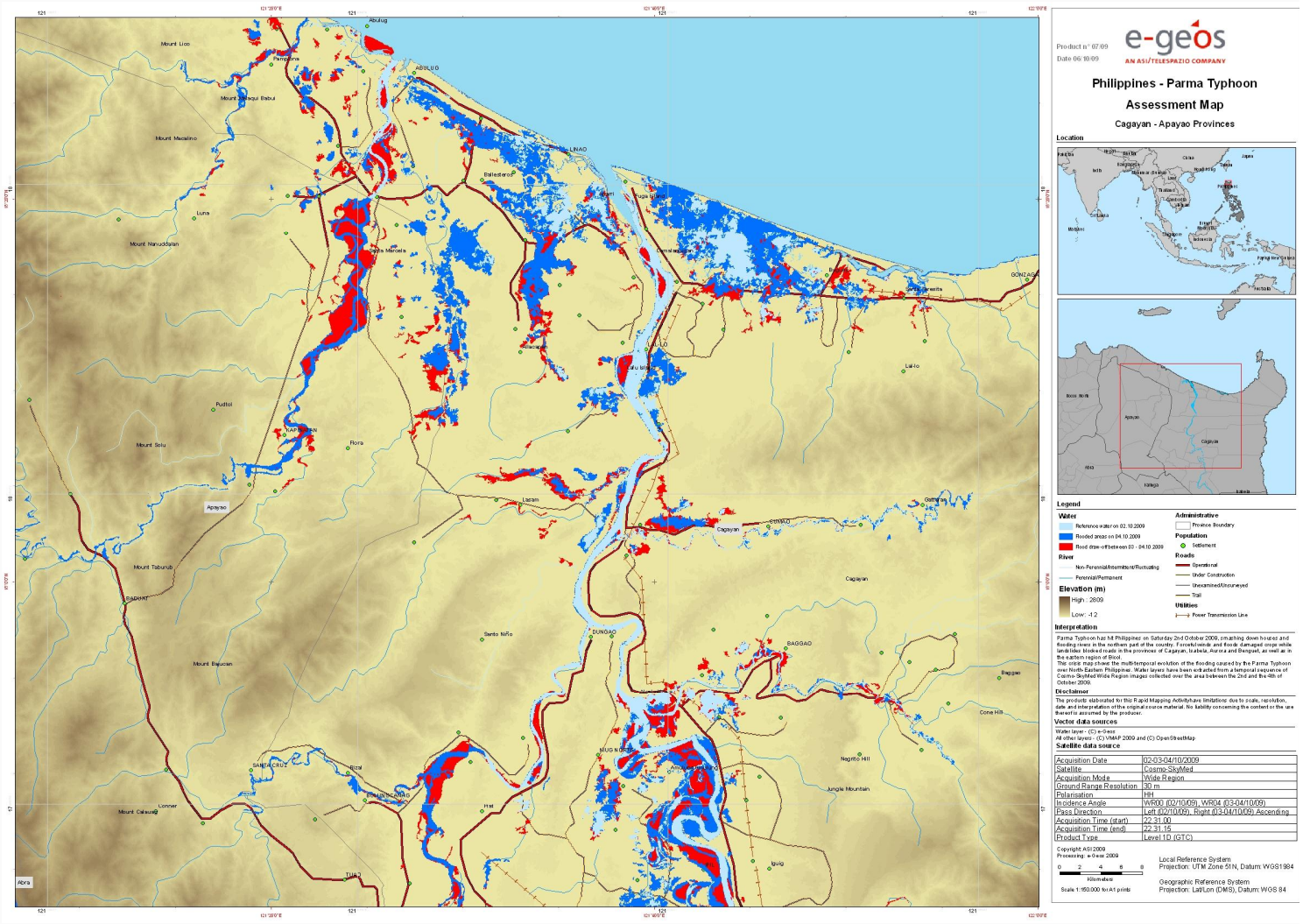
  Ÿ Early loss estimations and categorizing the regions according to degree affected

Flood monitoring

- Radar sensors in addition to optical sensors very efficient.
- Crop loss assessment: duration and height of flood, crop types

Typhoon “Parma” in Northern Philippines on October 2 , 2009
Monitoring of flood

Max. monitoring frequency: 6 images/day



Legend:

	Reference water, (Oct 2)
	Flooded (Oct 4)
	Flood draw-off between Oct. 3 and 4

Outlook

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Remote sensing: A suitable technology for crop insurance?

1. RS for crop insurance currently in its infancy.
2. Potential to further develop and enhance crop insurance and disaster response by state authorities.
3. Further research and investments are necessary.
   - IFAD project ñEvaluation of RS for Index Insurance in West Africaò
4. Major constraints:
   - heterogeneous structure in crop production.
   - limited temporal availability of optical methods because of cloud cover.
5. Advances in the field of radar data may supplement optical data.

Thank you. For further information please see

Article: Herbold, J.: RS technology for crop insurance. Geospatial World, September 2013. Can be downloaded from:

http://www.drjoachimherbold.de/

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