



Potential of selective harvest based on mycotoxins content assessment in cereal crops

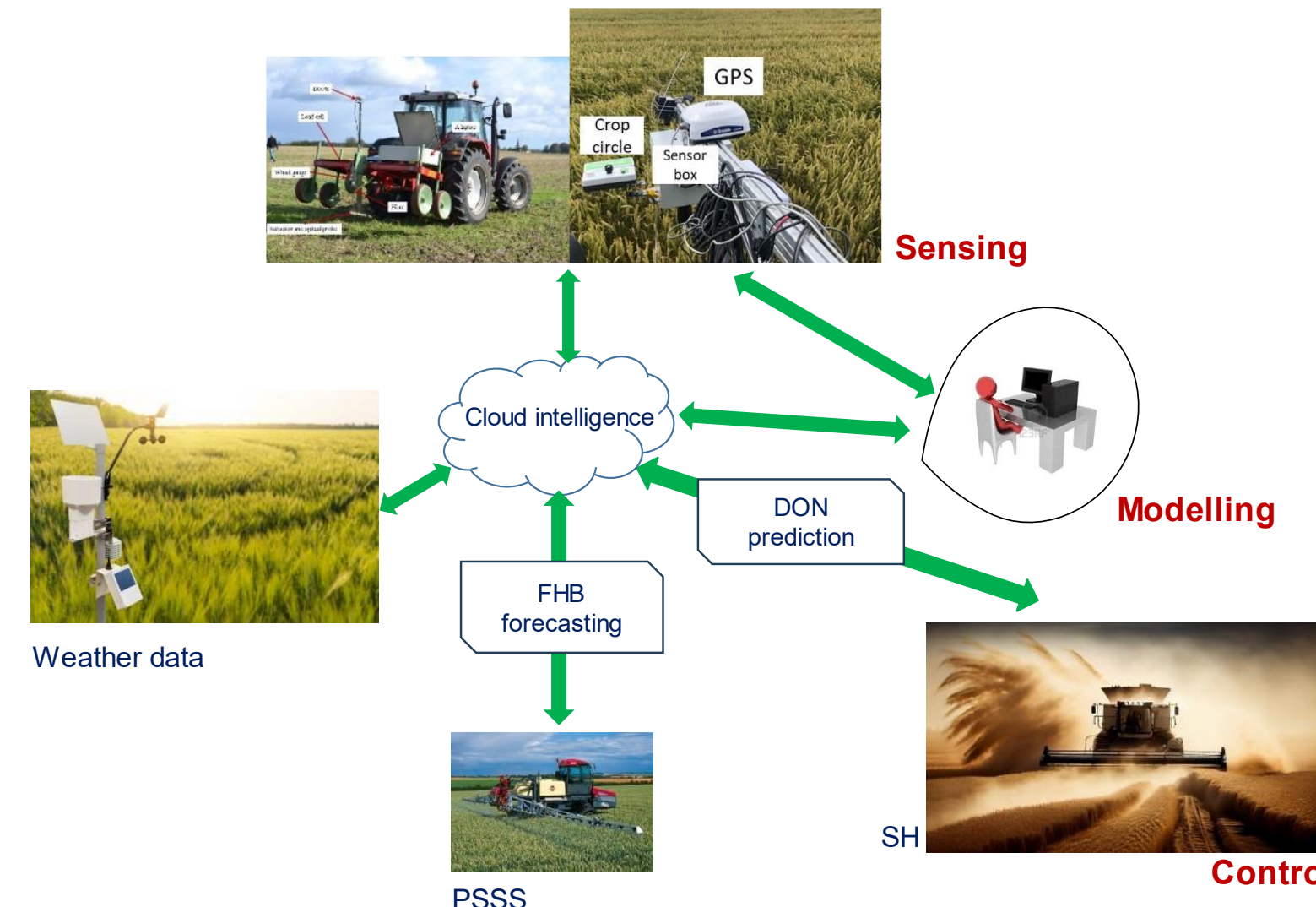
Introduction

The aim of the project is to develop a multi-sensor, data fusion approach for the detection and forecasting of the spatial distribution of *Fusarium* Head Blight (FHB) and Deoxynivalenol (DON) mycotoxin contamination in barley and wheat.

Preventive site specific spraying (PSSS) of fungicides and selective harvest (SH) are proposed to minimize *Fusarium* risks and mycotoxin contamination in wheat and barley grains.

RESEARCH QUESTION

Can Precision Agriculture help to minimize the contamination of mycotoxins in cereals?

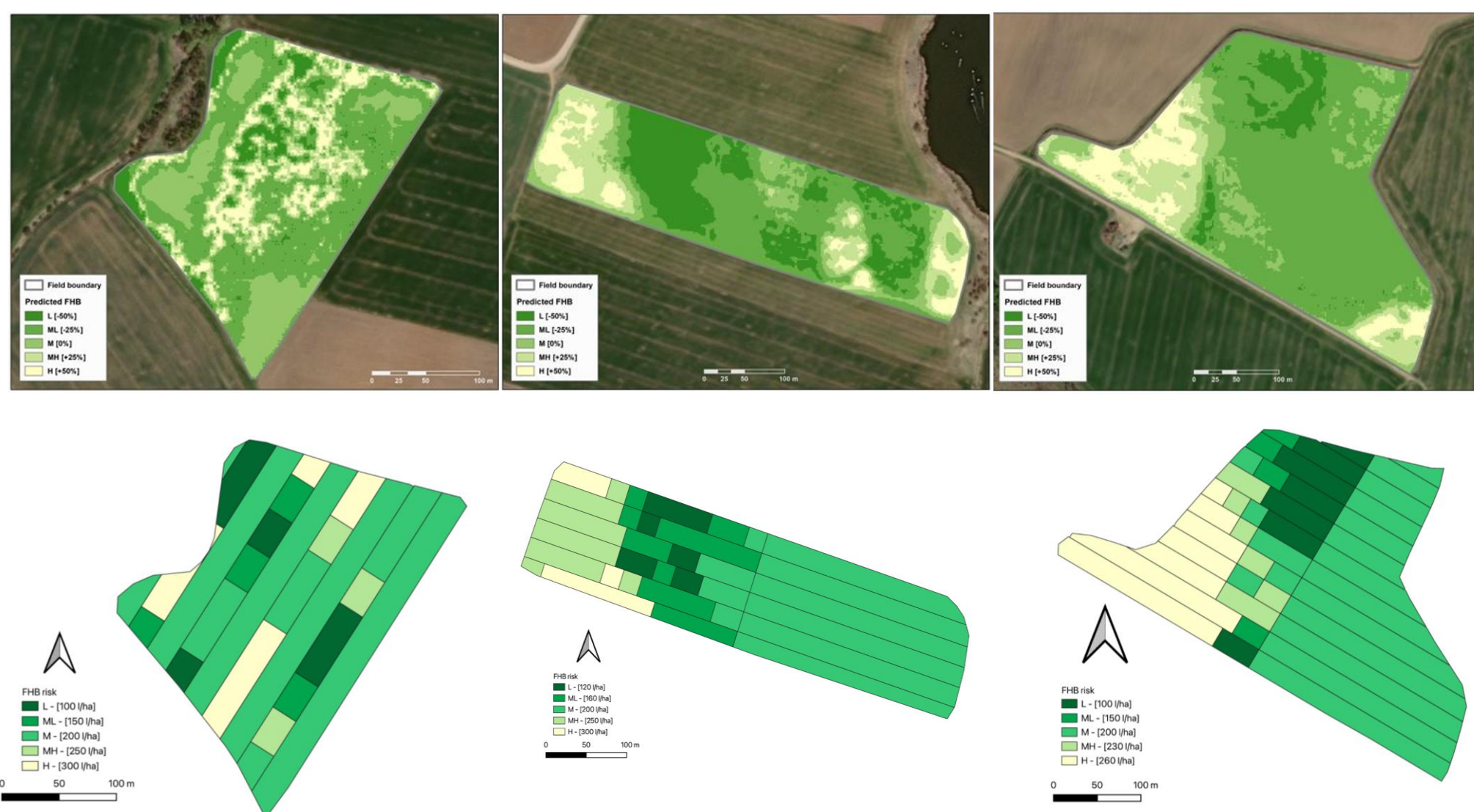


MAIN OBJECTIVES

- To collect data on soil, crop, topography and microclimate conditions,
- To map the spatial variability of key attributes including FHB and mycotoxin,
- To develop recommendations for PSSS and SH using data fusion modelling,
- To provide optimal route planning for combine harvesters to perform SH,
- To assess socio-economic, environmental and agronomic impacts and adoption potential of the proposed approach, and
- To communicate with key stakeholder groups to promote adoption of the combined solution.

RESULTS & POTENTIAL IMPACT

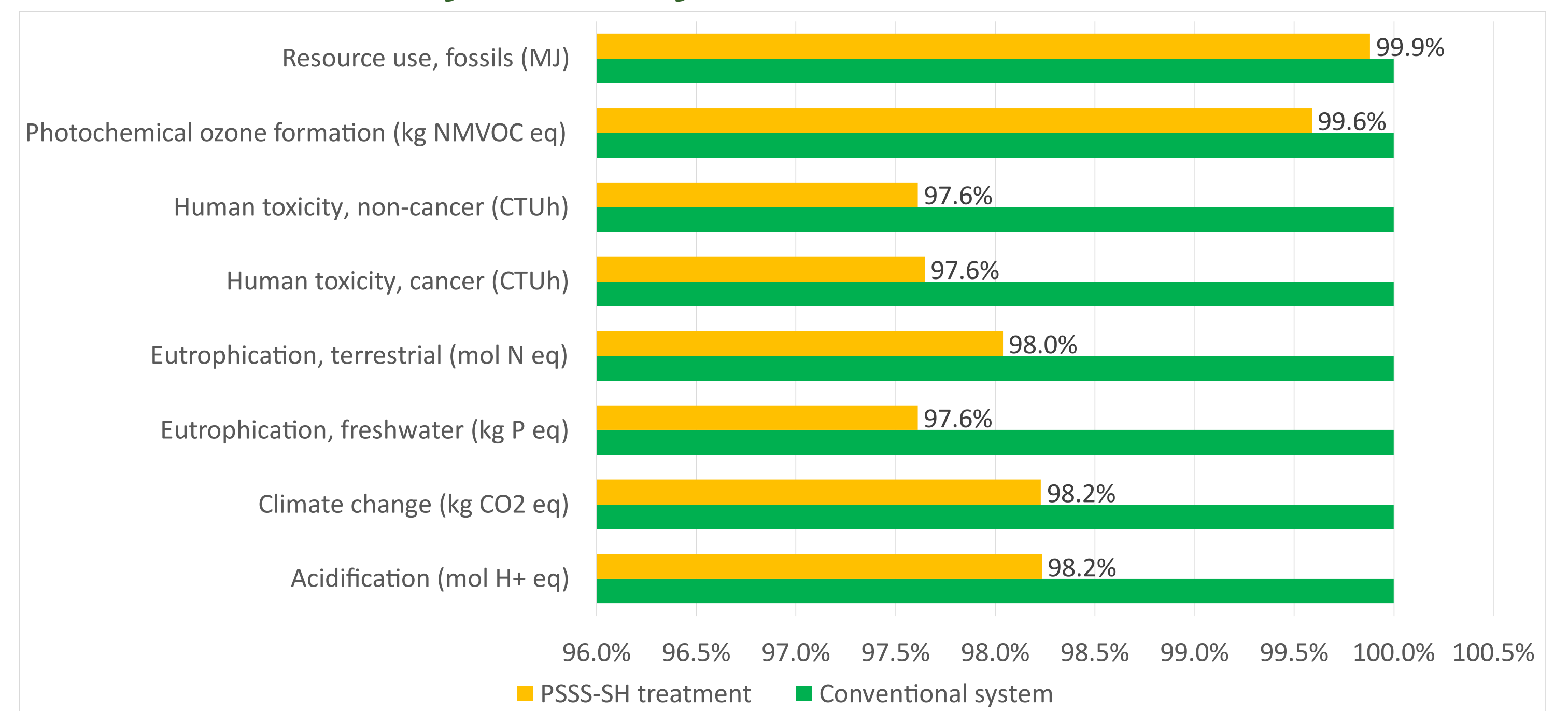
Fusarium forecasted & PSSS treatments maps



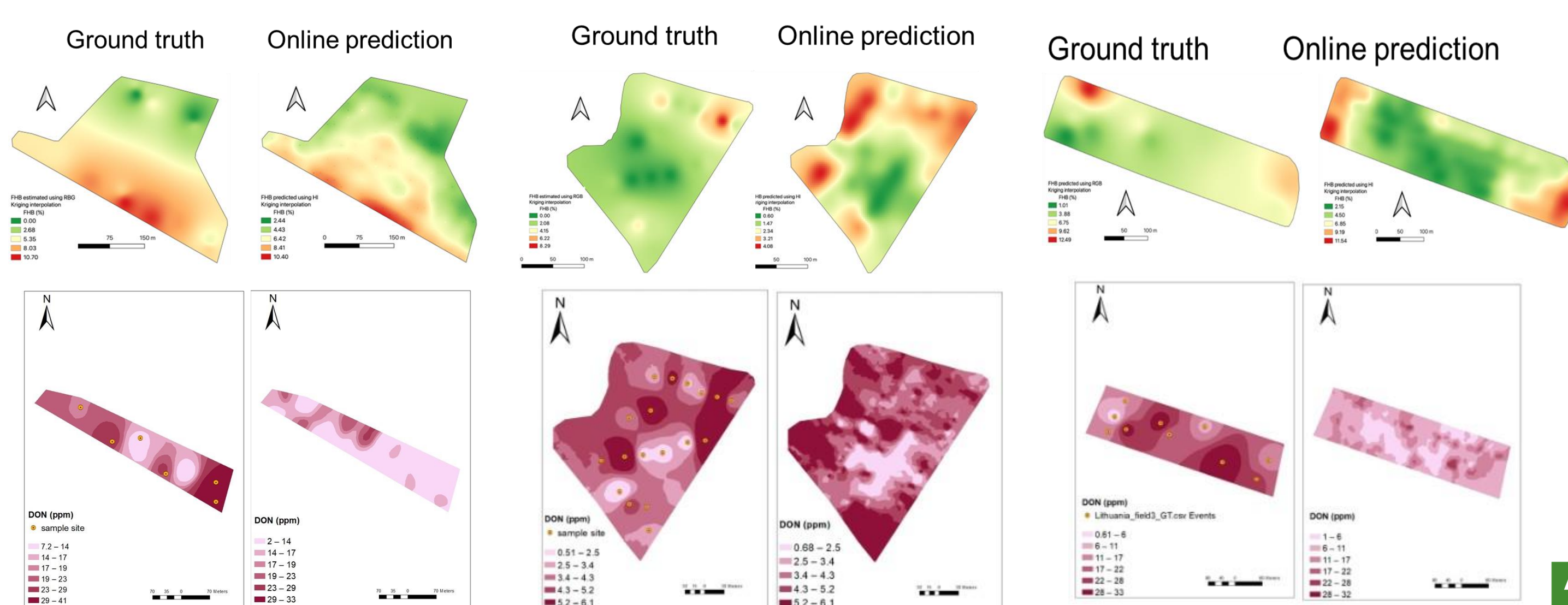
Gross-margin analysis of PSSS

	Field 1					Field 2					Field 3				
	Total area (ha)	Fungicide cost (€/ha)	yield (t/ha)	Revenue (€/ha)	Gross margin (€/ha)	Total area (ha)	Fungicide cost (€/ha)	yield (t/ha)	Revenue (€/ha)	Gross margin (€/ha)	Total area (ha)	Fungicide cost (€/ha)	yield (t/ha)	Revenue (€/ha)	Gross margin (€/ha)
UR	2.58	25	7.47	1755.1	1730.1	4.80	25	8.58	2016.4	1991.4	3.80	25.00	7.15	1679.2	1654.2
VR	2.34	25.08	7.26	1706.2	1681.1	4.37	24.9	8.94	2100.4	2075.5	3.82	25.42	7.57	1780	1754.6

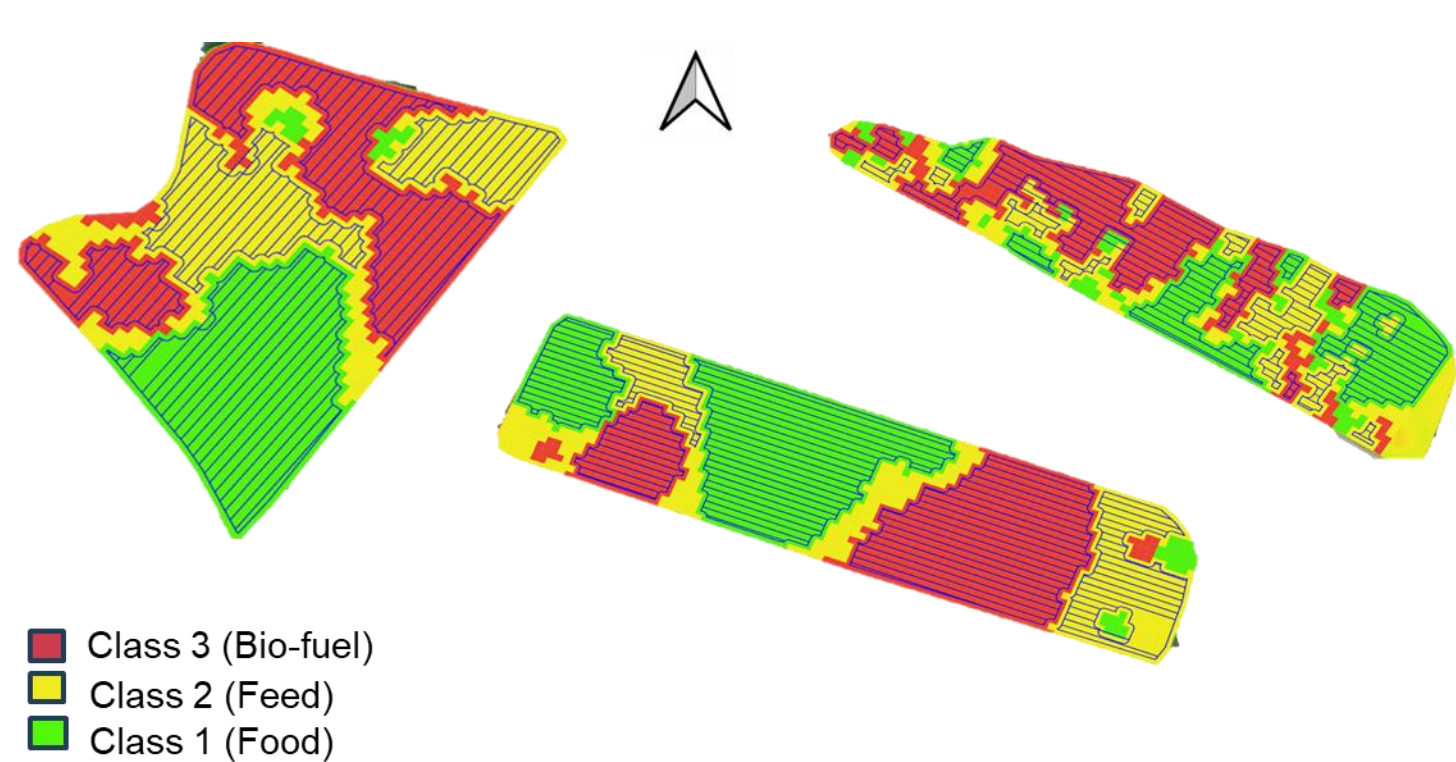
Life Cycle Analysis for PSSS-SH solution



Prediction and mapping of FHB and DON in three fields in Lithuania

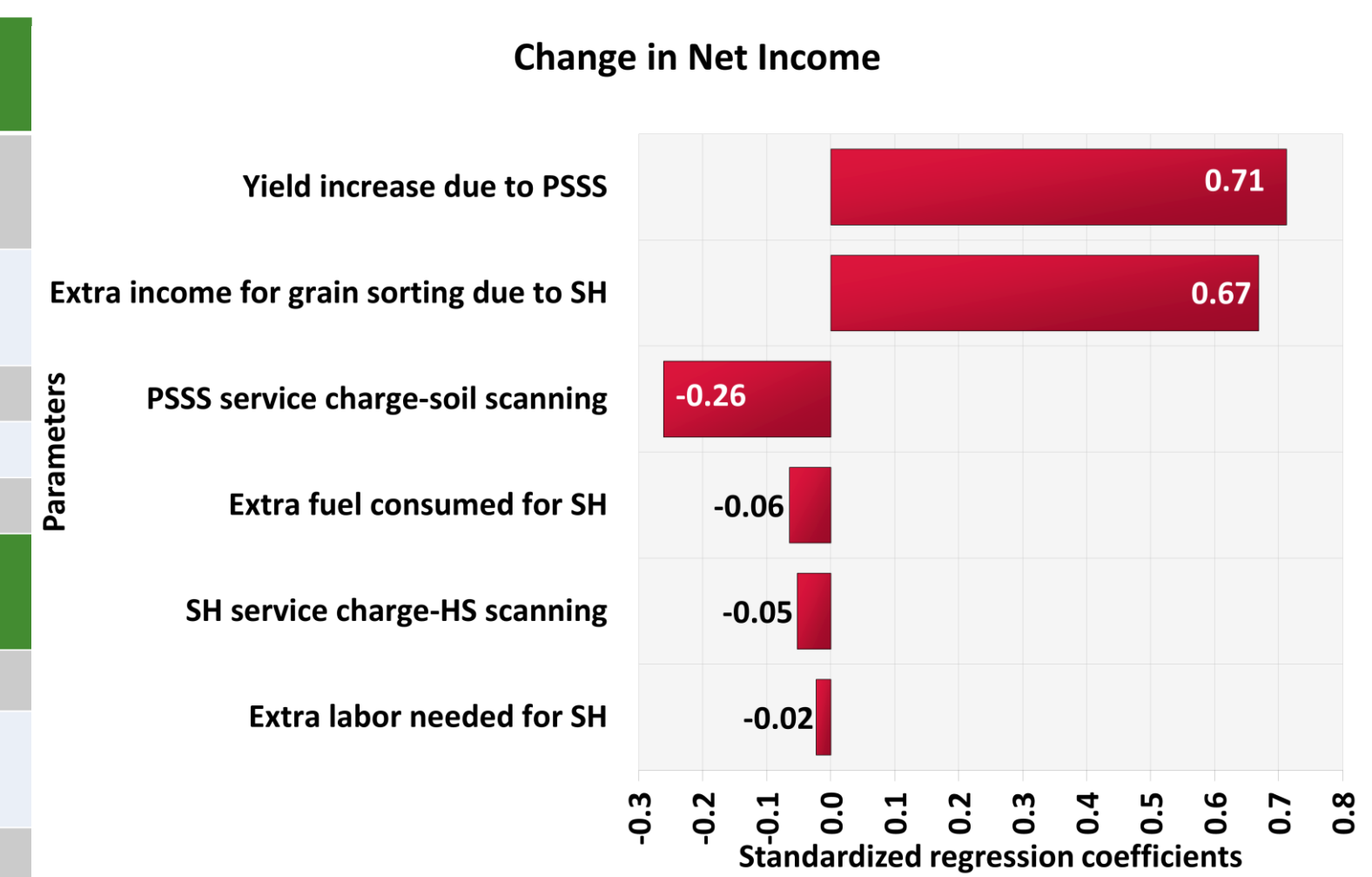


Route planning maps for SH based on DON level



Cost-benefit analysis of PSSS-SH technology

Added income due to change	Value (€)	Added costs due to change	Value (€)
Yield increase due to PSSS	68	PSSS service charge-soil scanning	25
Extra income for grain sorting due to SH	64	SH service charge-HS scanning	5
		Extra labor cost for SH	2
		Extra fuel cost for SH	6
Total added income	132(20)	Total added cost	38(2)
Reduced costs due to change	Value (€)	Reduced income due to change	Value (€)
Total reduced cost	0(0)	Total reduced income	0(0)
Increase in net income	132(30)	Decrease in net income	38(2)
Change in net income	94(20)		



CONCLUSIONS & POTENTIAL IMPACT

- The hyperspectral camera exhibits a strong predictive capability, accurately determining FHB severity with an accuracy exceeding 81%.
- The prediction of DON concentration from the FHB percentage is not only feasible but also reliable, with an acceptable accuracy of 71%.
- Importantly, our study proves the feasibility of mapping the distribution of FHB severity and its corresponding DON mycotoxin across the field.

Economic impacts

- PSSS is a promising approach, offering a 5% increase in net profit compared to uniform rate fungicide application.
- Adopting the PSSS-SH integrated solution results in a net income of €132 /ha/yr.

Environmental impacts

- Reducing fungicides applied into the soil, ground, and surface water resources by 2% compared to the conventional method.

Societal impacts

- Securing clean of mycotoxin-contaminated grains will reduce the risk to human health, leading to a better food safety

