Welcome to this webinar!

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Programme of the webinar

1st session: Characterization and integrated assessment of organic mixed livestock farms in Europe

- MIX-ENABLE farm data: From farm surveys to the project database, *by Guillaume Martin (INRAE)*
- Identifying characteristics to estimate the productivity of multi-species organic farming systems in Europe, *by Gun Bernes (SLU)*
- High farmer satisfaction in multi-species livestock farming systems, *by Bernadette Oehen (Fibl)*
- Linking performances, structures and farming practices in multi-species livestock farms, *by Guillaume Martin (INRAE)*

Programme of the webinar

2nd session: Farm-level experiments in organic mixed livestock systems

- Mixed grazing of steers and lambs in presence of an adaptable nematode, *by Steffen Werne (Fibl)*
- Potential benefits of mixing young cattle and broilers, *by Severin Hubner (Thuenen Institute)*
- Effects of mixing crossbred beef cattle and sheep in mountainous grassland-based systems, *by Sophie Prache (INRAE)*

Programme of the webinar

3rd session: Modelling and co-design of more integrated organic mixed livestock farms

• Reducing vulnerability of organic mixed beef-sheep farms : Simulations with the Orfee bioeconomic farm model, by Claire Mosnier *(INRAE)*

4th session: Compilation and dissemination of results

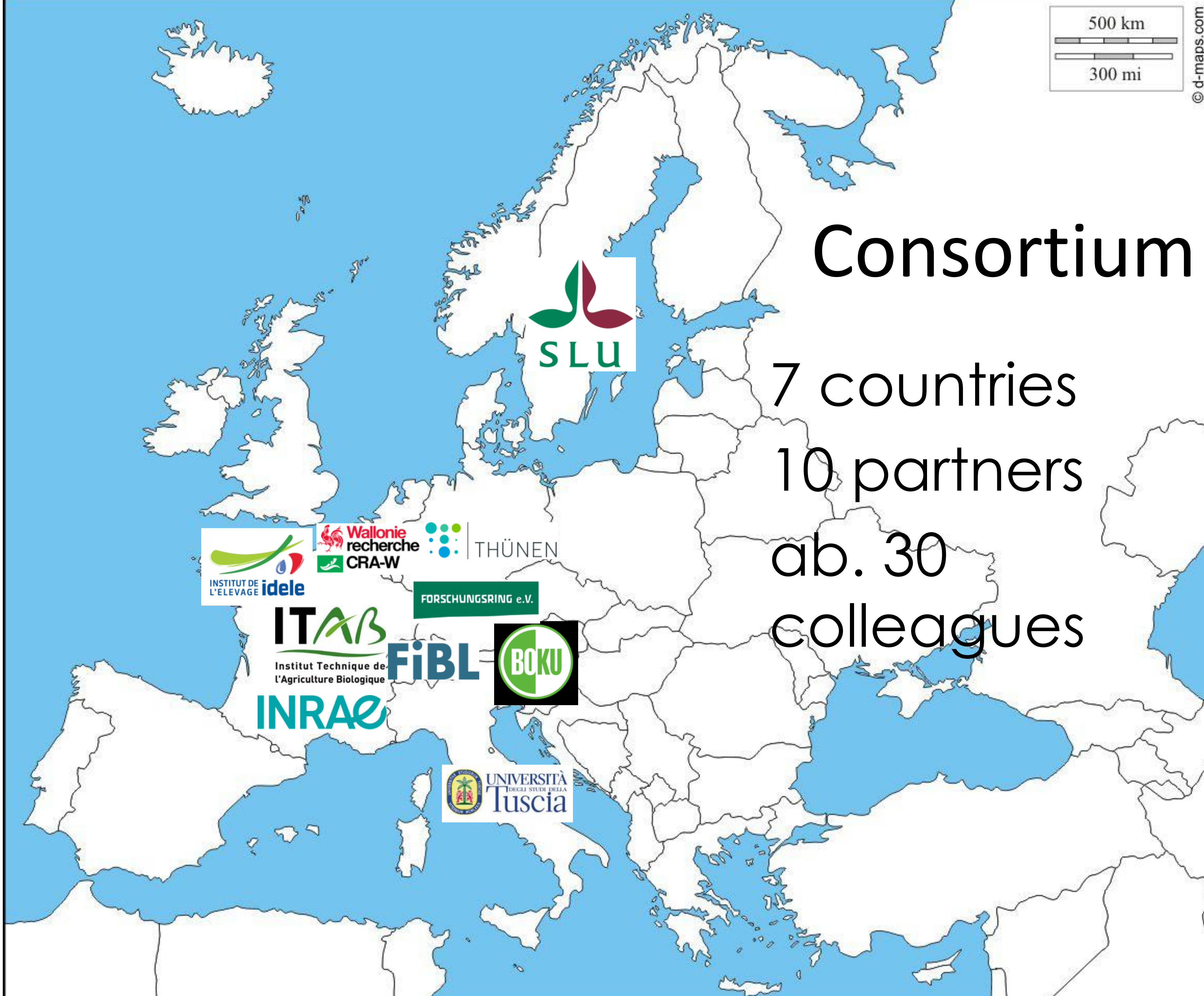
• User-oriented outputs of the project, *by Fabienne Launay and Brendan Godoc (IDELE), and Guillaume Martin (INRAE)*

Consortium

7 countries

10 partners

ab. 30 colleagues



Diversified farming systems

"We refer to a farming system as "diversified" when it intentionally includes functional biodiversity at multiple spatial and/or temporal scales" (Kremen et al., 2012)

Kremen, C., A. Iles, and C. Bacon. 2012. Diversified farming systems: an agroecological, systems-based alternative to modern industrial agriculture. *Ecology and Society* 17(4): 44. http://dx.doi.org/10.5751/ES-05103-170444

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Guest Editorial, part of a Special Feature on A Social-Ecological Analysis of Diversified Farming Systems: Benefits, Costs, Obstacles, and Enabling Policy Frameworks

Diversified Farming Systems: An Agroecological, Systems-based Alternative to Modern Industrial Agriculture

Claire Kremen[1], *Alastair Iles*[1] and *Christopher Bacon*[2]

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Diversified farming systems A sustainable option?

“We refer to a farming system as “diversified” when it intentionally includes functional biodiversity at multiple spatial and/or temporal scales” (Kremen et al., 2012)

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Resilience in Agriculture through Crop Diversification: Adaptive Management for Environmental Change

BRENDA B. LIN

Internatio
iFirst artic

Recognition that climate change could have negative consequences for agricultural production has generated a desire to build resilience into agricultural systems. One rational and cost-effective method may be the implementation of increased agricultural crop diversification. Crop diversification can improve resilience in a variety of ways: by engendering a greater ability to suppress pest outbreaks and dampen pathogen transmission, which may worsen under future climate scenarios, as well as by buffering crop production from the effects of greater climate variability and extreme events. Such benefits point toward the obvious value of adopting crop diversification to improve resilience, yet adoption has been slow. Economic incentives encouraging production of a select few crops, the push for biotechnology strategies, and the belief that monocultures are more productive than diversified systems have been hindrances in promoting this strategy. However, crop diversification can be implemented in a variety of forms and at a variety of scales, allowing farmers to choose a strategy that both increases resilience and provides economic benefits.

Keywords: resilience, climate change, diversified agroecosystems, adaptation, trade-offs

The role of agricultural biodiversity in strengthening resilience to climate change: towards an analytical framework

Dunja Mijatović[a]*, Frederik Van Oudenhoven[b], Pablo Eyzaguirre[b] and Toby Hodgkin[a]

[a]*Platform for Agrobiodiversity Research, c/o Bioversity International, Via dei Tre Denari, 472, 00057 Maccarese, Rome, Italy;* [b]*Bioversity International, Via dei Tre Denari, 472, 00057 Maccarese, Rome, Italy*

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World Development Vol. 89, pp. 214
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http://dx.doi.org/10.1016/j.worlddev.2016.08.011

To Specialize or Diversify: Agricultural Diversity and Poverty Dynamics in Ethiopia

JEFFREY D. MICHLER [a,b] and ANNA L. JOSEPHSON [c,]*

[a] *University of Illinois, Urbana, USA*
[b] *International Crops Research Institute for the Semi-Arid Tropics, Bulawayo, Zimbabwe*
[c] *Purdue University, West Lafayette, USA*

Summary. — Recent agricultural development policies have begun to shift focus from the promotion of a few staple crops towa
encouraging crop diversity. The belief is that crop diversification is an effective strategy for dealing with a variety of issues, includi
poverty alleviation. However, there is a lack of empirical evidence to justify these positions. We contribute to filling this research g

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Multi-species livestock farms

Farms including two or more livestock species kept simultaneously and integrated with crops, pastures and/or agroforestry.

Knowledge gaps

- Multi-species livestock farming = Candidate approach to achieve sustainability (Martin et al., 2020)

Contents lists available at ScienceDirect
Agricultural Systems
journal homepage: www.elsevier.com/locate/agsy

Review

Potential of multi-species livestock farming to improve the sustainability of livestock farms: A review

Guillaume Martin[a,*], Kerstin Barth[b], Marc Benoit[c], Christopher Brock[d], Marie Destruel[a], Bertrand Dumont[c], Myriam Grillot[a], Severin Hübner[b], Marie-Angélina Magne[e], Marie Moerman[f], Claire Mosnier[c], David Parsons[g], Bruno Ronchi[h], Lisa Schanz[i], Lucille Steinmetz[c], Steffen Werne[j], Christoph Winckler[i], Riccardo Primi[h]

- Little knowledge of the diversity, management and actual performances of multi-species livestock farms

Key questions

How sustainable and robust are organic multi-species livestock farms?

What are the conditions for the sustainability and robustness of organic multi-species livestock farms?

A combination of approaches

Desktop data analysis

System trials

Farm surveys

~~Co-design~~

Farm modelling

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Selection of farm survey results

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MIX-ENABLE farm data

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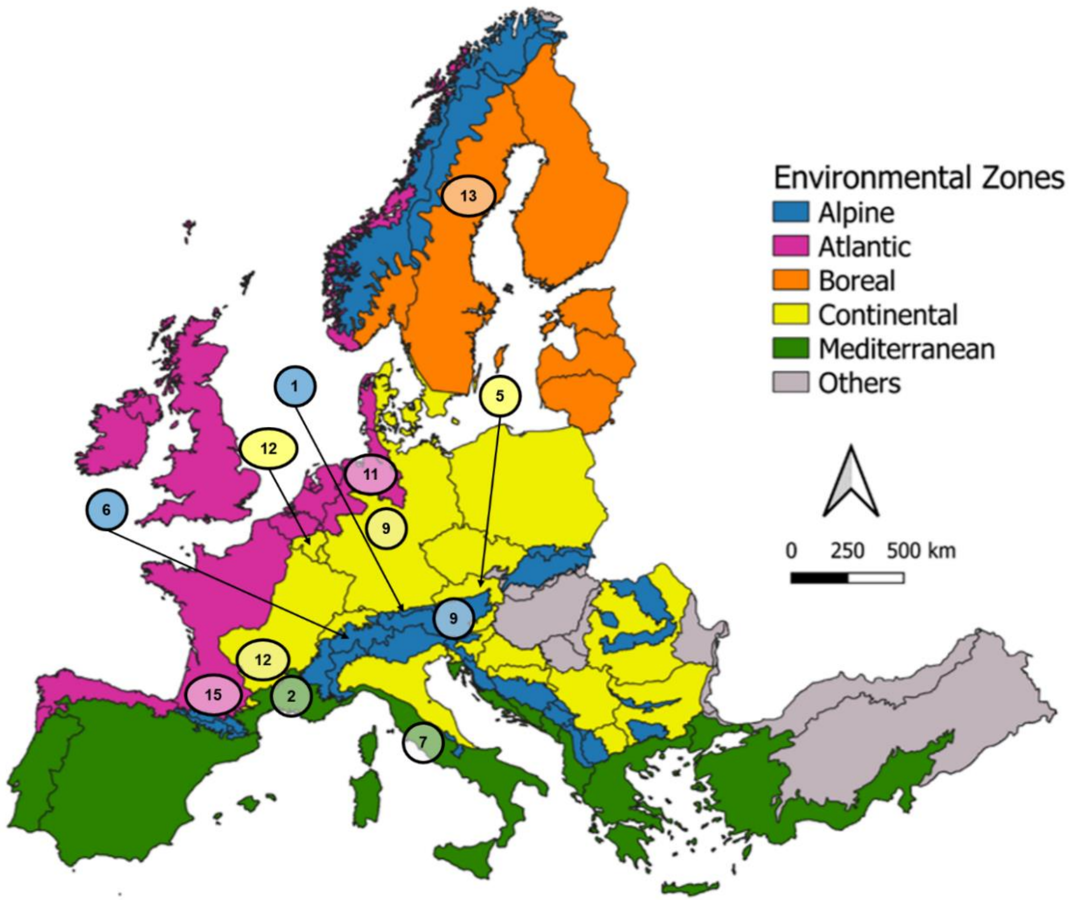
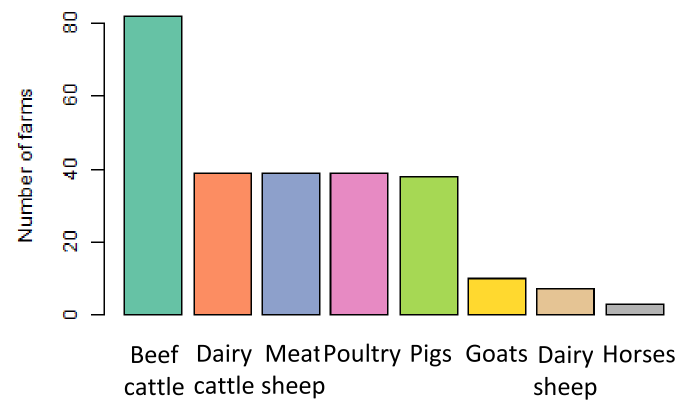
Design of a survey guide

METADATA				
FARM STRUCTURE	TYPES OF PRODUCTIONS	NATURAL AND HUMAN RESOURCES	CONSTRAINTS TO FARMING	DIVERSIFICATION BEYOND FARMING
FARM MANAGEMENT	LAND MANAGEMENT	LIVESTOCK MANAGEMENT	MANAGEMENT OF INTERACTIONS AMONG ENTERPRISES	
	MANAGEMENT OF ON-FARM PROCESSING	SALES MANAGEMENT	WORK MANAGEMENT	
SUSTAINABILITY	RESOURCE USE EFFICIENCY	RESOURCE CONSERVATION	PRODUCTIVITY	
	ANIMAL WELFARE	HUMAN WELFARE		

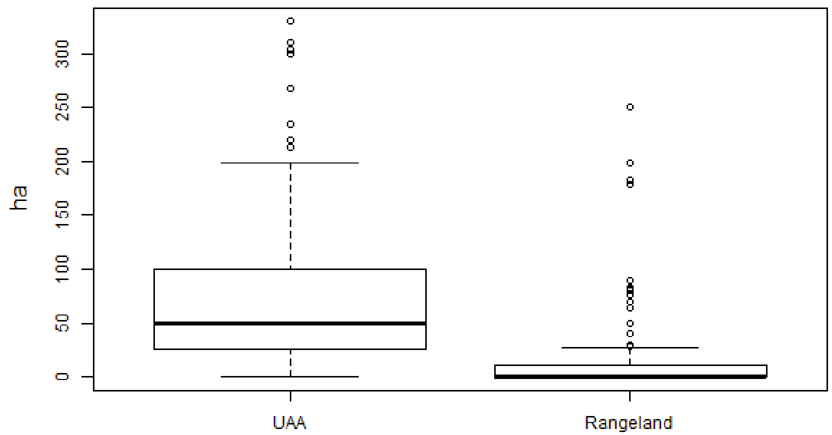
Farm sampling

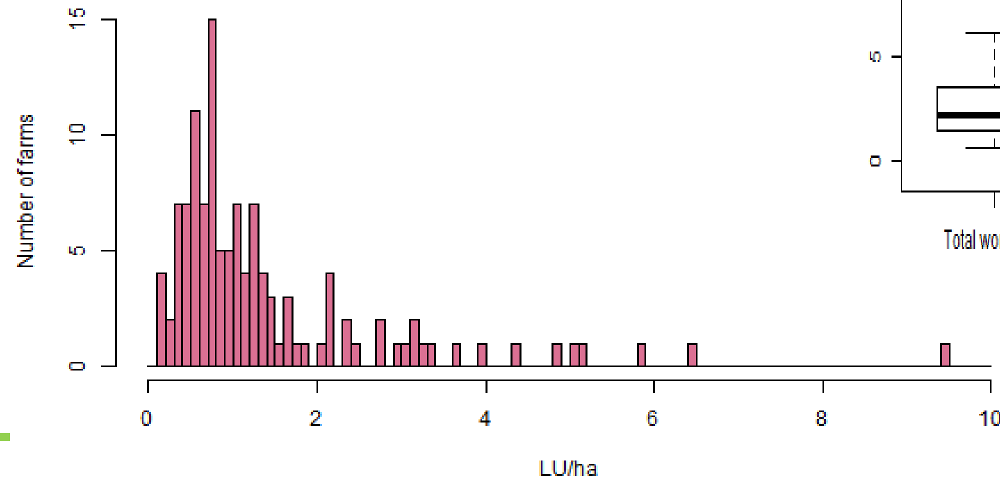


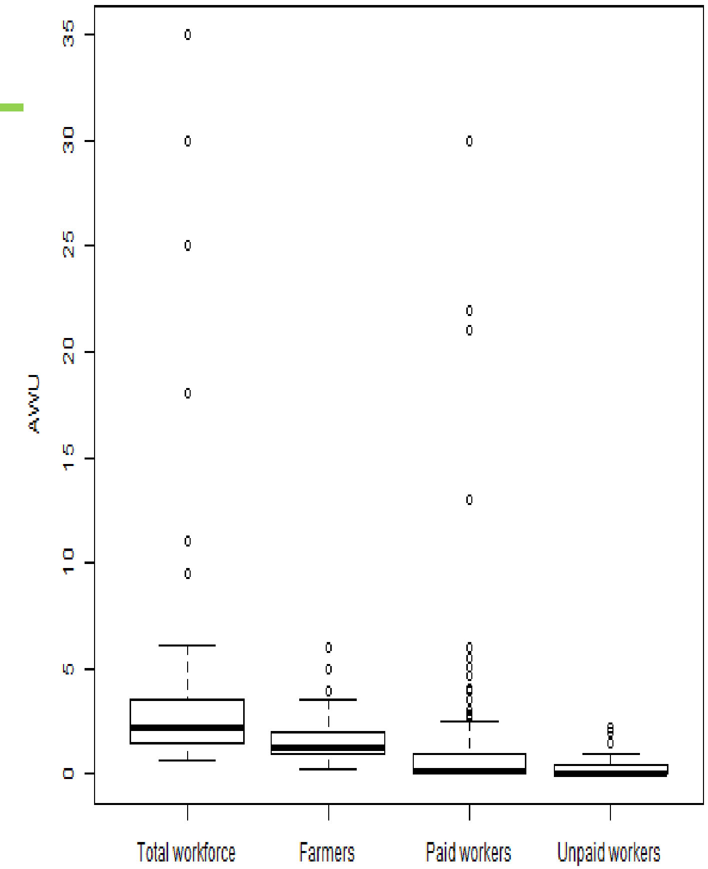


21 different livestock species combinations
+ Crop
+ Agritourism
+ Energy production

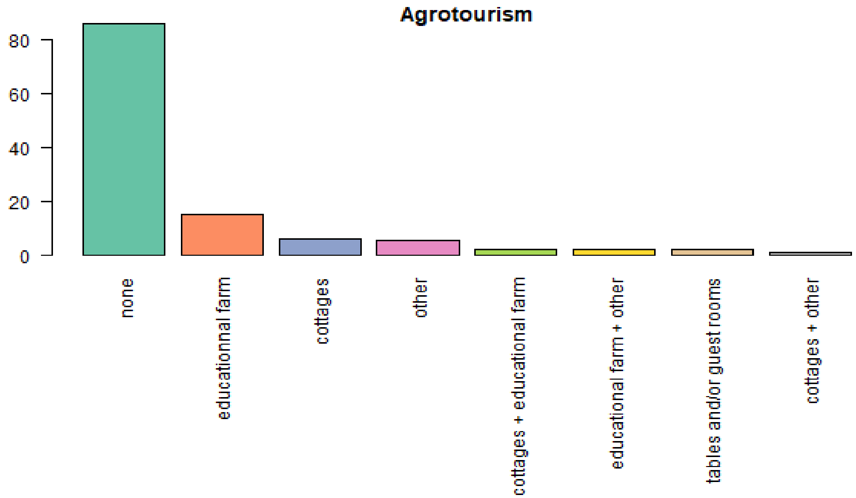
A diversity of farms

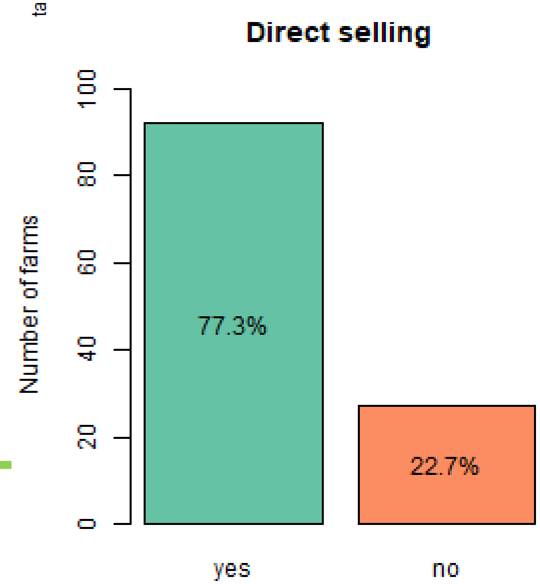


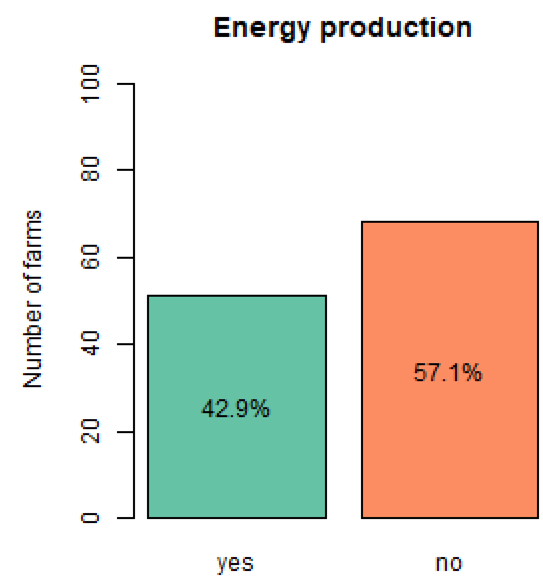




Diversified farms beyond livestock production



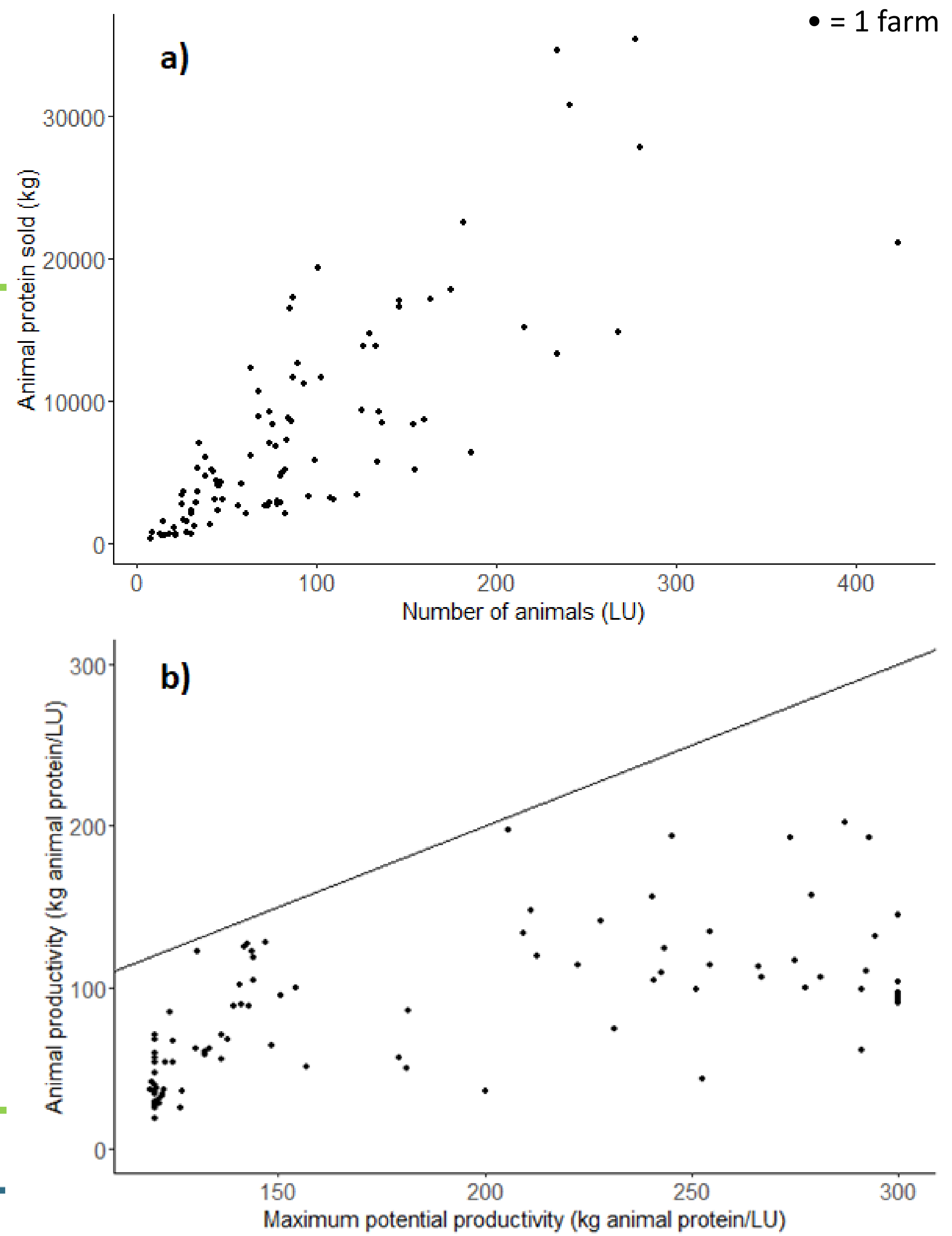




Data verifications

- Raw data (1574 variables)
- 107 indicators

- Example with livestock productivity



Data paper

- DOI: 10.3389/fsufs.2021.685778

frontiers in Sustainable Food Systems

DATA REPORT
published: xx xx 2021
doi: 10.3389/fsufs.2021.685778

Check for updates

Survey Data on European Organic Multi-Species Livestock Farms

Defne Ulukan[1†], Lucille Steinmetz[2†], Marie Moerman[3†], Gun Bernes[4], Mathilde Blanc[4], Christopher Brock[5], Marie Destruel[1], Bertrand Dumont[2], Elise Lang[1], Tabea Meischner[5], Marc Moraine[6], Bernadette Oehen[7], David Parsons[4], Riccardo Primi[8], Bruno Ronchi[8], Lisa Schanz[9], Frédéric Vanwindekens[3], Patrick Veysset[2], Christoph Winckler[9], Guillaume Martin[1] and Marc Benoit[2]*

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Dataset

Open data
+ scripts

DOI:10.15454/AKEO5G

data INRAE

Portail Data INRAE (INRAE)   Génération datapaper

Survey data on European organic multi-species livestock farms

Version 3.0

Ulukan, Defne; Steinmetz, Lucille; Moerman, Marie; Bernes, Gun; Blanc, Mathilde; Brock, Christopher; Destruel, Marie; Dumont, Bertrand; Lang, Elise; Meischner, Tabea; Moraine, Marc; Oehen, Bernadette; Parsons, David; Primi, Riccardo; Ronchi, Bruno; Schanz, Lisa; Vanwindekens, Frédéric; Veysset, Patrick; Winkler, Christoph; Martin, Guillaume; Benoit, Marc, 2021, "Survey data on European organic multi-species livestock farms", https://doi.org/10.15454/AKEO5G, Portail Data INRAE, V3, UNF:6:PUzfKaaKLLdI4D05MeckGQ== [fileUNF]

Cite Dataset -   Learn about Data Citation Standards.

Contact Owner   Share

Dataset Metrics

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Description

While there is increasing evidence of the sustainability benefits of diversified systems in the organic cropping sector, this has been much less investigated with organic livestock farming. To fill this knowledge gap, we surveyed a sample of 128 European organic multi-species livestock farms located across seven countries – Austria, Belgium, France, Germany, Italy, Sweden and Switzerland – and covering a large range of livestock species combinations. We recorded 1574 variables as raw data out of which we calculated 107 indicators describing farm structure, management and several sustainability dimensions: resource use efficiency and conservation, animal, land and work productivities, animal and human welfare. After technical validation of the data, we withdrew 26 farms and the database covers 102 farms. This database is well suited to unveil relationships between various dimensions of organic multi-species livestock farm sustainability and their structure and management. It can help reveal sustainable strategies for organic multi-species livestock farming systems, and levers or barriers to their development.

Subject   Agricultural Sciences

Files | Metadata | Terms | Versions

Search this dataset...   Find

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1 to 10 of 27 Files   Request Access

Animal welfare script.Rmd
application/octet-stream - 16.6 KB - Jan 7, 2021 - 0 Downloads
MD5: b8202d3f51c03092385a7f1eed27ecd8

Combinations script.R
type/x-r-syntax - 6.5 KB - Jan 7, 2021 - 0 Downloads
MD5: 020f879270987cdb8a8fab412279b53c

empty_survey_guide.pdf
application/pdf - 140.2 KB - Jan 7, 2021 - 0 Downloads
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Farm structure script.R
type/x-r-syntax - 3.0 KB - Jan 7, 2021 - 0 Downloads
MD5: cce9f1371bbf4dff05e1195c3d1f23d7

Guideline to survey Excel file.pdf

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Identifying characteristics to estimate the productivity of multi-species organic farming systems in Europe

Leonardo Monteiro, David Parsons, Gun Bernes
and many more

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Objectives

1. Study the relationship between farm characteristics and productivity on the visited farms

2. Identify which variables that are best in predicting productivity

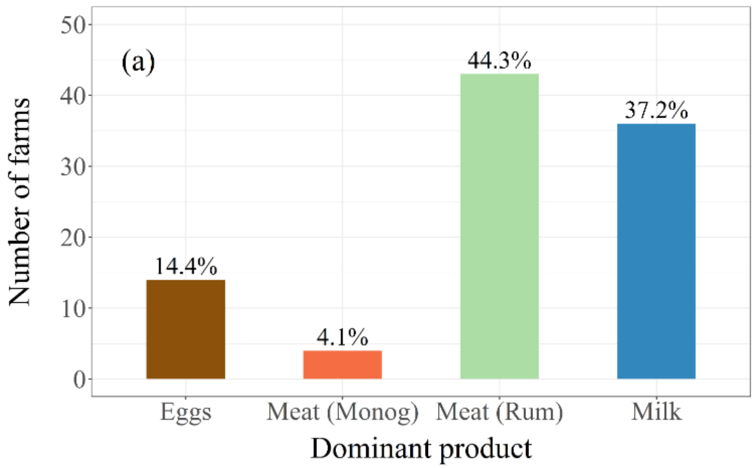
Productivity indicators

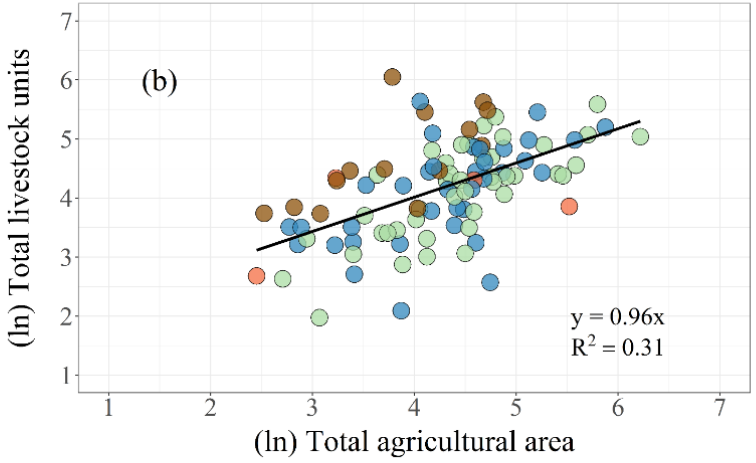
Animal Productivity (AP):
(kg animal protein sold / total livestock units)

Land productivity (LP):
(kg total protein sold / hectare agricultural area)

Worker productivity (WP):
(kg total protein sold / number of working hours)

Productivity Results





Most farms dominated by ruminant products

Farm area vs livestock units

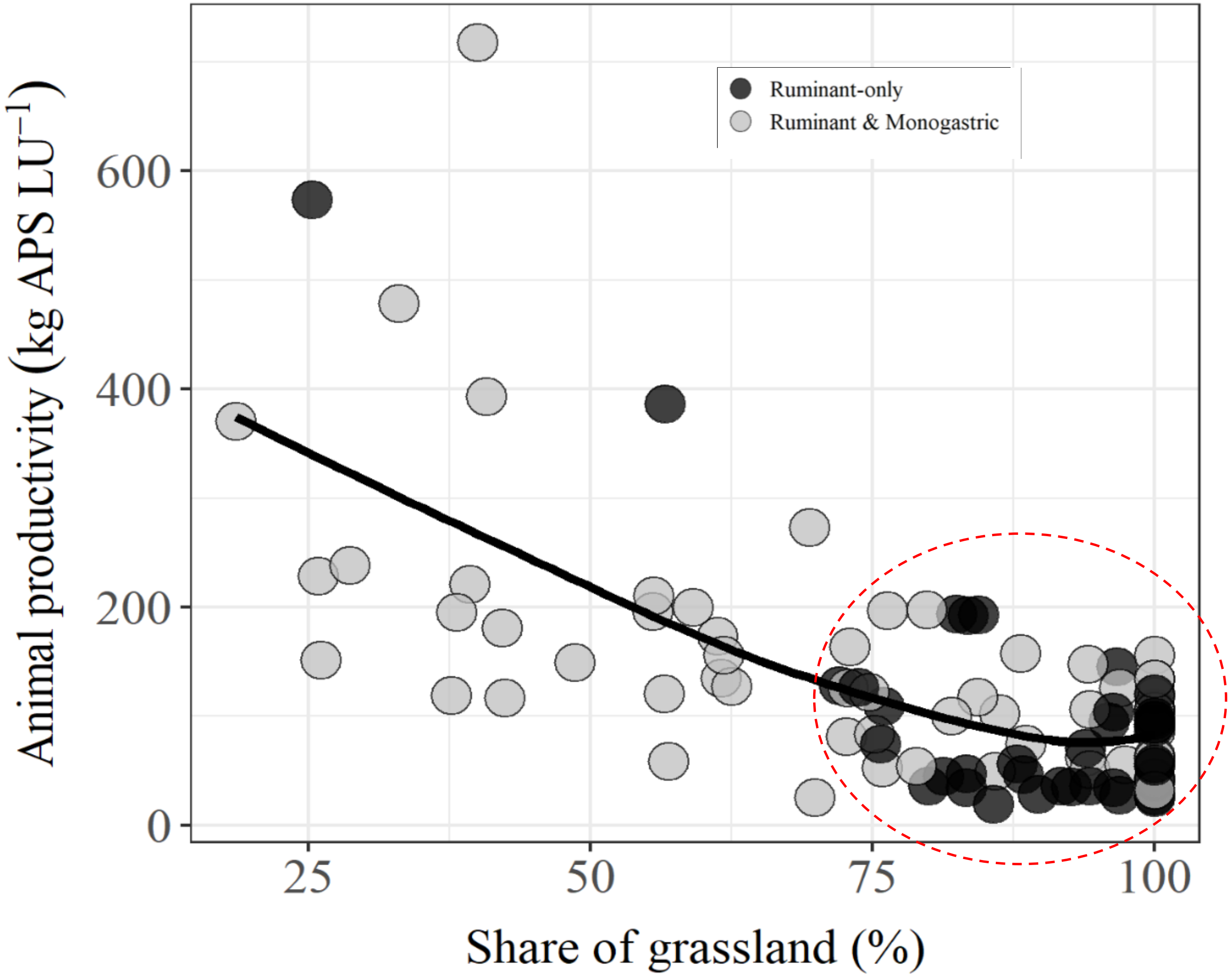
Stocking density ~ 1.2 LU/ha

Productivity Results, average (min – max)

Productivity indicator	Ruminants only	Ruminants + monogastrics	Statistic signific.
Animal productivity	98 (19-574)	149 (25-718)	Yes
Land productivity	83 (5-480)	178 (12-572)	Yes
Worker productivity	3100 (300-21900)	4973 (572-51000)	No

- Large variation!
- Farms with ruminants + monogastrics tend to have higher animal and land productivity

Productivity Results



- Farms with large share of grassland tend to have lower animal productivity

Modelling productivity with multivariate analysis

17 farm variables were chosen and models were built with 2-10 variables.
The best variables in a model for estimating productivity were:

Animal productivity:

- Amount of livestock units
- Percentage of grassland
- Amount of cereals sold
- Percentage meat of sold products

Land productivity:

- Amount of livestock units
- Amount of grassland
- Percentage meat of sold products

Worker productivity:

- Annual working time
- Amount of cereals sold

Thanks for listening

Tack

Merci beaucoup

Grazie

Vielen dank

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Farmer satisfaction in OMLF

Bernadette Oehen & Lisa Schanz

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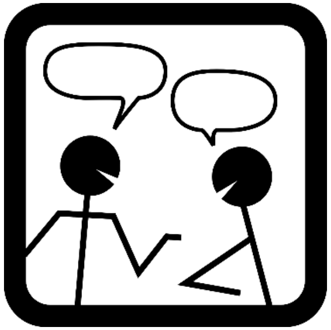
Why?

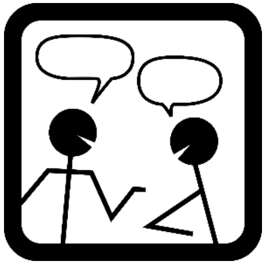
- Measuring human well-being as part of sustainability
- Farmers at higher risk of mental health issues, mortality and suicide
- Some farming systems environmentally and socially more sustainable than others

Aim

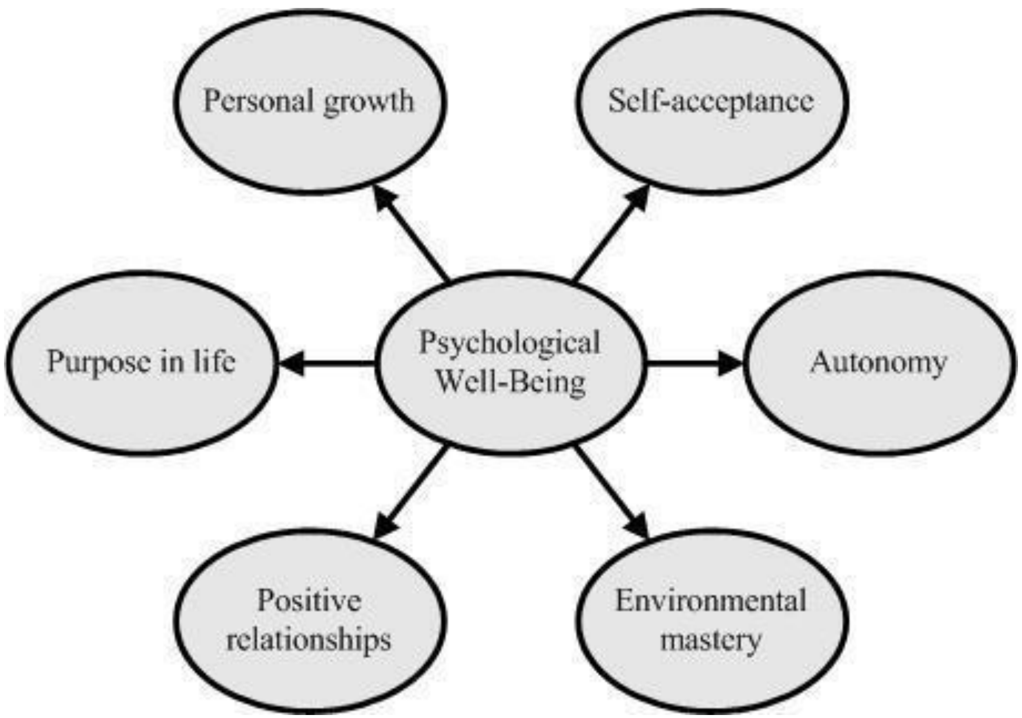
Qualitative and quantitative approach to analyse farmer satisfaction (with income), work peaks per year, mental complexity and physical severity



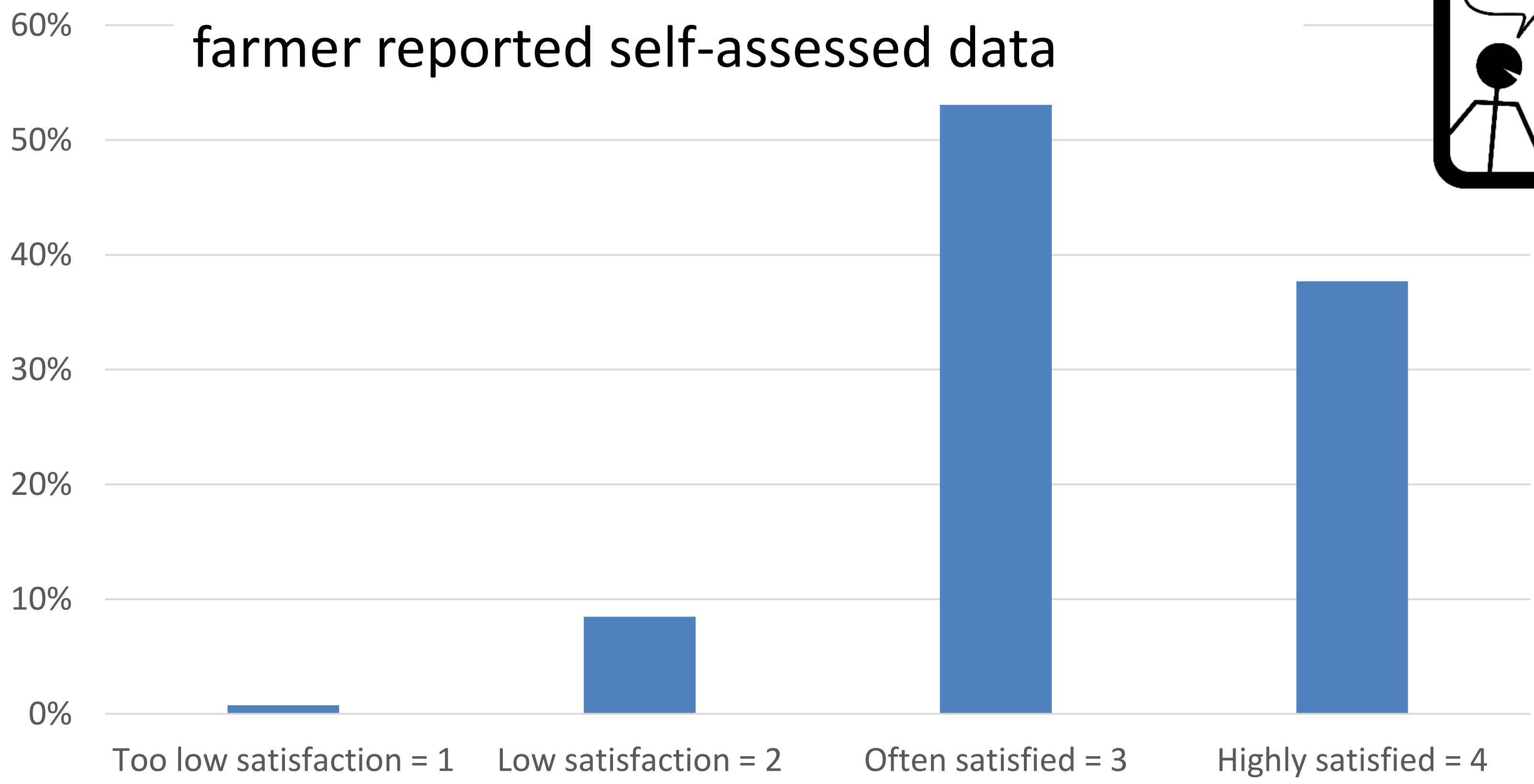
Qualitative Analyses



- Analysis of farmer reported self-assessed data



Qualitative Analyses



Reason for satisfaction

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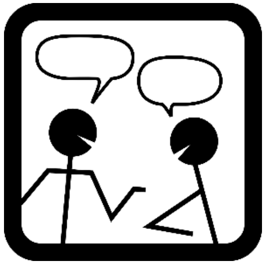
Qualitative Analyses

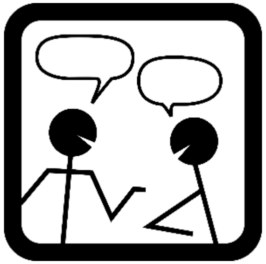
Reasons for satisfaction



- Varity / diversity of tasks, learning, no routine
- Network, contact with people, recognition, appreciation
- Having no boss / Autonomie
- Producing food for people, working with nature, taking care for animals
- “Fun at work”

Qualitative Analyses

Reasons for lower satisfaction



- Economic challenges
- Environmental challenges
- Limited contact to people or too much interaction with people
- No recognition, no appreciation

Quantiative Analyses

Satisfaction with income

- **satisfaction with free time**
- **versatility of workers**
- physical severity
- environmental area

Quantiative Analyses

Satisfaction with income

- **satisfaction with free time**
- **versatility of workers**
- physical severity
- environmental area

Percentage workpeaks over a year

- **workload**
- **total number LU**
- physical severity

Quantiative Analyses

Satisfaction with income

- **satisfaction with free time**
- **versatility of workers**
- physical severity
- environmental area

Percentage workpeaks over a year

- **workload**
- **total number LU**
- physical severity

Mental complexity of work

- **Number of training days per year**
- **total number LU**
- **Satisfaction with income**

Quantiative Analyses

Satisfaction with income

- **satisfaction with free time**
- **versatility of workers**
- physical severity
- environmental area

Percentage workpeaks over a year

- **workload**
- **total number LU**
- physical severity

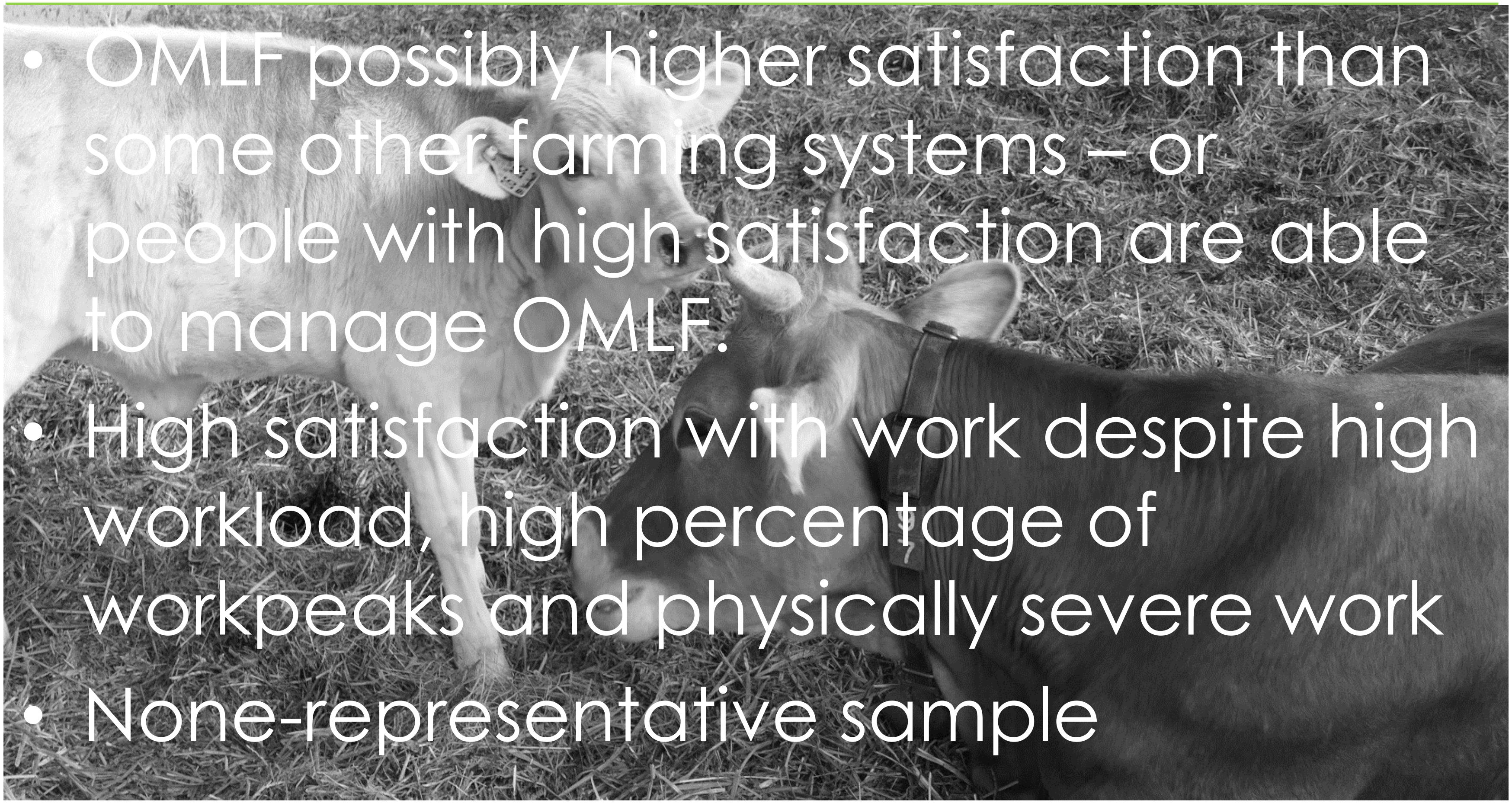
Mental complexity of work

- **Number of training days per year**
- **total number LU**
- **Satisfaction with income**

Physical severity of work

- **percentage workpeaks over a year**
- **percentage of unpaid workers AWU**
- workload
- percentage monogastrics

Take home messages



- OMLF possibly higher satisfaction than some other farming systems – or people with high satisfaction are able to manage OMLF.
- High satisfaction with work despite high workload, high percentage of workpeaks and physically severe work
- None-representative sample

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Integrated analysis

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Objectives

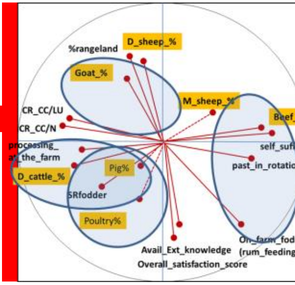
- Identifying main farm types and related management (livestock management, sales, etc.)

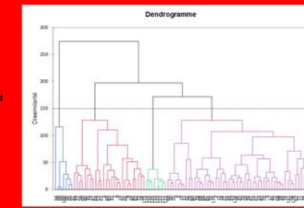
- Identifying the link between livestock species combinations and farm production efficiency

Data

- 96 farms
- 5 types of variables
  - Farm structure (area, enterprises, livestock number…)
  - Management practices (crop-pasture rotation, self-sufficiency for feed…)
  - Sales practices (on-farm processing, type of sale channel…)
  - Level and efficiency of livestock production (€, kg, protein)
  - Farmer (roots in farming, satisfaction, years since conversion to organic…)

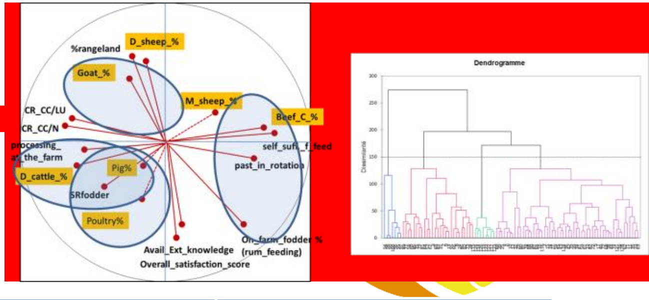
Four types of farms





Group	1	2	3	4
	Dairy cattle (+pigs/beef cattle)	Beef cattle (+poultry/dairy cattle)	Dairy sheep (+ cattle/goats)	Beef cattle + Meat sheep
Nb LU	64	**101**	**112**	44
AWU	4.4	2.2	6.1	1.3
AWU employees	**36%**	18%	**46%**	14%
On-farm processing (%€) Short sale channels (%€)	**82%** 64%	39% 44%	**71%** 82%	0% 53%
Autonomy for feed (%UF)	81%	**84%**	**46%**	**98%**

Four types of farms



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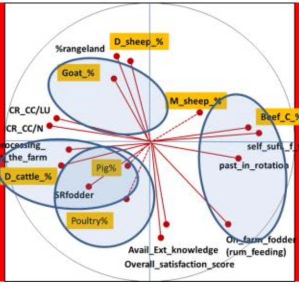
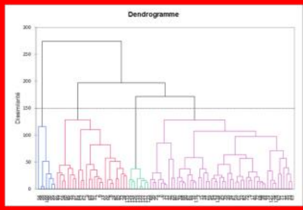
Four types of farms





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AWU employees	**36%**	18%	**46%**	14%
On-farm processing (%€) Short sale channels (%€)	**82%** 64%	39% 44%	**71%** 82%	0% 53%
Autonomy for feed (%UF)	81%	**84%**	**46%**	**98%**

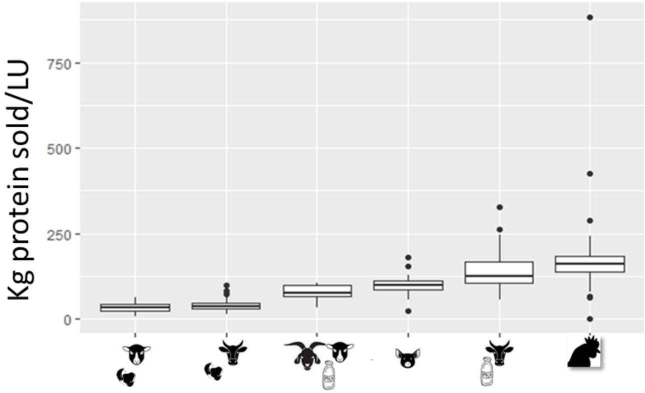
Dairy : premium prices (on-farm processing + direct selling ➔ milk price x 10 vs. conventional price) but high workload

Combination of cattle and sheep (meat): technical performance (autonomy) due too limited price premiums (➔ meat price long channel x 1.1-1.15 vs. conventional price; short channel x 1.5-2 vs. conventional price)

Efficiency assessment

Efficiency = max. production with min. inputs → Kg output / kg feed concentrates (on a protein basis)

Ruminants, monogastrics, dairy, meat: different physiologies and production potentials



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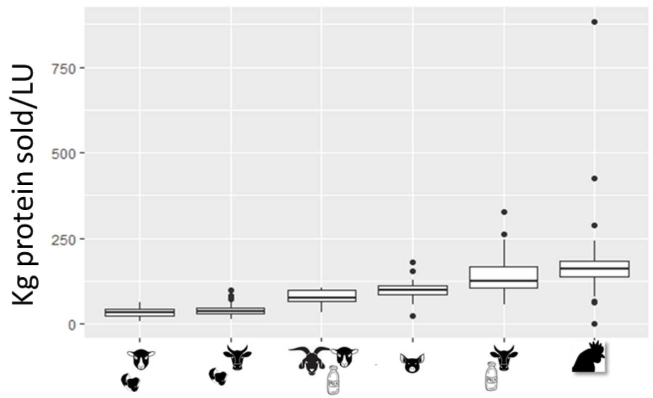
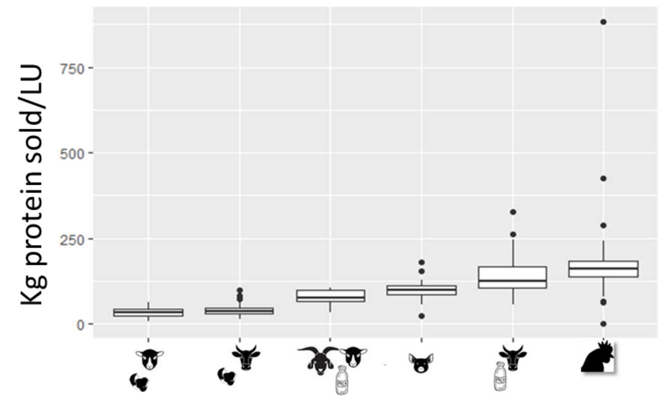


Data standardized per type of enterprise (outputs + concentrates) → Weighted sum of enterprises (acc. to %LU) → **Farm efficiency**

Efficiency assessment

Efficiency = max. production with min. inputs → Kg output / kg feed concentrates (on a protein basis)

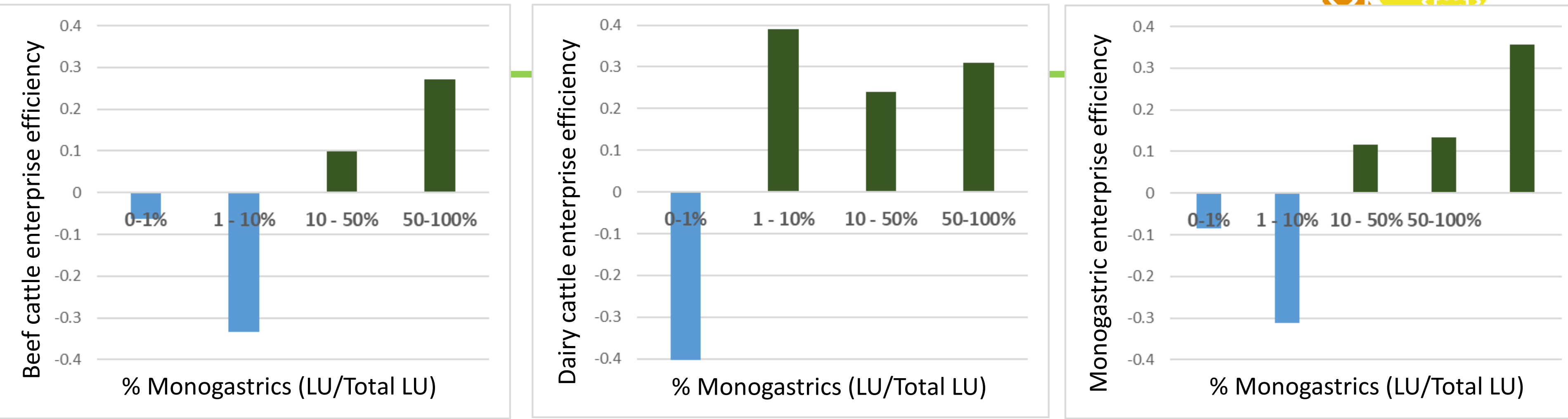
Ruminants, monogastrics, dairy, meat: different physiologies and production potentials



Data standardized per type of enterprise (outputs + concentrates) → Weighted sum of enterprises (acc. to %LU) → **Farm efficiency**

	Group 1 Dairy cattle (+pigs/beef cattle)	Group 2 Beef cattle (+poultry/dairy cattle)	Group 3 Dairy sheep (+ cattle/goats)	Group4 Beef cattle + Meat sheep
Eff: Output / Conc.	+ 0.14	- 0.04	- 0.49	+ 0.62

Min. 10% of monogastrics to improve efficiency of other productions



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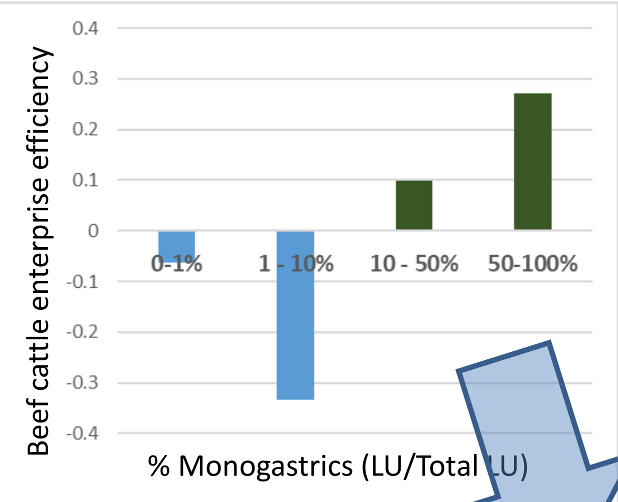
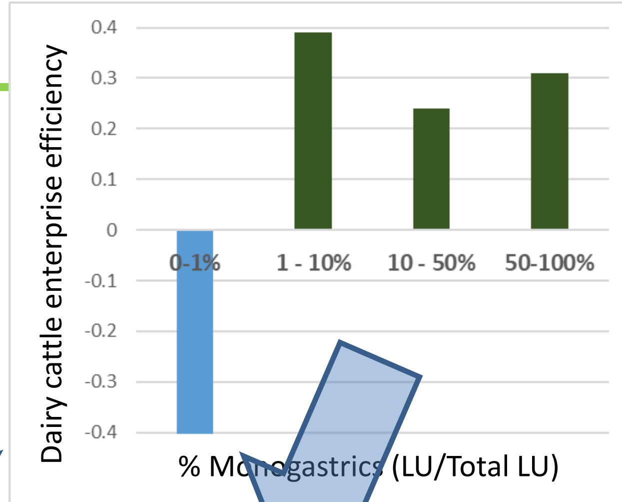
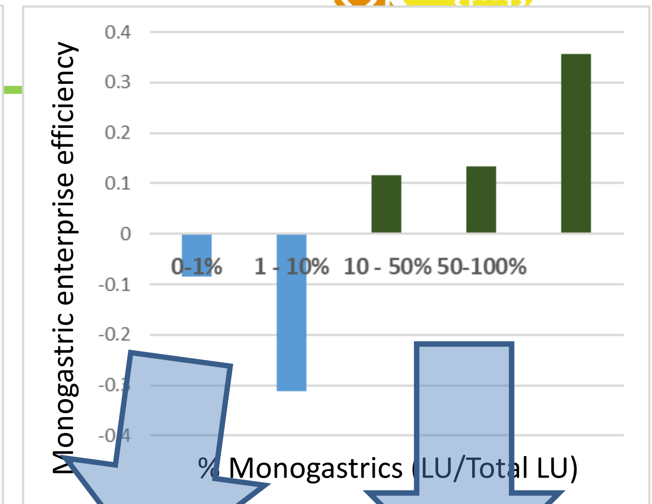




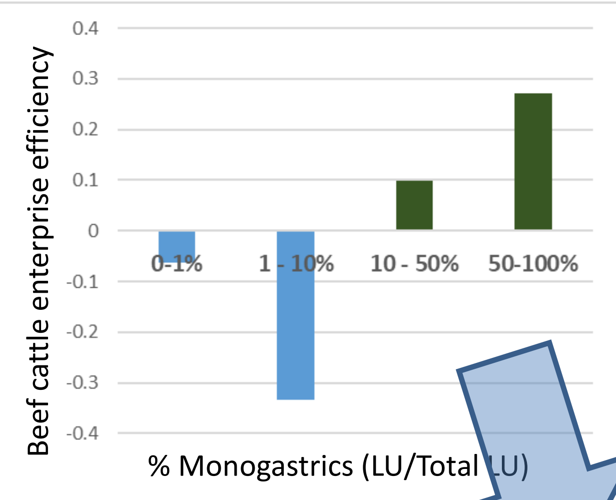


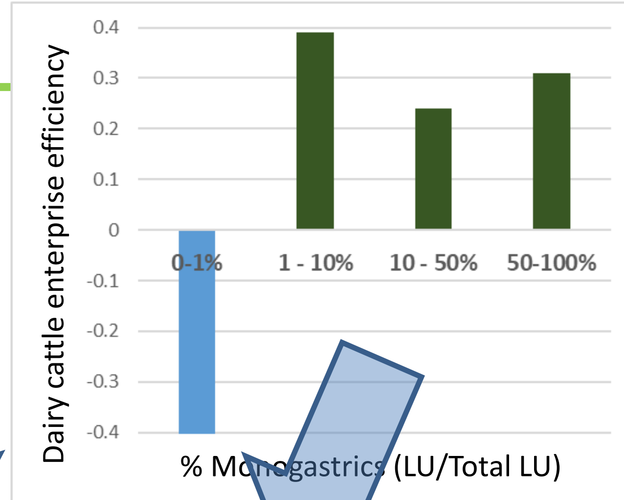
Fertility transfer: feed inputs for monogastr. → fertilization of crop and pastures → autonomy to feed ruminants

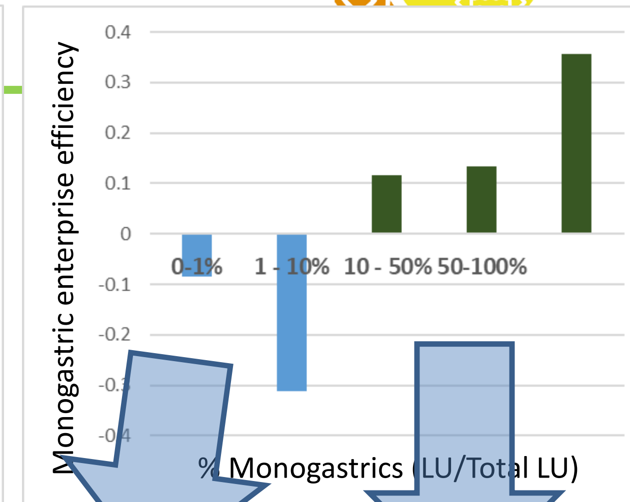
Hyp:
Small monog. enterprises
→ Short channels
→ Technical efficiency matters less

Large optimized enterprises → efficiency

Min. 10% of monogastrics to improve efficiency of other productions







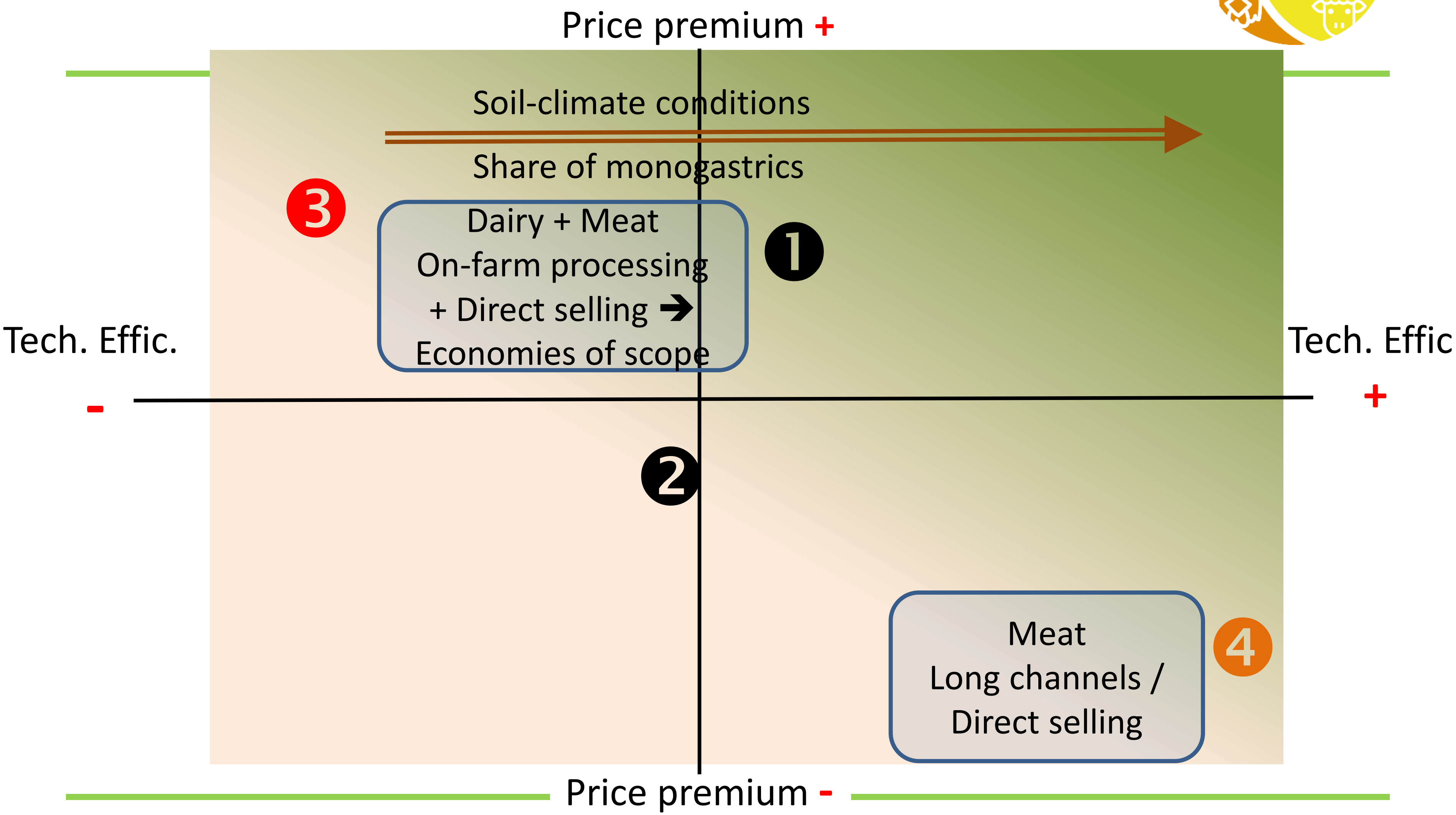
Fertility transfer: feed inputs for monogastr. → fertilization of crop and pastures → autonomy to feed ruminants

Hyp:
Small monog. enterprises
→ Short channels
→ Technical efficiency matters less

Large optimized enterprises → efficiency

3 interacting factors:
monogastric enterprise size x fertility transfer x sales channels

Trade-off: technical efficiency vs. price premiums



MIX-ENABLE

Mixed grazing of steers and lambs in presence of an adaptable nematode

Steffen Werne

CORE organic

Background

- Sheep usually benefit from mixed grazing with cattle (performance ↑)
- Usually without effects on cattle
- But: intensive sheep treatment (worms)
  - May limit cross-transmission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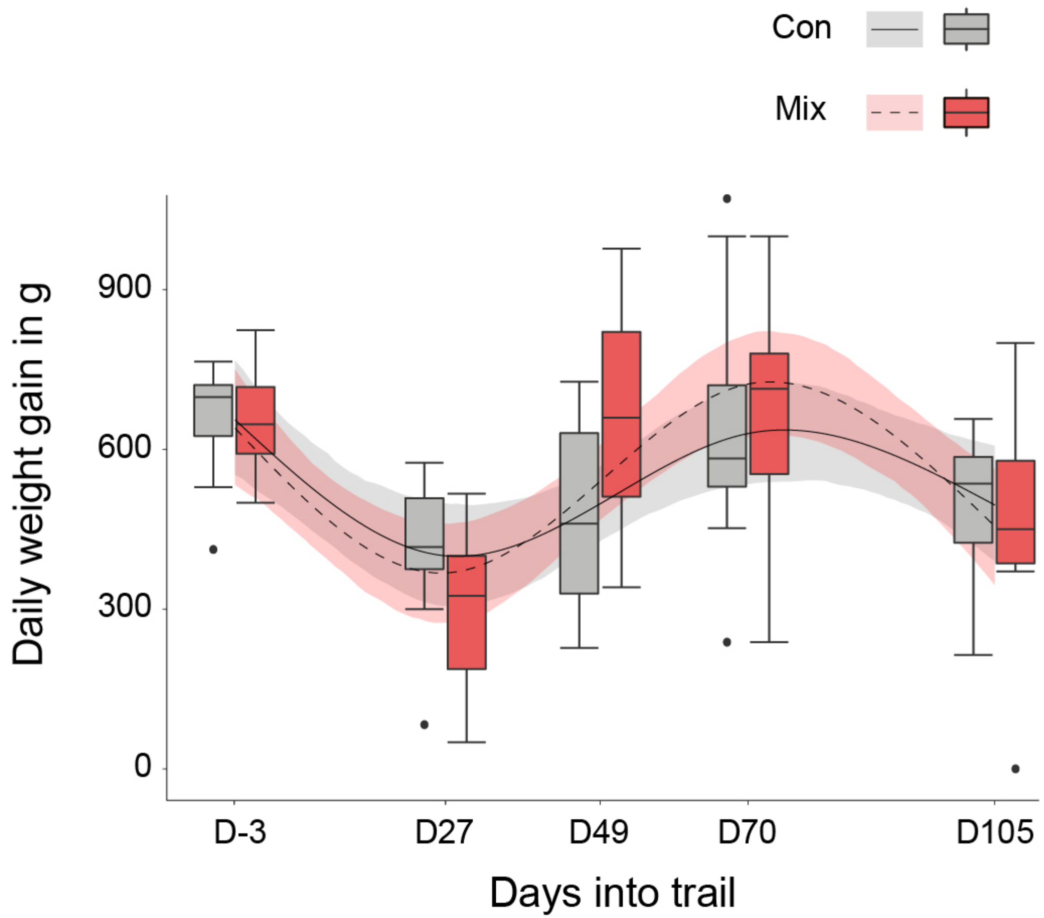
Weight gain



Con
Mix
Daily weight gain in g
900
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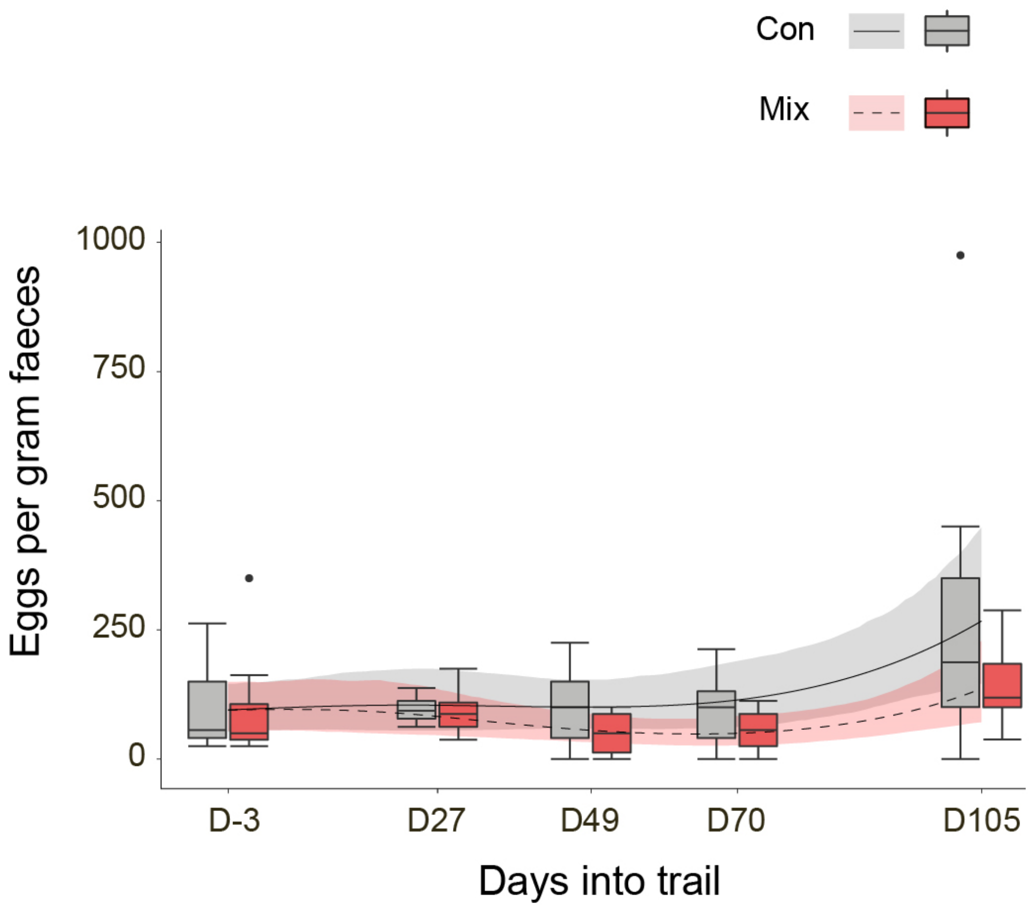
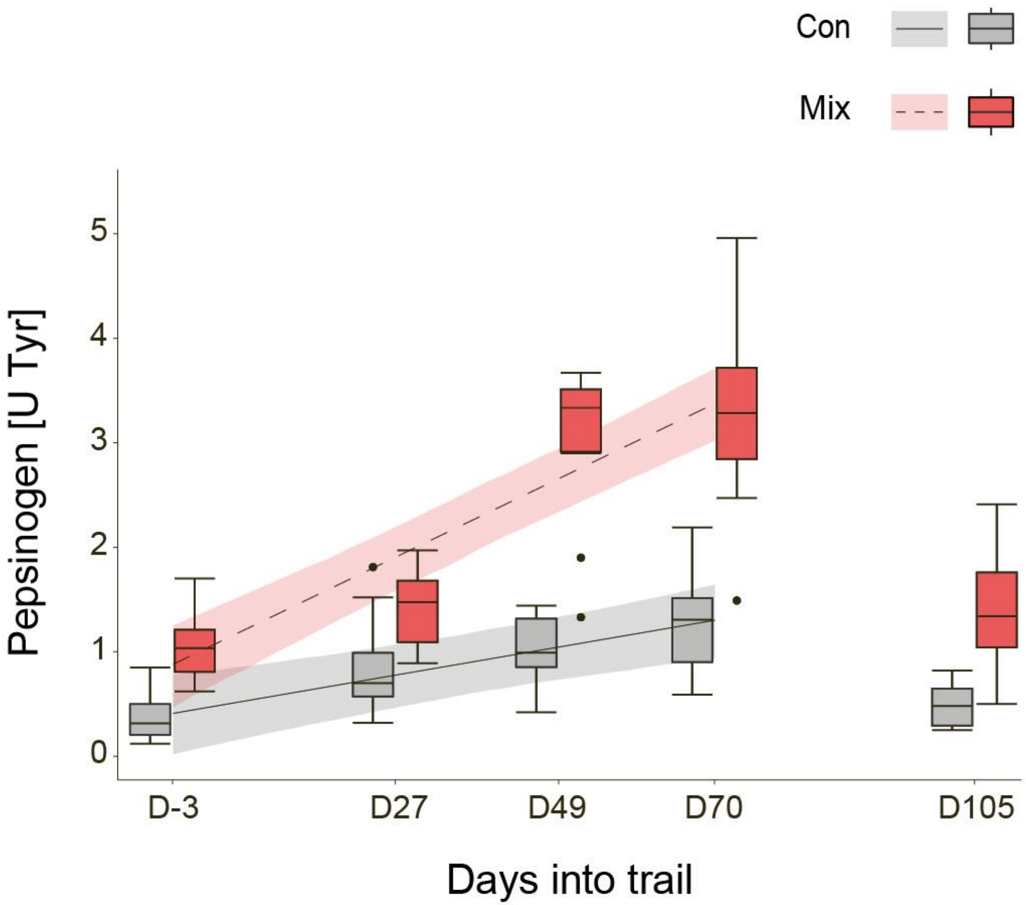
300
0
D-3
D27
D49
D70
D105
Days into trail

Parasite eggs



Pepsinogen



- PCR: Cross transmission of *H. contortus* from sheep (and deer) to cattle

Conclusions

- Cattle did not benefit but also not suffer from sequential grazing with lambs
- Dry summer maybe prevented further cross-transmission of worms from sheep to cattle

Thank you

MIX-ENABLE

Mixing young cattle and broilers

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Goal of the experiment

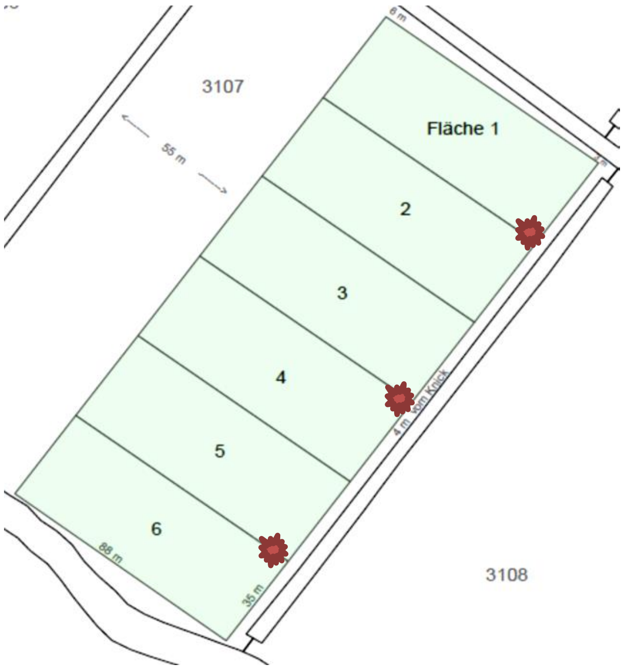
<u>Comparison of two treatments:</u>

1) Simultanuous grazing of broilers and cattle on the same pasture

2) System with broilers following cattle on pasture

Material and Methods

Set-Up



scheme of one paddock

- 2 paddocks, each with 6 sections (0.3 ha)
- Weekly rotation
- Two rounds/ year:
    - June - July
    - Sept - Oct.
- Paddocks switched in the 2nd round

Material and Methods

Animals

2 groups of 54-61 broilers (ISA JA 757)
age: 4 weeks

2 groups of 10 heifers (German Holstein)
1 heifer 300 m^{-2}

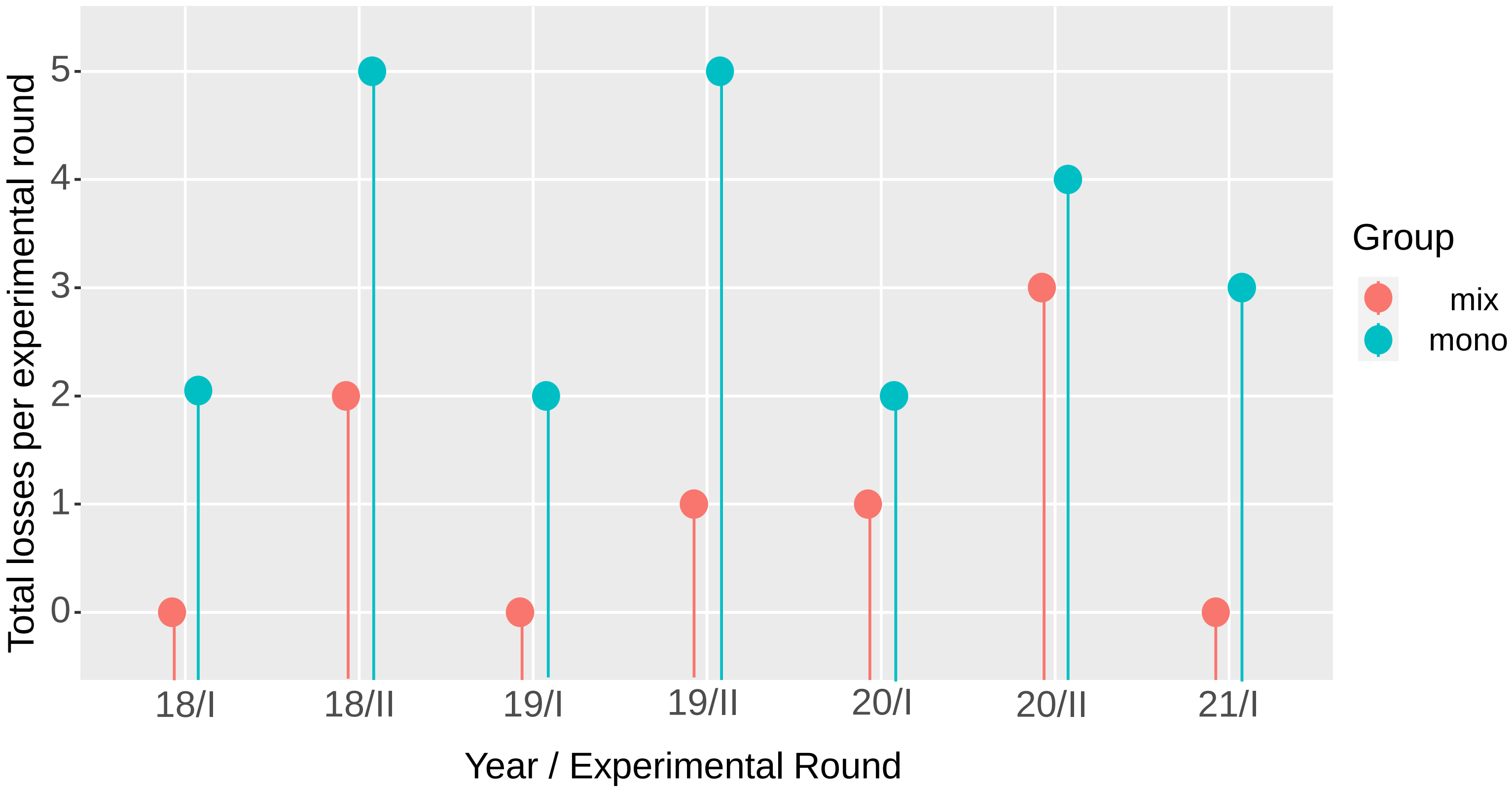
Age: 8-13 months

Material and Methods

Site

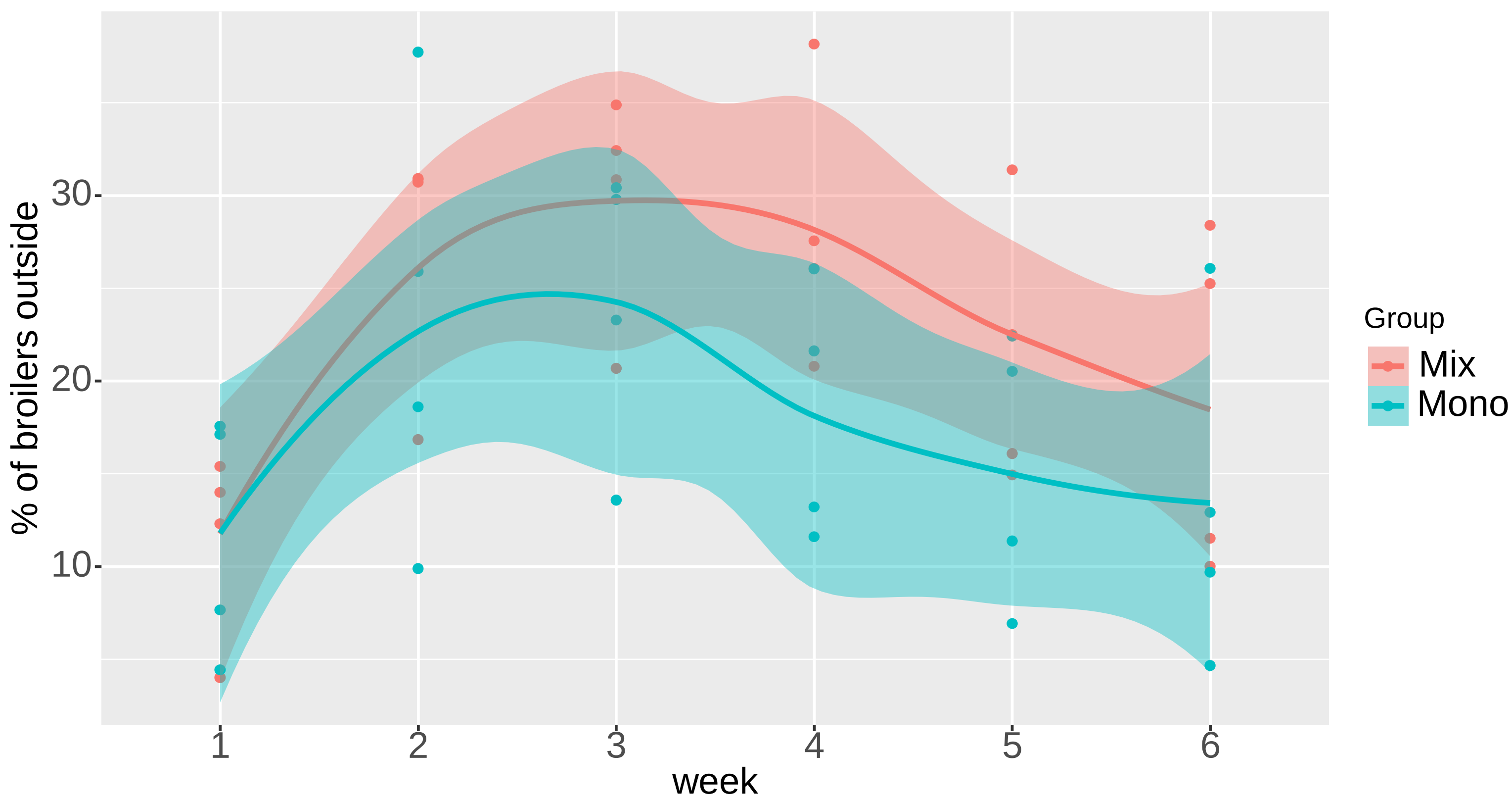
Results

Broiler losses



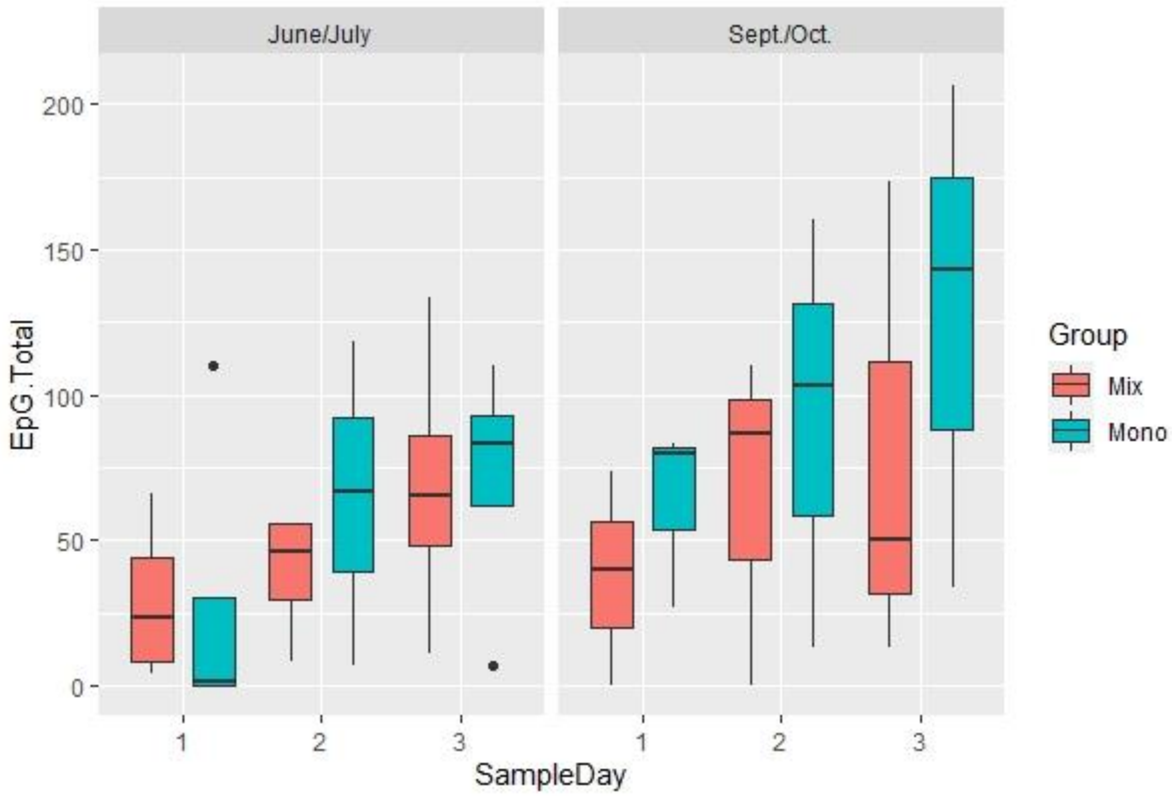
Results

Use of range



Insects

Parasitic Eggs



Summary

- Losses of broilers due to predators
  - Fewer losses in the mix-group throughout the trials
- Percentage of broilers outside
  - On average 6% more broilers outside if with cattle
- Fecal egg count
  - No differences measured

Thank you

MIX-ENABLE

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Effects of mixing beef cattle and sheep in mountainous grassland-based farming systems

An experiment at the system level

Prache S. [1], Vazeille K. [2], Chaya W.[1], Jury C. [1], Troquier C.[1], Sepchat B., Benoit M.[1], Veysset P.[1]

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sophie.prache@inrae.fr

Livestock farming project

Objectives

Produce grass-fed meat self-sufficiently from permanent pastures in sustainable farming systems
Grassland-based systems maximizing the use of pastures and a minimizing external inputs

Questions

Associating beef cattle and sheep → agro-ecological advantages?
Cross-breeding → early maturing for favouring grass-finishing?

Experiment at the system level (Herbipôle experimental unit, Laqueuille, Massif Central)

Mountain area, 1100 to 1400m asl., 100% permanent grasslands

3 organic farming systems:
- -an experimental mixed system associating sheep and beef cattle
- -2 specialized systems: sheep and beef cattle

Same area (40 ha), LSU (30) and average annual stocking rate (0.75 LU/ha) per system

3 organic livestock farming systems – 3 farmlets-30 LU-40 ha grasslands

Specialized sheep

- 164 Limousine ewes + 4 Suffolk rams + 2 Limousine rams - 20% replacement (33 ewe lambs per year)
- 1 lambing period per year in spring
- Lamb finished on aftermaths after weaning
- Indoor finition for non slaughtered lambs when ewes get mated (October)

Specialized beef cattle

- 22 Salers cows + 1 Angus bull Angus - 10% replacement (2 Salers heifers purchased per year)
- calving period: 15 January → 15 March, weaning in October
- All young animals (males and females) finished indoors with conserved forages
- Young animals sold at 12 to 16 months old (200-280 kg carcass)

Mixed sheep-beef cattle

- LU: 60% beef cattle and 40% sheep
- 66 ewes Limousines + 2 Suffolk rams Suffolk + 1 Limousine ram
- 13 Salers cows + 1 Angus bull
- Same strategic rules used in specialized systems, except pasture management
  - Co-grazing until weaning of the lambs
  - Mono-specific grazing of aftermaths for weaned lambs
  - Sequential grazing on previous grazed pastures based on animal requirements

- Concentrate supplementation of the dams if necessary at key periods (mating, gestation) to reach a pre-defined body condition score
- Castration of young males
- Anthelmintic treatments if mean faecal egg counts > a pre-defined level
- Decision for slaughtering: satisfactory carcass degree of fatness

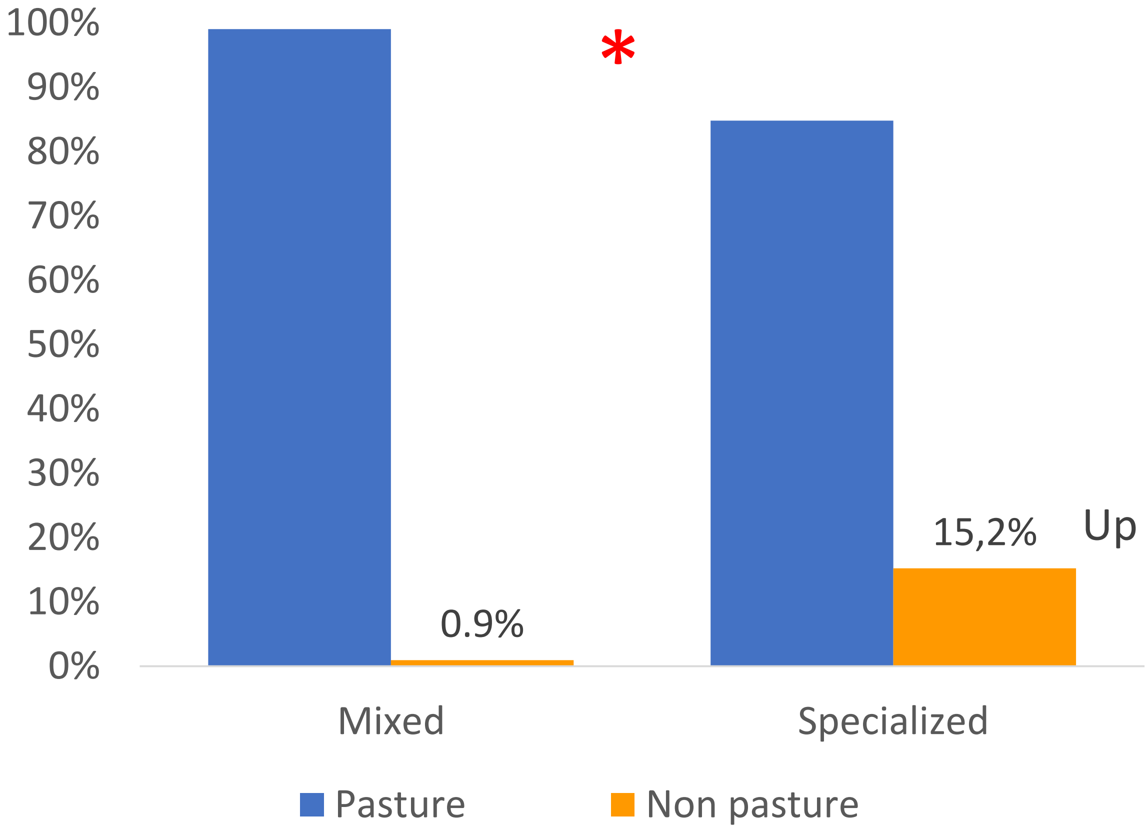
The association of beef cattle and sheep led to higher performances for sheep, not for beef cattle

Beef cattle: young animals were successfully finished with conserved grass, but no effect of the association on beef cattle technical, economic and environmental performances

Focus on **sheep** entreprise

A higher proportion of lambs finished at pasture in the mixed system

The association of beef cattle and sheep favoured lamb pasture-finishing



Up to 26% in 2020 (severe drought conditions)

Higher lamb performances in the mixed system

	Mixed		Specialized
Lamb growth rate from birth to slaughter (g/day)	211	*	179
Age to slaughter (days)	166	*	188
Carcass weight (kg)	15,4	*	14,9

A lower level of parasitism → direct and indirect (via maternal milk production level) effects

A higher nutritive value of the pastures

Higher ewe performances in the mixed system

	Mixed	Specialized
Fertility	95,9%	96,2%
Prolificacy	1,86 *	1,74
Productivity	1,55 *	1,42

Slightly higher body condition score and liveweight

A lower level of external inputs in the mixed system

	Mixed	Specialized
Concentrate (kg/ewe/year)	56,2 *	69,5
Number of anthelmintic treatments (nb/ewe/year)	2,5 *	3,1

A lower concentrate consumption level in the Mixed system:

2 groups of animals/periods of interest:

-***lambs*** : a higher proportion of lambs finished at pasture

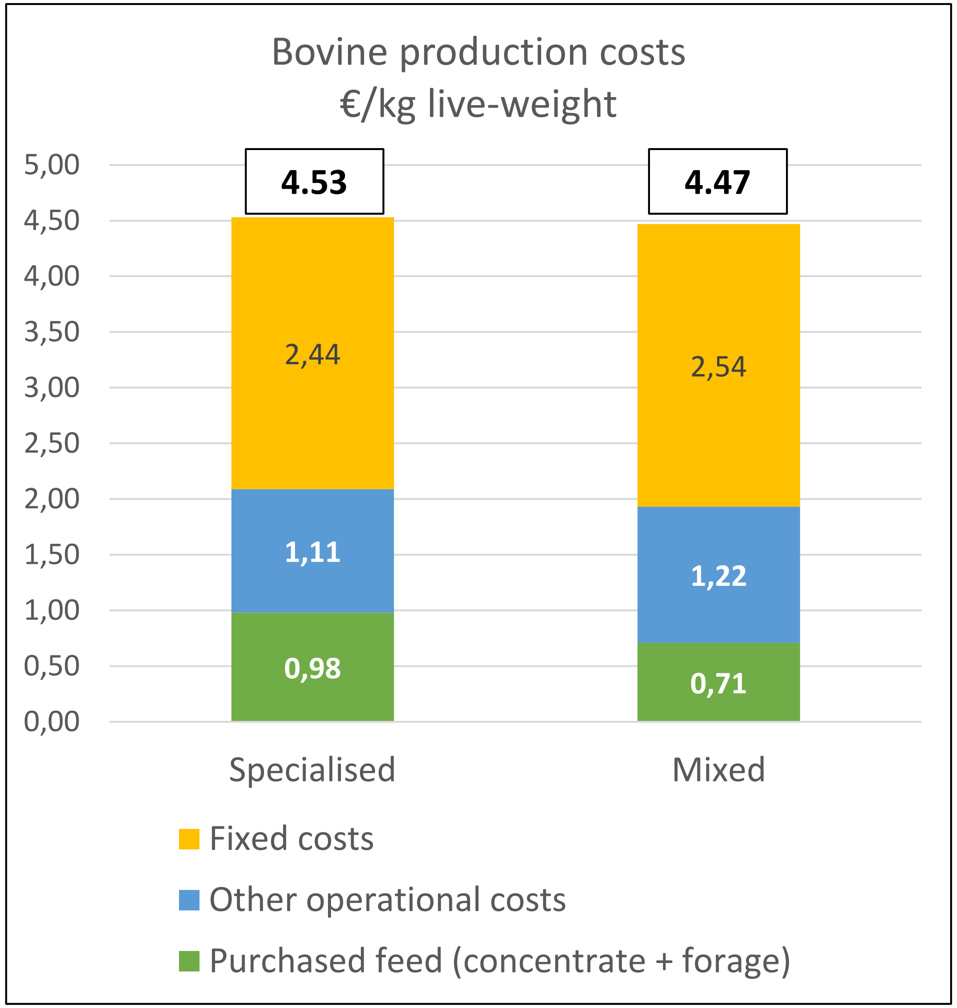
-***ewes at mating period***: a lower competition between ewes and lambs for pasture availability

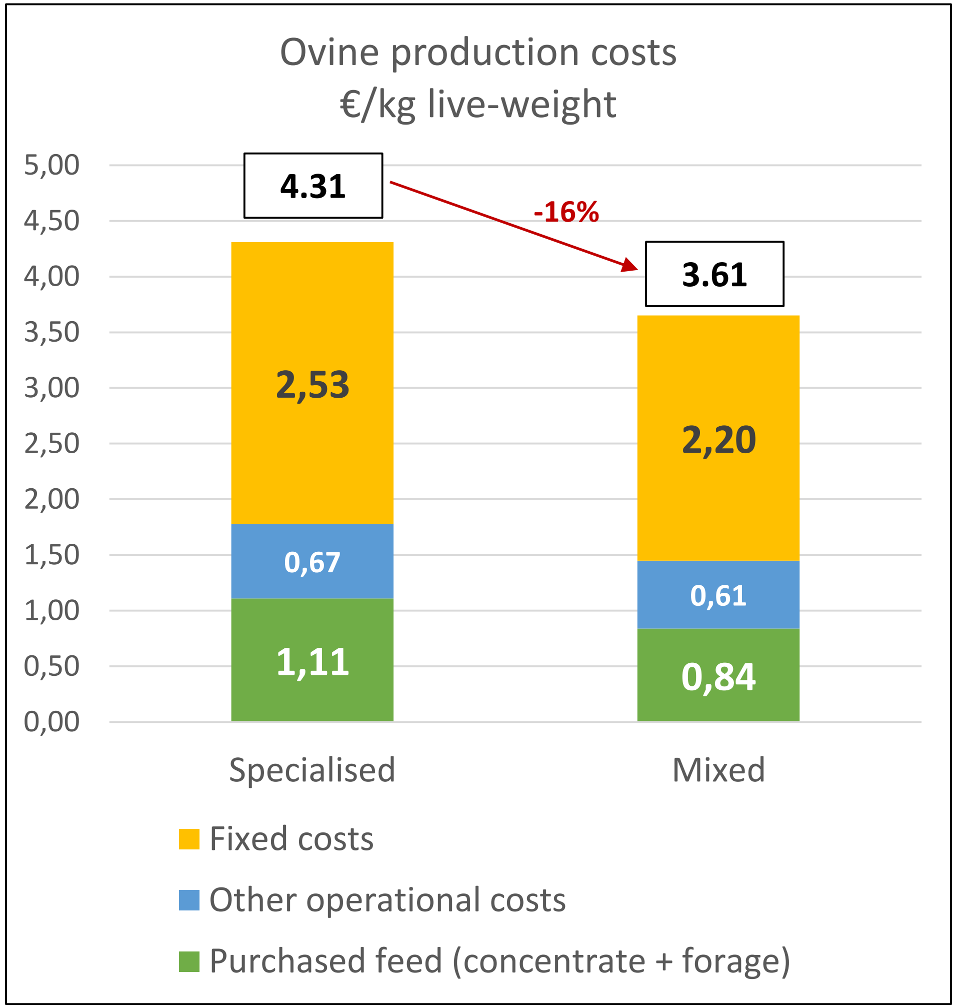
A lower number of anthelmintic treatments in the Mixed system:

a dilution of parasites or a perturbation of parasites' cycles

Economic Results – Production Costs €/Kg Live-Weight

Average annual results over 3 years: 1 May 2017 → 30 April 2020 (missing one year)





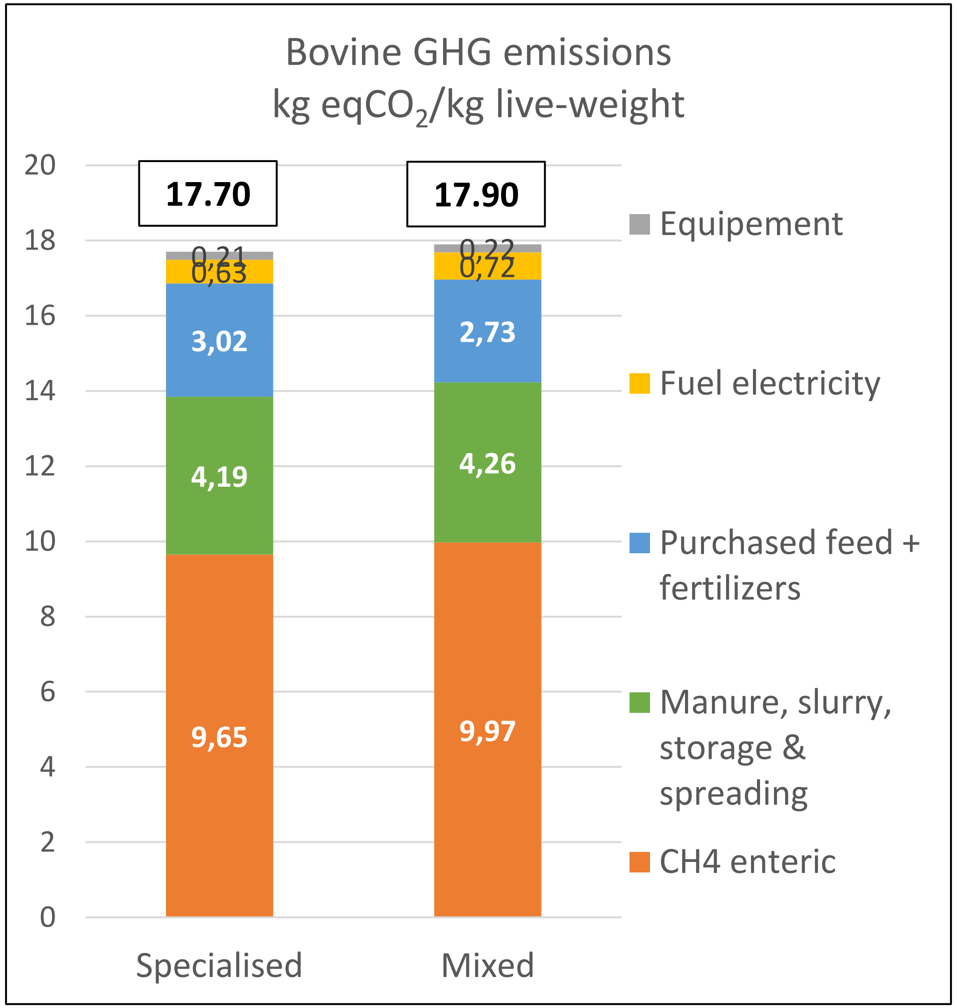
A lower use of external inputs (-19% concentrate)

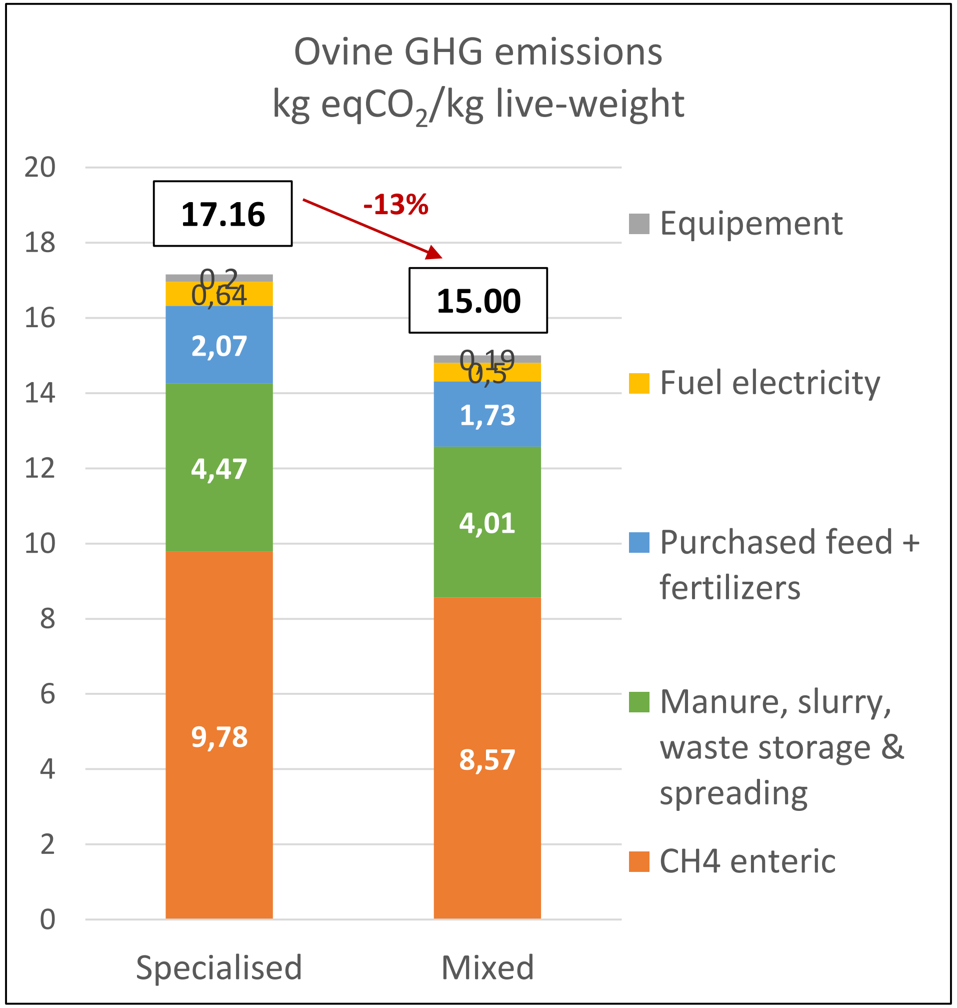
combined with

a **higher animal productivity** : +15% (higher number of lambs produced per ewe and higher lamb carcass weight)

Greenhouse Gases Emissions (GHG)

Average annual results over 3 years: 1 May 2017 → 30 April 2020 (missing one year)





A higher animal productivity (lamb carcass produced/ewe/year),

A **lower lamb age at slaughter**

and

a lower use of external inputs

Conclusions

The **association of beef cattle and sheep favoured pasture-finishing of lambs**

A **lower use of external inputs in sheep**

↘ concentrate consumption by lambs and by ewes at mating period; ↘ number of anthelmintic treatments

A **lower level of GHG emissions** (kg eqCO2/kgLW) **in the mixed system for sheep**

↗ animal productivity (kg meat produced/ewe) and ↘ use of external inputs

Crossing with an early maturing breed favoured the finishing of young animals without concentrate feed

These productive grassland-based systems are exposed to climatic and sanitary hazards

need to produce sufficient quantity of high-quality forages

need to carefully monitor the level of parasite infestation in animals

Meat quality: work in progress

MixEnable Final webinar, 28th September 2021

Reducing the vulnerability of mixed cattle-sheep farms

Claire MOSNIER[1], Nassima MOUFID[1], Frederic JOLY[1], Marc BENOIT[1]

[1]Université Clermont Auvergne, INRAE, VetAgro Sup, UMR 1213 Herbivores, inrae Saint-Genès-Champanelle, France

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With the financial contribution of

Context

- Farmers are exposed to multiple sources of risks
- Mixed farming systems are gaining interest both or the application of agro-ecological principles and as a <u>risk management strategy</u>

Context

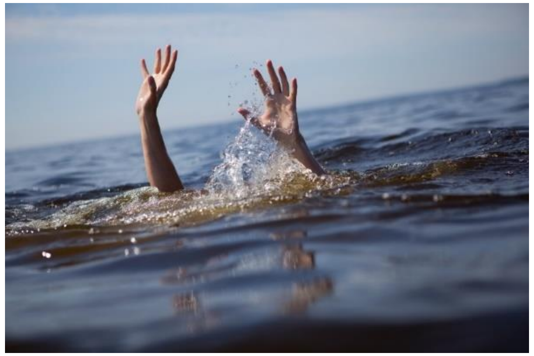
- Farmers are exposed to multiple sources of risks

- Mixed farming systems are gaining interest both or the application of agro-ecological principles and as a <u>risk management strategy</u>

= planned decisions made to deal with the hazards identified

to reduce <u>vulnerability = </u>significant risk of falling below a critical level *(Hoddinott and Quisumbing, 2010)*

Probability \ Impact	Low	Medium	High
High	Low	Medium	High
Medium	Low	Medium	Medium
Low	Low	Low	Low

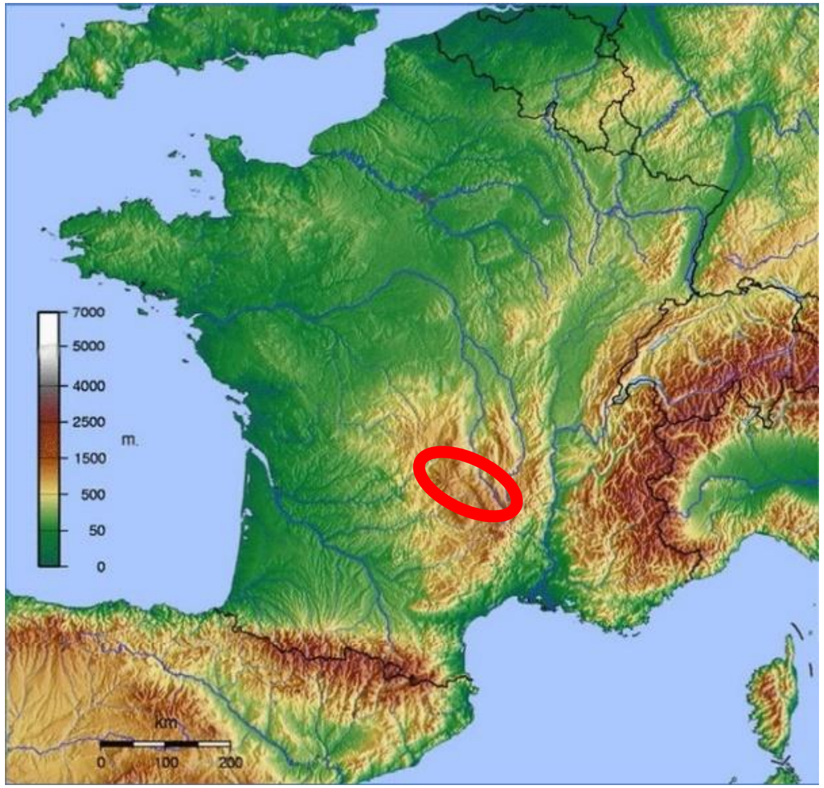


Objectives

- How organic cattle-sheep farmers of the French Massif Central feel exposed to risks and how they manage them
- What are the effects of different strategies to reduce their vulnerability?

Method

- Interviewed 4 organic farmers in 2021 to supplement surveys conducted in 2017 *(Steinmetz et al., 2021)* to identify
    - The main risks for them
    - Short (ex post) and long term (ex-ante) adaptation strategies



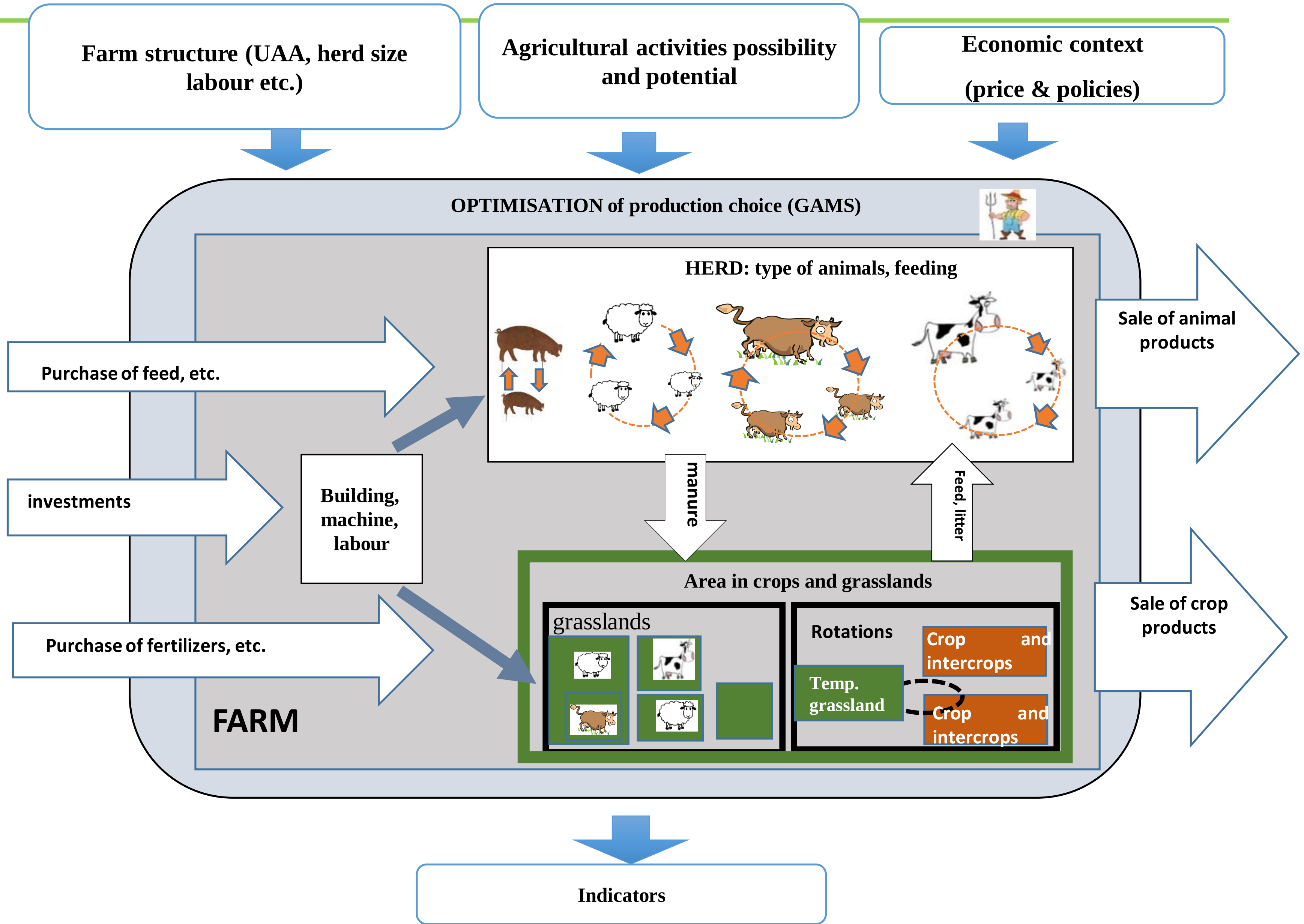
Method

- Main characteristics of the 4 farms

	F63	F65	F67	F74	Mean
Labour (worker unit) 	1	1.6	1.3	1	1.2
Cows (heads) 	15	28	39	47	32
Ewes (heads) 	220	185	200	100	176
Stocking rate	1.2	0.7	0.6	1.2	0.9
Agricultural area (ha)	75	116	196	107	124
grasslands (% total) 	80%	92%	86%	81%	85%
Consumption of own cereals 	Yes	yes	no	Yes	Yes

Orfee bioeconomic model

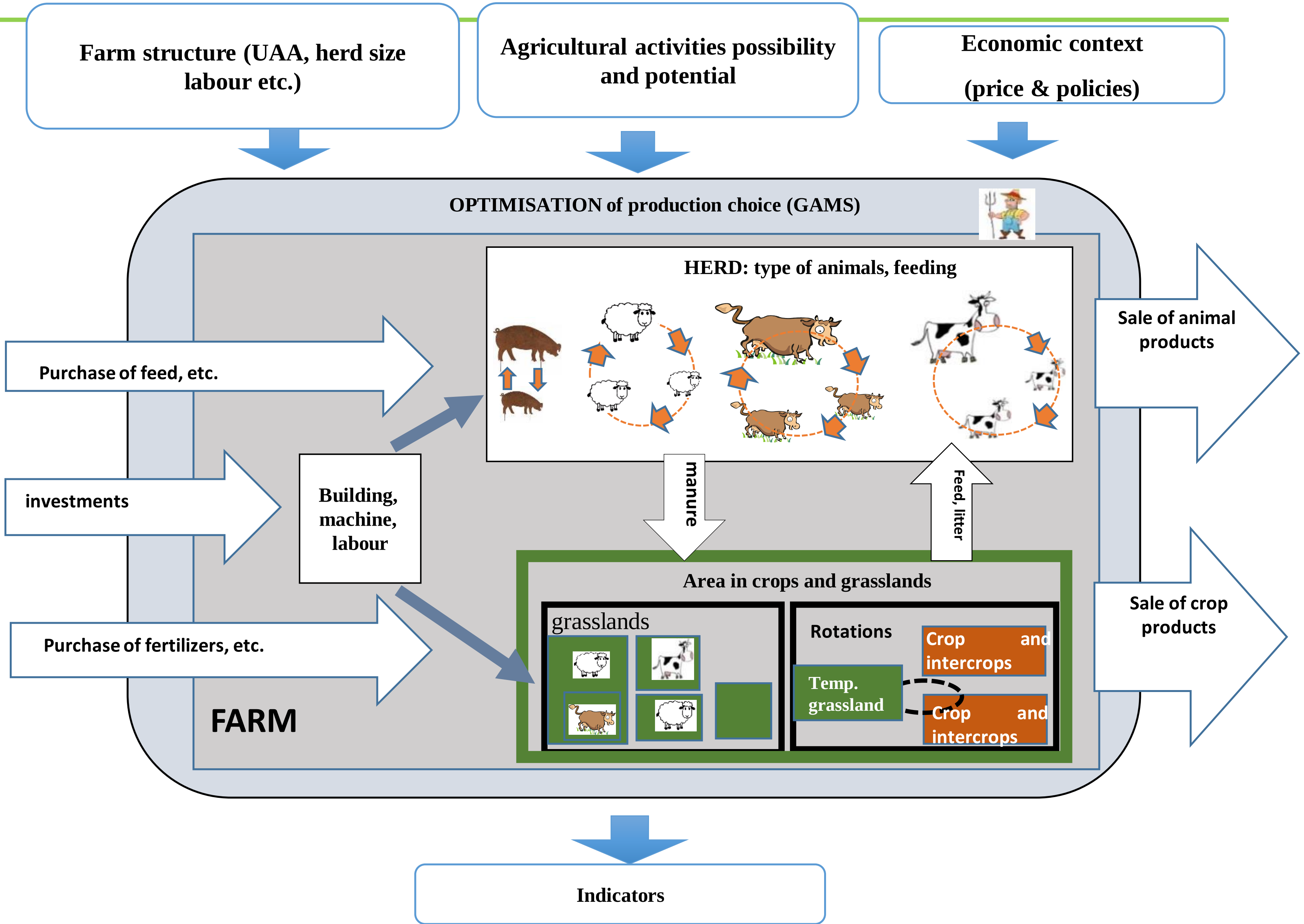
Orfee: Simulates the decision process and production process



Orfee bioeconomic model

Orfee: Simulates the decision process and production process

Orfee is used :
-Optimize short-term decisions to adapt to a hazard.
-Simulate technical, economic and sustainability indicators at the farm level.



Results

Results: main risks for farmers

- Farmers have been asked to classify these risks :

low	medium	High

	Human Health	Plant disease	Public policies	Machine breakdown	Animal production	Input prices	Output prices	Climate
F63								
F65								
F67								
F74								

Current adaptations and plans

To face these hazards, farmers have more or less flexibility. The short term adaptations frequently used are the following:

	↓ age or liveweight of animals sold	↑Sell cows	↓ mowing	↓Grazing	intercrops	↑Feed purchase
F63	+			+ (cows out of pasture in august)	(+)	+
F65					+	+
F67	(+)		+	+ (ewes in lake shore)	+	+
F74		+	+	+ (ewes in mountain pasture)	+	+

INRAE

Simulations

- Combination of hazard simulated according to farmer's declaration
  - Spring grassland yield (+ forage price and ewe prolificity) x fall grassland yield x cereal yield x intercrop yield x animal price x cereal price x input prices (national index) = max 400 simulations

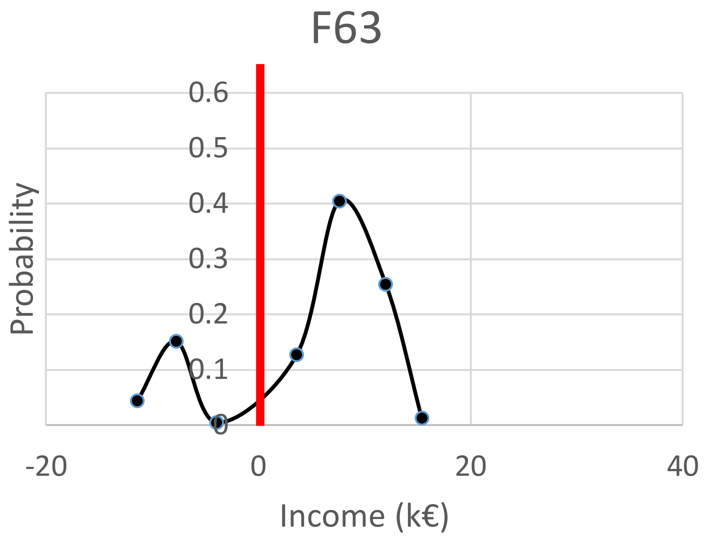
Simulations

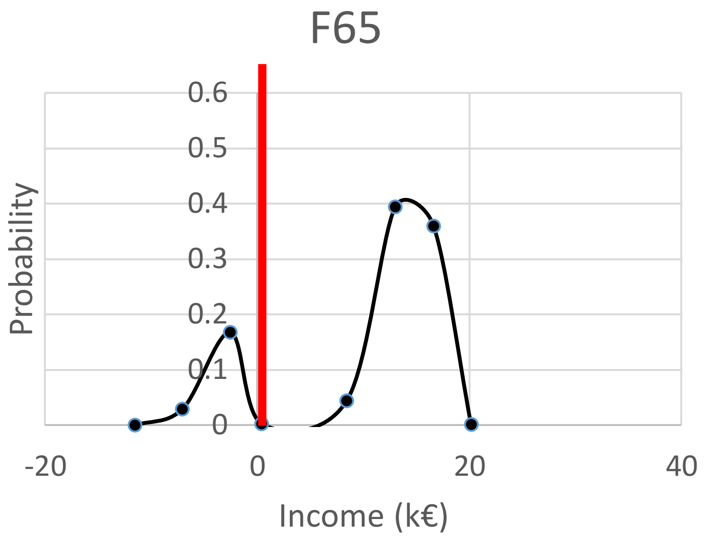
- Combination of hazard simulated according to farmer's declaration
  - Spring grassland yield (+ forage price and ewe prolificity) x fall grassland yield x cereal yield x intercrop yield x animal price x cereal price x input prices (national index) = max 400 simulations

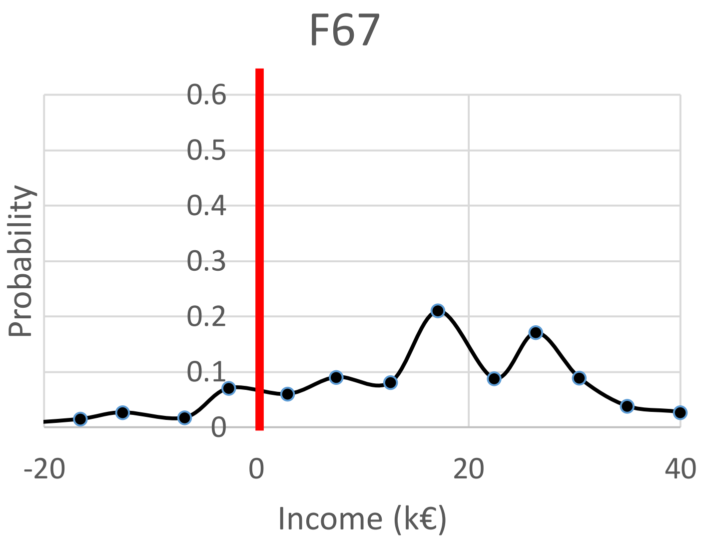
- Adaptation tested

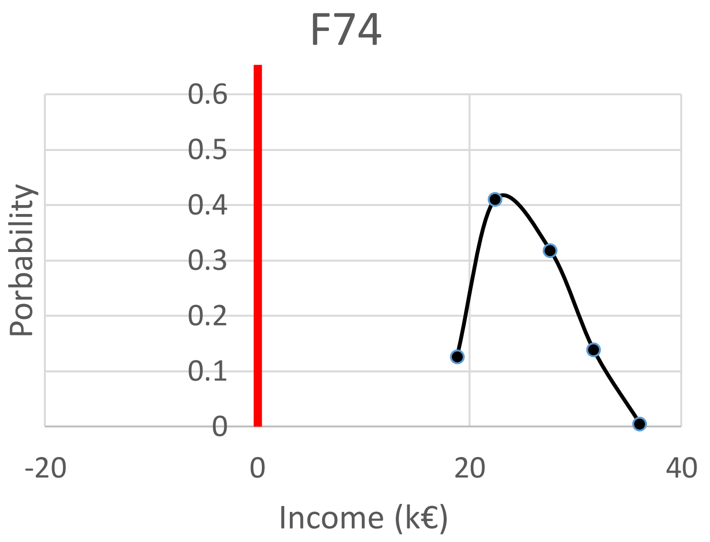
	Base	Reduction of stocking rate	new enterprise mix
F63	15 SCow +220 Ewes	10 SC + 220 E	500 piglets +10 SC + 220 E
F65	28 SC+185E	80% of beef and sheep	19 dairy cows ; 185 E
F67	39 SC+120E		500 piglets + 31 SC + 96 E
F74	[39-47] SC+ 100E	+30 ha of perm. grasslands	500 piglets + [39-47] SC+ 100E

Distribution of income simulated baseline



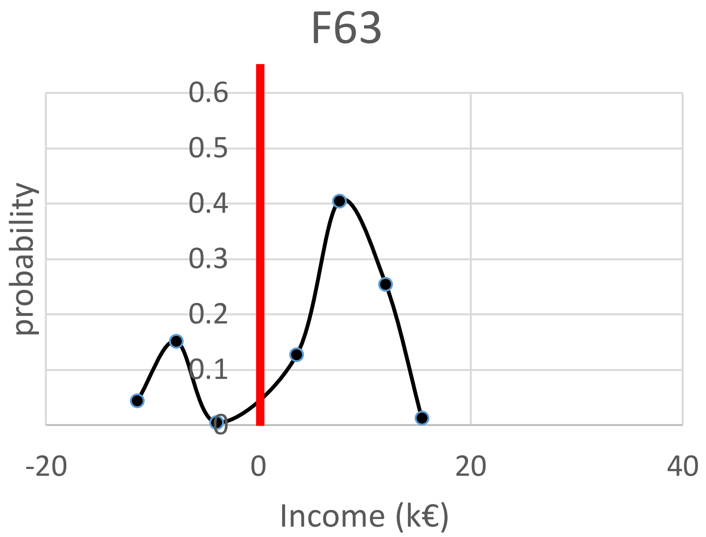


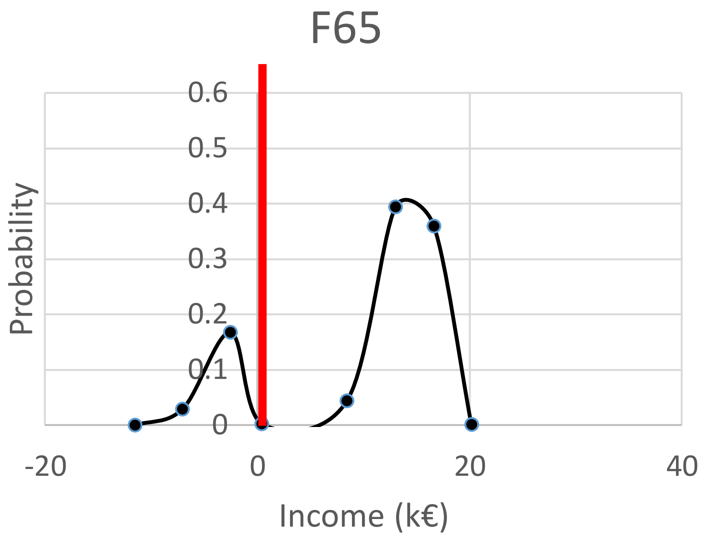


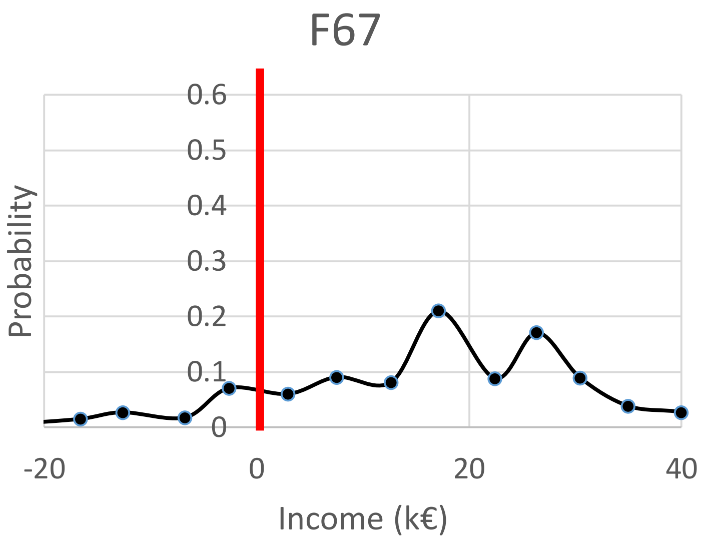


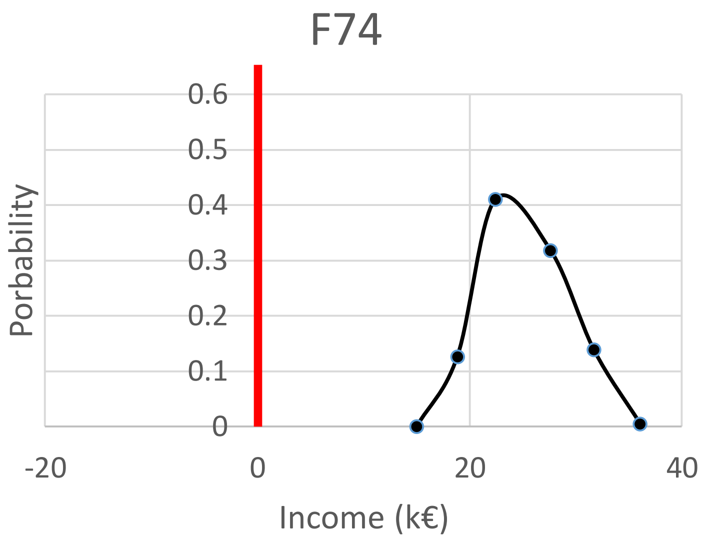
- the curves show the risk of obtaining income below different thresholds

Distribution of income simulated





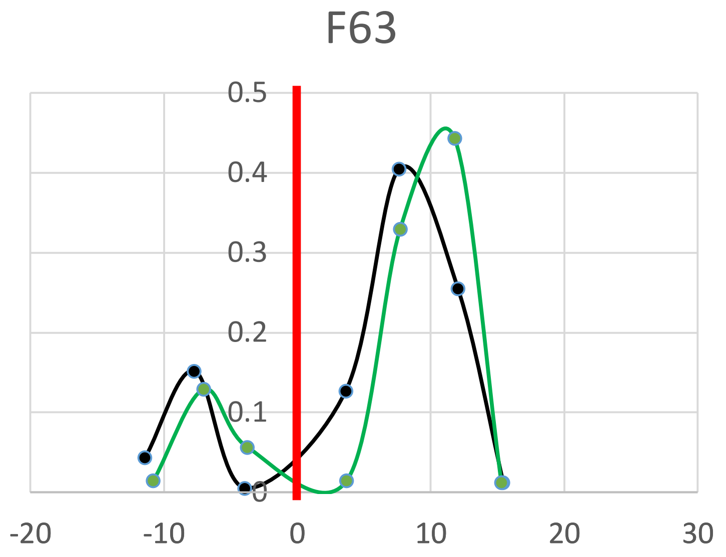


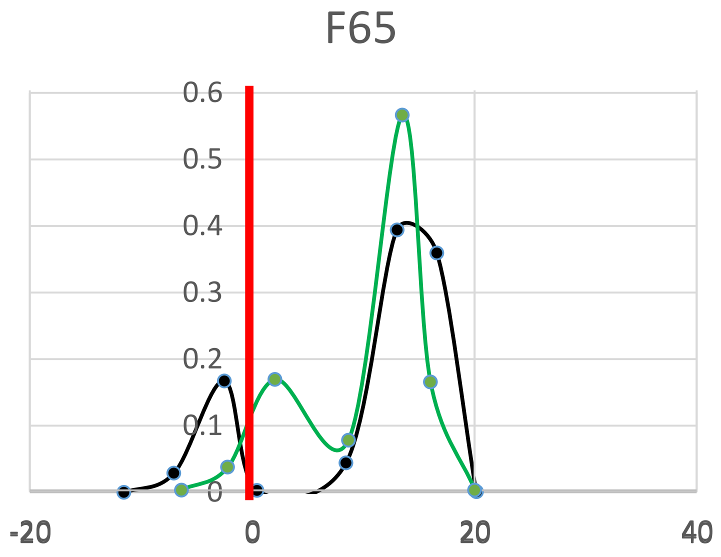


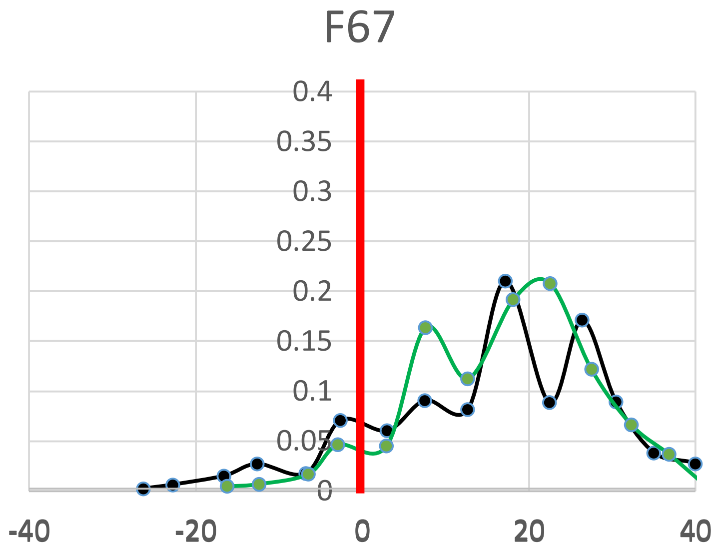
- the curves show the risk of obtaining income below different thresholds

- Differences between farms are explained by :
- The prob. of grassland yields declared by farmers (F67: 1 to 5 tDM/ha vs F74: 2.5 to 5 tDM/ha)
- Sales of cereals (F67)
- Flexibility (F74)
- Equilibrium grassland production/ herd need in a normal year

Distribution of income simulated : lower stocking rate



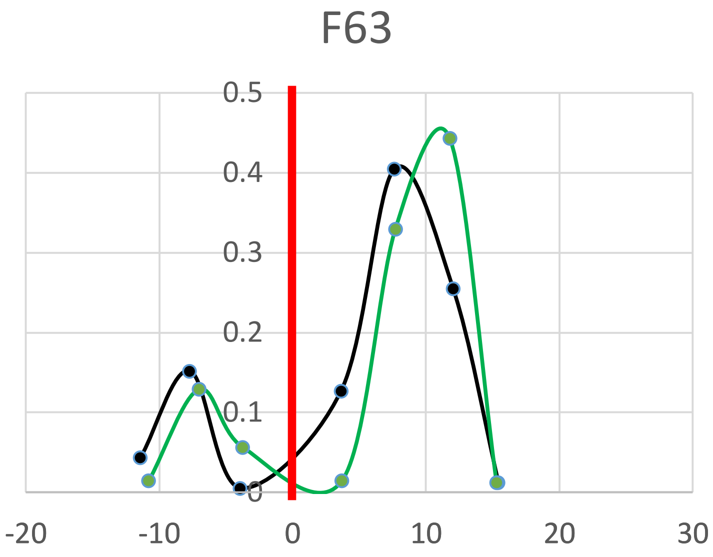


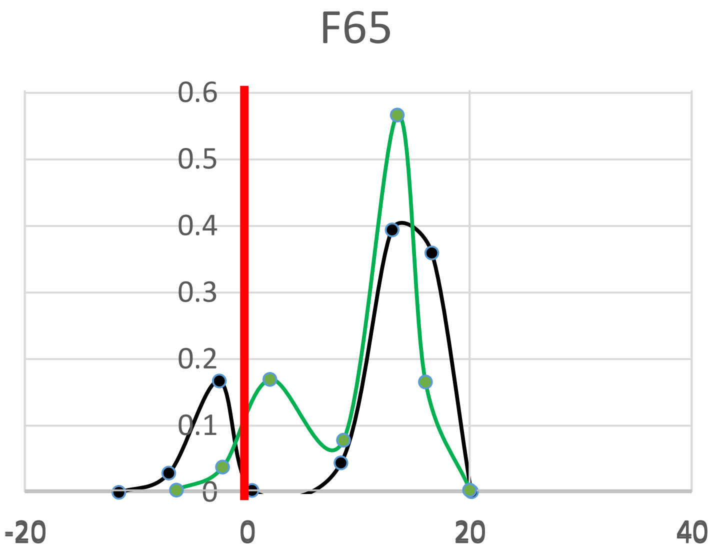


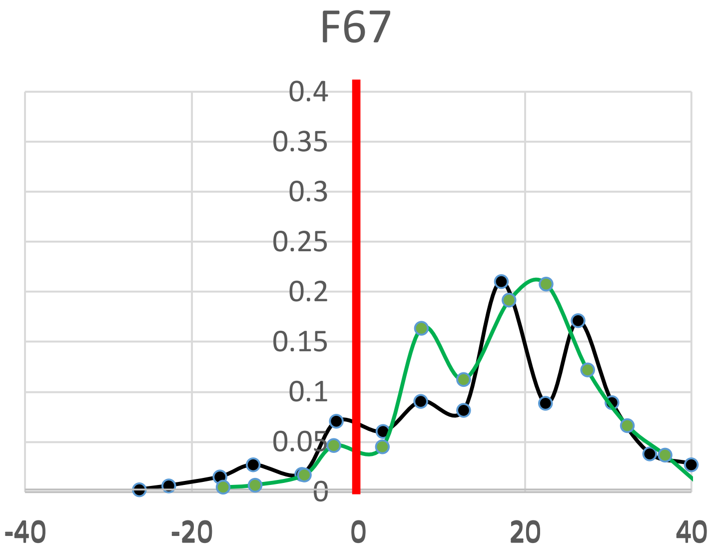
- Reducing the stocking rate

- Reduces but doesn’t remove the probability to have very low income

Distribution of income simulated : lower stocking rate







Mean income

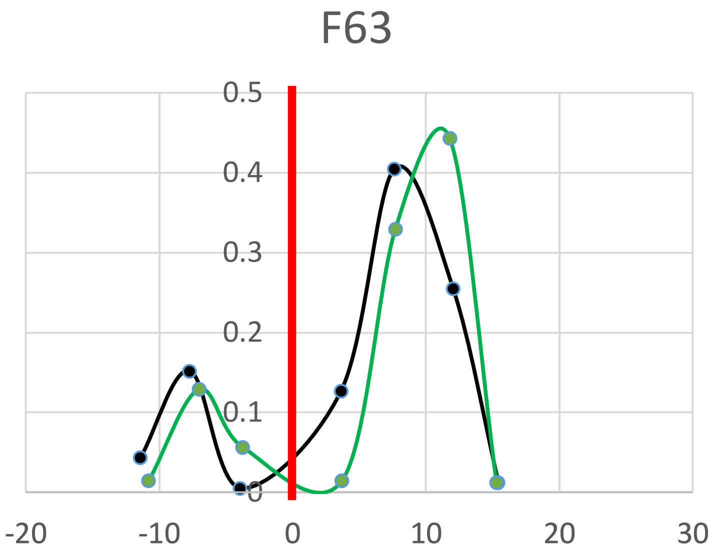
	Base	↓ LU
F63	5.1	7.2
F65	10.9	11.1
F67	16.7	17.3

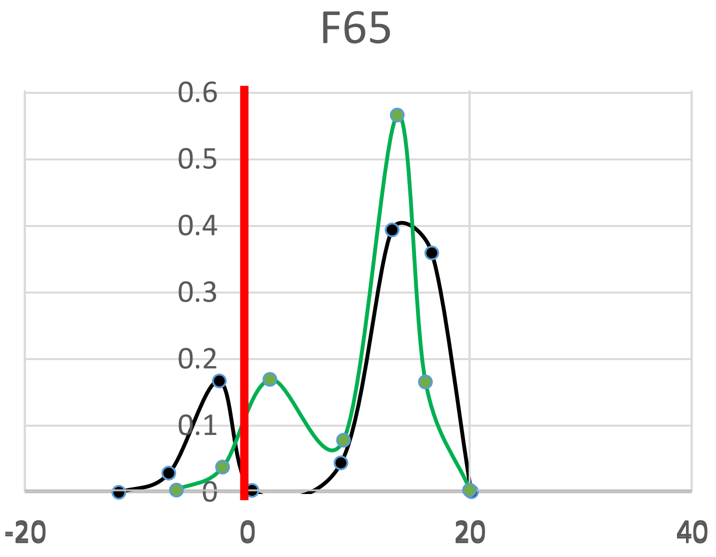
- The reduced stocking rate :

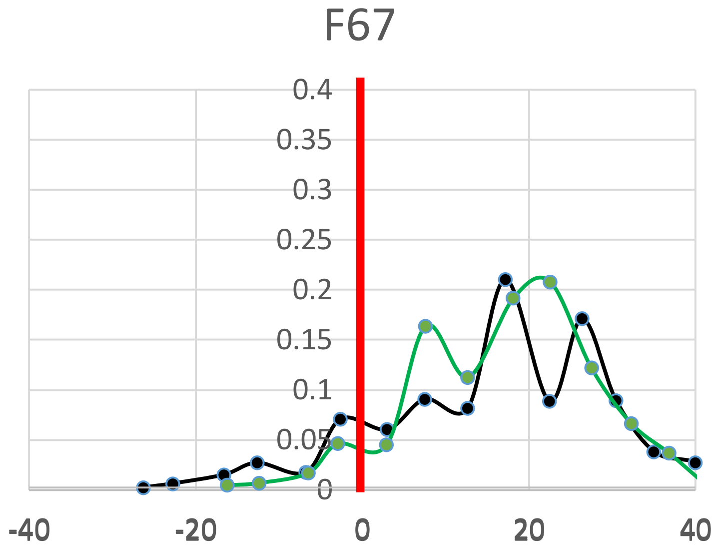
- Reduces but doesn't't remove the probability to have very low income

- slightly increases average income, above all for farms not self sufficient in a 'normal year'

Distribution of income simulated : lower stocking rate







Mean income

	Base	↓ LU
F63	5.1	7.2
F65	10.9	11.1
F67	16.7	17.3

- Reducing the stocking rate

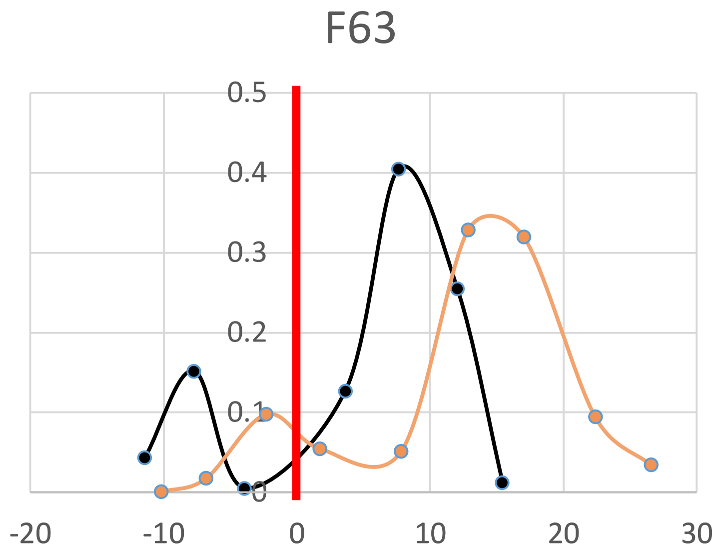
- Reduces but doesn't remove the probability to have very low income

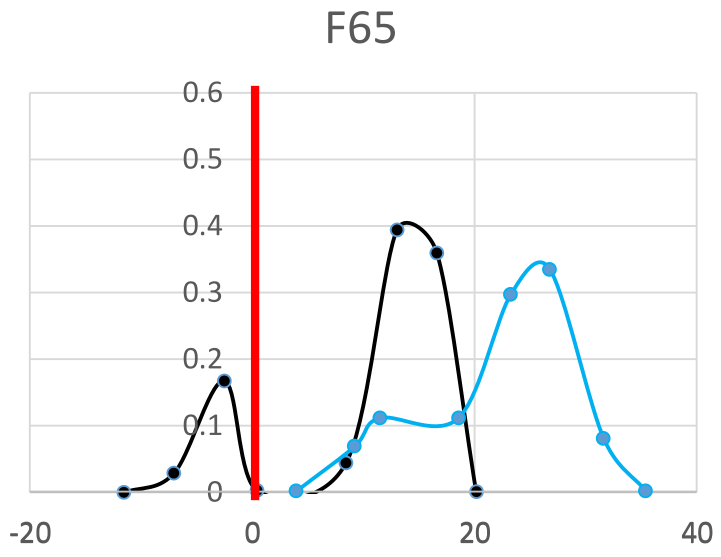
- slightly increases average income, above all for farms not self sufficient in a 'normal year'

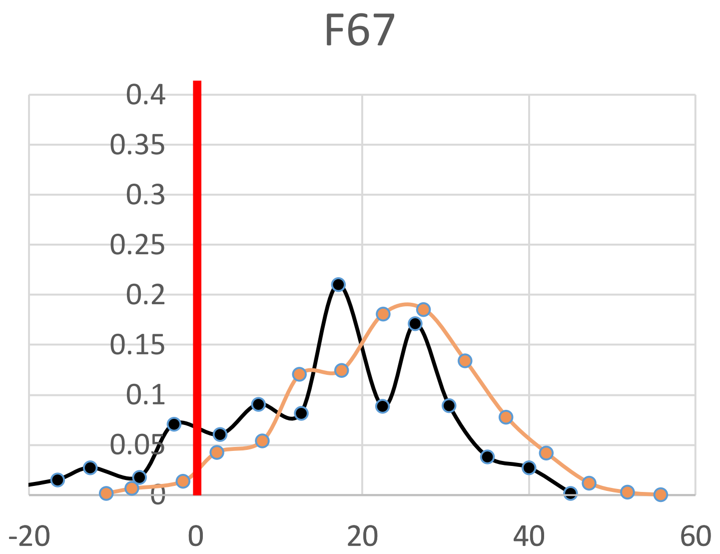
⚠ - the impacts of under stocking on grazing quality and encroachment has not been considered

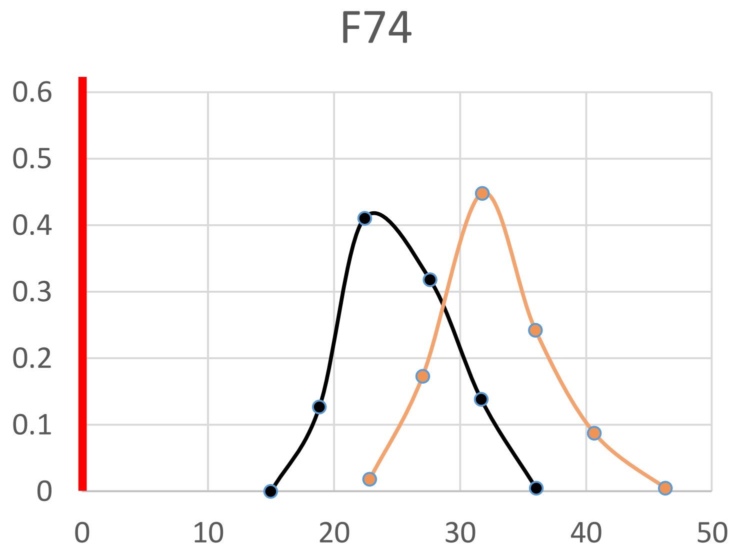
- Public compensation for drought have not been considered

Distribution of income simulated f63









- A new animal enterprise (pig or dairy) :

- Reduces the probability to have very low income

- Increases income above all if the performances of beef& sheep were not very good in the baseline

Conclusions

Conclusion

- The most important risk = climate risks (grasland production) followed by market risks
- All farmers plan to maintain or increase the mix of enterprise on their farm
- Reduction of stocking rate & addition of pig or dairy enterprises enables to reduce (but not remove) farm vulnerability
- Should we improve the functioning of the current farming systems before adding new activities?
  Define optimal stocking rate taking with more accuracy the different parameters

MixEnable Final webinar, 28th September 2021

Reducing the vulnerability of mixed cattle-sheep farms

Claire MOSNIER[1], Nassima MOUFID[1], Frederic JOLY[1], Marc BENOIT[1]

[1]Université Clermont Auvergne, INRAE, VetAgro Sup, UMR 1213 Herbivores, inrae Saint-Genès-Champanelle, France

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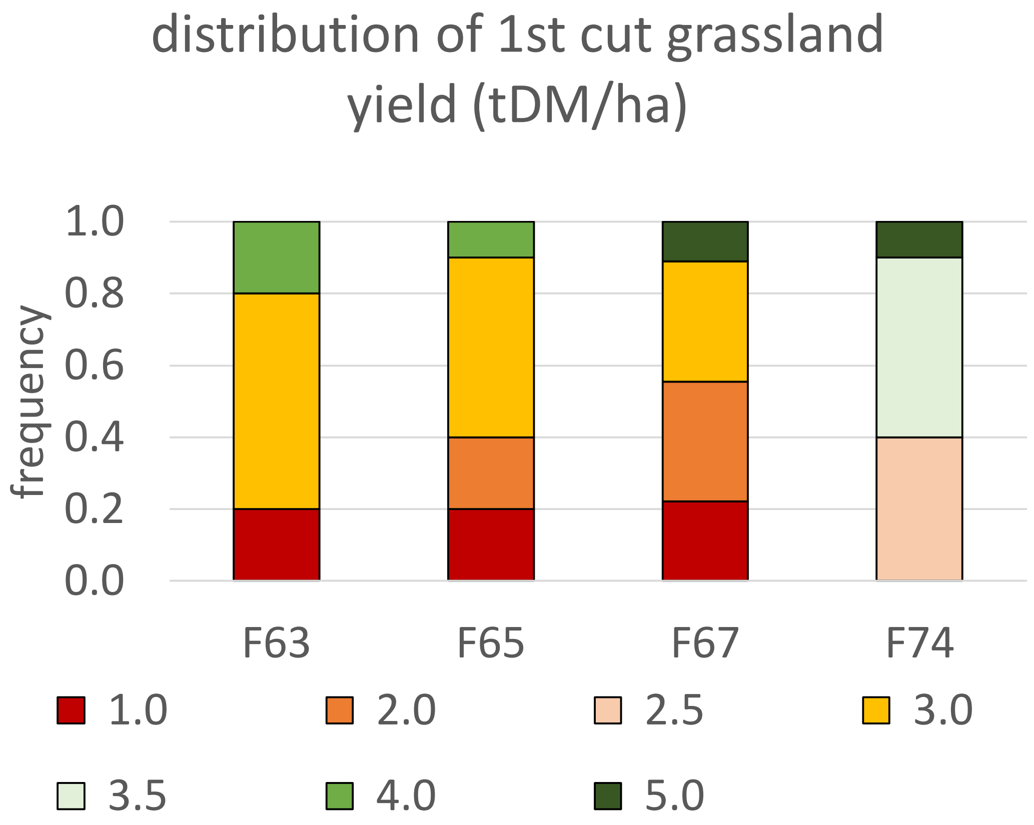
RÉPUBLIQUE FRANÇAISE

Potential long term adaptations

	Reduction of stocking rate	Keep sheep and beef?	Forage and crops	New enterprise	trees	insura nce
F63	done	yes	↓ spring cerelas, Legume for flour?	Poultry?	no	no
F65	Planned (↓ herd)	Stop beef	↑cereals?	Dairy for cheese	no	no
F67	done	yes	↑spring forage? ↑perm. grassland?	Poultry? Pig?	no	no
F74	Planned (↓ perm. grasslands)	yes	↑perm. grassland	?	no	no

Risk for grassland production

- Farmers have been asked the frequency of grassland yields over the last 10 years



- A high probability of « bad years » (<3 tDM/ha)
- F63 : - 0.15 of ewe productivity when grassland production is low

MIX-ENABLE

User-oriented outputs of the project

Fabienne Launay, Brendan Godoc,
Institut de l'Elevage – IDELE
Guillaume Martin INRAE

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INRAE · idele · ITAB Institut Technique de l'Agriculture Biologique · Wallonie recherche CRA-W · FiBL · THÜNEN · FORSCHUNGSRING e.V. · BOKU · Università degli Studi della Tuscia · SLU

User-oriented outputs of the project - Presentation

1. Different users targeted by the project

2. Outputs and dissemination:
   – Deliverables list
   – Other communications and dissemination
   – Educational Toolkit

User-oriented outputs of the project

Different users targeted by the project

Organic mixed livestock farmers and agricultural advisers

Farmers converting to organic mixed livestock farming

Conventional farmers and agricultural advisers active in the organic sector

Project outputs

MIX-ENABLE

Students at agricultural colleges and universities

Researchers

Public policy-makers

Deliverables list:

Users targeted

Students at agricultural colleges and universities

Researchers

Public policy-makers

Type	Detail
Journal, scientific paper	3 published', e.g *Potential of multi-species livestock farming to improve the sustainability of livestock farms* *In* Agricultural Systems, 181 Other publications submitted, or soon to be submitted
Conference paper, poster, etc.	Many articles or posters in several conferences: OWC, European Federation of Animal Science, Farming Systems Design Symposium…
Report	*Effects of livestock species diversity on the economic performance of commercial farms compared to specialized ruminant farms* by Pierre Mischler (IDELE)
Thesis	3 thesis reports in French

Deliverables list:

Users targeted

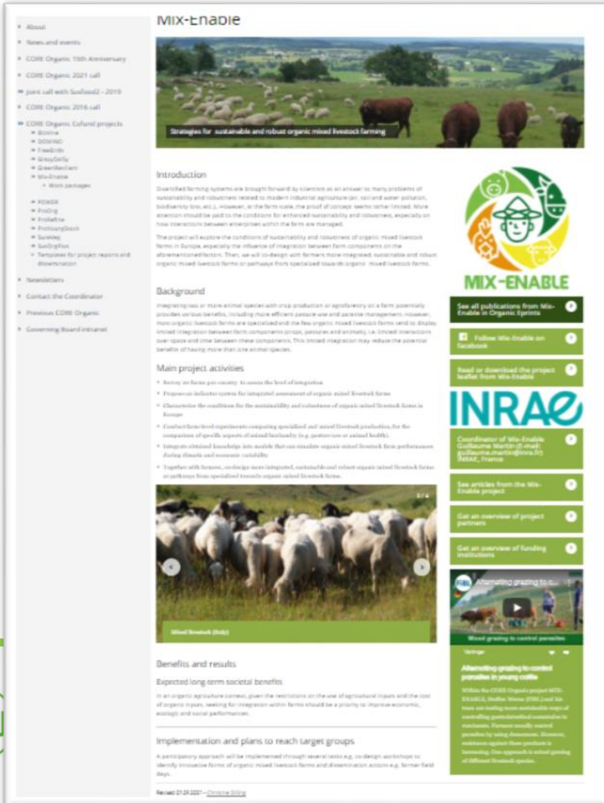
Farmers and agricultural advisers (conventional, converting, or organic livestock farming)

Type	Detail
Newspaper or magazine article	21 technical articles in specialized magazines or newspapers in all partner countries (in different languages)
Video	*Alternating grazing to control parasites in young cattle* by FIBL

All deliverables are listed and downloadable (excepted papers) on https://orgprints.org/view/projects/Mix-Enable.html

Other communications and dissemination

- Facebook Mix-Enable page: https://www.facebook.com/Mixenable.europeanproject/
- Webpage on the Core Organic Website, and newsletters: https://projects.au.dk/coreorganiccofund/core-organic-cofund-projects/mix-enable/
- User-oriented events: cancelled due to Covid
- Leaflets presenting the project
- Final Webinar



INRAE
INSTITUT DE L'ELEVAGE idele
ITAB Institut Technique de l'Agriculture Biologique

2/ Educational toolkit on multi-species livestock systems

3 independent and complementary tools for students :

1. A Quiz,
2. A Q-sort
3. and a tool "Implementation" with cases (fictitious or real)

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EDUCATIONAL TOOLKIT:

To inform and consolidate the sometimes incomplete knowledge of multi-species livestock farming.

To transform the sometimes negative learners' representations of multi-species livestock farming.

For mobilizing knowledge in action and acquiring skills in order to understand the sustainability and viability of farm diversification.

3 INDEPENDENT AND COMPLEMENTARY TOOLS:

The proposed order of use of the different tools is the **quiz,** then the **q-sort** and finally the **implementation,** but this order can be different and adapted to the convenience of each teacher.

N°1 QUIZ

OBJECTIVE: Informing

To build a first knowledge base on multi-species livestock farming among the students.

N°2 Q-SORT

OBJECTIVE:

Transforming representations

Identify learners' initial representations of multi-species livestock farming;

Set up the construction of an argumentation.

N°3 IMPLEMENTATION

OBJECTIVE:

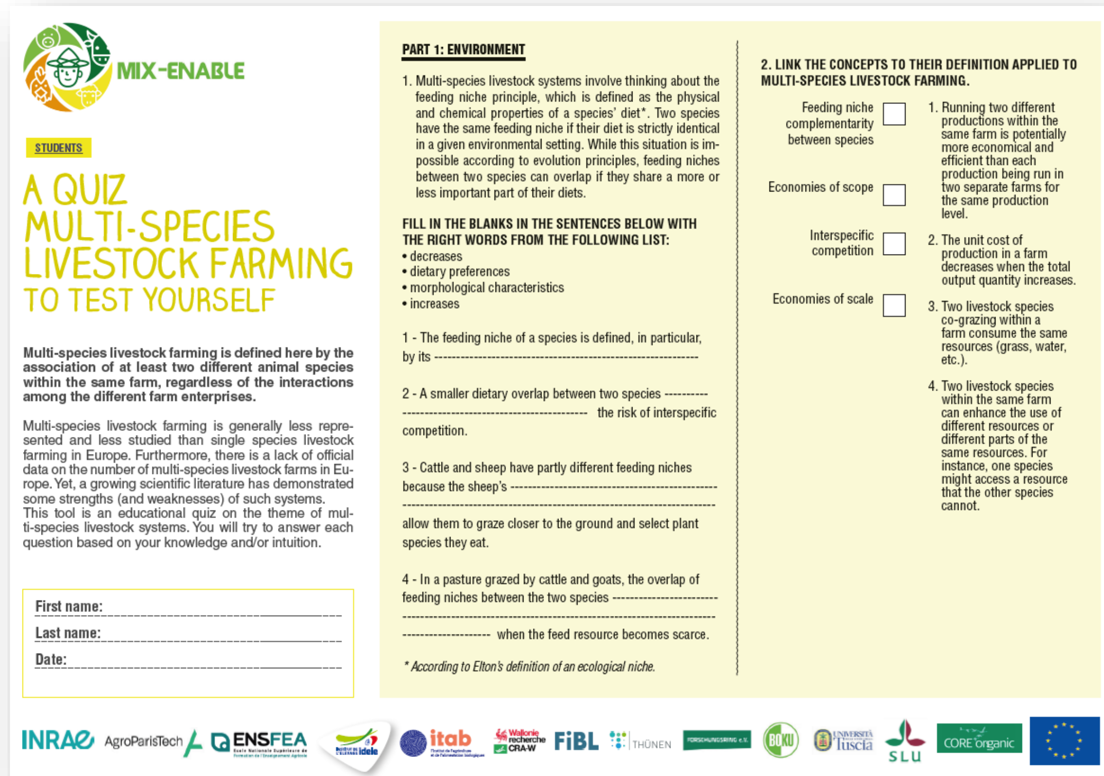
Mobilizing knowledge in action (fictitious or real)

To apply the new knowledge to farm cases and place the learners in a reflection on the most relevant solution of multi-species livestock farming.

INRAE AgroParisTech ENSFEA idele itab Wallonie recherche CRA-W FiBL THÜNEN FORSCHUNGSRING e.V. BOKU Università Tuscia SLU CORE organic

Quiz

- 21 Questions in various formats (True/False, MCQ...)
- For each question, the trainer presents the correct answer and an explanation of the related mechanism.



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STUDENTS

A QUIZ MULTI-SPECIES LIVESTOCK FARMING TO TEST YOURSELF

Multi-species livestock farming is defined here by the association of at least two different animal species within the same farm, regardless of the interactions among the different farm enterprises.

Multi-species livestock farming is generally less represented and less studied than single species livestock farming in Europe. Furthermore, there is a lack of official data on the number of multi-species livestock farms in Europe. Yet, a growing scientific literature has demonstrated some strengths (and weaknesses) of such systems. This tool is an educational quiz on the theme of multi-species livestock systems. You will try to answer each question based on your knowledge and/or intuition.

First name: ______________________

Last name: ______________________

Date: ______________________

PART 1: ENVIRONMENT

1. Multi-species livestock systems involve thinking about the feeding niche principle, which is defined as the physical and chemical properties of a species' diet*. Two species have the same feeding niche if their diet is strictly identical in a given environmental setting. While this situation is impossible according to evolution principles, feeding niches between two species can overlap if they share a more or less important part of their diets.

FILL IN THE BLANKS IN THE SENTENCES BELOW WITH THE RIGHT WORDS FROM THE FOLLOWING LIST:

- decreases
- dietary preferences
- morphological characteristics
- increases

1 - The feeding niche of a species is defined, in particular, by its --

2 - A smaller dietary overlap between two species ---------- -- the risk of interspecific competition.

3 - Cattle and sheep have partly different feeding niches because the sheep's -- -- allow them to graze closer to the ground and select plant species they eat.

4 - In a pasture grazed by cattle and goats, the overlap of feeding niches between the two species ----------------------- -- ------------------- when the feed resource becomes scarce.

** According to Elton's definition of an ecological niche.*

2. LINK THE CONCEPTS TO THEIR DEFINITION APPLIED TO MULTI-SPECIES LIVESTOCK FARMING.

Feeding niche complementarity between species ☐	1. Running two different productions within the same farm is potentially more economical and efficient than each production being run in two separate farms for the same production level.
Economies of scope ☐	2. The unit cost of production in a farm decreases when the total output quantity increases.
Interspecific competition ☐	3. Two livestock species co-grazing within a farm consume the same resources (grass, water, etc.).
Economies of scale ☐	4. Two livestock species within the same farm can enhance the use of different resources or different parts of the same resources. For instance, one species might access a resource that the other species cannot.

Q-sort

- List of 18 statements that deal with the different dimensions of multi-species livestock farming, to be sorted according to each one's positioning (agree/disagree)
- Learners' positioning must be argued on each statement.

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
1.Being a multi-species livestock farmer means working more than a farmer specialized in a single livestock species (in terms of hours per day).				
2. A multi-species livestock system is necessarily more complex to manage than a single species livestock system.				
3. Doubling the number of animal enterprises in a farm means doubling the number of value chain stakeholders the farmer has to interact with (cooperatives, slaughterhouses, etc.).				
4. Combining multiple animal species in a farm increases byproduct and waste amounts which needs to be managed.				
5. Adding another animal enterprise to the farm requires high investment costs.				
6. Multi-species livestock farms perform worse economically than single species livestock farms.				
7. A multi-species livestock farmer is less exposed to market hazards and volatility (than a single species livestock farmer).				
8. Being a multi-species livestock farmer always involves direct selling of products.				
9. To optimize the benefits of multi-species livestock systems, one has to minimize the interactions among animal enterprises.				
10. Co-grazing allows a better grass valorisation.				
11. Feed self-sufficiency is more difficult to achieve in a multi-species livestock farm than in a single species livestock farm.				
12. Co-grazing always increases stocking rates in grasslands (Livestock Unit/ha)				
13. Multi-species livestock farms are more exposed to parasitic issues than single species livestock farms.				
14. All livestock species can share the same paddock without any risk for their health.				
15. Preventive parasitic treatments such as deworming are useless in multi-species livestock farming with a co-grazing situation.				
16. In a multi-species livestock farm, it is more difficult to manage fertilization than in a single species livestock farm.				
17. All ruminant species eat the same grass species.				
18. A single species livestock farm will improve its environmental performances by switching to a multi-species livestock system.				

Total:

Implementation

3 STEPS CHARACTERIZES THE PROCESS OF SIMULATION

Red: Diagnostic steps
Blue: Conception step

DIAGNOSTIC		CONCEPTION
STEP 1 **Understanding the initial farm situation** (context, farmer's expectations, farm's structure and performances)	**STEP 2** **Identify and formalise challenges** (by confronting farmer's will and the farm performances)	**STEP 3** **Design animal species combination to meet the challenges**

Implementation

- Simulation exercise based on a concrete case of specialized farm: presentation of the farm and the difficulties encountered.

- The learners act as neighboring farmers or advisors, they formulate the problem situations and propose solutions for the farm, mobilizing the knowledge acquired on multi-species livestock farming.

First case: Unité INRAE SAD-ASTER (Mirecourt)

Tests

- Quiz and Q-sort have been tested in different countries
- The 3 tools have been tested in France

- Overall positive assessment in terms of pedagogical objectives
- Educational toolkit structure deemed relevant
- *« The first session is very useful for the following »* ⇨ **complementarity of tools**

Where to find outputs?

- All outputs, including presentations of this webinar, and toolkit, will be available on https://orgprints.org/view/projects/Mix-Enable.html

- And on the webpage of the Core Organic Website: https://projects.au.dk/coreorganiccofund/core-organic-cofund-projects/mix-enable/

Thank you for your attention!

Take home messages

MIX-ENABLE

CORE organic

- Conceptual and methodological advances to analyze, model and evaluate multi-species livestock farms e.g.
  - LU calculation across species
  - Efficiency of multi-species systems

- Design of trials with multi-species systems

- Legacy of MIX-ENABLE for future projects

- A large diversity of organic multi-species livestock farms
- Diversity extends far beyond livestock species combinations

- Diversity in farm performances is very high
- Trade-off efficiency vs. premium prices
- But highly satisfied farmers

- Positive effects of diversity (health, predation, risk mitigation, etc.) to be further exploited

Thank you all for your attending this webinar

- Any last comment / Question?