

Agro-economic performances of cropping systems with low use of pesticides

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CHAMBRE D'AGRICULTURE BRETAGNE

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Context

The recognized impacts of phytosanitary products on human and ecosystems health call for a deep modification of cropping systems. In Brittany, cropping systems are mainly aimed at providing animal feed. If the breeding of ruminants allows the valorization of fodder and therefore the presence of perennial crops in rotations, this is not the case with the breeding of monogastric animals. In these systems, reducing the use of pesticides is challenged by the difficulty of controlling weeds in rotations composed solely of annual crops.

Objective

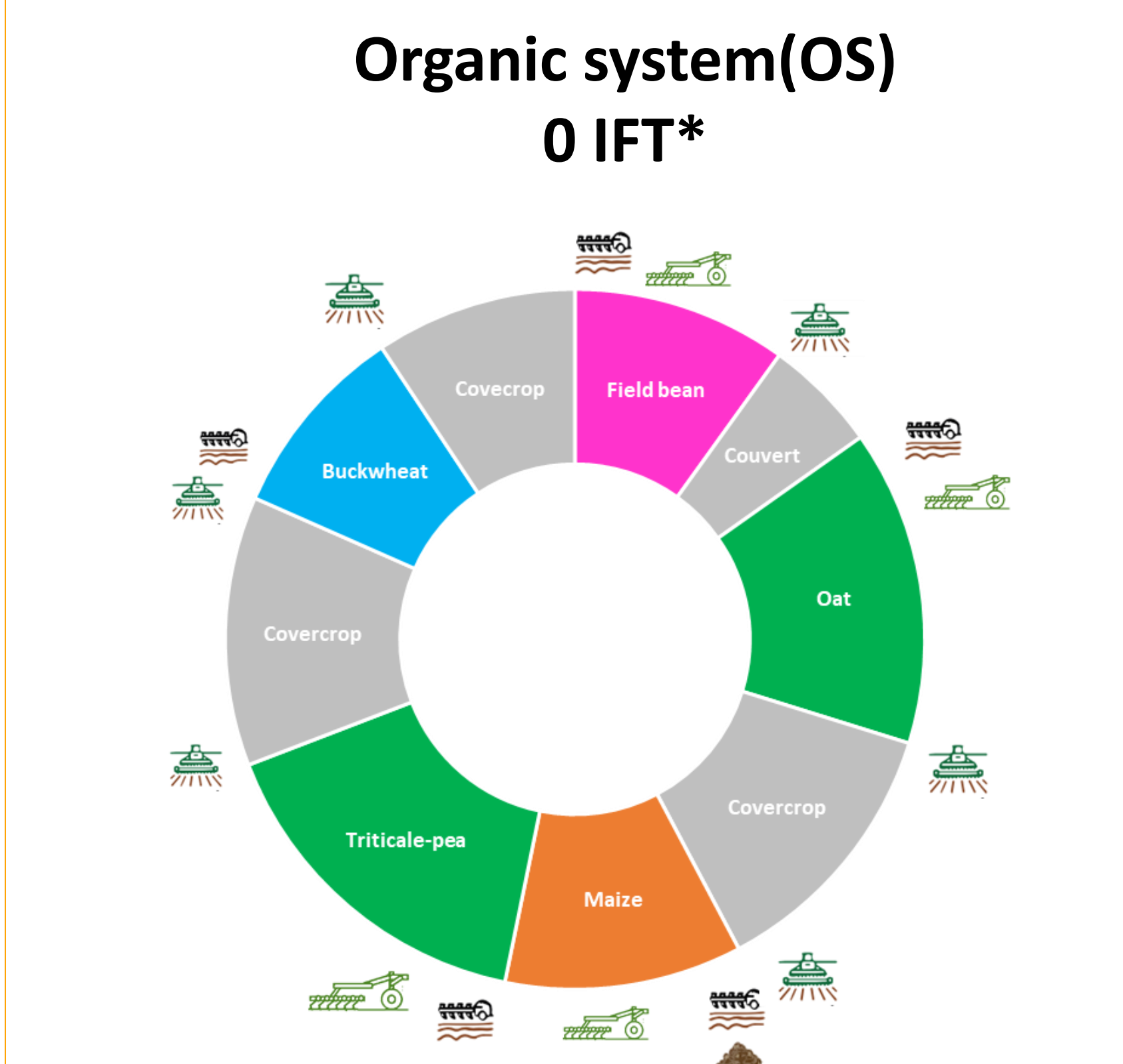
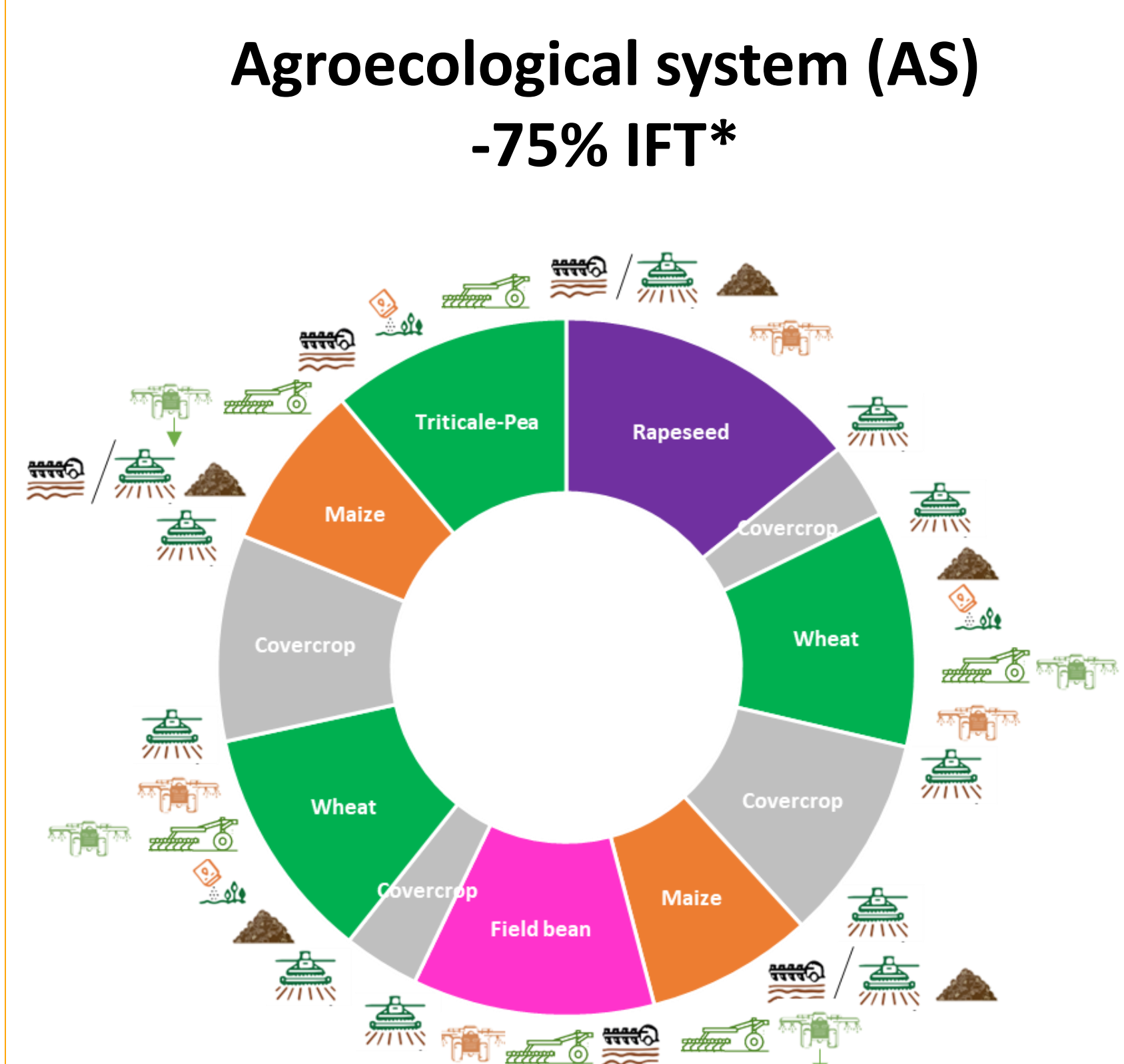
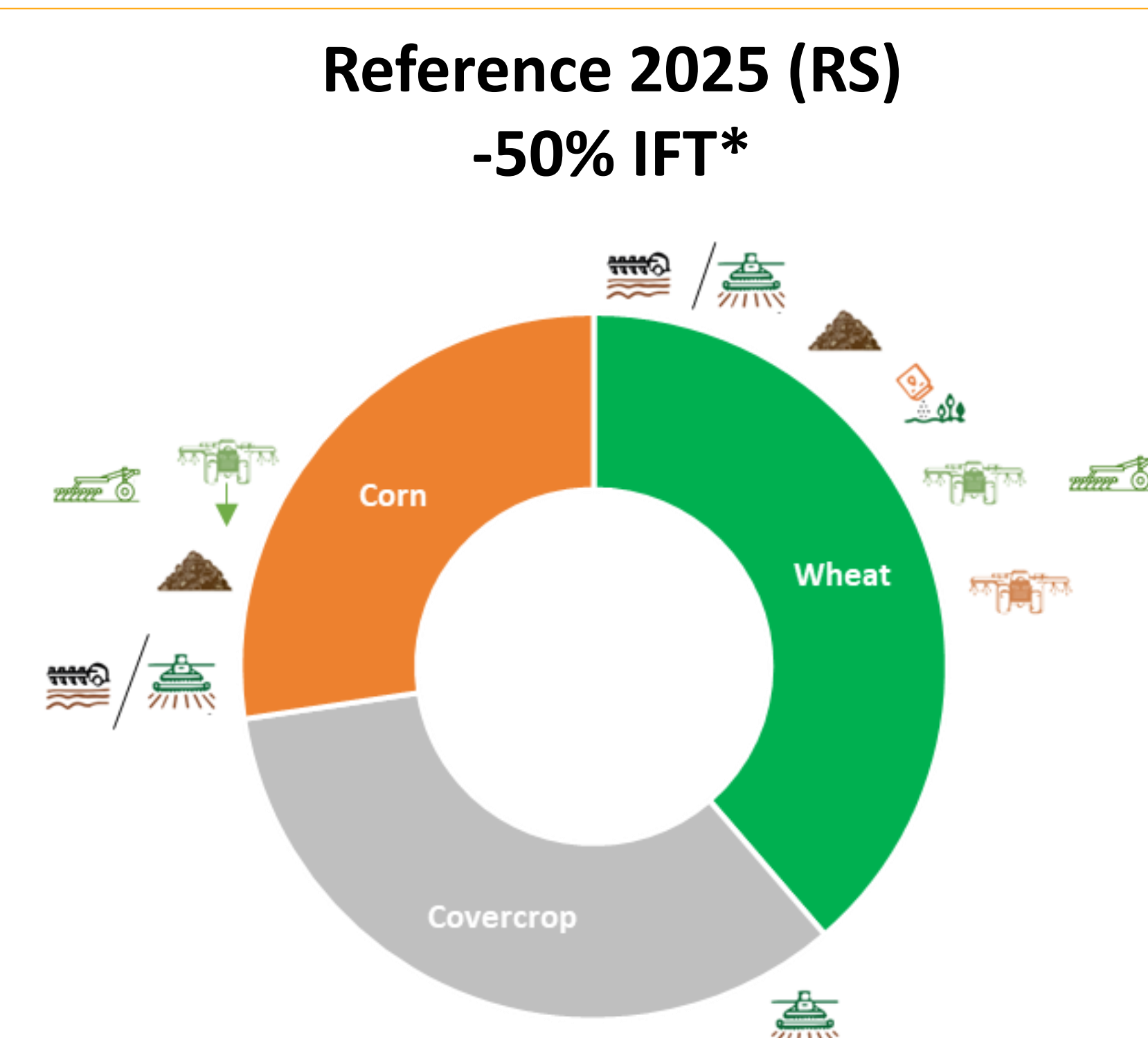
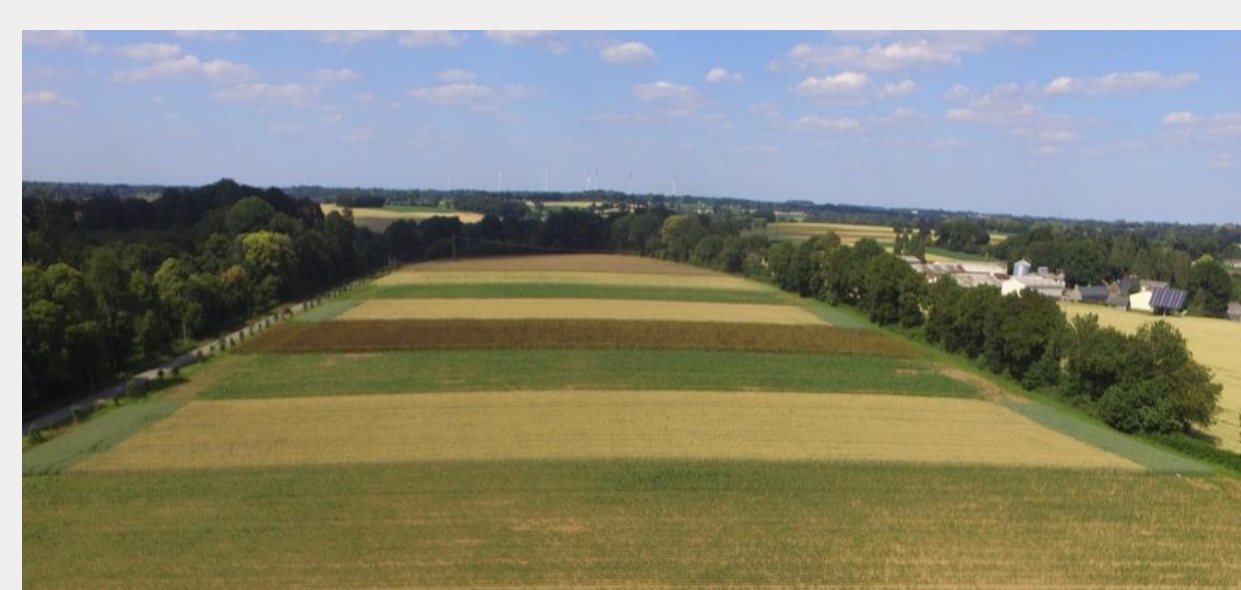
Design, test and evaluate the performances of three cropping systems with little or no use of pesticides

Systems tested

- Crop rotations were designed to provide feed to pig or poultry farming.
- Pest management strategies and associated decision rules were co-constructed in workshops organized regularly during the first two years of the project, gathering stakeholders from varied backgrounds (INRAE, technical institutes, farmers...).

Experimental design

- Cropping systems were tested from 2018 to 2023.
- The three systems were implemented at the Kerguéhennec experimental station, in the center of Morbihan, France. All crops were present each year.
- The systems were monitored for 5 growing seasons. The data collected concerned (i) the technical itineraries, recorded under Systerre® tool; (ii) crop yield components, (iii) crop health status, (iv) weed density and biomass.
- The systems were evaluated on their agronomic, economic and working time performances through indicators provided by Systerre. Prices used in the evaluation scenario were fixed from one year to another, based on the average prices of the past 10 years.



* Treatment Frequency Index. Reduction compared to the Breton average IFT of a corn-wheat rotation

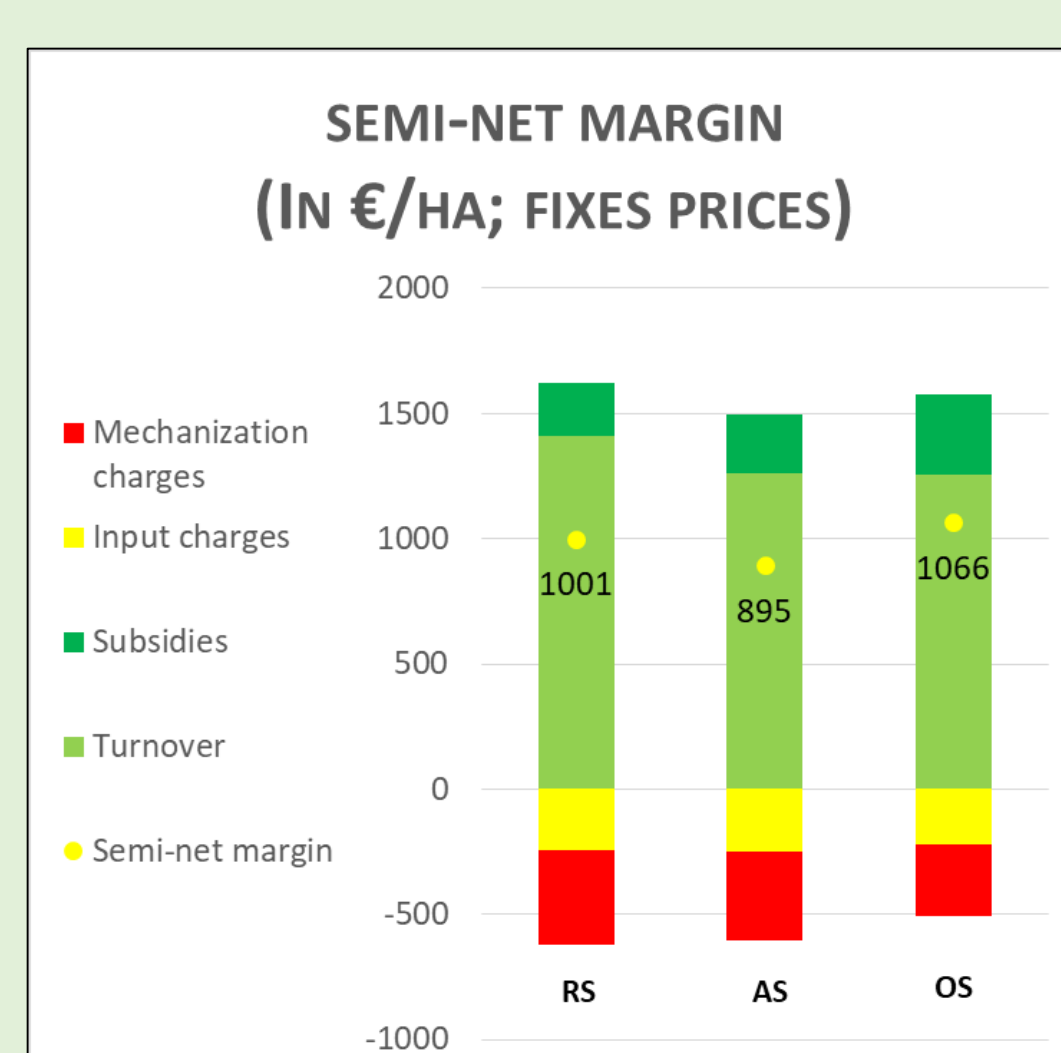
Agonomic performances

		Wheat	Corn	Triticale-pea	Fava bean	Rapeseed	Buckwheat	Oat
Average yield (qx/ha)	RS	75±13	98±9					
	AS	81±12	99±14	53±13	33±8	40±5		
	OS		76±10	30±4	23±14		12±10	33±12
Target yield achieved (frequency)	RS	2/5	4/5					
	AS	3/5	4/5	2/5	2/5	5/5		
	OS		4/5	2/5	2/5		2/5	4/5

- Protein crops had variable yields
- In AS, wheat benefited from favorable previous crops
- Weed control was satisfactory in AS and RS, satisfactory for annuals but very unsatisfactory for perennials in OS

Economic performances

System	Semi-net margin (€/ha, average 2019-2023)
RS	1001 ± 138€
AS	895 ± 96 €
OS	1066 ± 187 €



- Significant year variations due to yield differences / climatic conditions
- Reduced charges in OS

Workload

System	Average workload (in h/ha, 2020-2023)
RS	7h36
AS	6h44
OS	6h29

- Similar workloads in OS and AS
- Working time is increased by 1 hour on average in RS
- Work schedule is very different from one system to another, with work peaks more pronounced in RS

Conclusion

- **“No system is perfect”**: in the present socio-economic context, compromises have to be found when reducing use of pesticides, either on workload or economic performances.
- AS is very promising, it achieves good yields and a satisfying weed control despite an important reduction of the use of pesticides; however, low prices of pulses lead to a deteriorate semi-net margin compared to RS
- OS is a very performant system regarding economic performances and workload in the evaluation scenario used in this study. However, the present context of prices in organic production is a concern for the future of this system.
- Special attention has to be paid to perennial weed management, which is particularly challenging in rotations based only on annual crops.

