



70th Annual Meeting of the
European Federation of Animal Science
City of Ghent (Belgium), 26 - 30 Aug 2019



What have been the advantages of mixed
livestock farming systems under past
prices and policies?

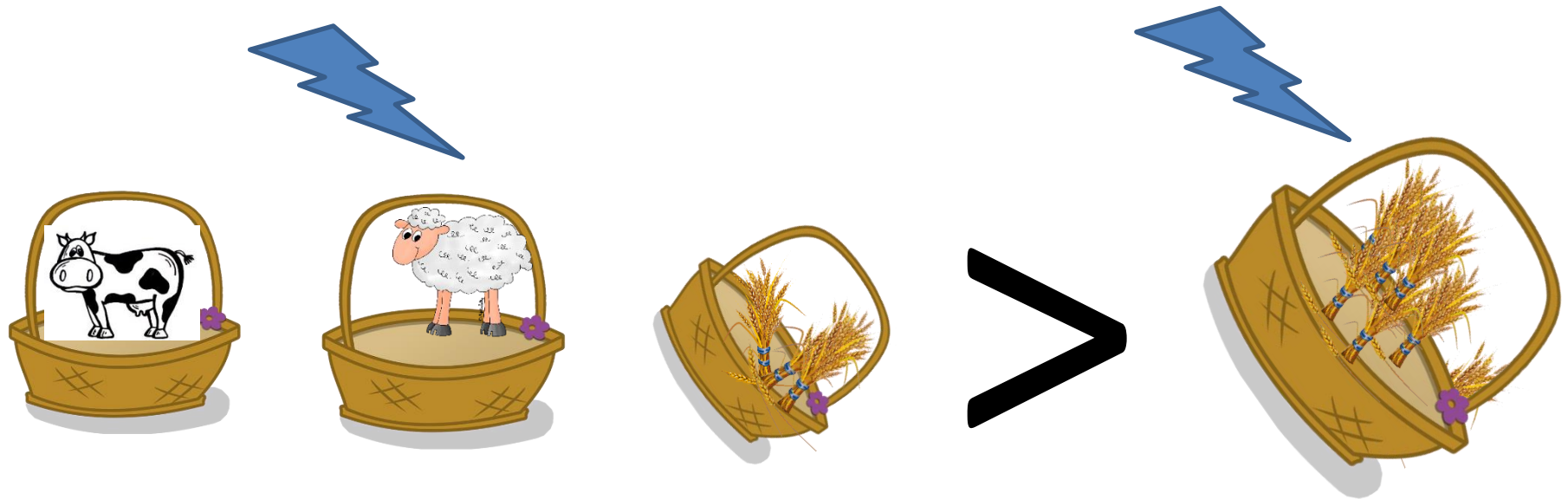
Claire Mosnier
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Mixing productions: WHY?

- To reduce risks

If risks don't affect the different activities in the same way (*correlation between activities are < 1*), risk is reduced

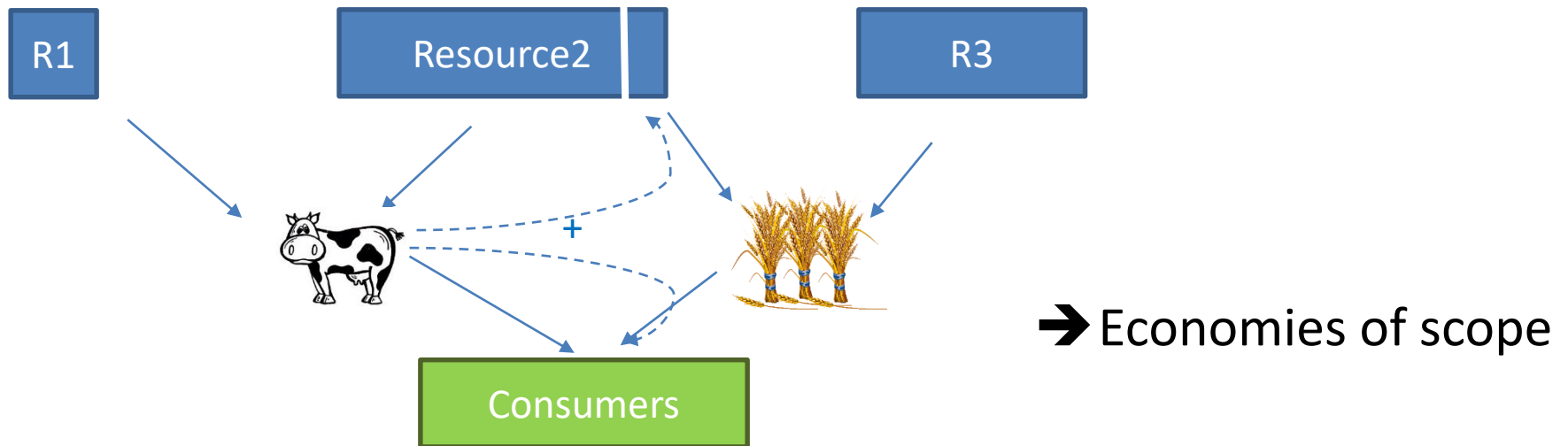


Mixing productions: WHY?

- To better value complementarity and positive interactions between activities (→ agroecology)

Complementary: one activity uses a resource that cannot be used by the other one

Positive interactions: one activity improves resource/market for the other activity



→ Economies of scope

Mixing productions: Why NOT?

- To do only the most profitable activity

Activities are competing to use some resources

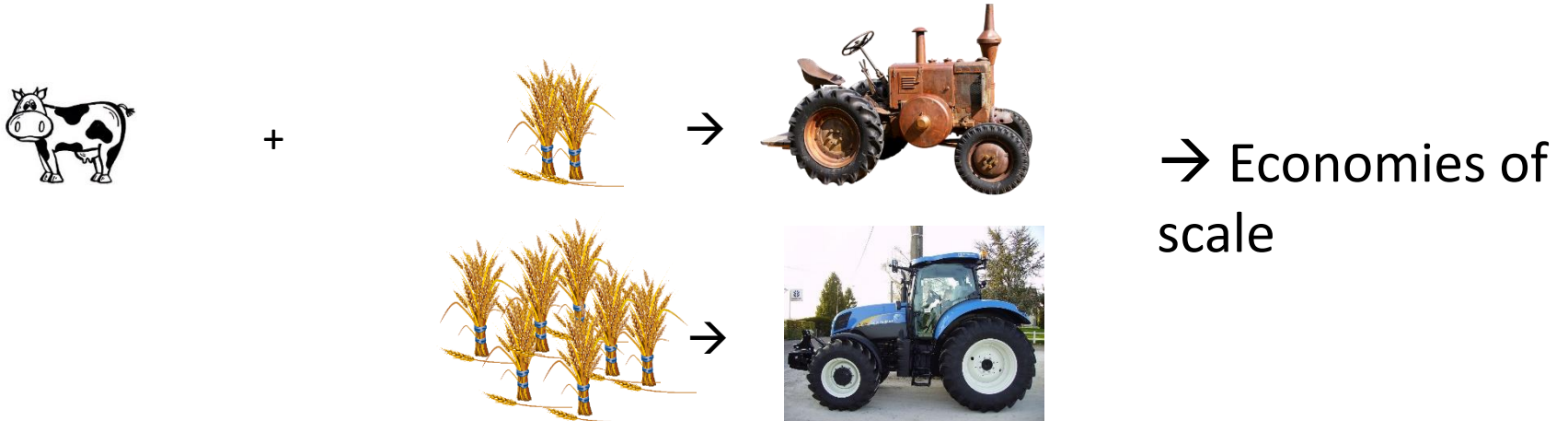


→ If activity 1 is more profitable than activity 2 , allocating resource to A2 will reduce farm average profit

Mixing productions: Why NOT?

- To invest in expensive, specialized technologies or advices

Adding a new activity can reduce the size of the other one



To go further : Martin et al., **Multi-species livestock farming systems: a review.**
submitted to *Agricultural Systems*

Objectives

- Are all mixed farms less risky?

More efficient to use their inputs?

More profitable?

- Under price and policy variations [2000; 2017]
 - For different mixes: beef-sheep, dairy and beef cattle, beef cattle and crops
-
- Method
 - Bioeconomic simulations at farm level



METHOD

Farm case studies



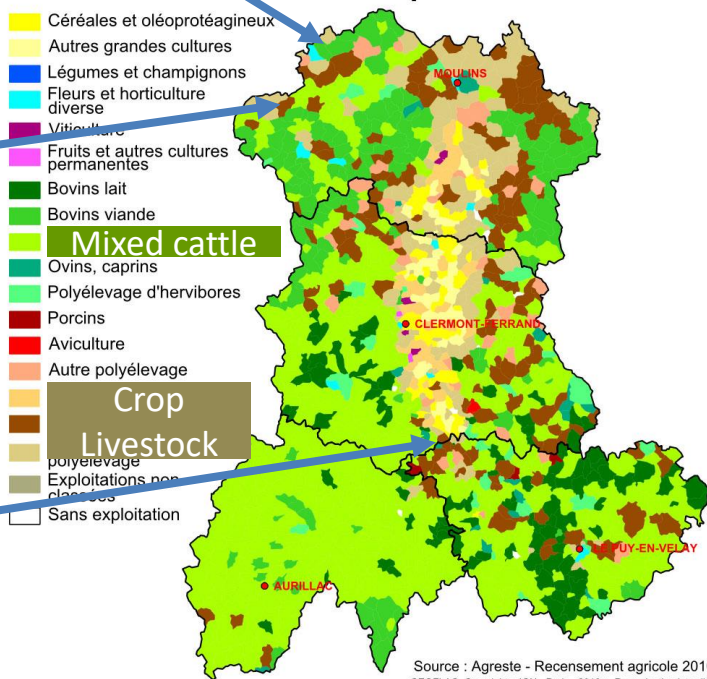
SHEEP+ BEEF
 850 ewes + 40 suckler cows,
 200 ha (95% grasslands, 5% cash crops)

Localisation of agricultural production in Auvergne

BEEF + CROP
 breeder-fattener, 251 LU
 280 ha (45% Perm. Grassland, 36% of cash crops)

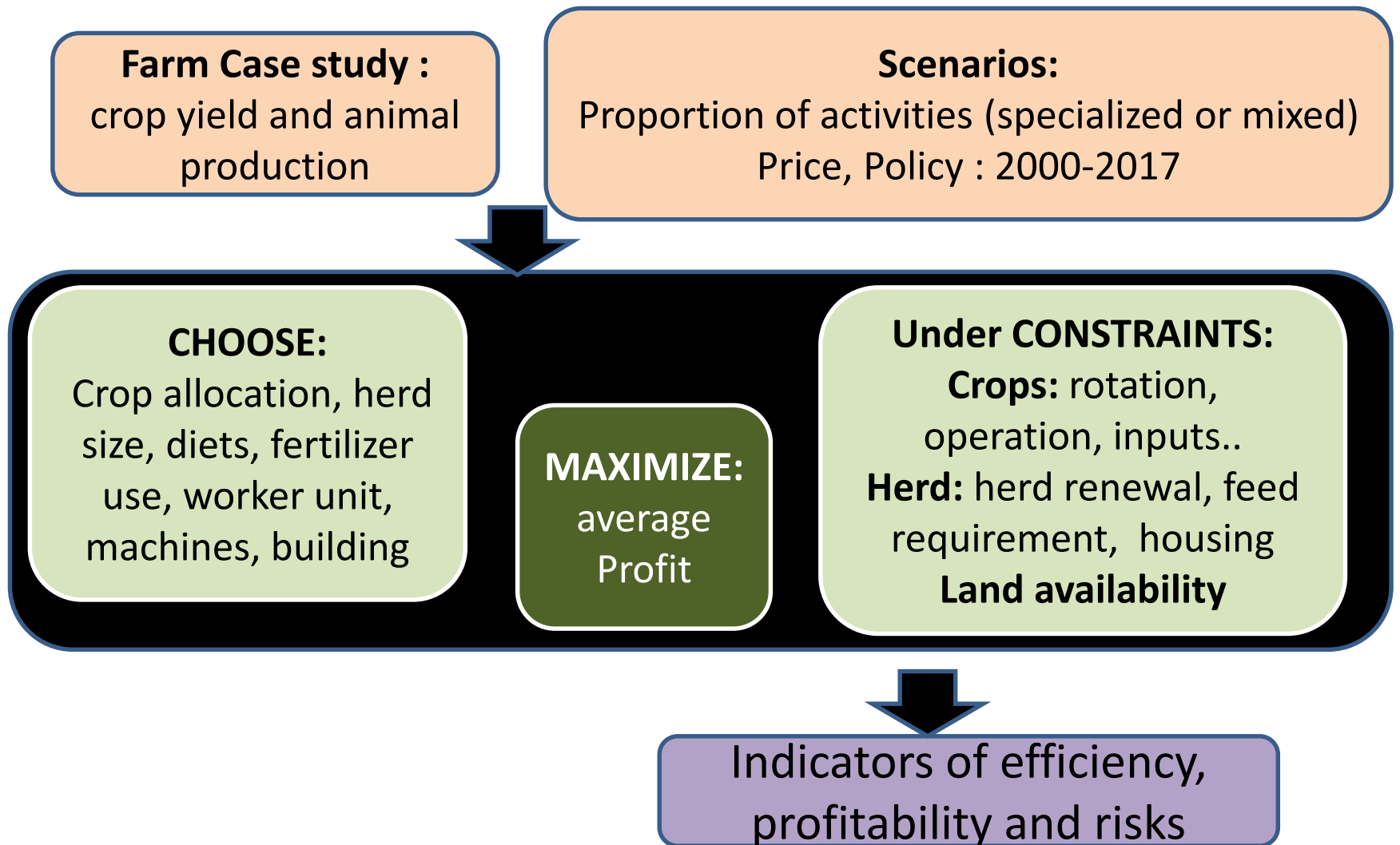
BEEF + DAIRY
 49 dairy cows (≈6000L/cow)
 41 suckler cows+ weanlings (≈/LU)
 113 ha (4% of cash crops, 96% of grassland)

Orientation technico-économique de la commune

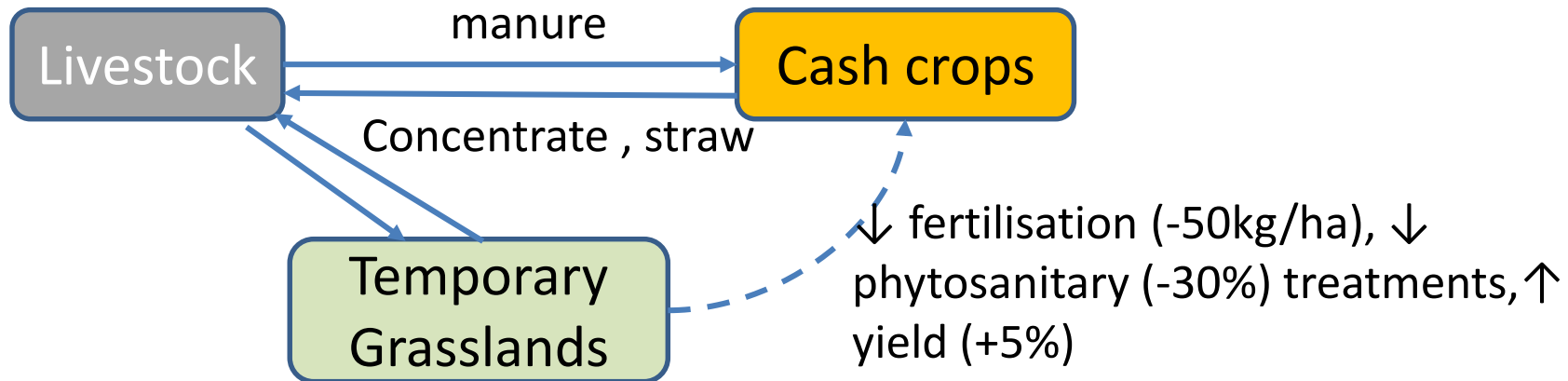


Source : Agreste - Recensement agricole 2010
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The Orfee farm Bioeconomic Model



Interactions/ complementarities taken into account in the model



Beef + Dairy

Dairy cow cannot graze on remote pastures

Beef +sheep

- A fraction of sheep can stay outdoor and graze during winter (0.15 LU/ha ForArea)
- Grass quality is lower (5%) if there is only sheep



RESULTS

Beef/dairy farm structure

	Beef	Mixed*	Dairy
Dairy cow	0	42	73
Beef cow	80	47	0
Worker unit	1.2	1.9	2.1

**dairy = 50% of LU, beef = 50% of LU*

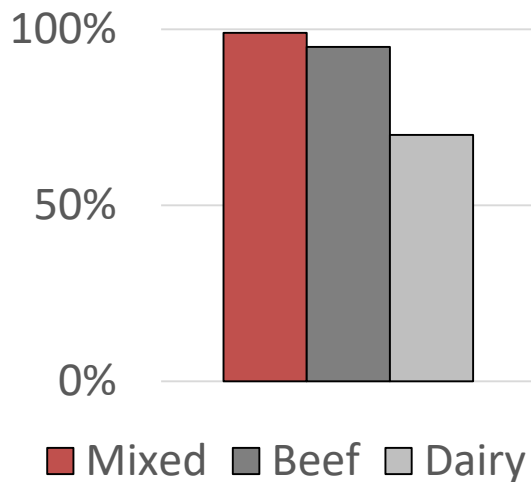
Mixing beef and dairy:

→ Reduction by less than 50% of the number of cows compared to specialized systems

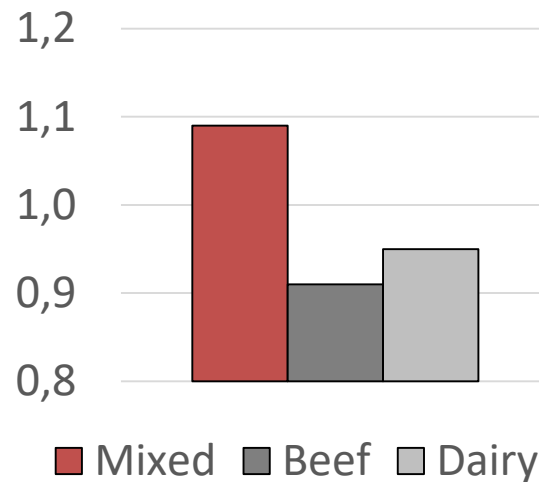
→ Labour increases with the proportion of dairy cows..

Beef/dairy farm technical efficiency

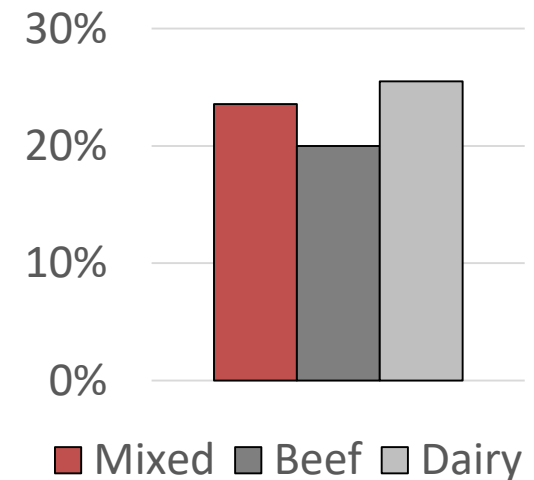
Grazed grass / grass available (*after losses*)



Livestock Unit /ha forage



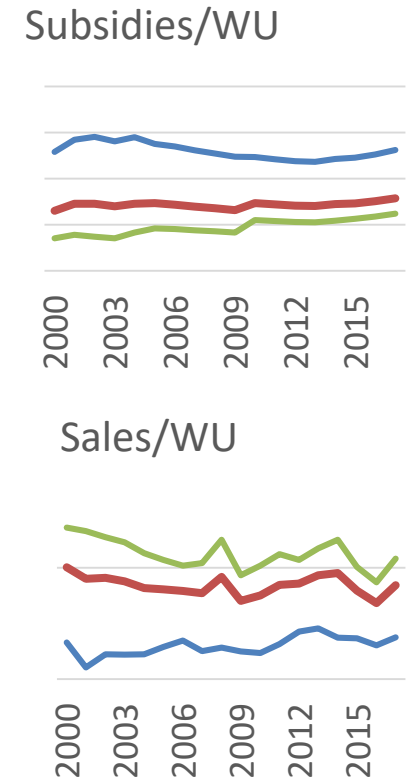
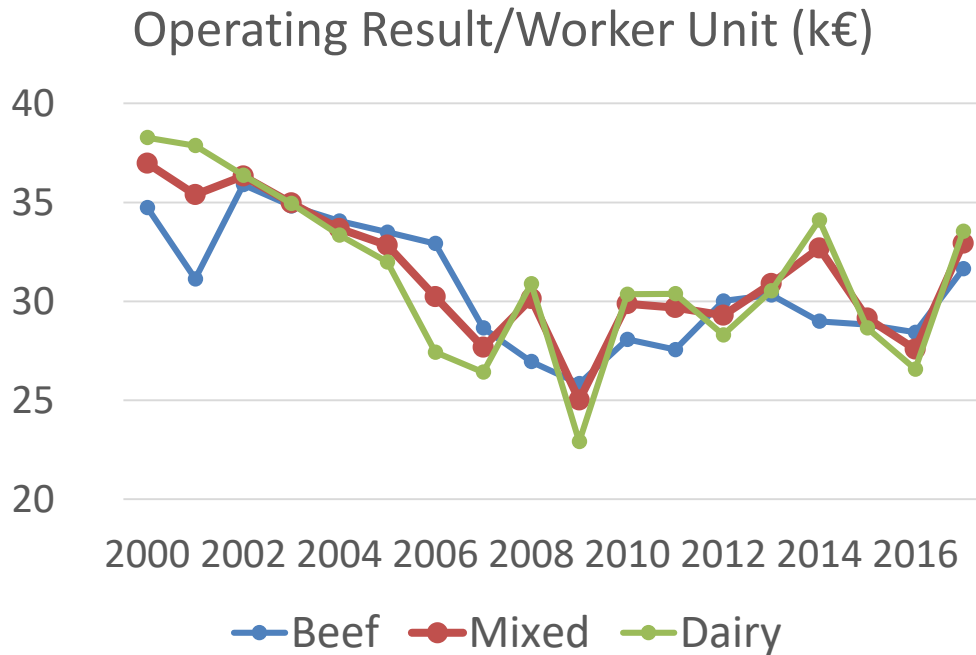
Input/(Sales + subsidies)



Mixing beef and dairy:

- Increases grass use and animal production per unit of forage area
- Doesn't really improve the efficiency of variable inputs

Beef/dairy farms Income



	Beef	Mixed	Dairy
Mean Operating profit	39	58	64
Mean OP/WU	25	31	31
Coefficient of Variation	12%	11%	13%

→ Mixed farm is slightly less risky with a similar profit/WU as dairy

Beef/Sheep farm structure

	Beef	Mixed*	Sheep
Beef cows	109	64	
Ewes		575	1 066
Worker unit	1.7	2.2	2.5

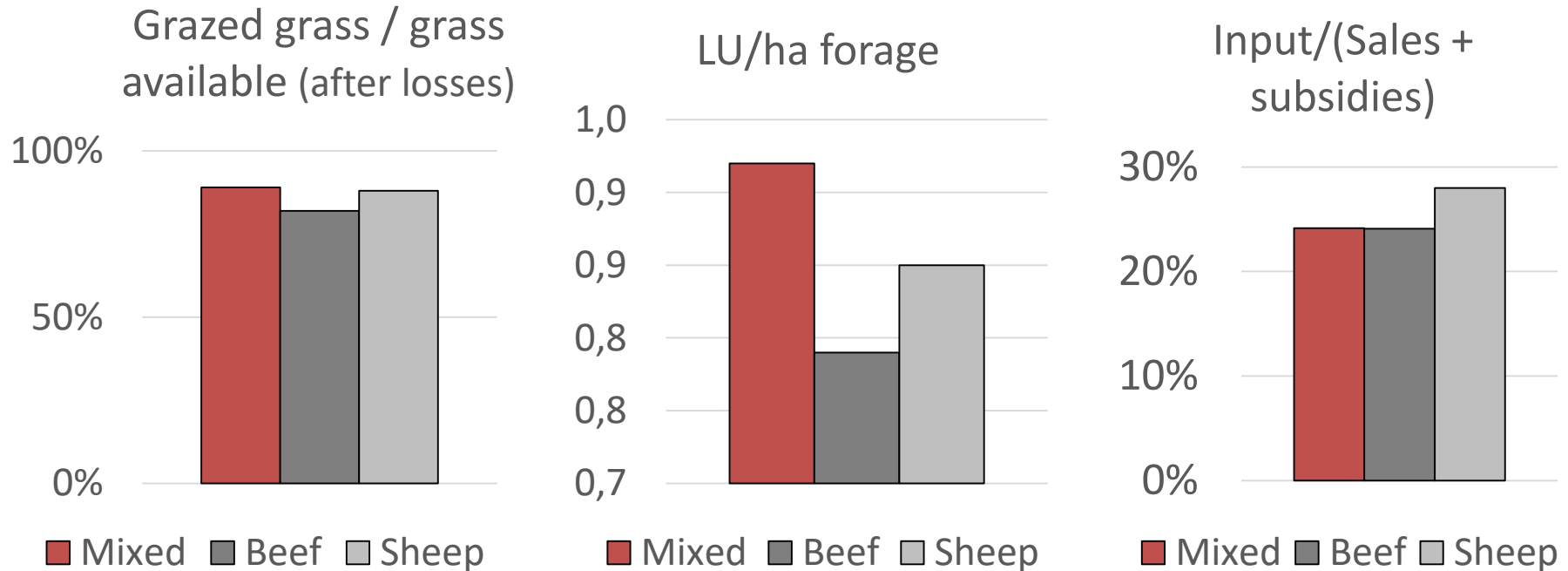
**sheep = 50% of LU, beef = 50% of LU*

Mixing beef and sheep:

→ Reduction by less than 50% of the number of animals compared to specialized systems

→ Labour increases with the proportion of sheep..

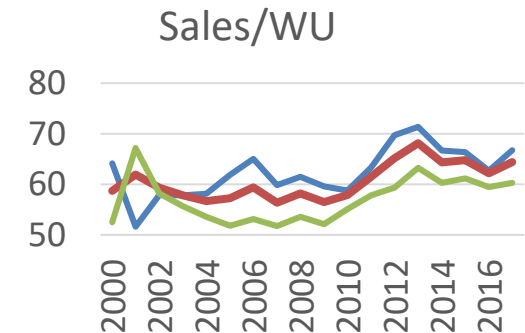
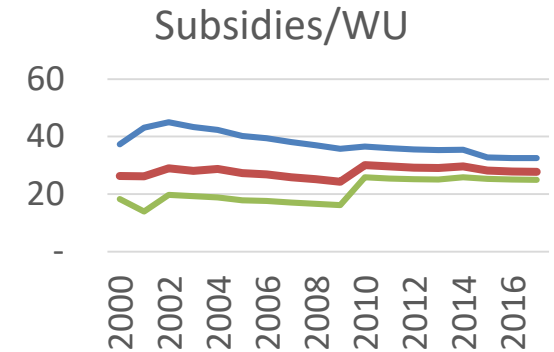
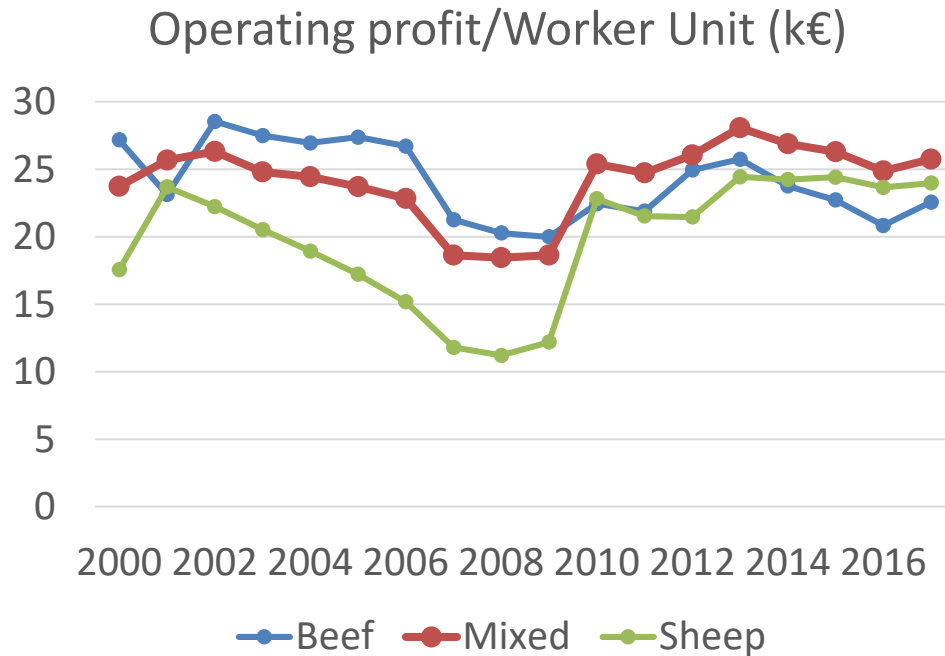
Beef/Sheep farm efficiency



Mixing beef and sheep:

- Increases animal production per unit of forage area
- improves input efficiency of the sheep enterprise

Beef/Sheep farms Income



	Beef	Mixed	Sheep
Mean Operating profit	43	59	54
Mean OP/WU	24	24	20
Coefficient of Variation	12%	12%	23%

→ situation reversal since 2010

Beef/Crop farm structure

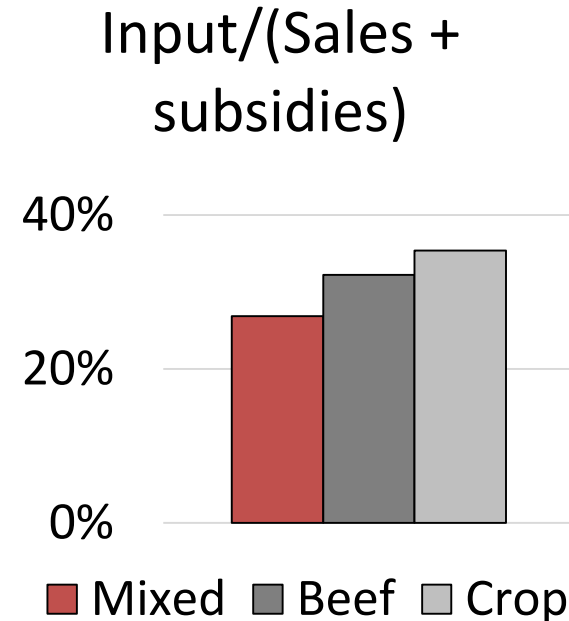
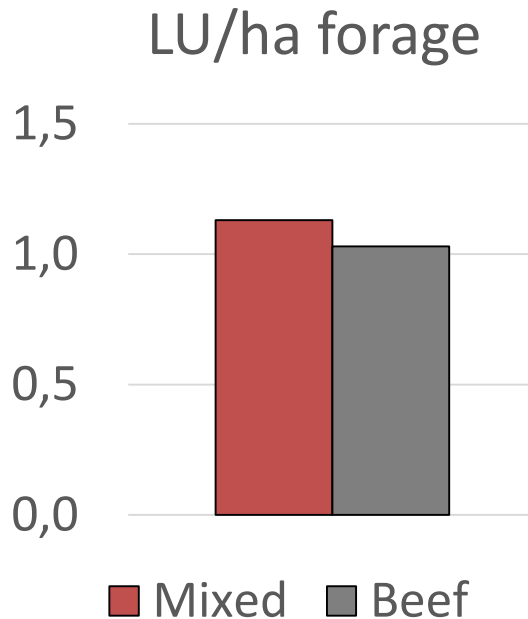
	Beef	Mixed	Crop
Total land (ha)	280 (100% Grassland)	280 (36% cash Crops)	154 (100% cash Crops)
Livestock Unit	290 (159 cows)	202 (111 cows)	
Worker unit	2.9	2.4	0.6

**sheep = 50% of LU, beef = 50% of LU*

Mixing beef and crops:

→ Labour increases with the proportion of beef

Beef/Crop farm structure and efficiency

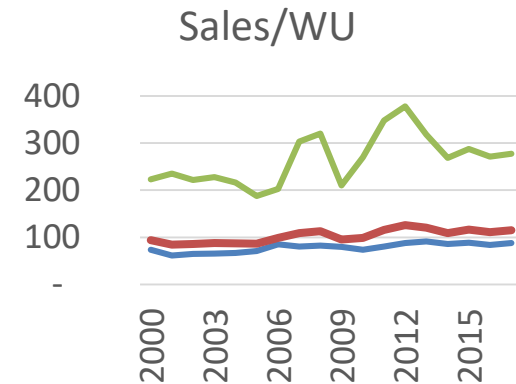
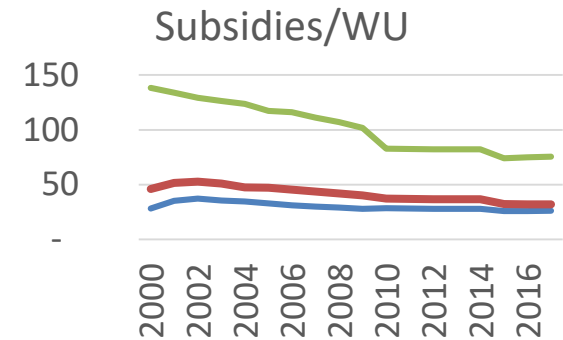
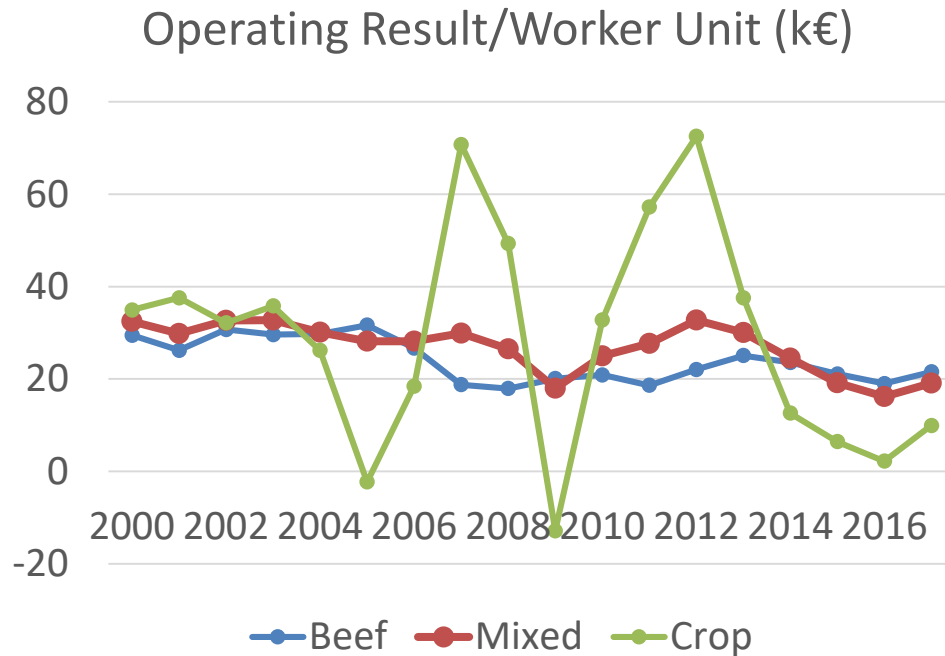


Mixing beef and cash crops:

→ increases animal production per unit of forage area

→ improves input efficiency, above all for the cash crop enterprise

Beef/Crop farms Income



	Beef	Mixed	Crop
Mean Operating profit	70	63	17
Mean OP/WU	24	27	29
Coefficient of Variation	19%	20%	82%

→ Mixed farm: a good compromise between risk and profit

Conclusions

- **Are mixed farms more efficient to use land and variables inputs?**
 - Yes but only if each activity cannot take the most of the resources by themselves (e.g. here beef cow doesn't benefit from dairy)
 - Highest gain in efficiency for the mixed beef-crop farm
 - **Are mixed farms more profitable?**
 - No clear (dis)advantages, depends on the profitability of each activity and on farm resource constraints
 - **Are mixed farms less risky?**
 - Yes but not always: adding crop production (very risky) to beef production (low risk) doesn't decrease profit variability
 - But some reversal could always happen on the long run (e.g. beef and sheep)
- **mixed farm, a good way to manage risks on the long run**

Conclusion

- Going further in exploring pros and cons of mixity:
 - Account for more sources of complementarities / interactions (data?)
 - Further explore economies of scale and labour efficiency
 - Include production risks
 - Generalize to other production contexts
 - Include other indicators of sustainability
- Supporting farmers' decisions
 - Define optimal level of mixity according to land, labour and local market characteristics



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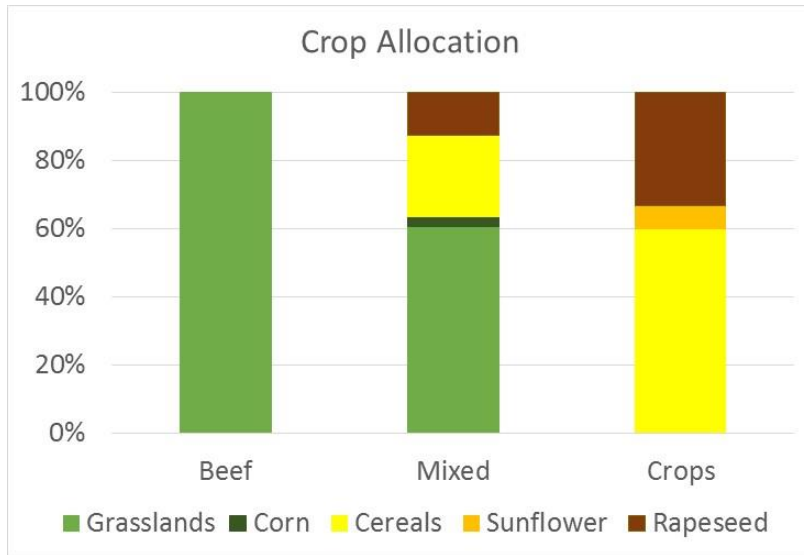


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Beef crop farm



	Beef	Mixed	Crops
Mineral Nitrogen (kg/ha)	24	56	134
compact manure (t/ha)	11	8	
phytosanitary treatment (€/ha)		- 35	165
concentrate feed (kg/LU)	717	496	