Syppre: innovative systems to meet the challenges of improving agriculture's carbon footprint.

ESTIENNE MARIE[1], VIGUIER LOÏC[1], JAMET DOMITILLE[2], TAUVEL PAUL[3]

[1]Arvalis, [2]Terres Inovia et [3]ITB

18th Congress of the European Society for Agronomy in Rennes, France

Syppre, an unique research & development methodology

Synergy between the 3 technical institutes on arables crops in France

An original methodology based on

- An **observatory** of algricultural practices
- 5 experimental **platform**
- Farmers **network**

Syppre, an original experimental network

5 pedoclimates representative of arable farming areas in France

Places for discussion with 40 regional partners (including farmers)

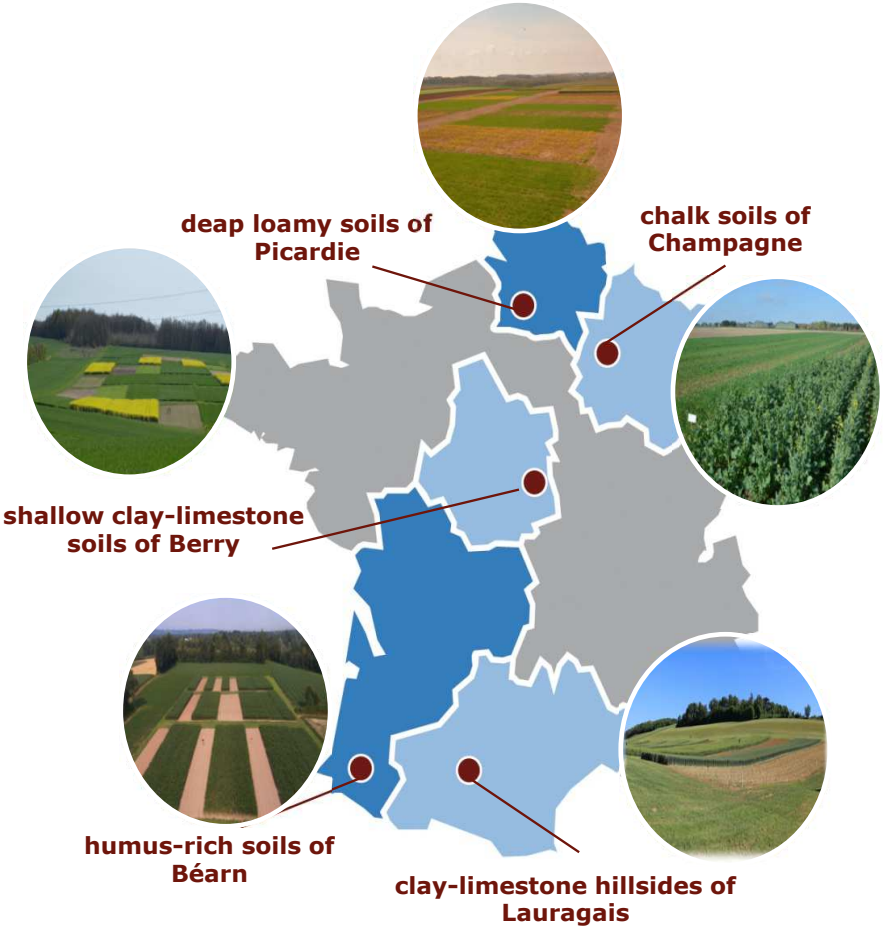
taking account of local issues

Plots from 3 to 10ha

All crops present every year

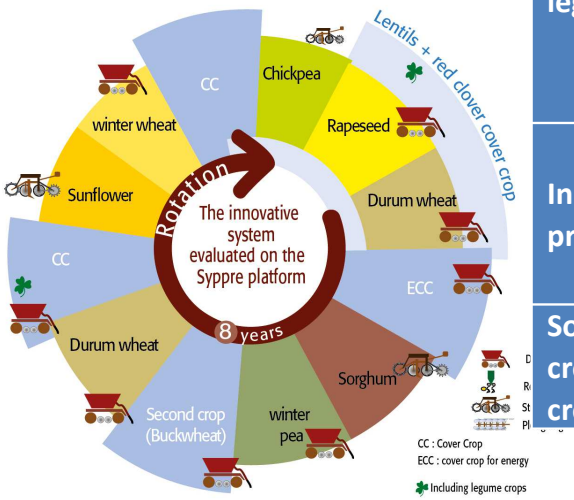
2 or 3 spatial repetitions

Multi-criteria analysis of 10 indicators calculated each year



The levers used in the systems

Levers	Expected benefits regarding carbon storage	Expected benefits regarding reduction of GHG emission	Expected benefits for achieving multi-performance
Diversifying species and lengthening rotation	Choice of species to include crops with a high residue content	Choice of species capable of recovering high nitrogen residue and limiting leaching	Better weed and pest control Reduction of climatic hazards Better alternation of botanical families, winter and spring crops to break weed cycle
Integration of legumes		Reduction in GHGs emissions linked to the reduction of mineral fertilisers inputs (reduction on fertilisers production, volatilization and leaching)	Atmospheric nitrogen fixation, lower nitrogen requirements for subsequent crops →Reduction in the amount of mineral N consumed →Reduction of input charges
Input of organic products	Effect on OM	Reduction in GHGs linked to the production of mineral fertilisers. but including GHG emissions from the storage of organic products	Improved OM rate
Soil cover with cover crops or Energy cover crops		Protection/improvement of soil structure thanks to roots and residues	The residues of the cover crops will feed the soil's biodiversity and increase the carbon storage



Mineral nitrogen input are lower in all innovative systems compared to reference: between -25% and -47%

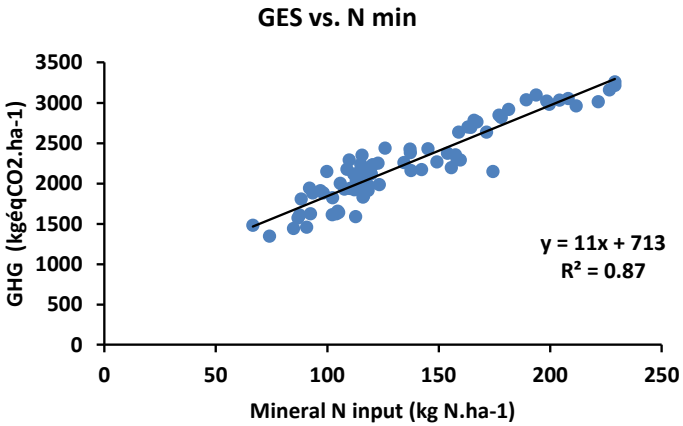
	Gap innovative/reference systems regarding mineral nitrogen inputs (average 2017-2023)
PICARDIE	-30%
CHAMPAGNE	-25%
BERRY	-32%
LAURAGAIS	-25%
BEARN- I01	-47%

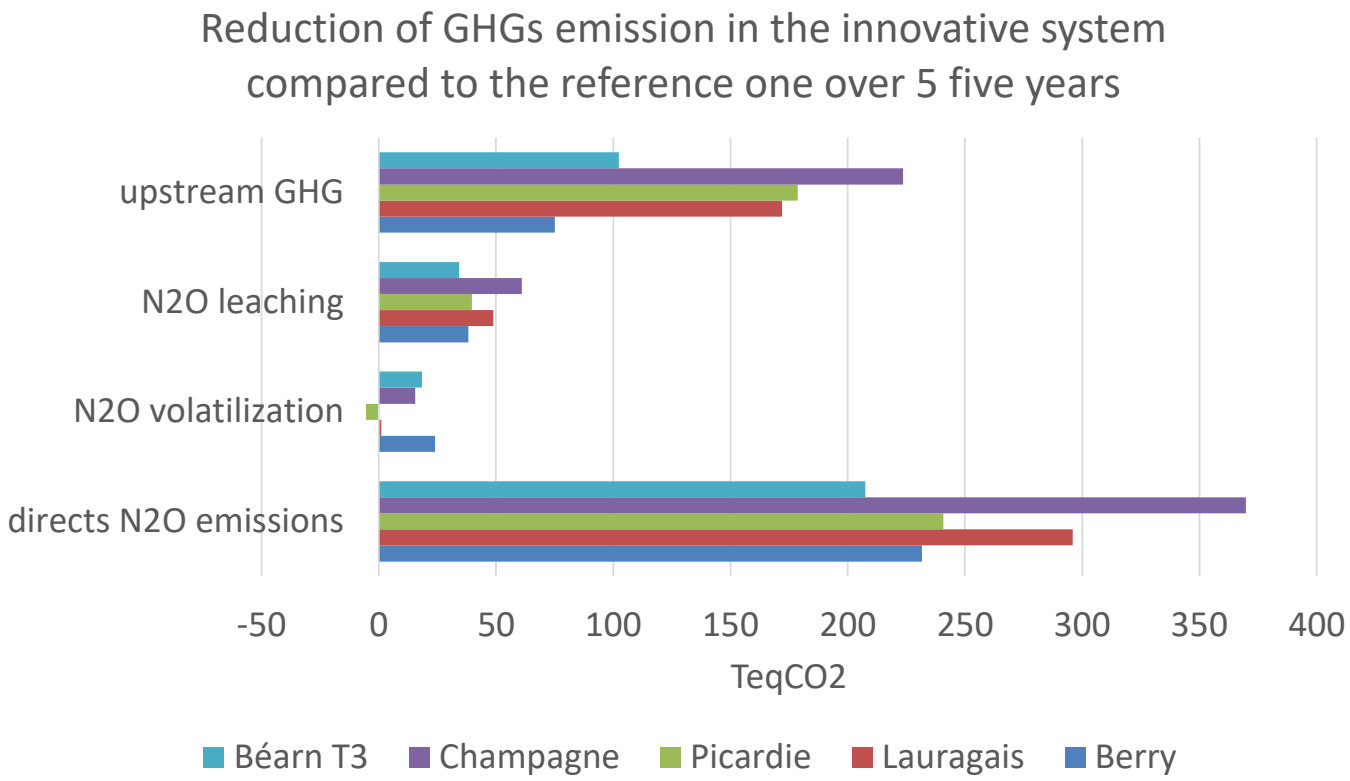
Main reasons:

1) Reducing nitrogen inputs thanks to légumes, optimization of their pre-crop effect and diversification at the system scale → dilution of nitrogen-consuming crops.

2) Reducing nitrogen inputs at the crop scale thanks to decision support tool : CHN conduite and organic fertilization when possible

GHG emissions are lower in all innovative systems

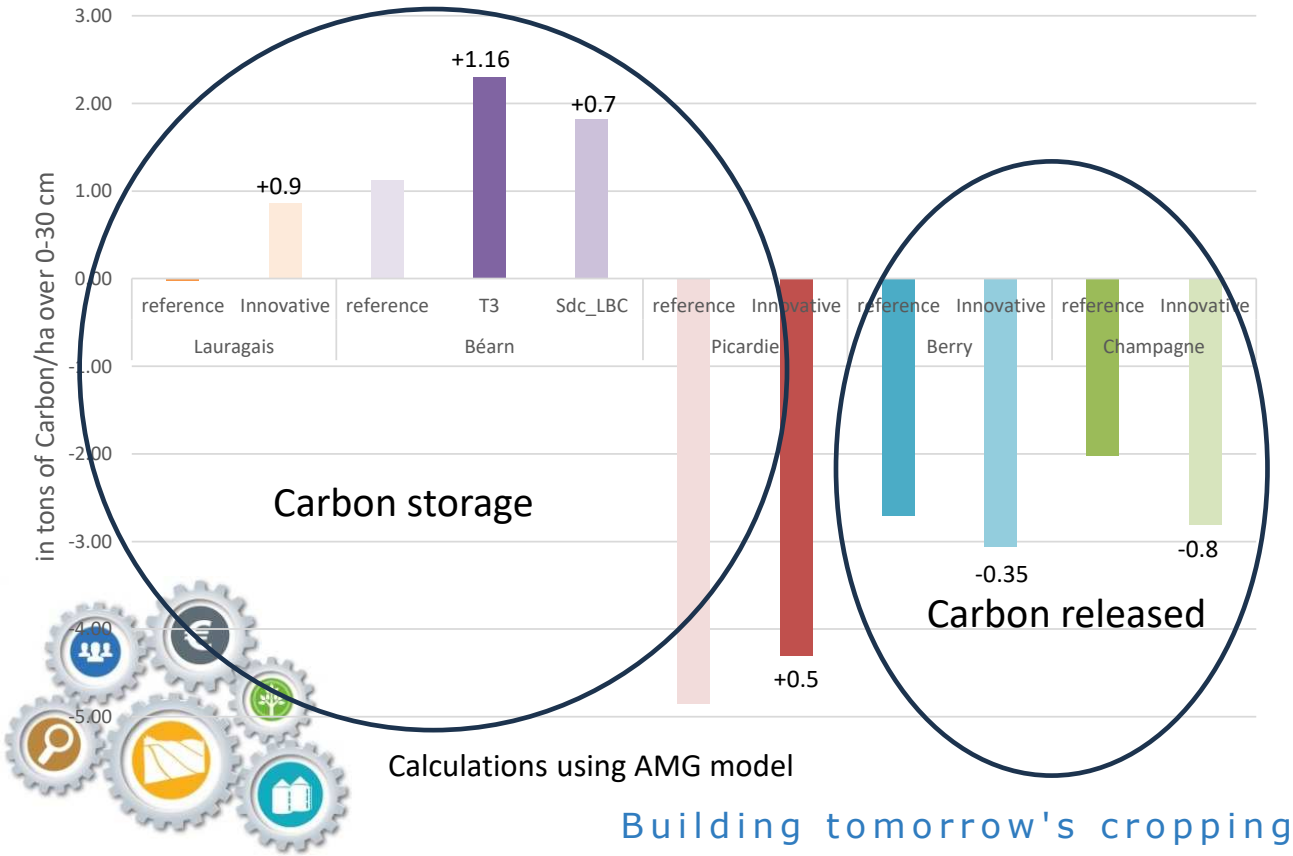




Building tomorrow's cropping systems together

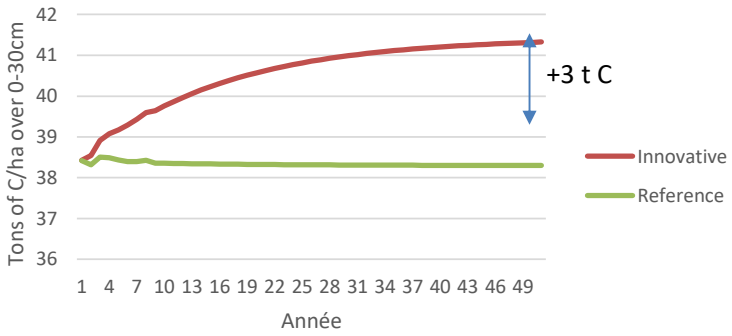
Carbon storage is improved by the innovative system in 3 of the 5 platforms

Tons of carbon/ha stored or released by innovative and reference system in **5 years**.



Calculations using AMG model

Carbon storage in Lauragais platform, in **50 years**



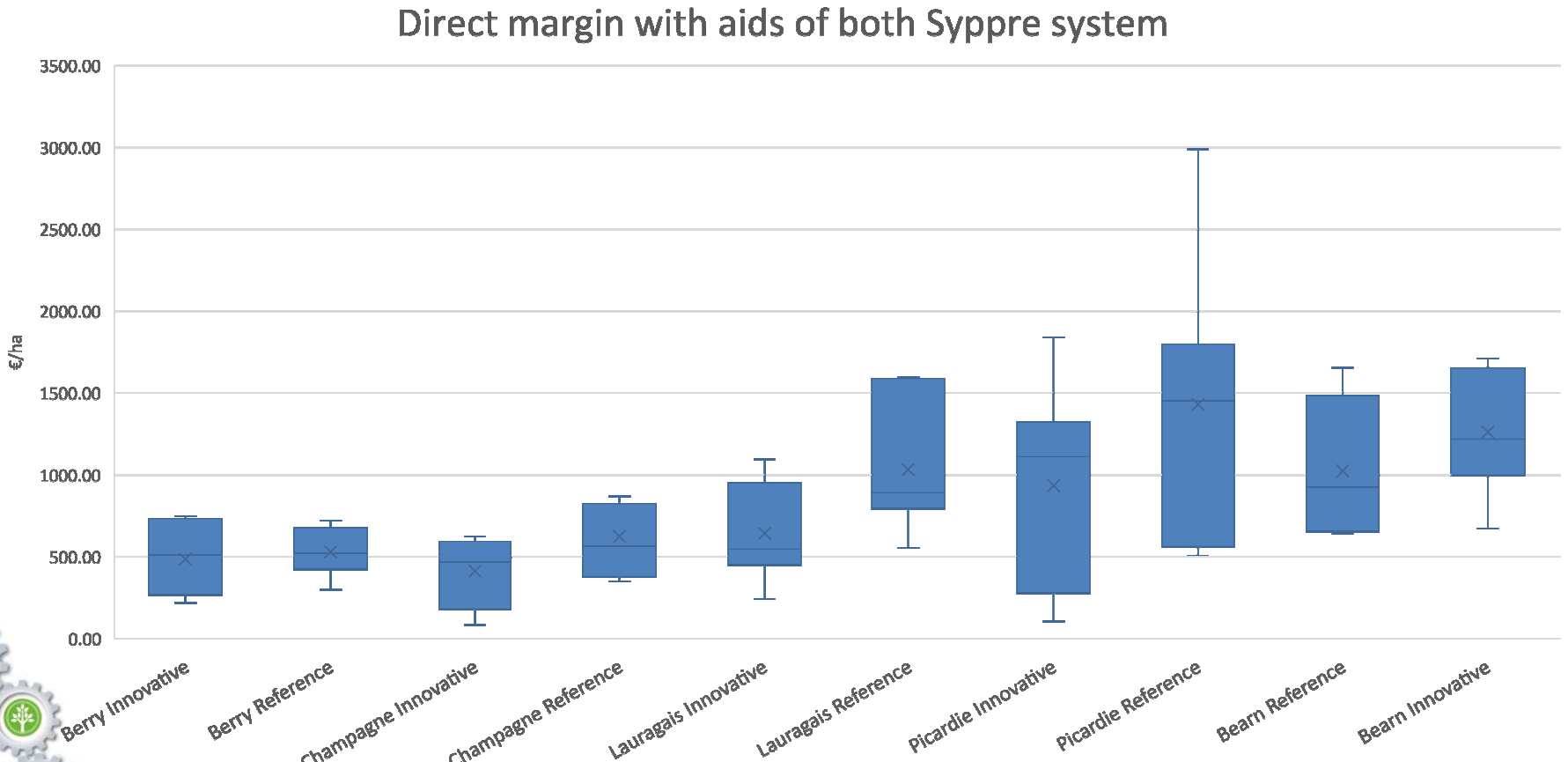
Building tomorrow's cropping systems together

Carbon balance is improved in 4 out of 5 situations

	Area (ha)	Carbon stock ini (t/ha)	Storage (teqCO2/ha for 5 years*)	GHG reduction (teqCO2/ha for 5 years*)	Carbon Balance (teqCO2/ha for 5 years*)	Carbon credits (teqCO2/ha /an)	Carbon credit generated on all the exploitation
Berry	150	67	-1.3	1.6	**0.3**	0.1	41.0
Lauragais	170	38	3.3	2.6	**5.8**	1.2	990.5
Picardie	160	63	2.0	2.2	**4.2**	0.8	664.4
Champagne	180	68	-2.9	2.5	**-0.4**	-0.1	-76.8
Béarn T3	63	95	4.3	4.6	**8.9**	1.8	558.8

* 5 years is the duration of a low carbon label project. Calculation made using low carbon label method for arable crops

Carbon credits could contribute to direct margin of innovative system



Calculation made with SYSTERRE

Building tomorrow's cropping systems together

Main conclusions

- The levers introduced into the systems improve their carbon footprint, particularly the efforts made on fertilization.
- The sale of carbon credit does not make up for the difference in margins between our innovative and control systems
- The sale of carbon credit is just enough to offset the cost of certain levers, but not the losses in productivity.

Thank you for your attention

Contact: m.estienne@arvalis.fr