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Modelling crop-weed canopies as a tool to optimise crop diversification in agroecological cropping systems

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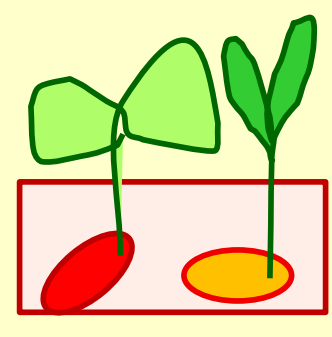
Aim Evaluate crop diversification and promote agroecological weed management

Method Mechanistic modelling to synthesize knowledge and simulate plant-plant interactions in agroecosystems

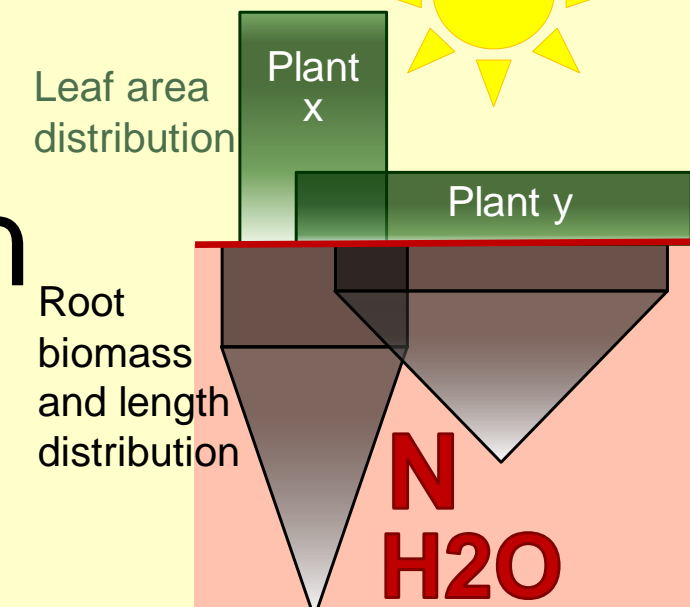
Synthesize knowledge on the effects of crop diversification in a 3D individual-based model

Key modelling points

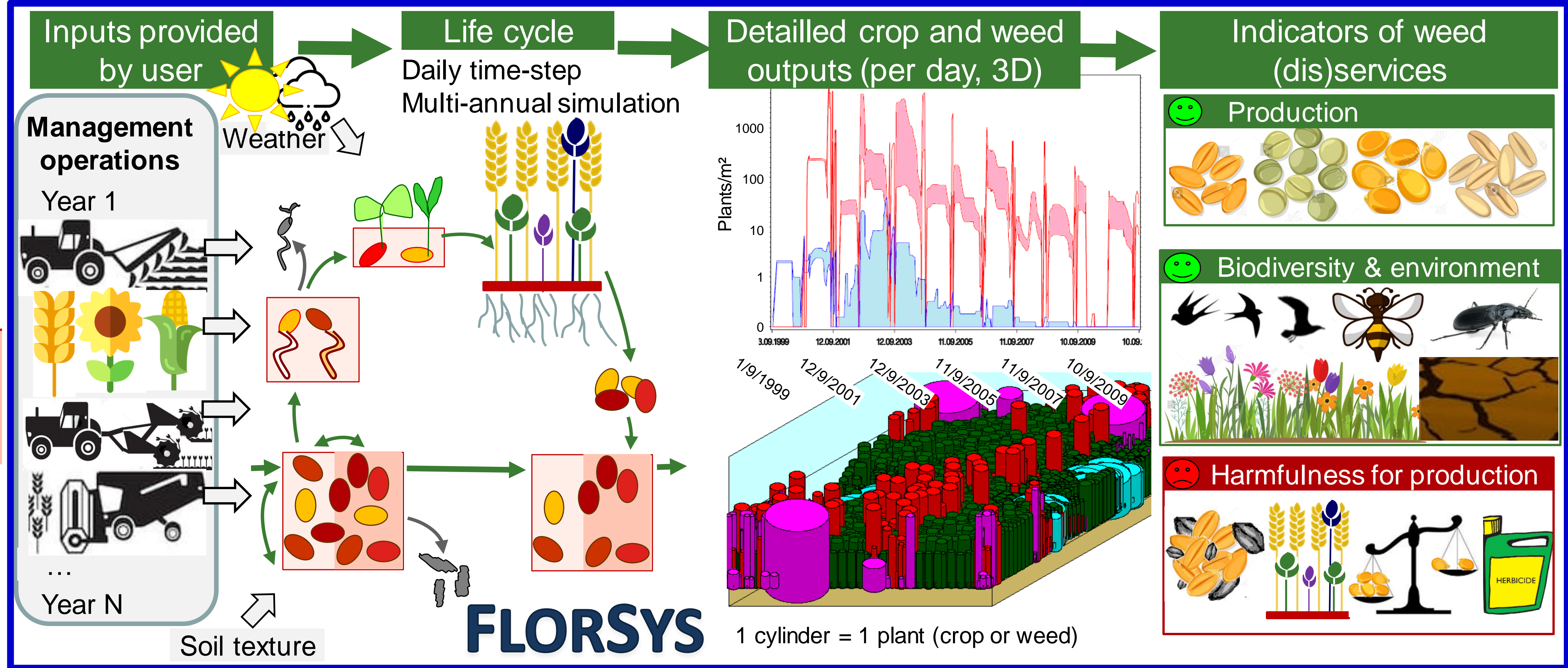
Emergence = f(ecological needs, season)



Plant-plant competition for resources

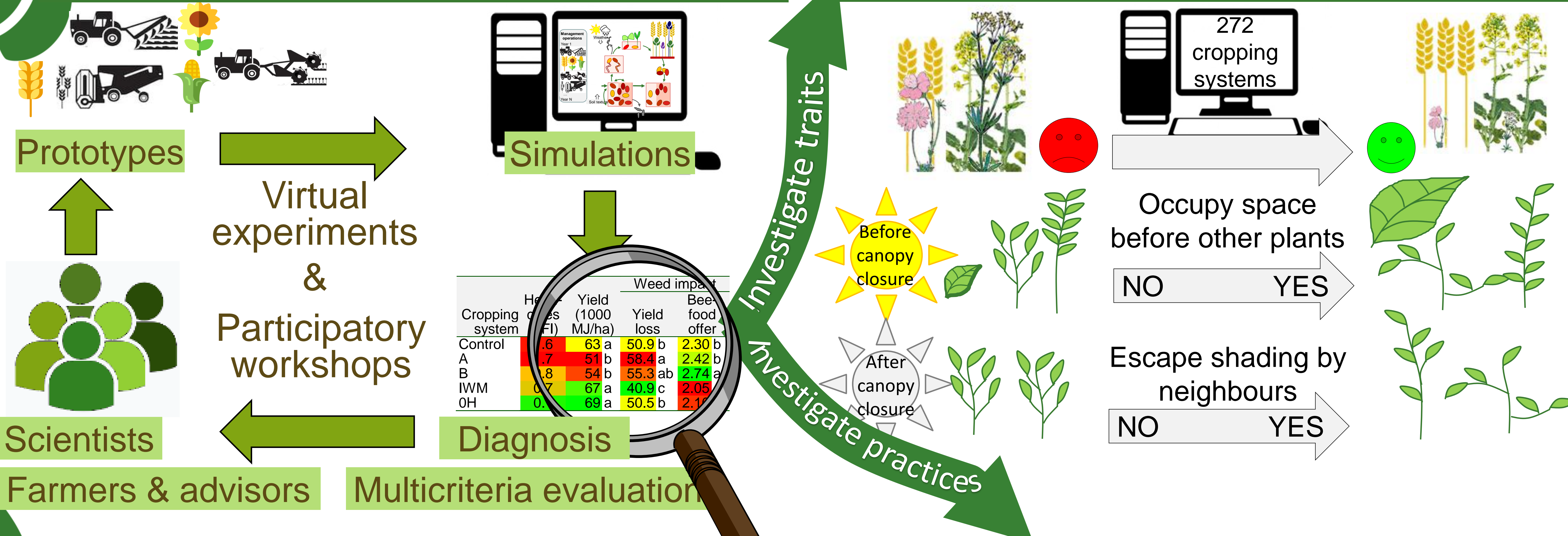


Soil legacy for future crops



A tool to investigate & promote diversification

Crop traits to regulate weed harmfulness



Diversifying crops allows to reduce herbicide use intensity

Cropping system	Crop diversity			Plough	Mechanical weeding	Herbicides (TFI)	Yield (1000 MJ/ha)	Weed impact	
	Species & varieties / 12 years	Winter crops	Cover crop (%)					Yield loss	Bee food offer
Conventional	4	100%	8%	Yes	No	1.6	63 a	50.9 b	2.30 b
IWM simplified	18	77%	39%	No	No	1.7	51 b	58.4 a	2.42 b
IWM medium	10	63%	8%	Yes	No	0.8	54 b	55.3 ab	2.74 a
IWM complete	8	55%	0%	Yes	Yes	0.7	67 a	40.9 c	2.05 c
IWM ~ 0 herbicide	12	63%	16%	Yes	Yes	0.1	69 a	50.5 b	2.10 c

Systems with the highest crop diversification = highest yield and lowest herbicide use

Diversifying crops is not enough to promote weed-based biodiversity (e.g. bee food)

Diversifying crops is not enough to control weeds and ensure crop production

What next...

Ergonomic tools

Colas et al 2020 EJA

Participatory workshops
Easier use by farmers & advisors



www.projet-cosac.fr
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