Assessing the quality of crowdsourced in-situ land-use and land cover data from the FotoQuest Austria application

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IIASA - FotoQuest Austria

• Treasure hunt!
• Arrive to a given point
• Take pictures in 4 directions
• System controls proximity, direction, tilt angle.
• Describe LU and LC

FotoQuest.at
FotoQuest Austria and LUCAS
When, what and who?

~ 400 points compared between LUCAS and FotoQuest Austria

- Some points: not visible, not sure of land use / land cover, test points.

82 participants:

81 users ~ 21 points (1 to 43 each)

1 user = 167 points! “power” user
How to compare?

Common features between systems
• Same land use and land cover categories

Comparison at 3 levels
• Exact (E)
• Parent category (P)
• Grand-parent category (GP)

What if you are a “power” user?
What if you have homogeneous points?
Agreement analysis

• Use of generalized linear mixed models
  • Binomial – logit link
  • Random effects allow accounting for lack of independence:
    • Between observations done by the same user (USER-ID)
    • Between observations taken on the same point (POINT-ID)

• 2 groups: Power user and non-power users (covariate)

Model selection using Akaike Information Criterion (AIC): $\Delta AIC > 2$
Agreement analysis (2)

• Model considers
  • Number of observations per user (OBSU)
  • Number of observations per point (OBPT)
  • Reach of observed land cover/land use (RADIUS)
  • Type of user (power user or not) (GROUP)

Model:
Y = f (RADIUS, GROUP, OBSU, OBPT :: USER-ID, POINT-ID)
Who agrees with what?

- No significant effect for other variables except GROUP
- If power user is removed only slight change:
  - OBSU significantly increase agreement at E and P levels for land use
What about power – not power users (GROUP)

Chances of agreeing with LUCAS as a “power” user (%):
- GP: 53% higher
- Exact: 56% higher

On other levels no significant differences but higher rate of agreement
Homogenous points

20 meter radius
Heterogeneous points
Homogenous points

Nevertheless, only significant differences between homogeneous and heterogeneous points in land use agreement at exact level (large variability).
Lessons learned

• Description / surrounding area increase agreement: Radius
• Use of satellite imagery in app: Precision measurements
• High variability: Crowd agreement might not be best solution
• Improved restrictions in app: Better control
• Incentives and users’ interest: Is the quest and treasure hunt good enough?
• What do we want from citizens and their involvement in science?
Thank you for your attention
## Agreement areas

<table>
<thead>
<tr>
<th><strong>Land cover</strong></th>
<th><strong>Land use</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td><strong>Coverage in FQ-Austria (%)</strong></td>
</tr>
<tr>
<td>Grassland</td>
<td>30</td>
</tr>
<tr>
<td>Woodland</td>
<td>23</td>
</tr>
<tr>
<td>Cropland</td>
<td>22</td>
</tr>
<tr>
<td>Artificial area</td>
<td>20</td>
</tr>
<tr>
<td>Others</td>
<td>5</td>
</tr>
</tbody>
</table>