



75th EAAP Annual Meeting
1/5 September 2024 - Florence, Italy

➤ What is the performance of a low-input sheep flock integrated in an agroecological crop farming system?

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➤ Context

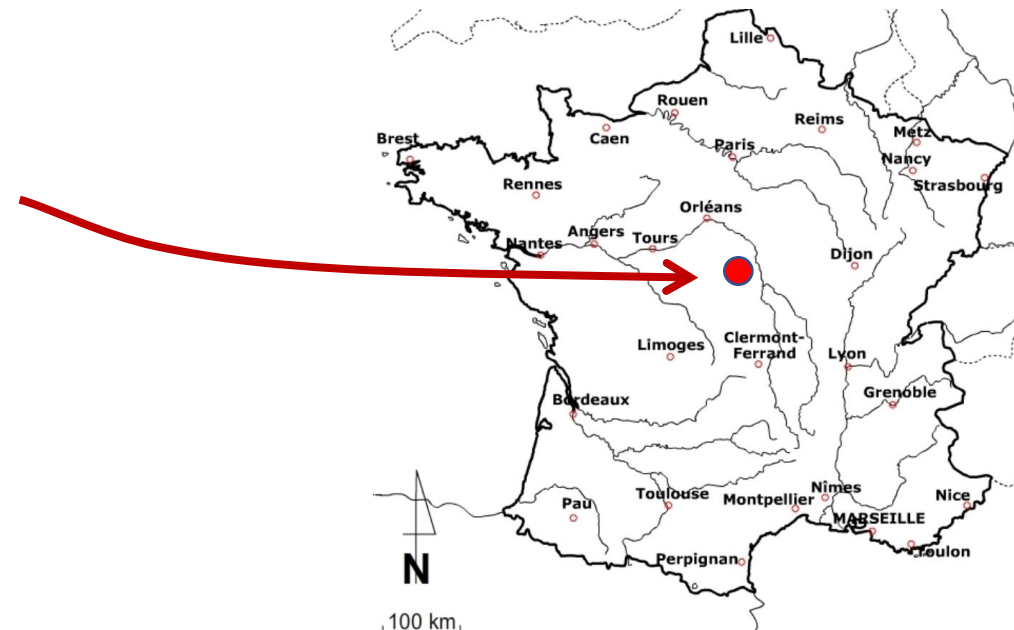
- 1- Reduce pesticide use in cropping systems → catch crops (N leaching, weeds...)
- 2- Reduce production costs in sheep farming → use co-products
- Use biomass from catch crops by sheep in mixt crop-livestock farming systems

A research program developed both on an experimental farming system and on private farms



A system experiment. Two-years results.

INRAE experimental farm near Bourges (France)

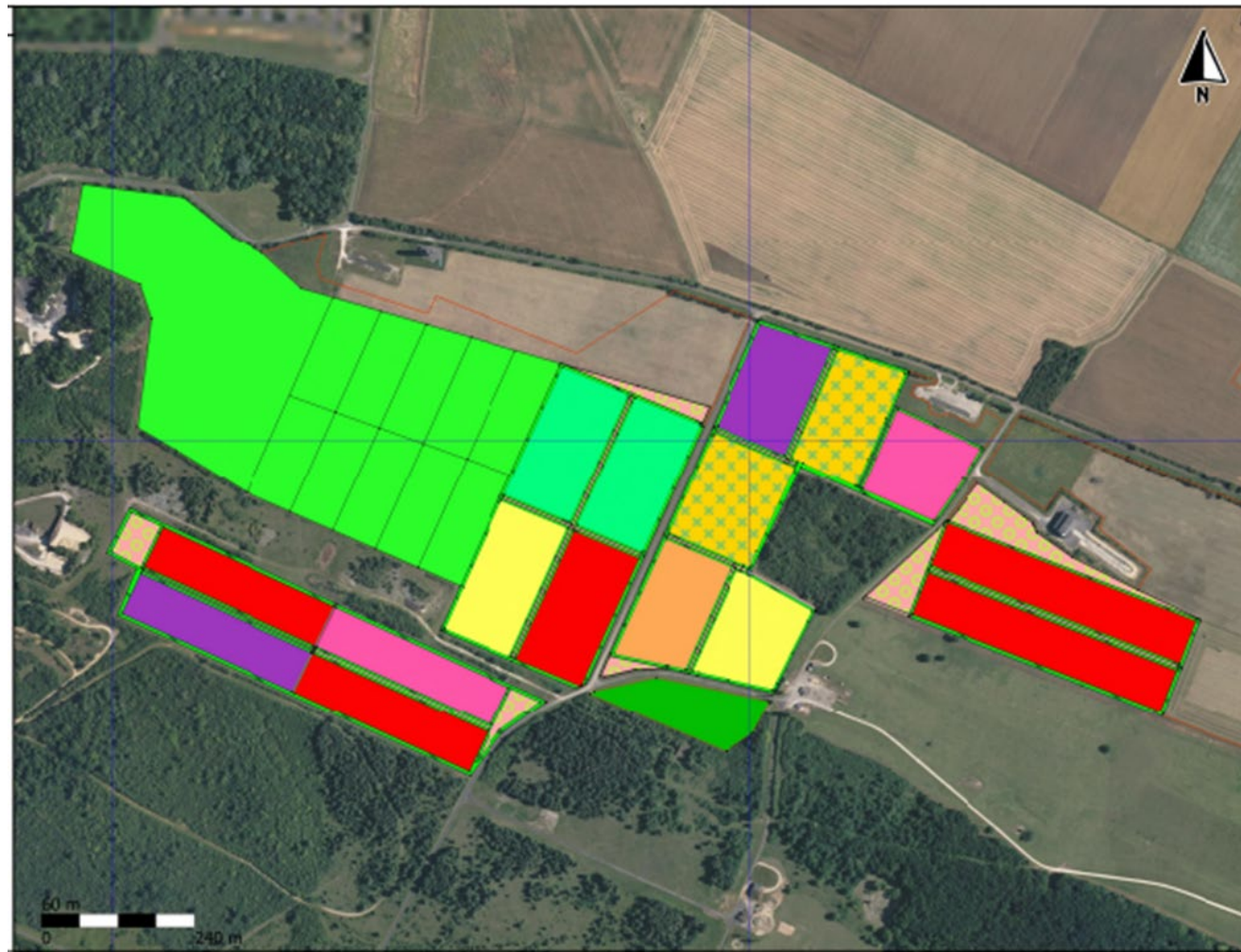


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➤ The system



➤ Main principles

- Lambs fattening: grazing catch crops (= autumn-winter)
 - Lambing in September
- Work: complementary with crops enterprise
- Fully free-range flock, with shelters in the plots
- Two breeds, 2 x 90 ewes: Romane and Berrichon de l'Indre (prolific).
- Individual monitoring of animals (weights, body cond. score, sales, etc.)
 - The 2 genotypes can be distinguished
- “System” approach, over 2 campaigns (2021-2022 = C1 and 2022-2023 = C2) (May 1 -> April 30)
- Benchmarking : Inosys réseaux d'Elevage n=16 farms (sheep-crops)



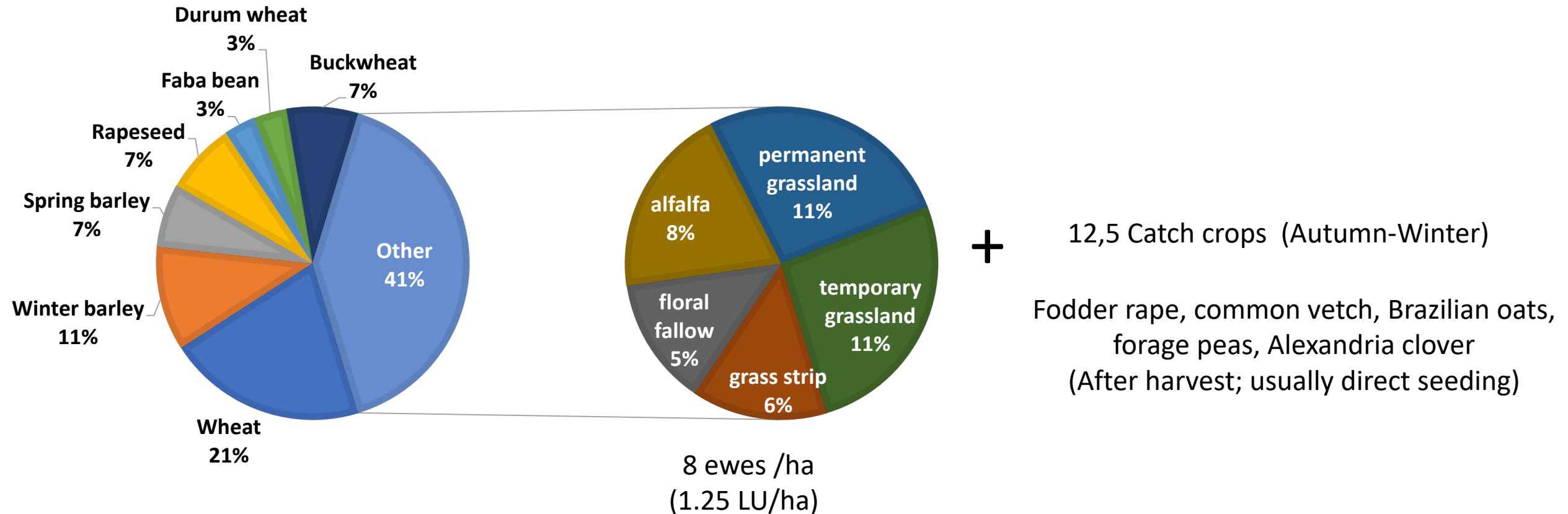
➤ Using the Ostral simulation tool

- Precisely reconstruct the functioning of the flock for each campaign, calculating average annual numbers of ewes, LUs, etc.
- Enables "corrections" / adjustments to be made
 - "Straightening out" the numbers of animals at the end of C2 (ewes leaving early)
 - Reintegrating some of the lambs that died of arthritis in C1 → artificial suckling + 100kg concentrate"
 - Transforming the very small part of concentrate purchased into onfarm concentrate
 - Modeling the chain of equipment's, adapted to the size of the system
 - Simulate the results at system scale by separating the 2 genotypes



➤ Crop rotation - Forages used

Agricultural Area Used = 61.1ha (around 40ha of Crops and 21 ha of grassland)



> Zootechnical results

				ROM		BERR	
	C1	C2	INOSYS	C1	C2	C1	C2
Fertility (%)	73.4	77.1					
Prolificacy (%)	223	212		237	232	185	193
Lambs mortality (%)	15.4	21.1					
Ewe productivity (/ewe +6ths)	1.50	1.39	1.25	1.86	1.60	1.16	1.21
Weight productivity (kg carc/ewe)	27.6	25.9	23.7				
Lambs weight (kg carcass/head)	18.2	19.0	19.3				
Concentrate (Tot. kg/ewe)	92	91	235	112	105	73	78
used by ewes	33	42		33	44	32	41
used by lambs	59	48		79	62	41	37
Concentrate /kg carc. produced (kg)	3.3	3.5	9.6				



➤ Economic results

				ROM		BERR	
	C1	C2	INOSYS	C1	C2	C1	C2
Gross product (€/ewe)	210	204		262	227	159	184
Operation. costs (€/ewe)	79	81		93	92	67	72
Gross margin (€/ewe)	130	123	95	169	135	92	112
Fodder autonomy (FU) (%)	84.5	85.4	60 ?				
Feed autonomy (FU) (%)	98.1	98.8					
Nitrogen balance (kg/ha)	51.0	47.4	39.0				
Fodder area							
Gross margin (€/ha)	1076	1000		1347	1069	794	929
Crops Gross margin (€/ha)	363	351					



➤ Environmental results

				ROM		BERR	
	C1	C2	benchmark	C1	C2	C1	C2
Energy consumption (MJ/kg carcass)	65.6	64.7	92.1 (Idele, sheep-Cr)	60.1	63.8	76.0	67.2
<i>those Fertilizers (%)</i>	23.7%	27.5%					
<i>Concentrate purch. (= milk) (%)</i>	17.0%	11.7%					
<i>Fuel (%)</i>	24.3%	24.3%					
<i>Equipments-Machines (%)</i>	20.2%	21.1%					
Gross GHG emissions (kg CO2Eq/kg c)	22.8	25.8	31.6 (INRAE n=1180)	19.4	24.0	28.6	28.4
CO2 (% CO2Eq)	14.9	14.4	20.6 (INRAE n=1180)				
CH4 (% CO2Eq)	61.6	61.2	61.7				
N2O (% CO2Eq)	23.5	24.5	17.7				
Feed-Food competition	0.42	0.35	0.30 ?				



Points + + +

- A high ewe productivity
 - ... while keeping concentrate use to a minimum
 - ... thanks to lamb fattening on pasture in winter
 - ... and despite off-season lambing
 - Winter catch crop grazing ensures lamb fattening ... and greatly limits parasite problems
- very good economic and environmental results

NB : the Romane breed outperforms thanks to high proliferation + controlled mortality

Points - -

- One consequence of high prolificacy: the large quantity of powdered milk used (and consequences on all perf. indicators)
- Nitrogen supply penalizes environmental performance
- Almost all the ressources used for feeding are based on land cultivation → economic and environmental cost (machines)

➤ Conclusion

A highly virtuous system with a number of advantages over other types of sheep farming systems in lowland areas

- either very grass-based, but with a high degree of seasonality
- ... or integrated with arable farming but with high concentrate input

A sheep-crops farming system

- Productive
- Cost-efficient (concentrates)
- Meeting the requirements of the industry (in particular: seasonality)

Implementation may raise other issues, such as skills, work, organization, etc.



➤ Thank you for your attention



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