Can satellites help organic crop certification?

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1. Context - Justification

Want organic food?
- Human health
- Environmentally friendly

Organic crop?
- NO chemical synthetic pesticide and fertilizer, NO GMO, ...

Organic food on the market

To trust or not to trust?

Certification
- Rules & agencies
- Labels

2. Objectives

Is it possible to help organic crop certification bodies with satellites?

Is it possible to discriminate organic and conventional crop fields with satellites?

3. Methodology

Management differences between organic and conventional crops have direct consequences on
crop biophysical characteristics and general field appearance among which some are supposed to be observable by
- Satellites and transformed into satellites derived indicators (Cf. Table)

4. Results

Field surveys

Photointerpretation and object oriented automatic tractor traces recognition

Identification of most discriminant spectral indicator from hyperspectral satellite

Crop management differences and satellite indicators

Crop management differences between organic & conventional
- Less use of fertilizer in organic fields
- opener change in organic crop
- Higher spectral heterogeneity in field (NDVI, NDMI, NBR...)
- Optimal spectral indicators for discrimination
- Less visible and closer tractor traces in organic crops

Separability graphs: value of computed indicators for organic vs conventional crop

Data

SATELLITE IMAGES
- Hyperspectral (CHRIS-PROBA) and multispectral (WorldView, Kompsat)

FIELD SURVEYS
- Many crop biophysical parameters measured during 2 field surveys: crop nitrogen content, biomass, height, canopy cover, (different crop content, hyperspectral indicators, etc

Results summary

Organic vs conventional

<table>
<thead>
<tr>
<th>Satellite indicators</th>
<th>Organic</th>
<th>Conventional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green NDVI (chlorophyll)</td>
<td>0.49 (Pan)</td>
<td>0.66 (Pan)</td>
</tr>
<tr>
<td>Object based spectral heterogeneity</td>
<td>0.78 (VHR)</td>
<td>0.66 (VHR)</td>
</tr>
<tr>
<td>Discriminant analysis</td>
<td>95%</td>
<td>93%</td>
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</tbody>
</table>

5. Conclusion

In the limited context of this study (wheat and corn in East of Germany), satellite images proved to be an efficient tool to discriminate organic from conventional crops and could consequently support work of organic certification bodies. However these first results call for more research to refine and validate the method in other areas and climatic conditions before its implementation in the organic crop certification process.

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