# Decision support for crop protection – Pest identification using UAV technology

LinkedOpenData Workshop Berlin,
Sept. 27th 2017

Dr. Bernd Hoffmann

# Outline

1. What‘s ZEPP?

2. UAV Pest Identification Service

# What's ZEPP?

**ZEPP**

**Z**entralstelle der Länder für EDV-gestützte
**E**ntscheidungshilfen und **P**rogramme im **P**flanzenschutz

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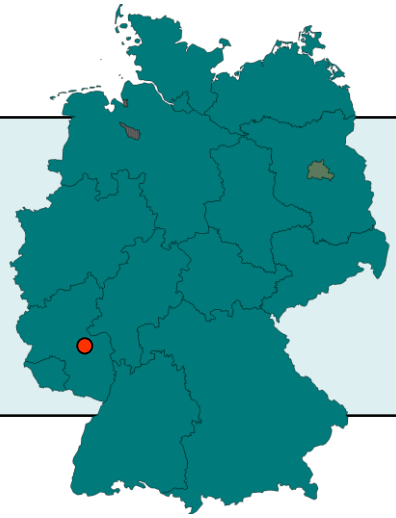
Central Institute for Decision Support Systems in Crop Protection in Germany

# What's ZEPP?



crop protection and advisory services of the German federal states

**Model Development**
**Scientific Institutions**
(Universities, JKI, DFKI, IFZ, etc.)

ZEPP

**Partner Institutions**
**ISIP e.V., German Meteorological Service (DWD)**

Free* decision support for farmers

# What's ZEPP?

**Farmer's input**
on www.ISIP.de

- Sowing date
- Location
- Crop/Variety

ZEPP DSS

- Estimation of disease/pest risk
- Estimation of treatment necessity
- Recommendation of field survey
- Prediction of treatment timing for maximum efficiency
- (limited) Pesticide recommendation

1. What‘s ZEPP?

2. UAV Pest Identification Service

# Motivation

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Bad Kreuznach-Bretzenheim, 23.05.2017

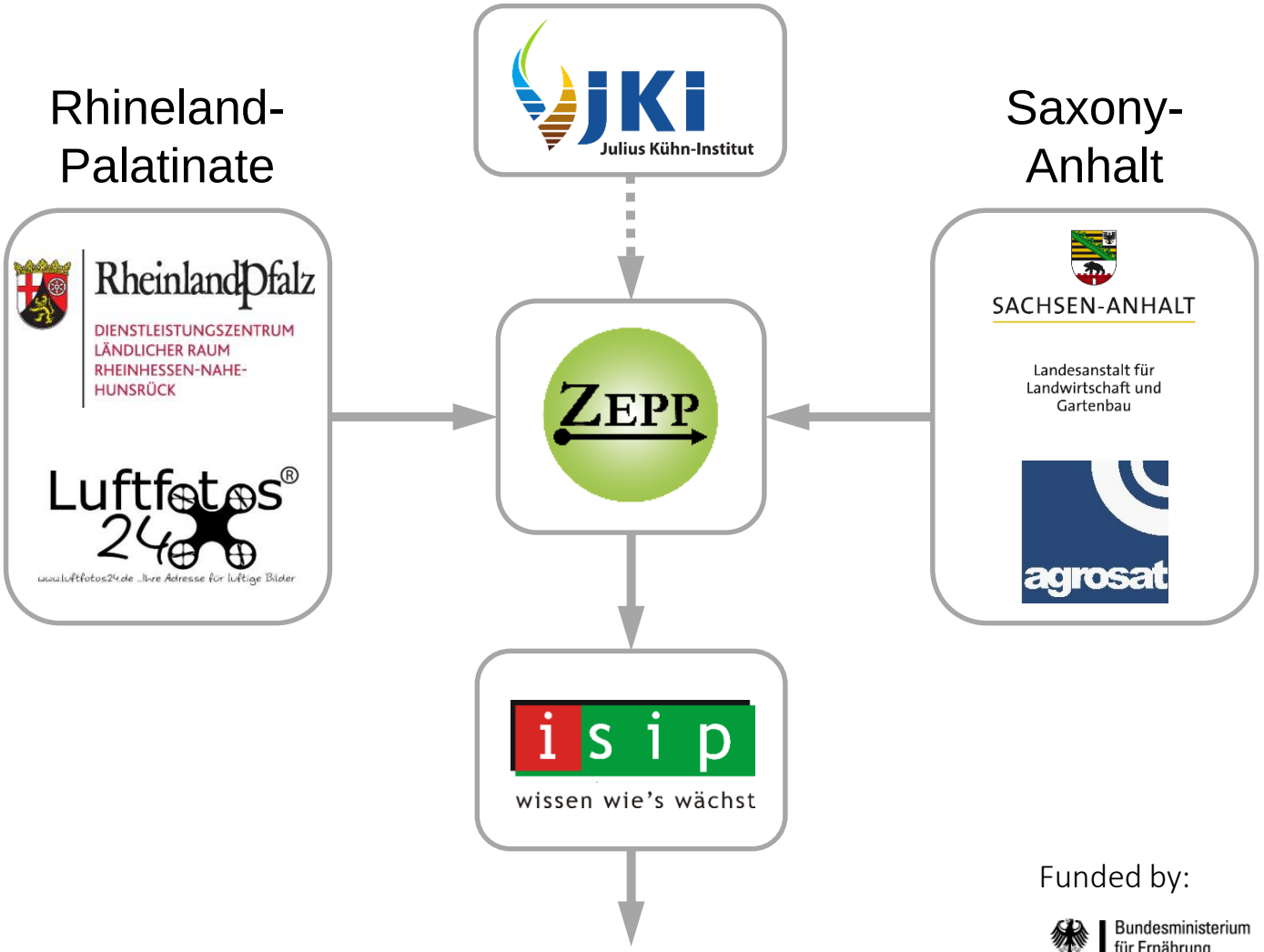
# Motivation

**Goal:** Automated UAV-imagery yellow rust (*Puccinia striiformis*) and field mice (*Microtus arvalis*) identification

→ Availabole on www.ISIP.de

**Prospects:** Sub-parcel specific pest control using geo-referenced pest maps

# Project Partner

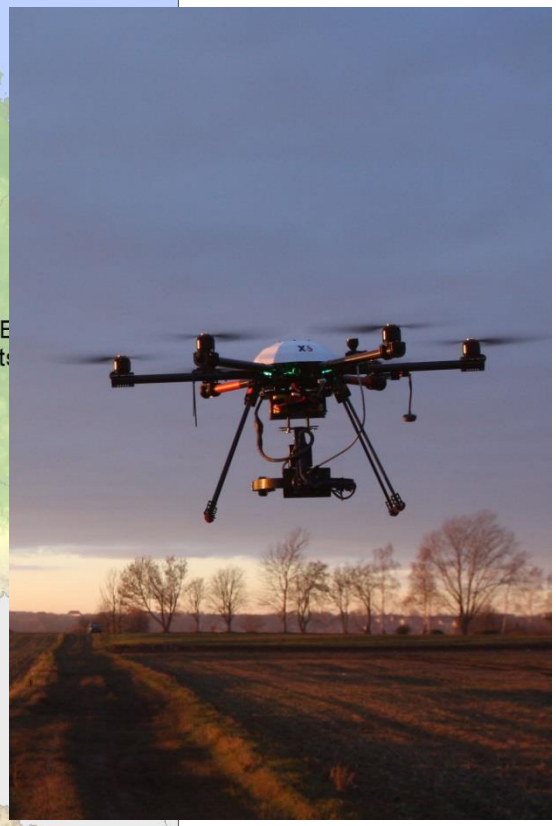



Project duration:
7/2016 – 7/2019

Funded by:
Bundesministerium für Ernährung und Landwirtschaft
aufgrund eines Beschlusses des Deutschen Bundestages
ptble
Projektträger Bundesanstalt für Landwirtschaft und Ernährung

# Data acquisition

Research area:

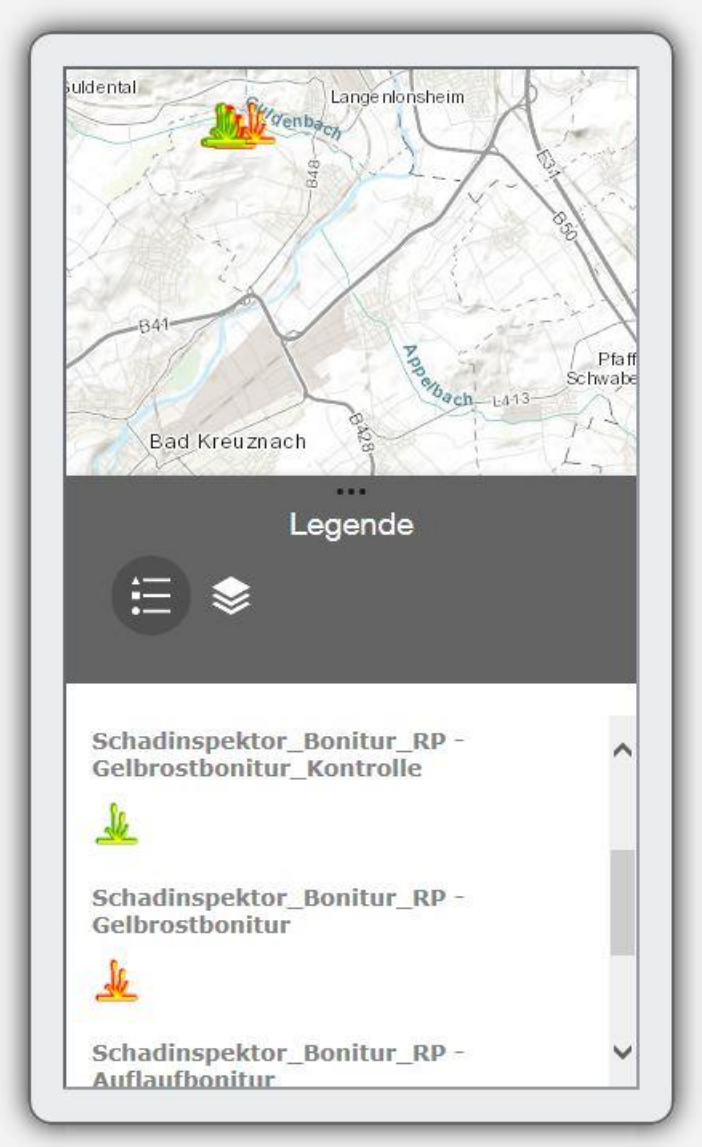


> 50 flights

> 15 km² aerial photography

> 120 GB

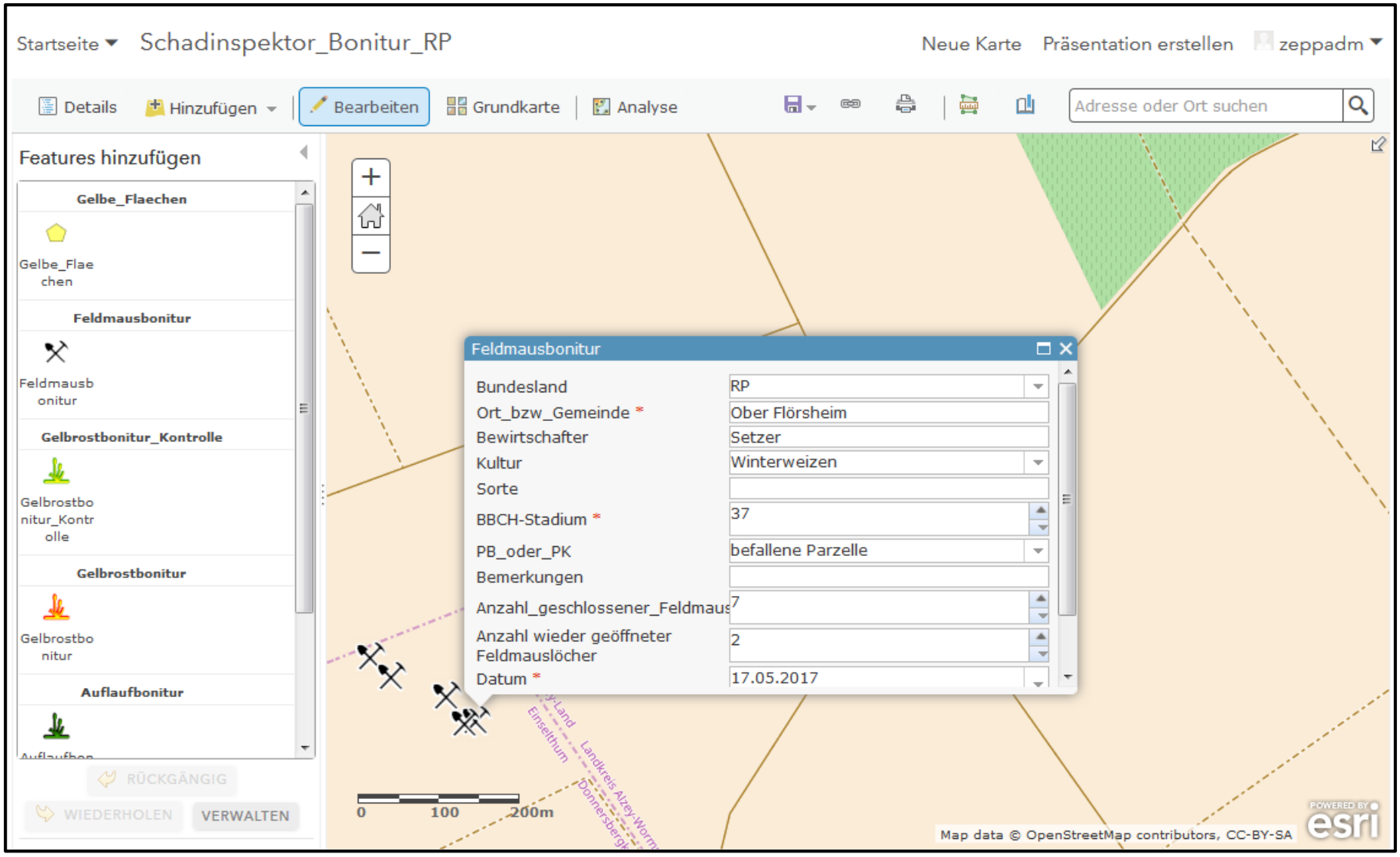
# Data acquisition




## Ground truth

- Customized ArcGIS Collector-App: Different schemes for pest specific infestation mapping
- 539 and 73 data points for yellow rust and field mice, respectively

# Data acquisition



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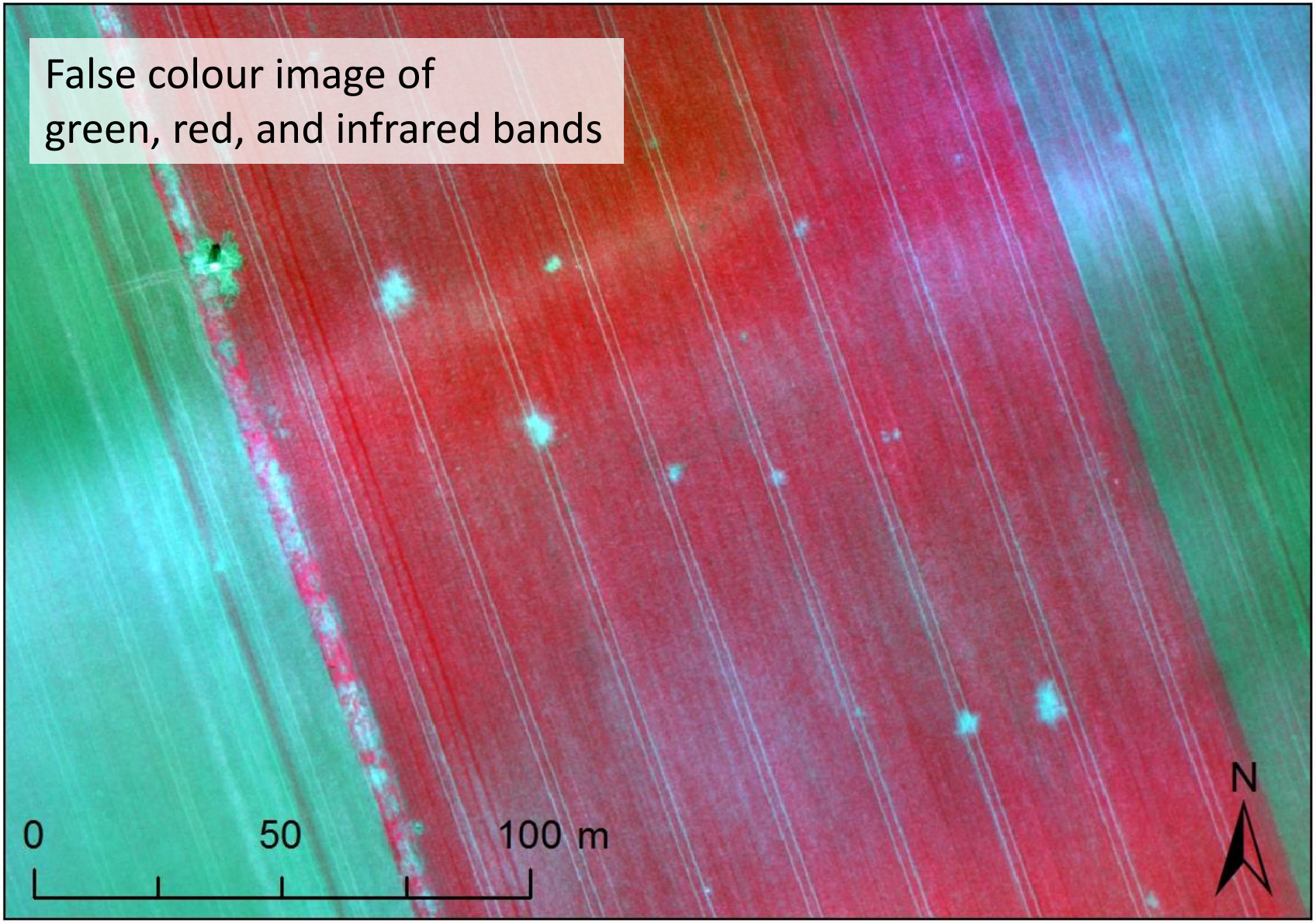

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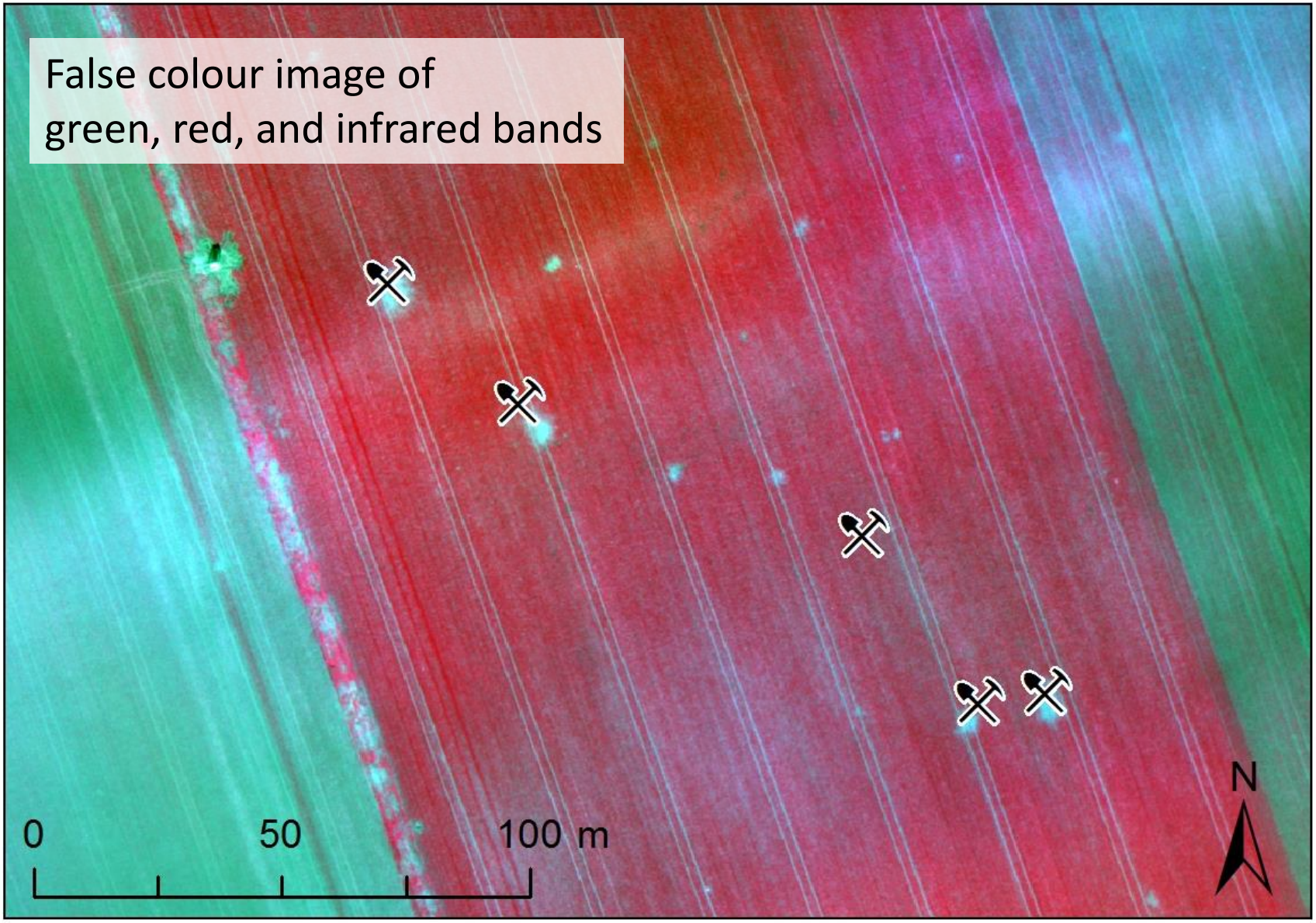
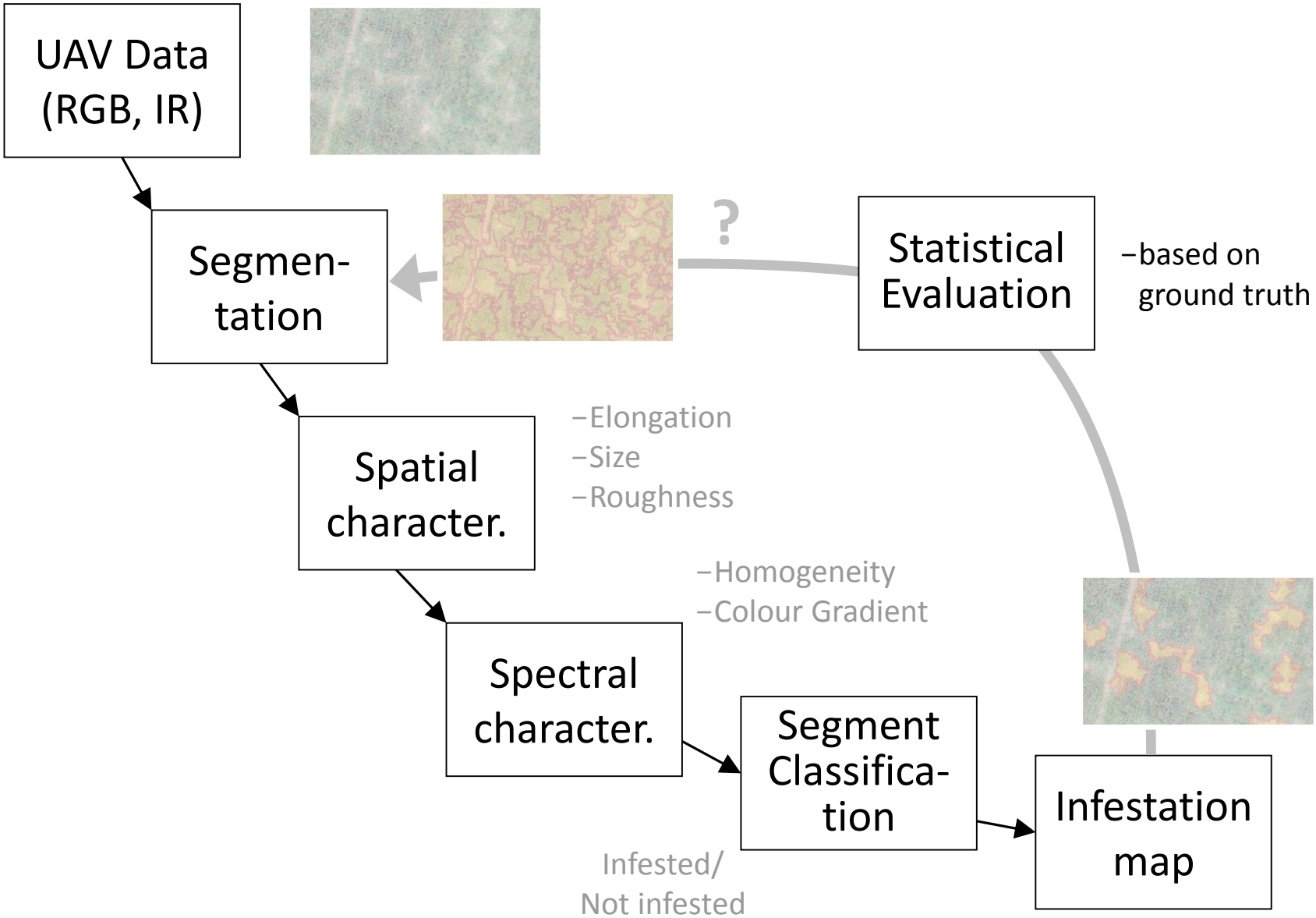


# Data analysis



# Evaluation

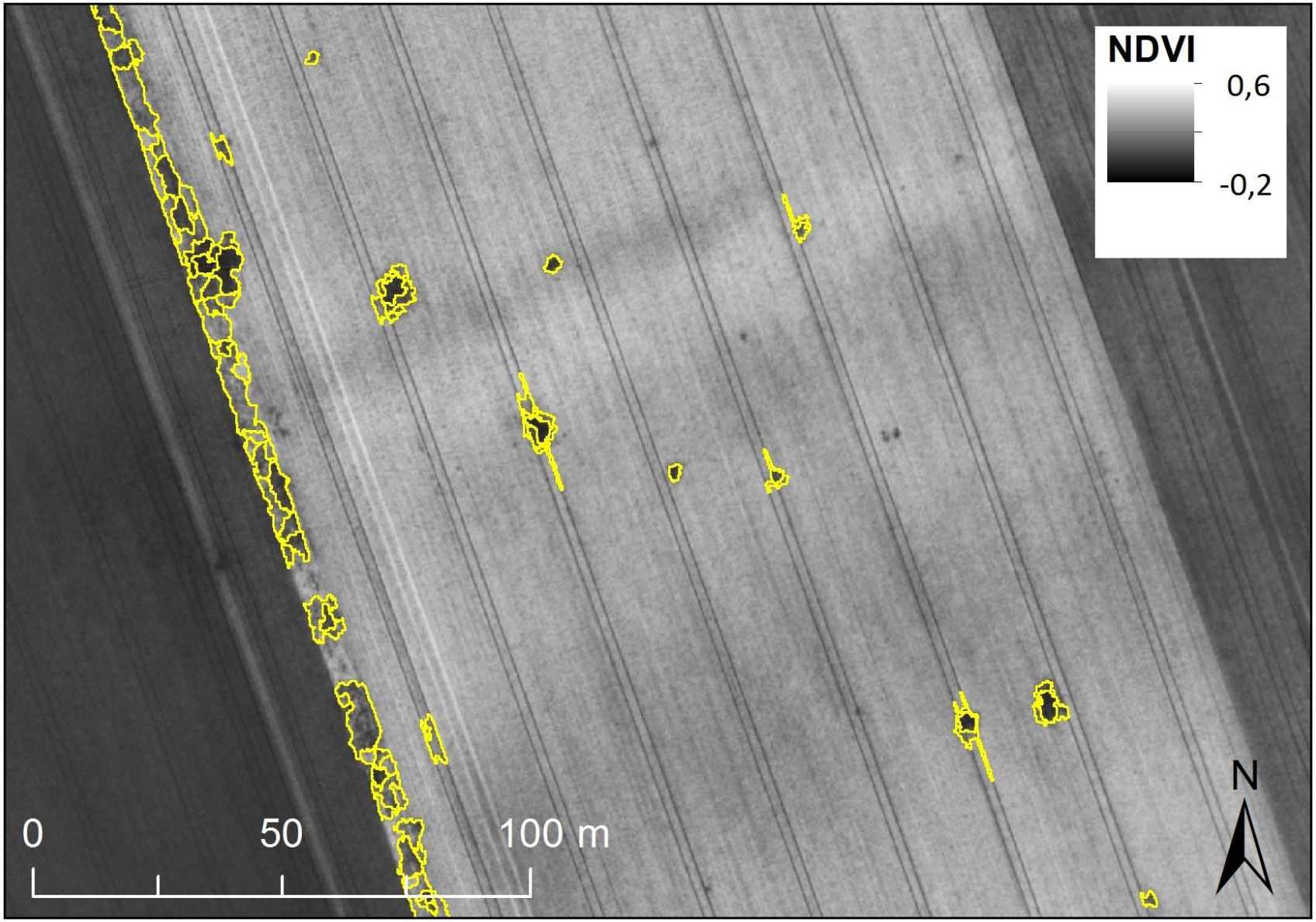
Binary model output – healthy or infested crop

→ Confusion matrix

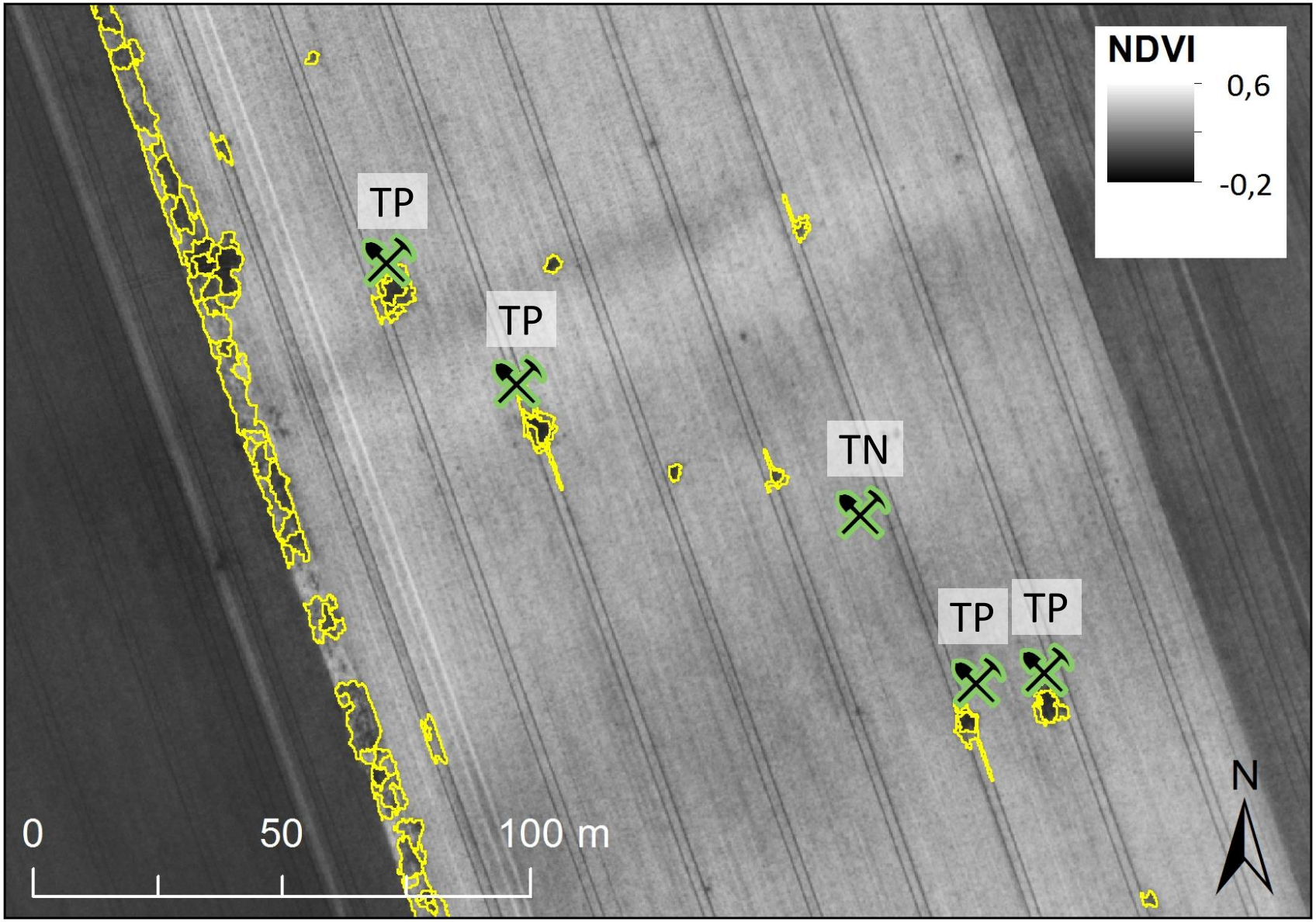
| | Condition + | Condition - |
|---|---|---|
| Prediction + | true positive (TP) | false positive (FP) |
| Prediction - | false negative (FN) | true negative (TN) |

… sensitivity, specificity, precision etc.

# Evaluation



# Evaluation



# Outlook

- Additional sampling in growing seasons 2017/2018 and 2018/2019
- Completion of field mice algorithm
- Development of yellow rust algorithm with inclusion of ontogeny & yellow rust model
- Implementation as service on www.ISIP.de

# Thanks for your attention!

## Partners:

RheinlandPfalz
DIENSTLEISTUNGSZENTRUM LÄNDLICHER RAUM RHEINHESSEN-NAHE-HUNSRÜCK

SACHSEN-ANHALT
Landesanstalt für Landwirtschaft und Gartenbau

isip
wissen wie's wächst

Luftfotos 24
www.luftfotos24.de ..Ihre Adresse für luftige Bilder

agrosat

JKI
Julius Kühn-Institut

## Funding:

Bundesministerium für Ernährung und Landwirtschaft

ptble
Projektträger Bundesanstalt für Landwirtschaft und Ernährung

aufgrund eines Beschlusses des Deutschen Bundestages