

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

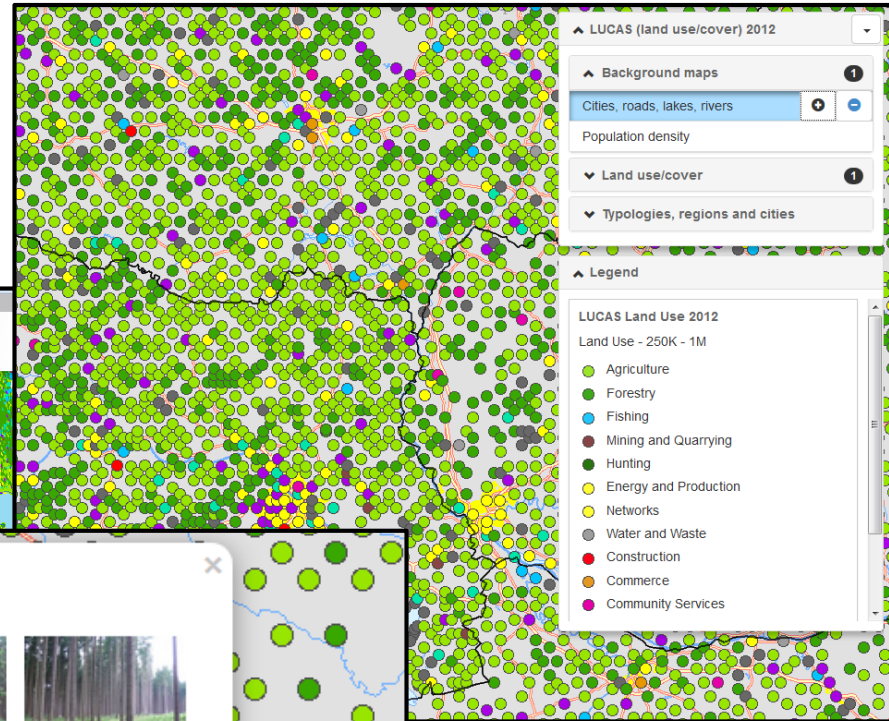
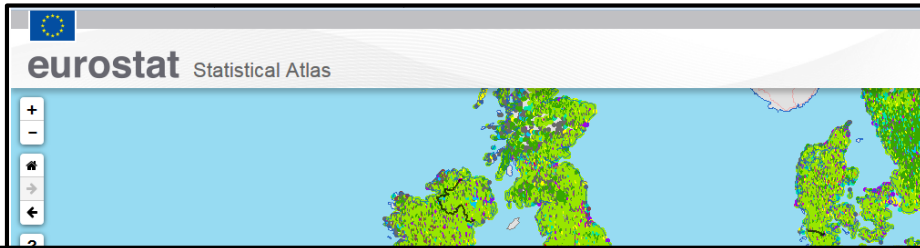
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Ecosystem Services and Management group (ESM),  
**International Institute for Applied Systems Analysis (IIASA)**

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# EUROSTAT - LUCAS



**LUCAS viewer**

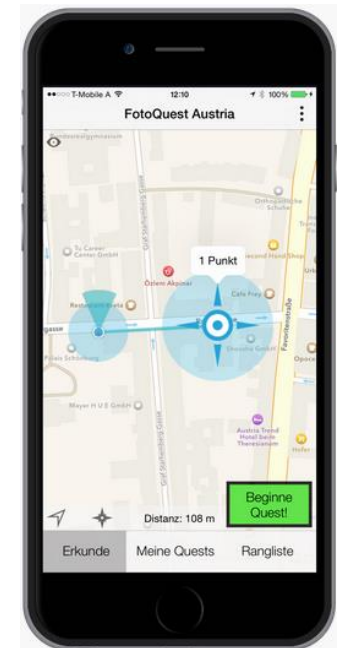
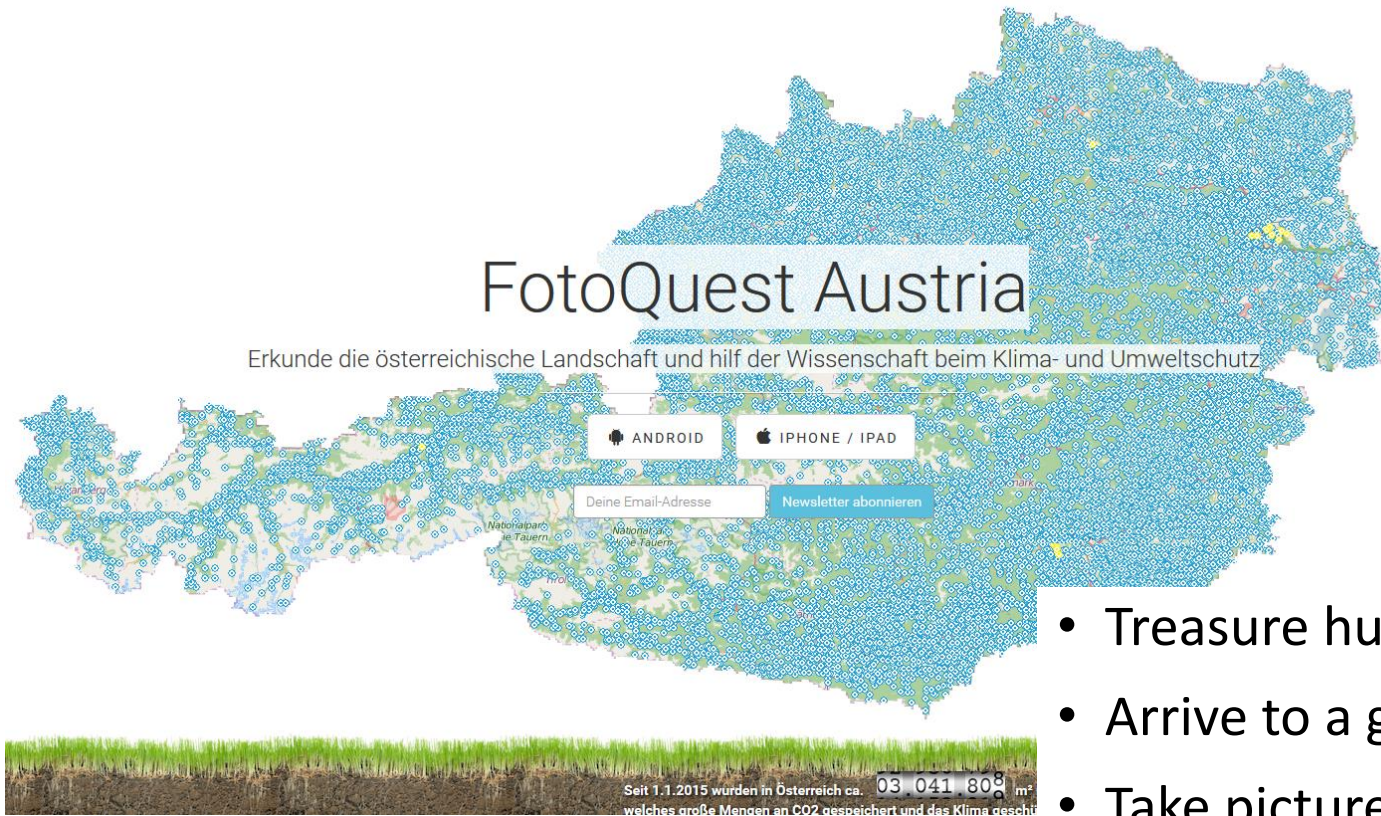
Point North East South West

Area size in ha: **area >= 10 ha**  
Date of observation: **3/07/2012**  
Land cover: **Spruce dominated coniferous woodland**  
Land cover code: **C21**  
Land use: **Forestry**  
Land use code: **U120**  
NUTS region: **AT12**  
Point ID: **47122860**  
Status of data: **preliminary**

[Order LUCAS photos.](#)



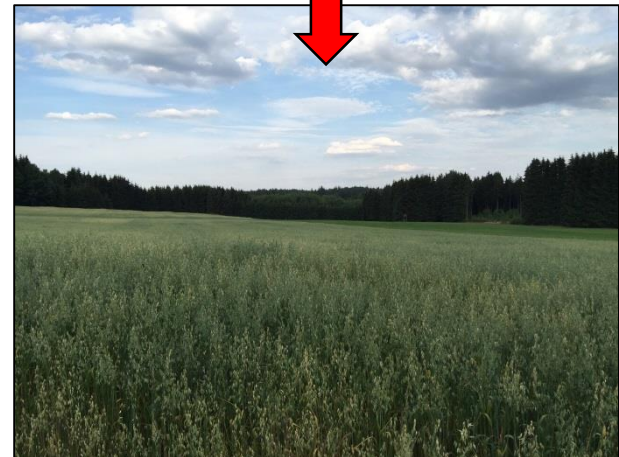
# IIASA - FotoQuest Austria



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

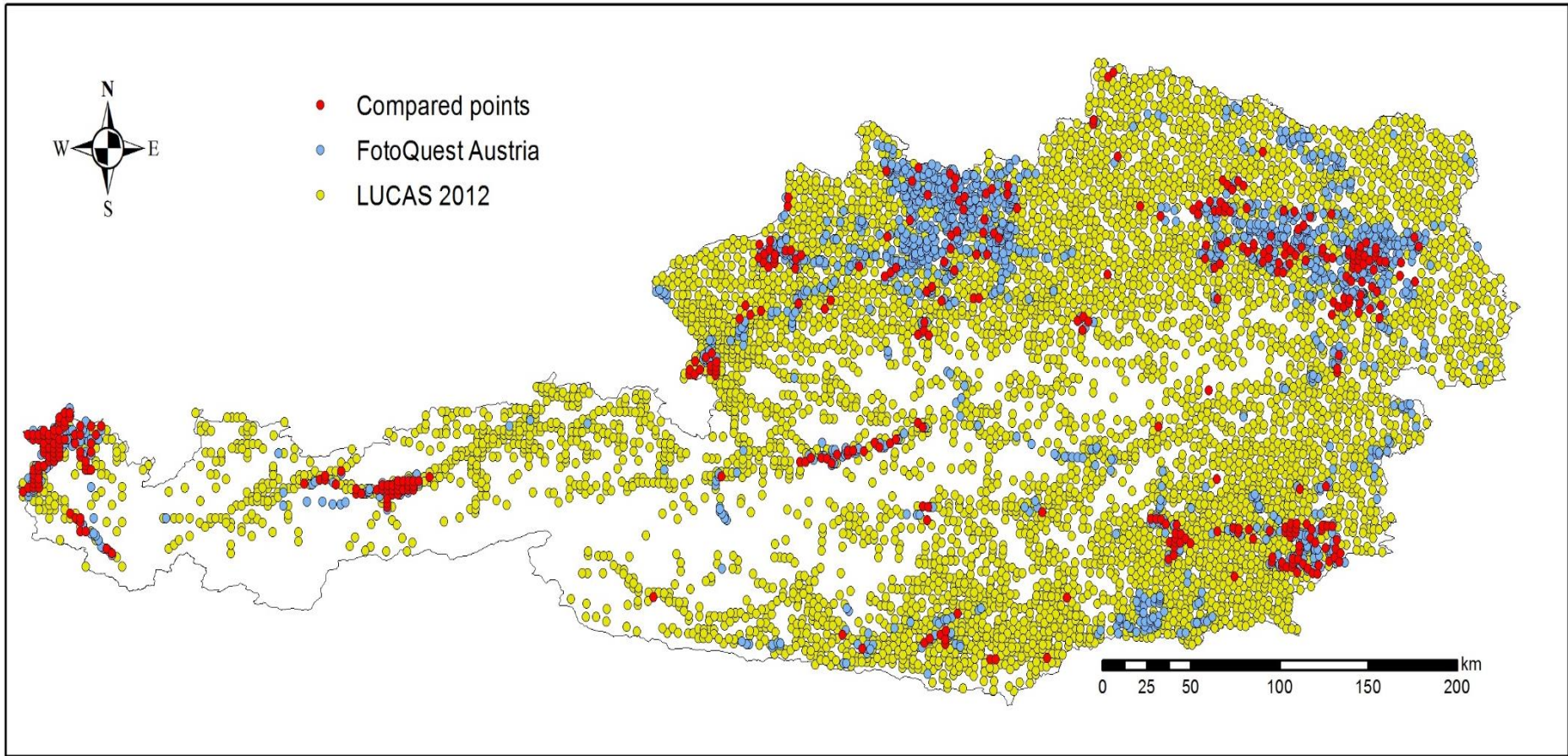
[FotoQuest.at](http://FotoQuest.at)



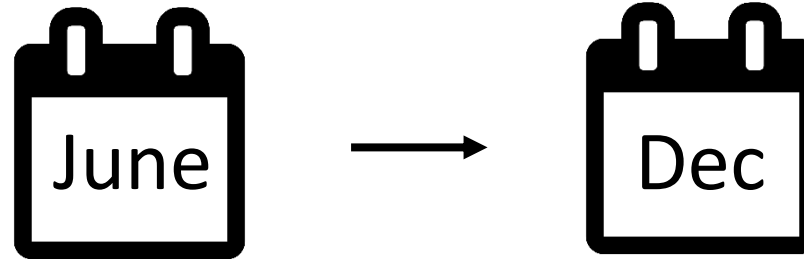




# FotoQuest Austria and LUCAS



# When, what and who?



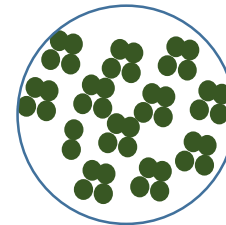
~ 400 points compared between LUCAS and FotoQuest Austria

- 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)                      B11 – Wheat
- Parent category (P)        B1    – Cereals →
- Grand-parent category (GP) B      – Cropland



What if you are a “power” user?

What if you have homogeneous points?

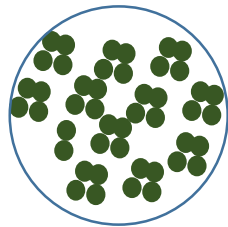


# Agreement analysis

Yes

No

- 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)



A



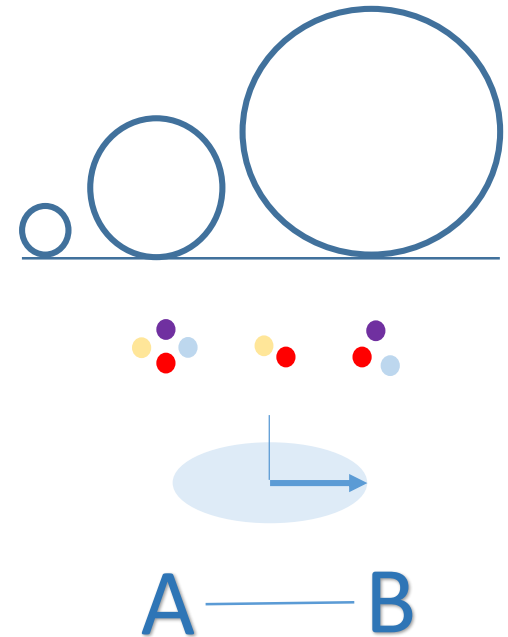
B

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



# Agreement analysis (2)

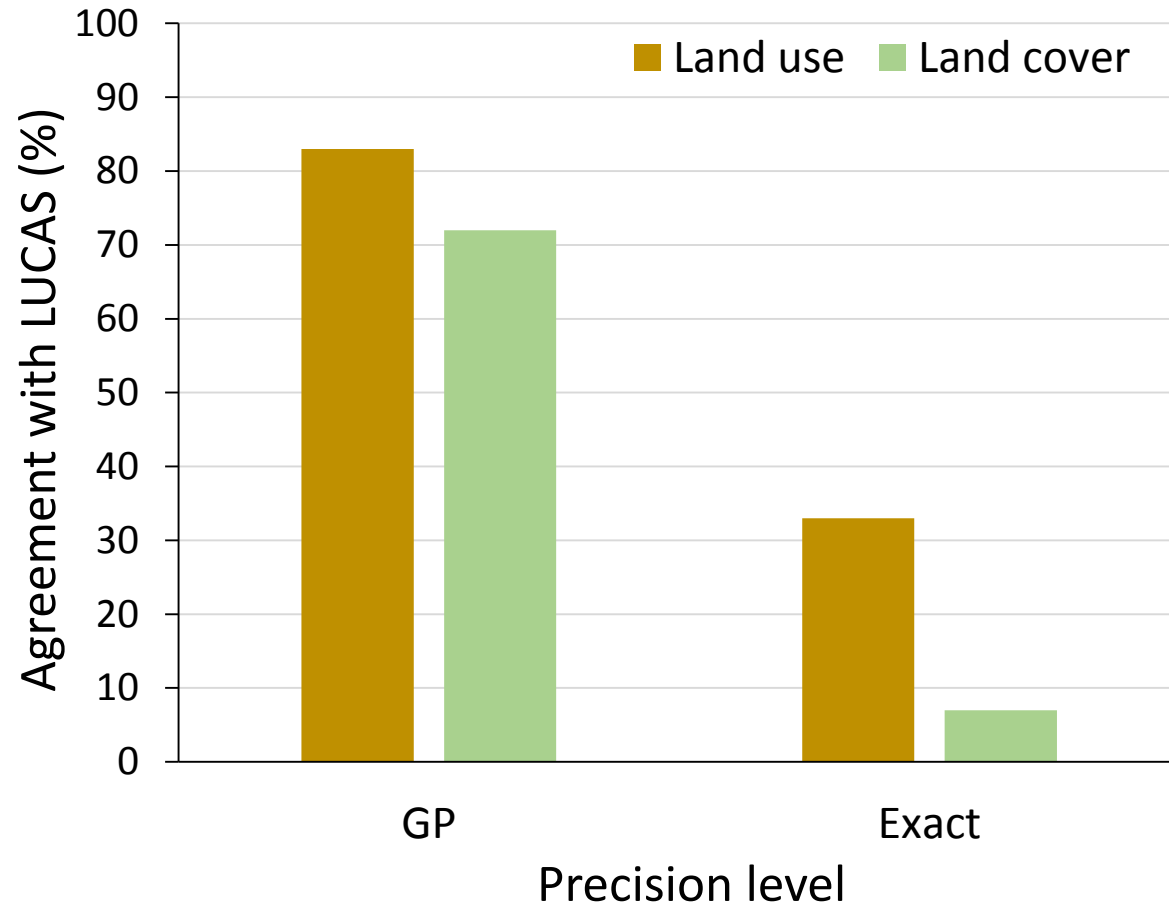
- Model considers
  - Number of observations per user (OBSU)
  - Number of observations per point (OBPT)
  - Reach of observed land cover/land use (RADIUS)
  - Type of user (power user or not) (GROUP)

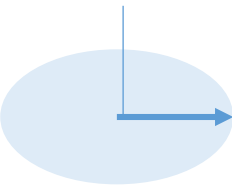



Model:

$Y = f(\text{RADIUS}, \text{GROUP}, \text{OBSU}, \text{OBPT} :: \text{USER-ID}, \text{POINT-ID})$

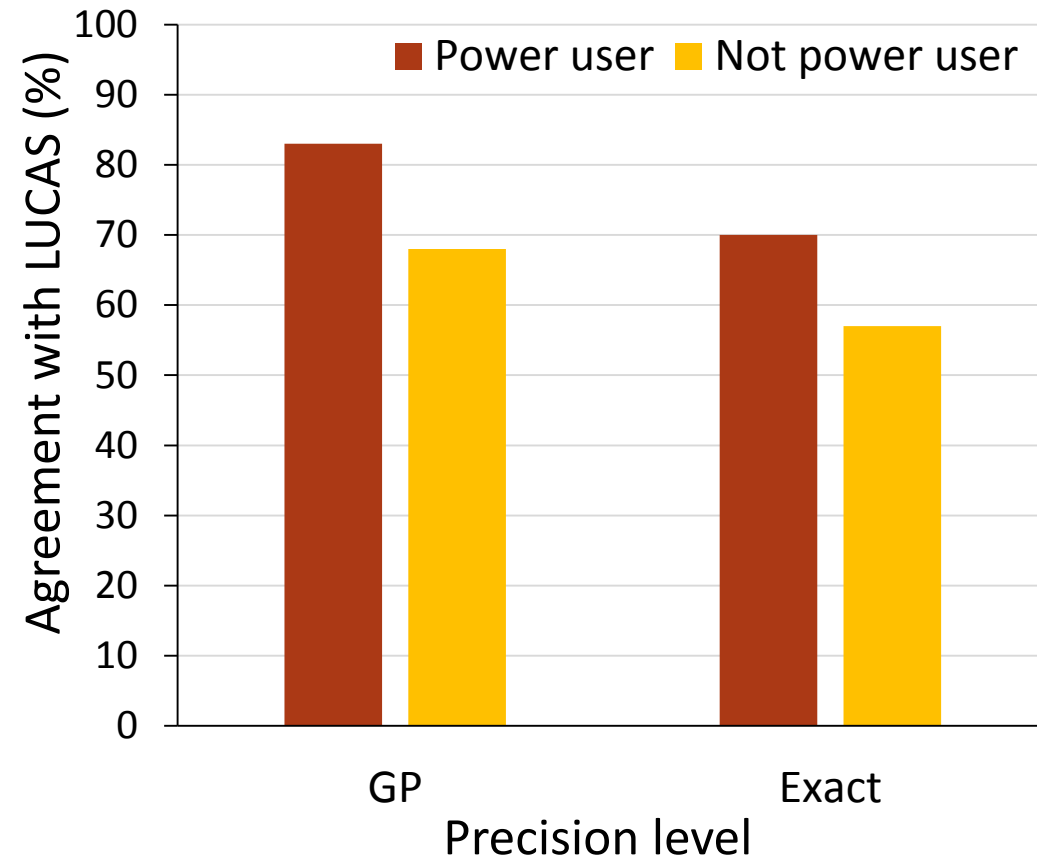
# Who agrees with what?



Radius:   ( $p < 0.05$ )

- 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

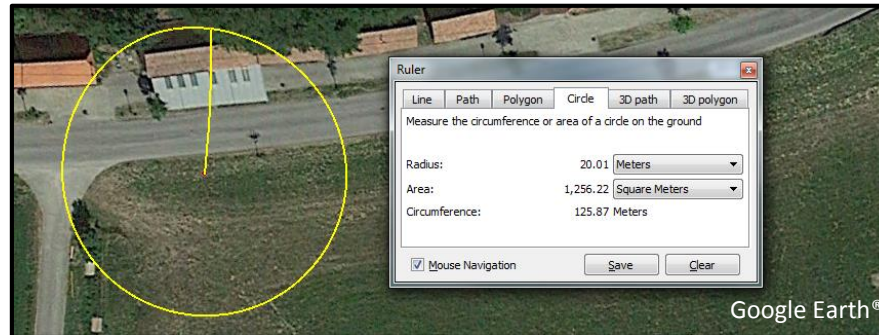


# Homogenous points

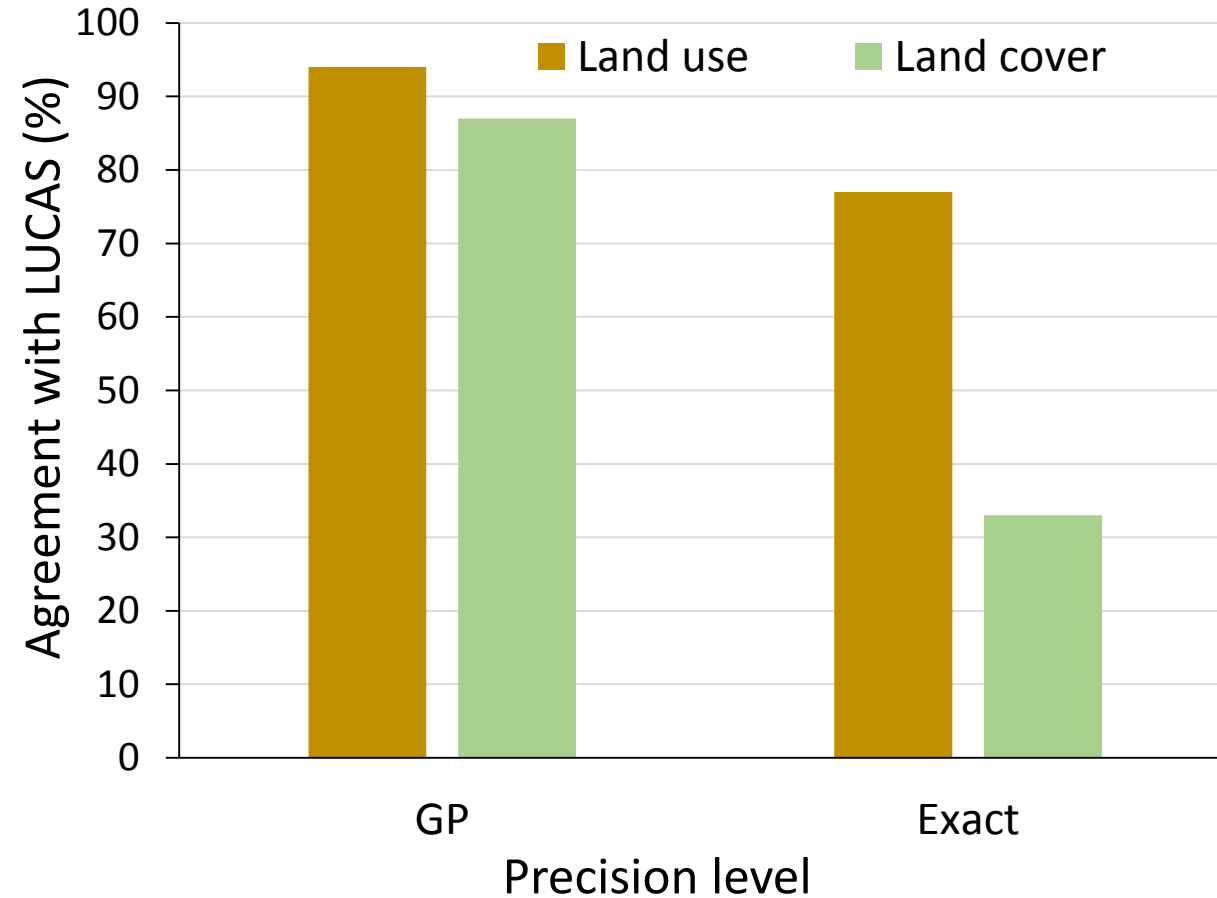
20 meter radius



# 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?

# FotoQuest Europe

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Thank you for your attention





# Agreement areas

## Land cover

Type	Coverage in FQ-Austria (%)	Overall agreement with LUCAS (%)
Grassland	30	58
Woodland	23	58
Cropland	22	93
Artificial area	20	90
Others	5	16-75

## Land use

Type	Coverage in FQ-Austria (%)	Overall agreement with LUCAS (%)
Agriculture	42	90
Forestry	18	67
Residential	16	84
Transport..	11	14
Others	13	17-40