

Introduction

Automatic acquisition of detailed animal movement data via GPS-tags is nowadays a common scientific method and is still evolving. The main requirement of monitoring data intended for regulatory risk assessments is the continuous (or at least minute-based) recording of the exact position of tagged individuals in the agricultural landscapes. This data can be used to determine daily values of time a radio-tracked animal spends in a specific crop of concern (in so-called PT field studies) or to verify exposure of animals in pesticide-treated crop fields (for more details about field study types, see EFSA 2009).

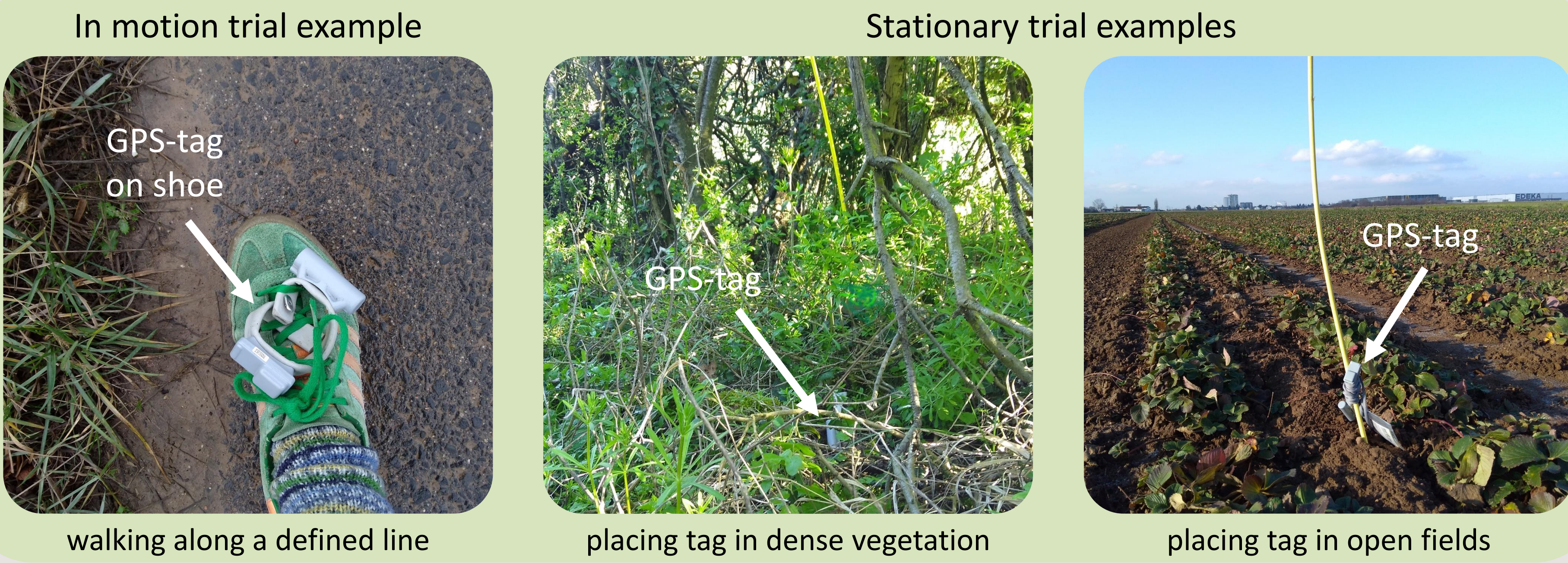
A main concern associated with this data is its accuracy. This can be a crucial requirement for species habitually moving along field margins. Depending on:

- the intended data to be collected (i.e. exact & continuous radio-tracking or radio-tracking to verify the use of treated fields)
- the ecology and habitat preferences of the species under investigation and
- the distribution of the crop of concern within an agricultural landscape

the issue of accuracy can be of varying importance. In order to assess the reliability of most recent GPS-tag datasets for use in pesticide risk assessments, we evaluated GPS-tag data for medium-sized mammals, such as lagomorphs, showing the accuracy of recorded locations under different field conditions.

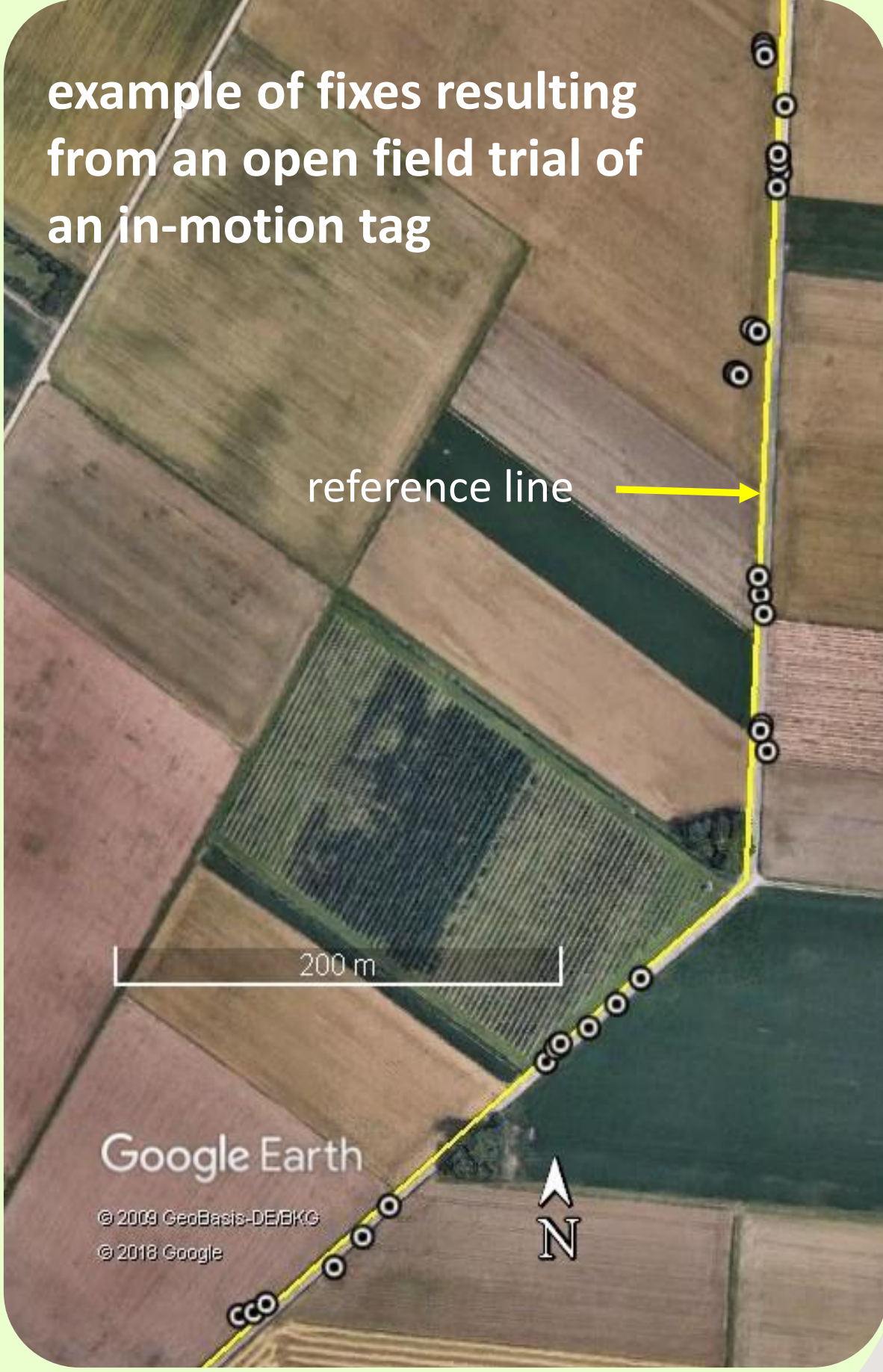
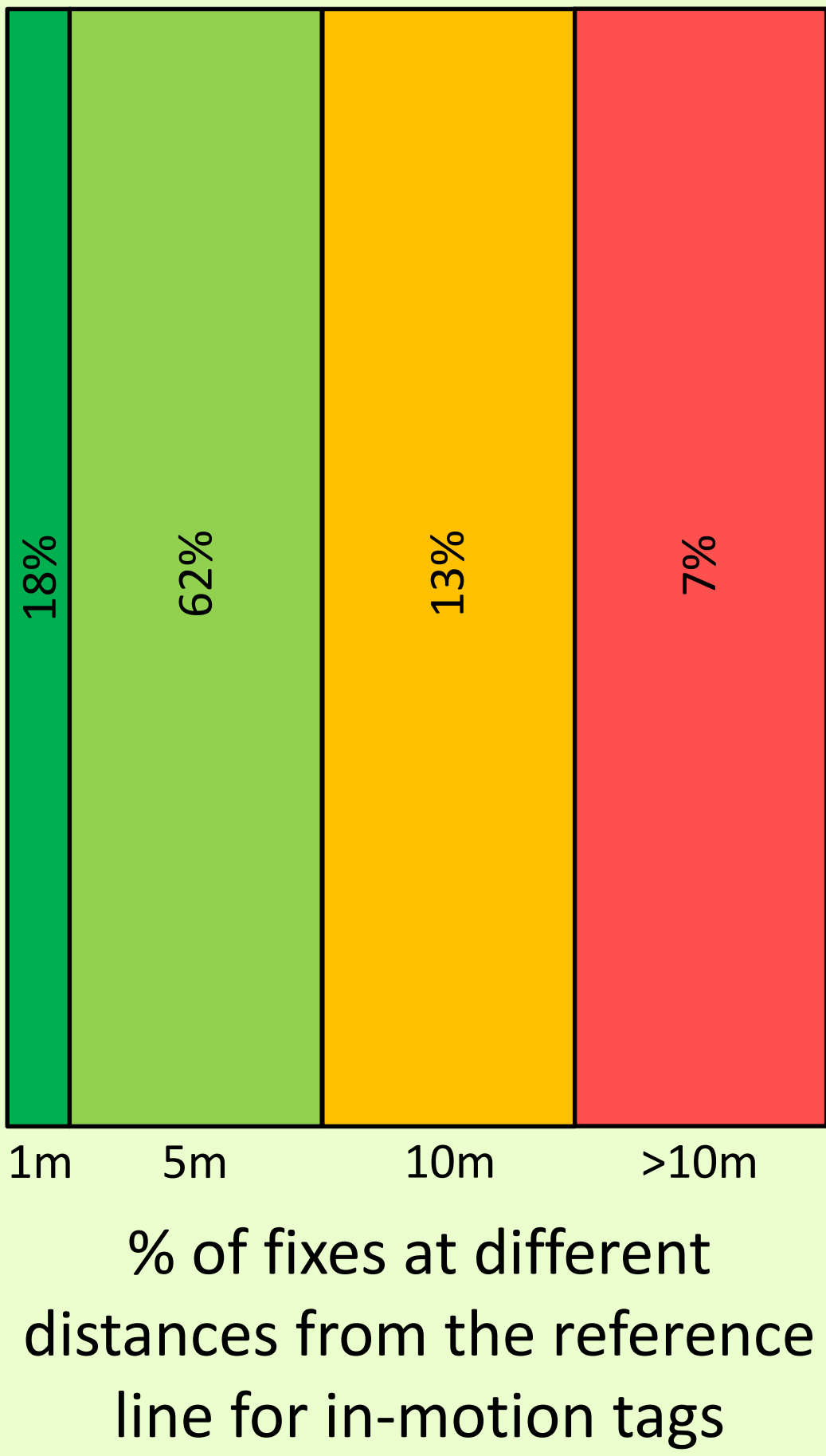
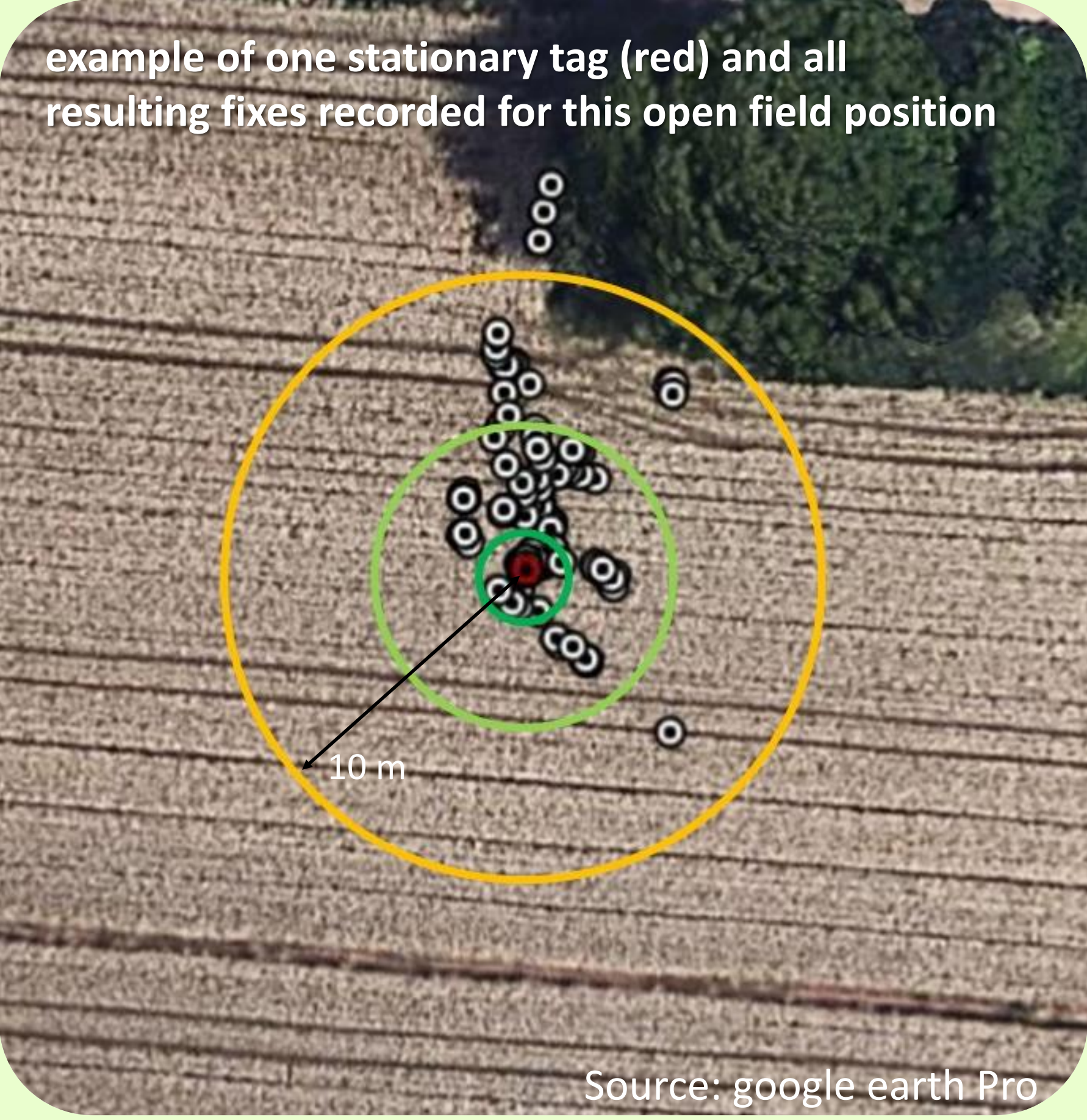
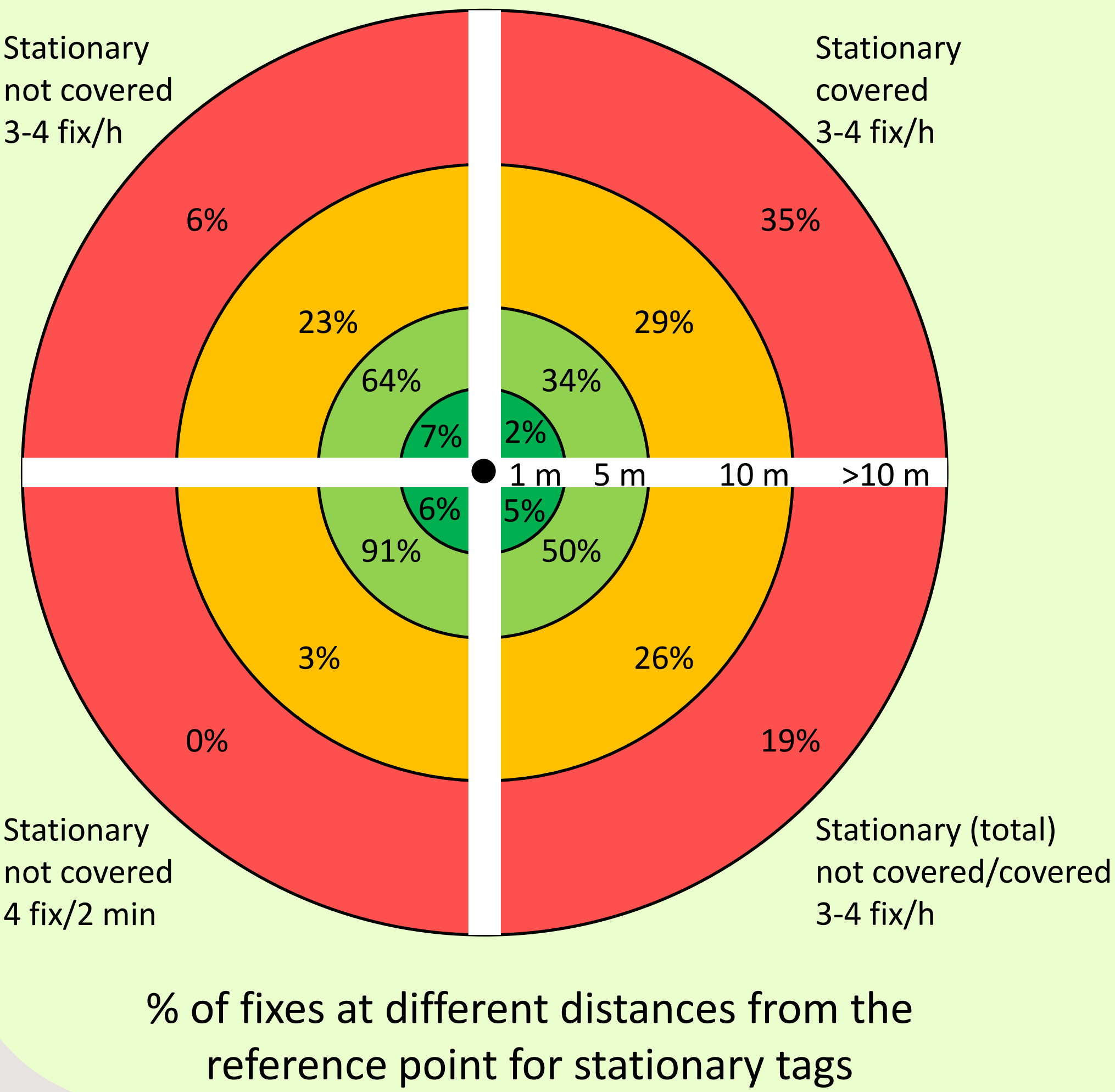
Methods

- We investigated GPS-tags from e-obs GmbH considering stationary tags and in-motion tags in 4 different regions in Portugal and Germany
- The scenarios included open field and vegetation-covered conditions
- We recorded 3-4 fixes every hour for 24 hours (stationary trials) or 3-4 fixes every two minutes for 15 to 60 minutes (in motion trials; and also in 1 stationary trial)
- The distance from each fix to the exact position (reference point or line) was measured



Results

Trial scenario	Vegetation cover	No. of analysed trials	Total no. of fixes	Mean distance to reference point/line [m] ± SD	Maximum distance to reference point/line [m]
GPS tag stationary (fixes every hour)	not covered	7	767	4.2 ± 3.7	27.7
	covered	6	590	9.5 ± 8.6	52.4
	total	13	1249	6.8 ± 7.1	52.4
GPS tag stationary (fixes/two minutes)	not covered	1	108	2.7 ± 1.1	5.6
GPS tag in motion (fixes/two minutes)	not covered/covered	6	347	3.3 ± 2.6	14.4

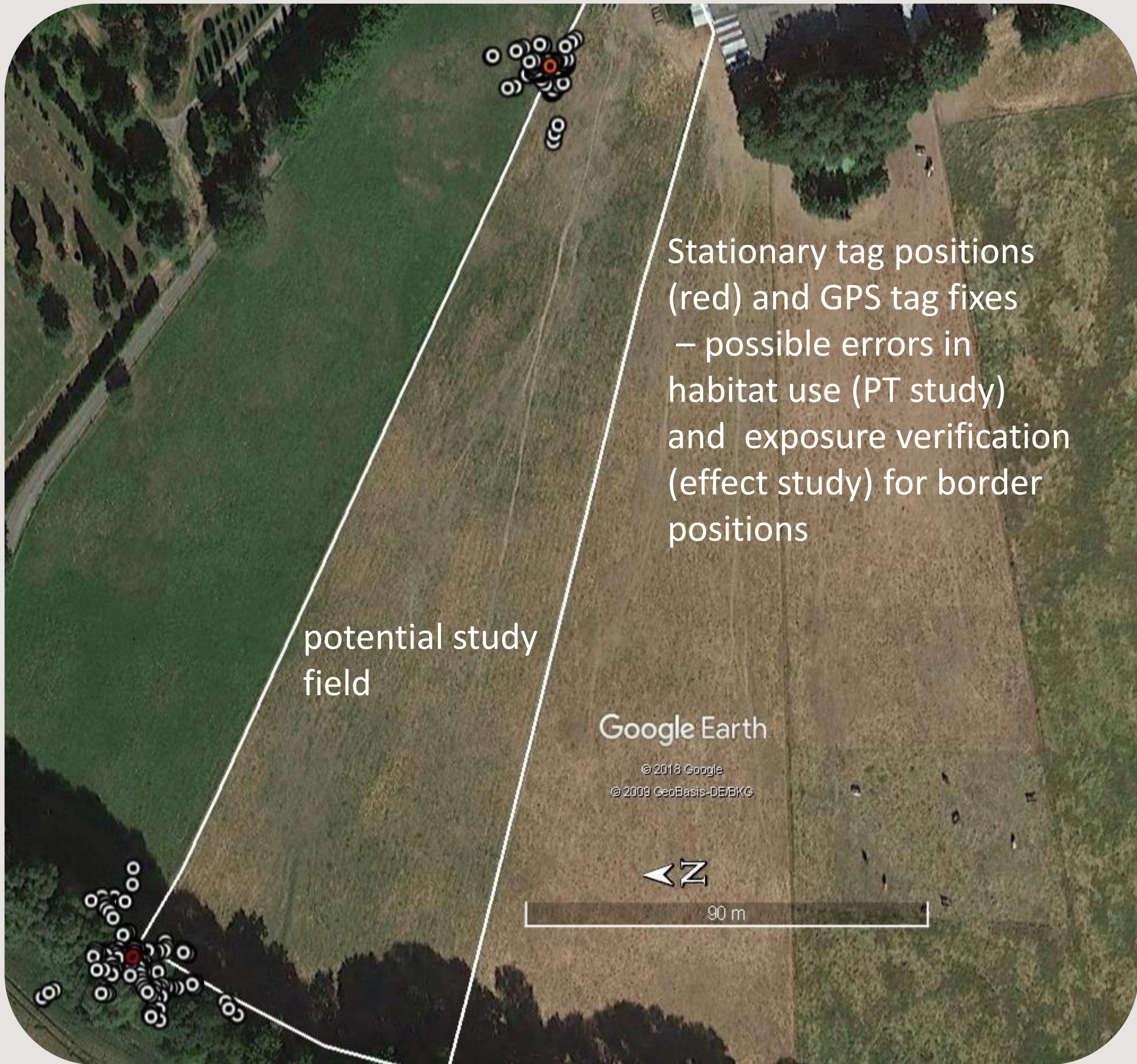


Factors affecting accuracy:

- habitat structure (open field vs. dense vegetation)
- frequency of fix recording (every hour vs. every two minutes)

Factors not affecting accuracy:

- geographical region
- time of day
- weather conditions (but two trials during heavy rain/fog resulted in no fixes)



Conclusions

Our results indicate that habitat use of investigated species and landscape structure need to be well considered for suitability of currently available GPS tracking devices.

- the generation of minute-based datasets of multiple individuals in parallel for several days without man-power or any disturbance of tracked animals is possible
- depending on tag settings and habitat, resulting fixes can present realistic locations of animals with an accuracy of ±5 m in more than 90% of all fixes
- data accuracy seems not necessarily sufficient for most reliable PT estimates for risk assessment of species utilizing preferably field borders (but worst-case PT values may be generated if questionable positions are added to the time spent in the treated area)
- Datasets can be used to verify exposure of animals to treated fields as recorded in field effect studies

Accuracy of smaller GPS tags needed for monitoring of small EFSA focal species, such as songbirds and rodents, will be investigated in a future project.