



DAIRY 4 FUTURE FINALE CONFERENCE
« TACKLING THE CHALLENGES OF
THE ATLANTIC AREA DAIRY SECTOR »



Impacts of innovations on the economic performance of pilot farms

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27th September 2022

Presentation Outline

1. Economic Evaluation of D4F Pilot Farms

- Farmer Case Studies
- Economics and Labour on D4F Farms

2. Farm Efficiency Scores

- Resource and Financial Efficiency

3. Farm Innovations and Efficiency



Outline

1. Economic Evaluation of D4F Pilot Farms

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Economic Evaluation of D4F Pilot Farms

- Collected financial and farm characteristic data
 - 100 farms
 - Across 5 countries
 - For 2 years
- Case studies produced for farmers
- Included Key Performance Indicators (KPIs)
 - measures collected from each area of the enterprise which are representative to the general performance e.g., Calving Interval

Region	No. of Farms	Average no. of Cows
France	21	94
Ireland	10	134
UK	25	265
Portugal	26	174
Spain	20	157

Year 1 (2018/2019)
Year 2 (2019/2020)

Farmer Case Studies

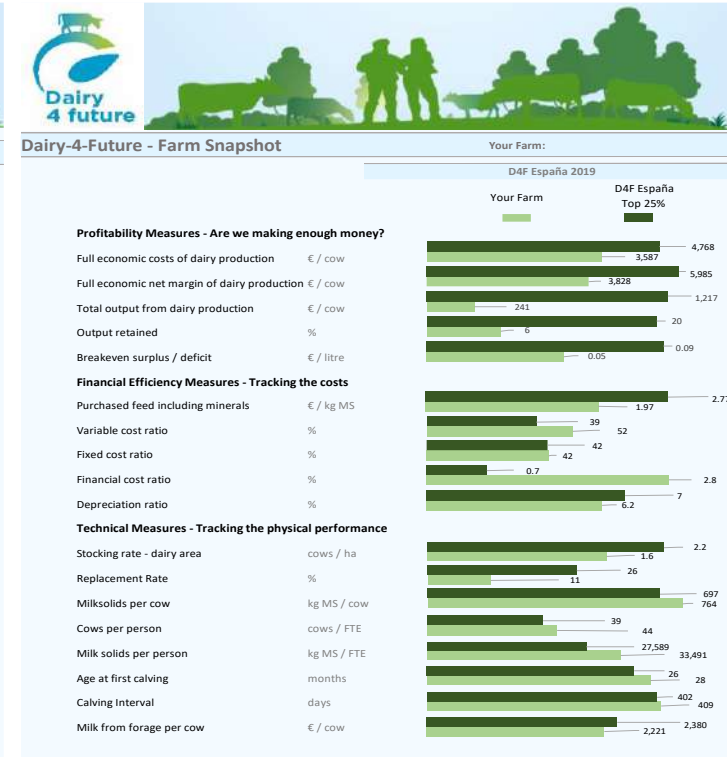
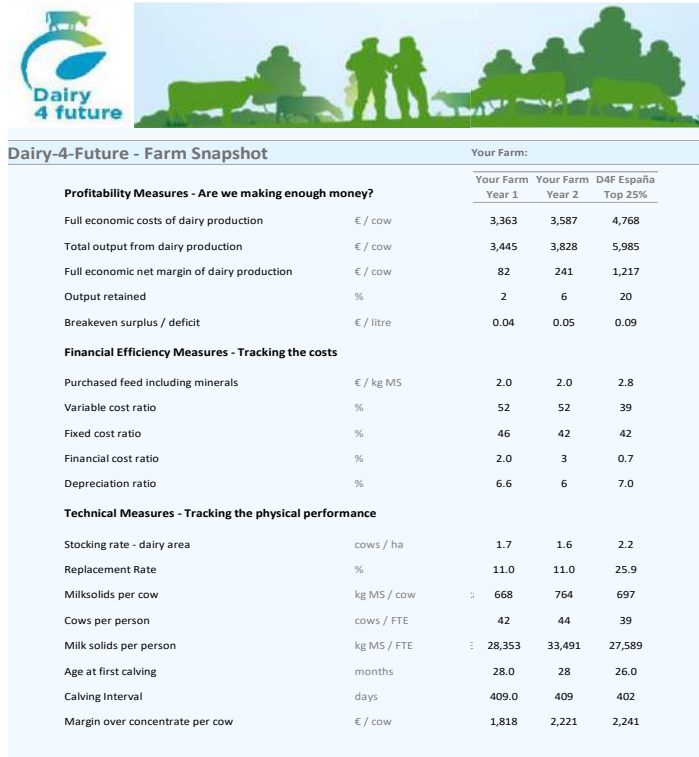
- Highlight Farm Performance Across Years within Region
 - Profitability, Financial Efficiency, Technical Performance (KPIs)



Farmer Case Studies

Example of Farm Snapshot

- Profitability
- Financial Efficiency
- Technical Performance



Farmer Case Studies

Example of Farm Snapshot

- Profitability
- Financial Efficiency
- Technical Performance



Dairy-4-Future - Farm Snapshot

Your Farm:

Profitability Measures - Are we making enough money?

	€ / cow
Full economic costs of dairy production	€ / cow
Total output from dairy production	€ / cow
Full economic net margin of dairy production	€ / cow
Output retained	%
Breakeven surplus / deficit	€ / litre

Your Farm	Your Farm	D4F España
Year 1	Year 2	Top 25%

3,363	3,587	4,768
3,445	3,828	5,985
82	241	1,217
2	6	20
0.04	0.05	0.09

Dairy-4-Future - Farm Snapshot

Your Farm:

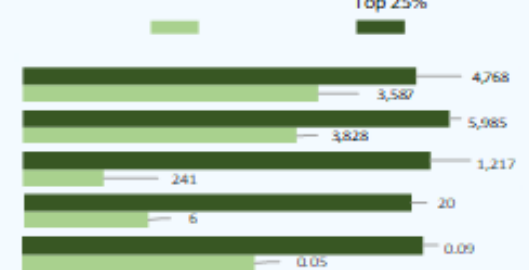
Profitability Measures - Are we making enough money?

	€ / cow
Full economic costs of dairy production	€ / cow
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Breakeven surplus / deficit	€ / litre

D4F España 2019

Your Farm

D4F España
Top 25%



Farmer Case Studies

Example of Farm Snapshot

- Profitability
- Financial Efficiency
- Technical Performance

Financial Efficiency Measures - Tracking the costs

Purchased feed including minerals	€/ kg MS	2.0	2.0	2.8
Variable cost ratio	%	52	52	39
Fixed cost ratio	%	46	42	42
Financial cost ratio	%	2.0	3	0.7
Depreciation ratio	%	6.6	6	7.0



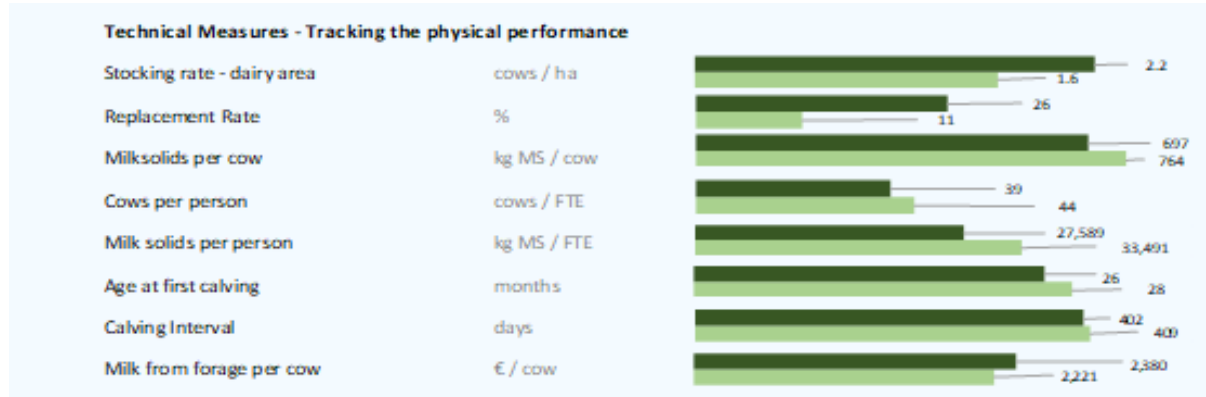
Farmer Case Studies

Example of Farm Snapshot

- Profitability
- Financial Efficiency
- Technical Performance

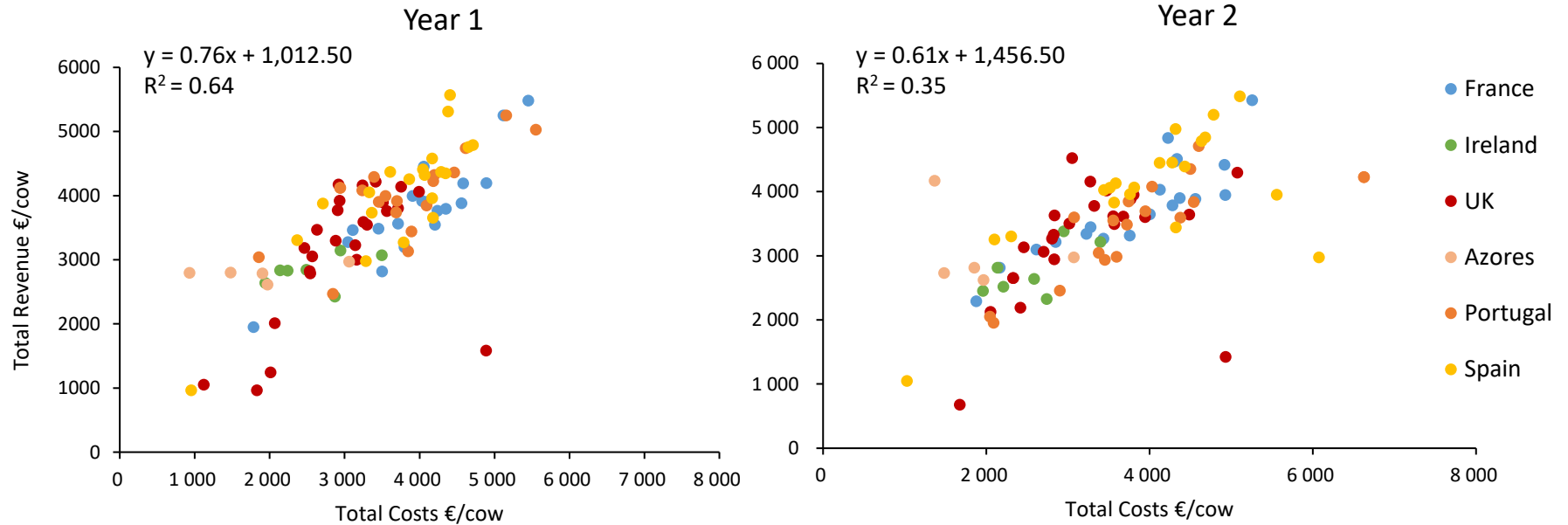
Technical Measures - Tracking the physical performance

Stocking rate - dairy area	cows / ha	1.7	1.6	2.2
Replacement Rate	%	11.0	11.0	25.9
Milksolids per cow	kg MS / cow	668	764	697
Cows per person	cows / FTE	42	44	39
Milk solids per person	kg MS / FTE	28,353	33,491	27,589
Age at first calving	months	28.0	28	26.0
Calving Interval	days	409.0	409	402
Margin over concentrate per cow	€ / cow	1,818	2,221	2,241



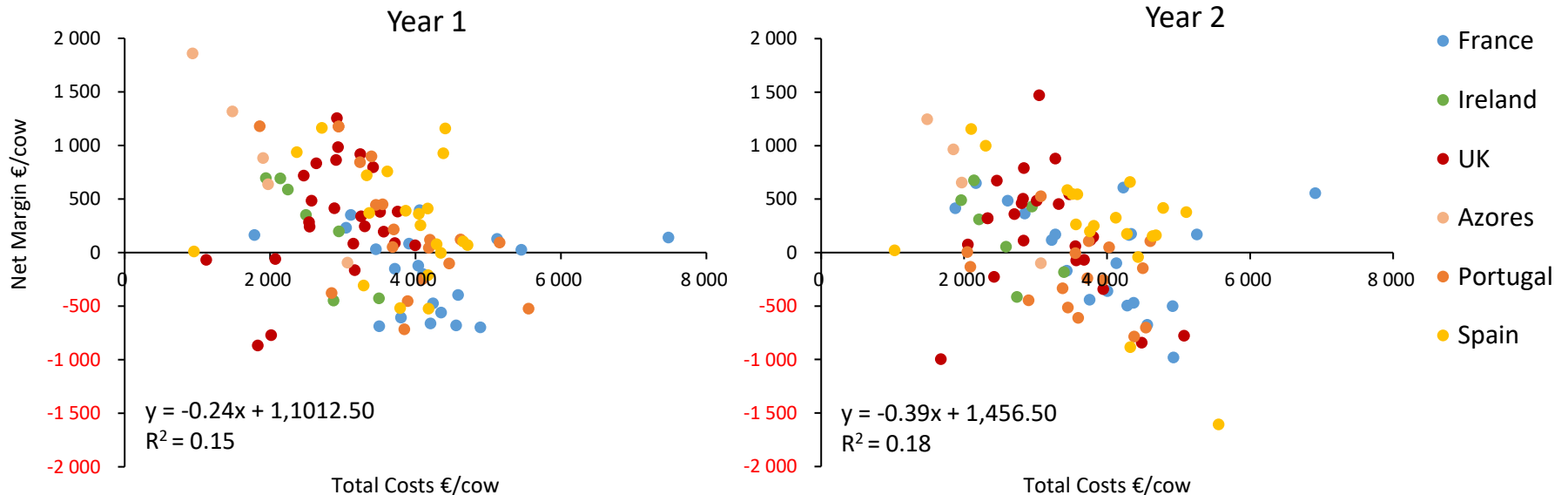
Profitability and Financial Efficiency Measures

- Higher costs tend to lead to higher revenue



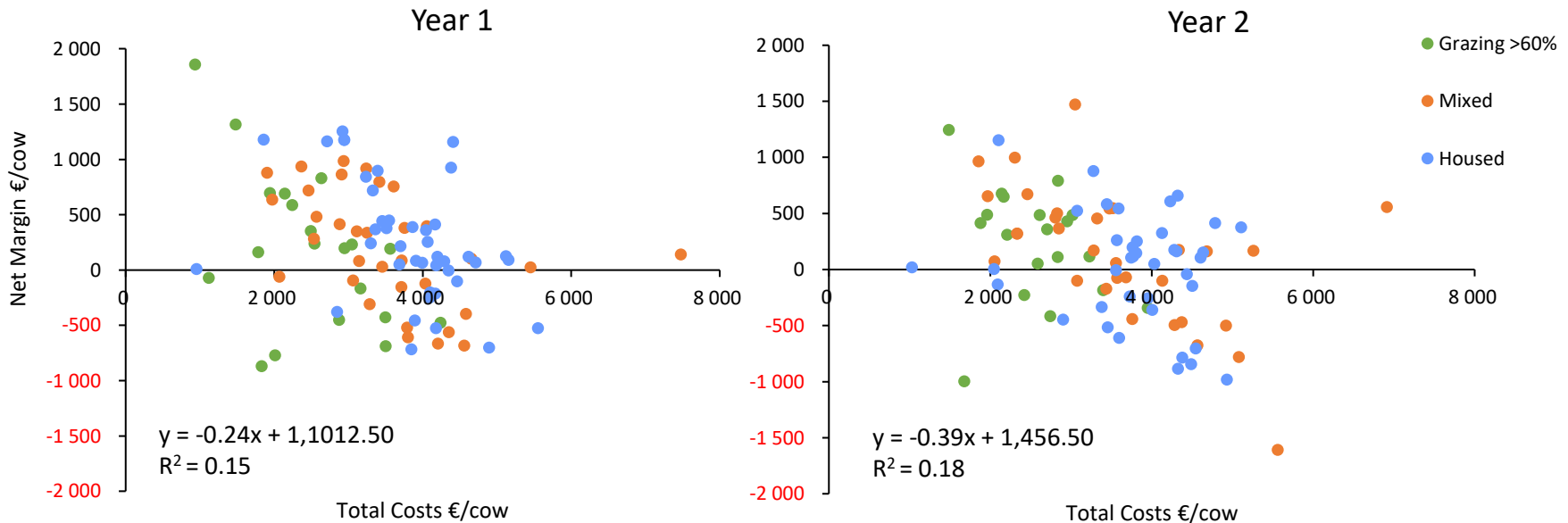
Profitability and Financial Efficiency Measures

- But higher revenues associated with higher costs don't tend to lead to the highest net margins



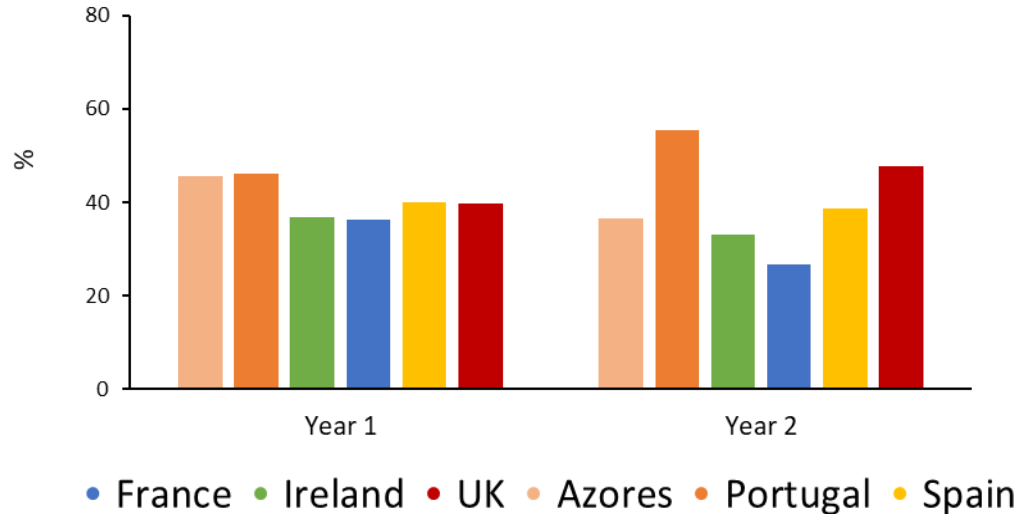
Profitability and Financial Efficiency Measures

- When split into systems, no one system consistently has a higher net margin per cow than another system



Profitability and Financial Efficiency Measures

Variable Cost Ratio



Variable Costs

- Dependent on production
- E.g. feed and energy costs

Similar variable cost ratio between regions

- Variable costs can be controlled
- farmer focus on costs

Profitability and Financial Efficiency Measures

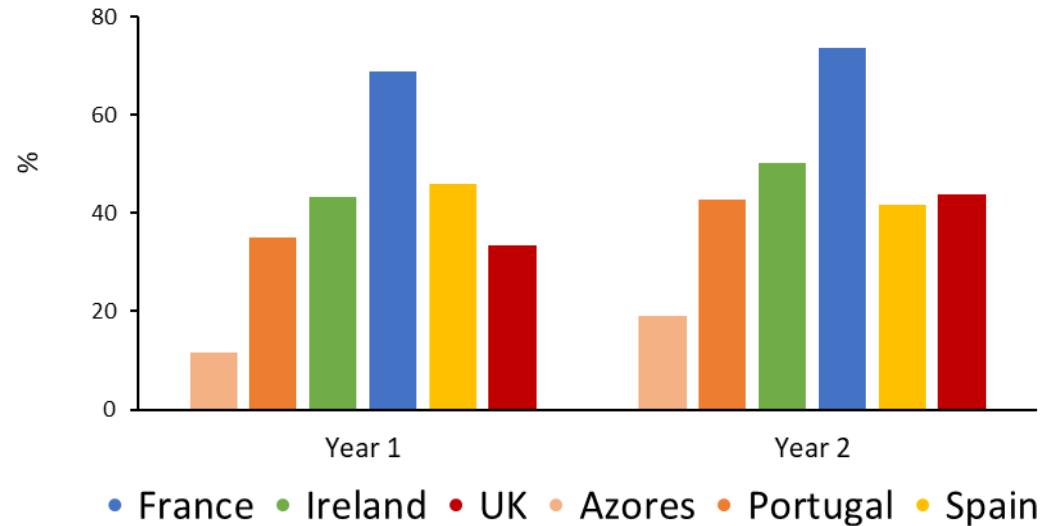
Fixed Costs

- Regardless of production levels
- E.g. depreciation and labour costs

Regional differences in fixed cost ratios

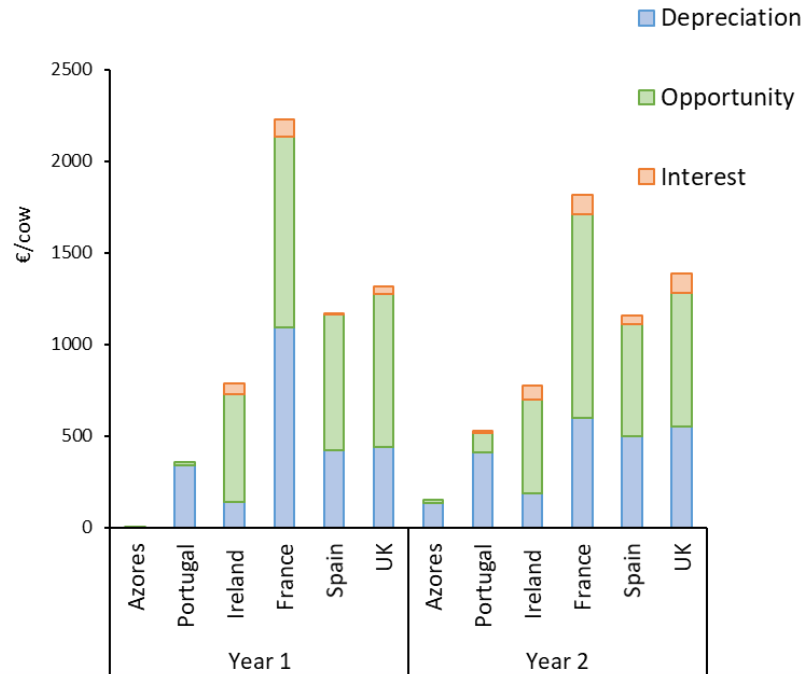
- Climate
- Farming method
- Farming practice history

Fixed Cost Ratio



Profitability and Financial Efficiency Measures

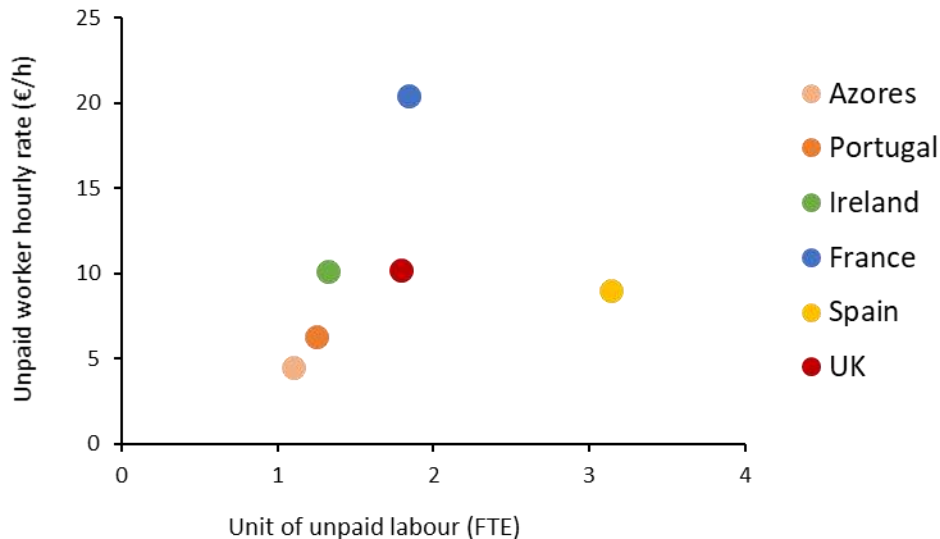
- Fixed costs effected by climatic factors and farming method



- Azores have very Low fixed costs
 - Climatic factors and farming methods require little investment in farm infrastructure
- France has very high fixed costs
 - Farming method cumulates high equipment and building depreciation costs
 - France has a high unpaid labour cost (€20.60/h)

Profitability and Financial Efficiency Measures

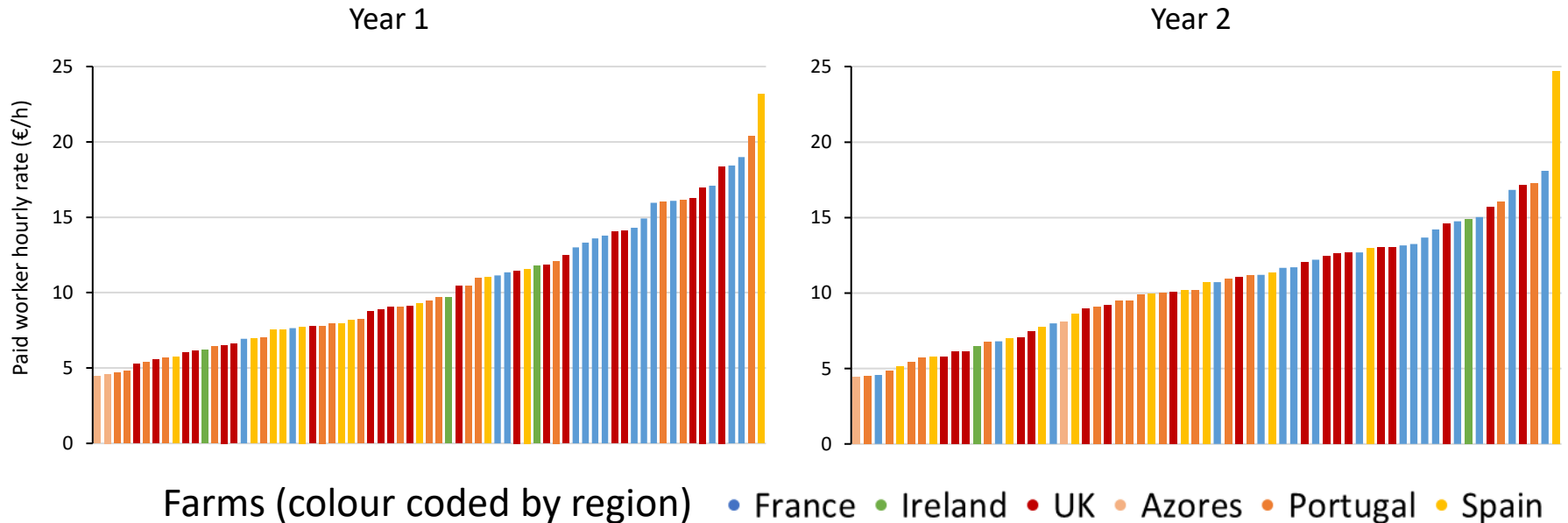
- Value of unpaid labour largely effects differences in fixed cost ratios



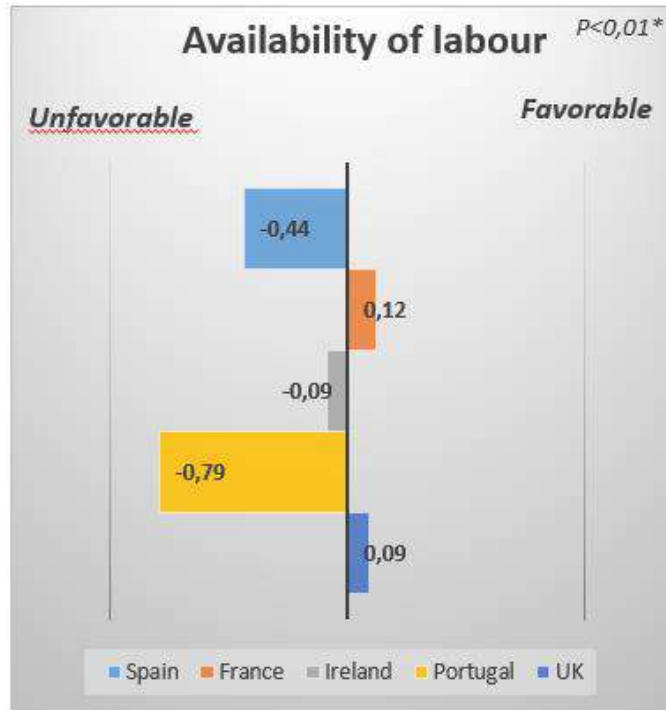
- Azores and Portugal
 - Low unpaid worker hourly rate
 - Contributes to low opportunity costs
- France
 - Highest unpaid worker hourly rate and highest opportunity costs

Profitability and Financial Efficiency Measures

- Of the top 20 farms for paid worker hourly rate, French farms make up the majority, followed by UK farms
- All regions feature in the bottom 20 farms



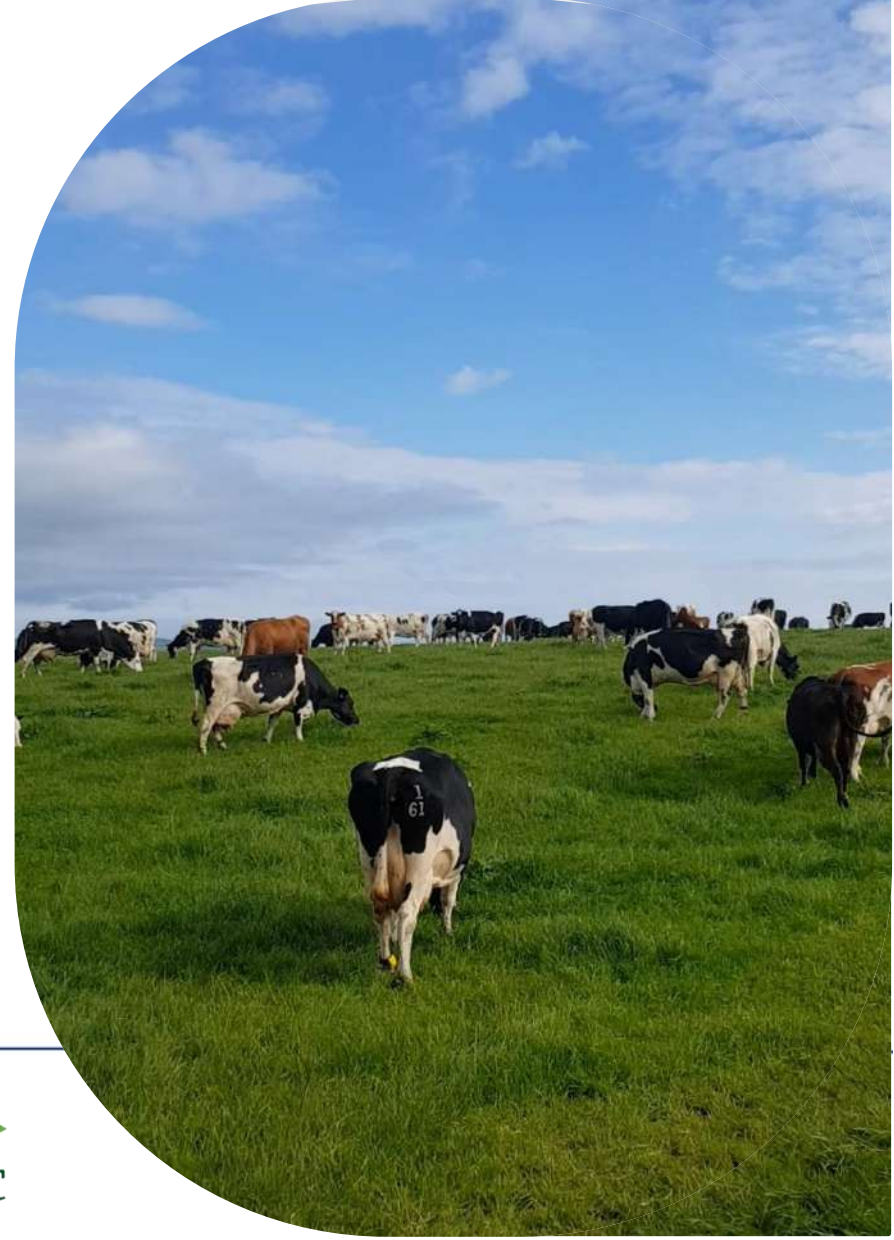
Online Farmer Survey Availability of Labour



- Online survey on pilot farmer opinions in 2020
- Most regions see labour availability as unfavourable to the success of their dairy operation
- France an exception
 - Possibly linked to high hourly rates of pay
- UK favourable response
 - Survey was pre-brexit

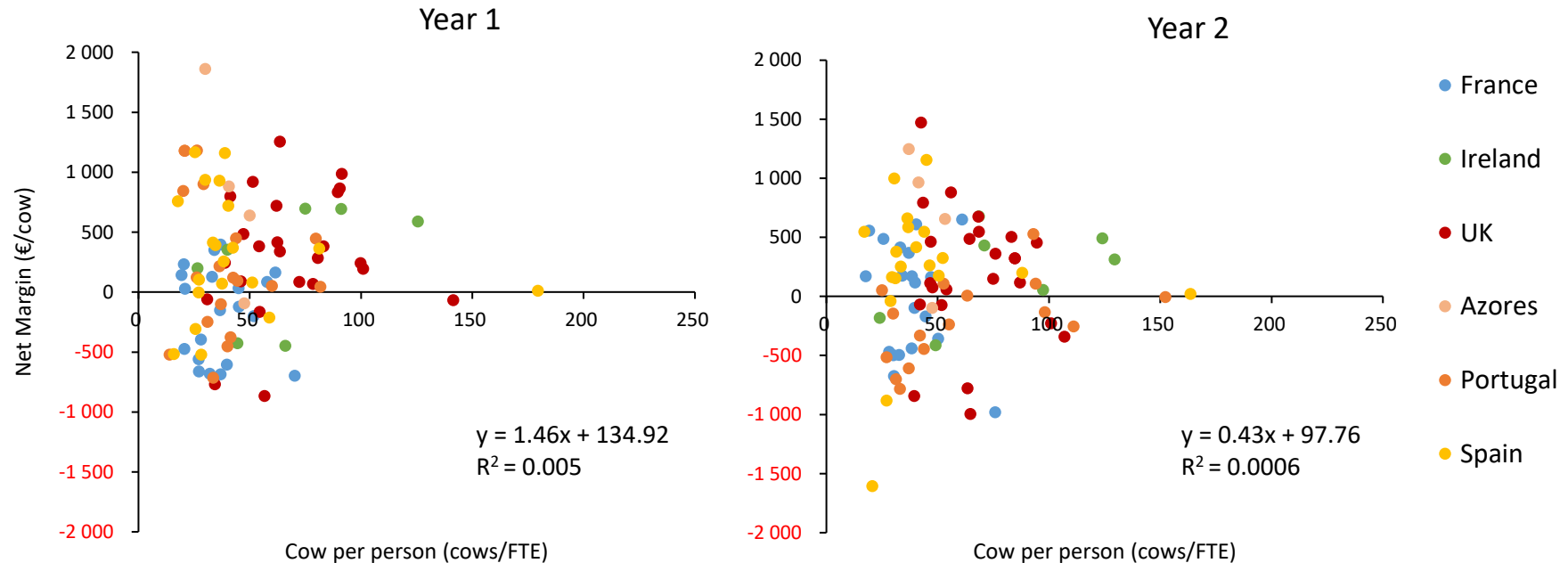
Technical Measures

- Stocking Rate
- Replacement Rate
- Cows Per Person
- Milksolids per person
- Age at first calving (AFC)
- Calving Interval (CI)
- Margin over concentrate
- Milk from forage
- Breakeven surplus/deficit



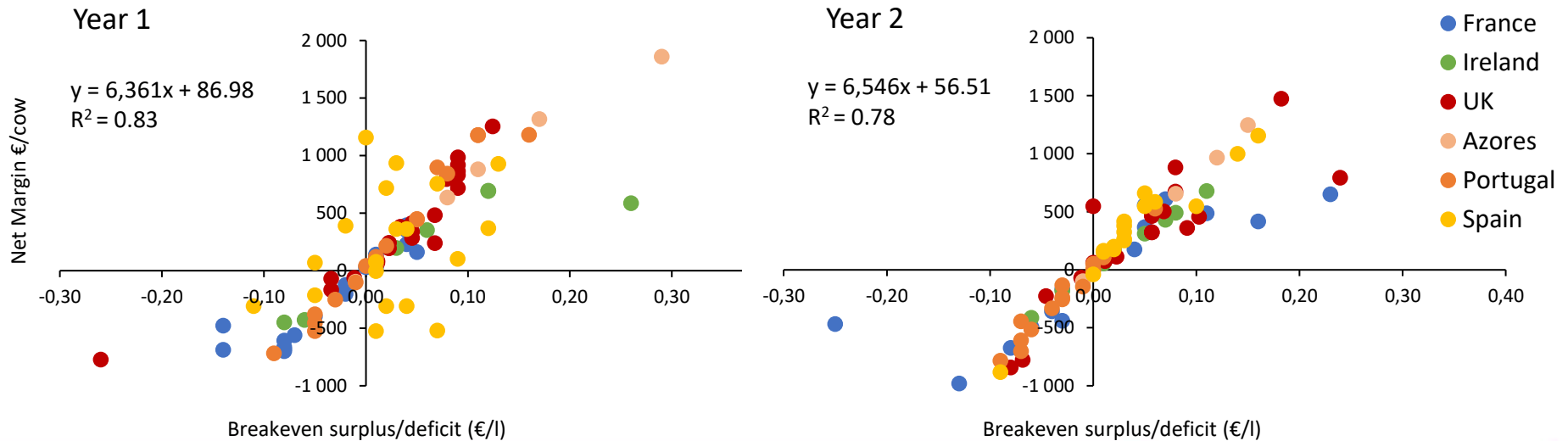
Technical Measures – Labour Efficiency

- Increasing cows per person does not result in an increased net margin



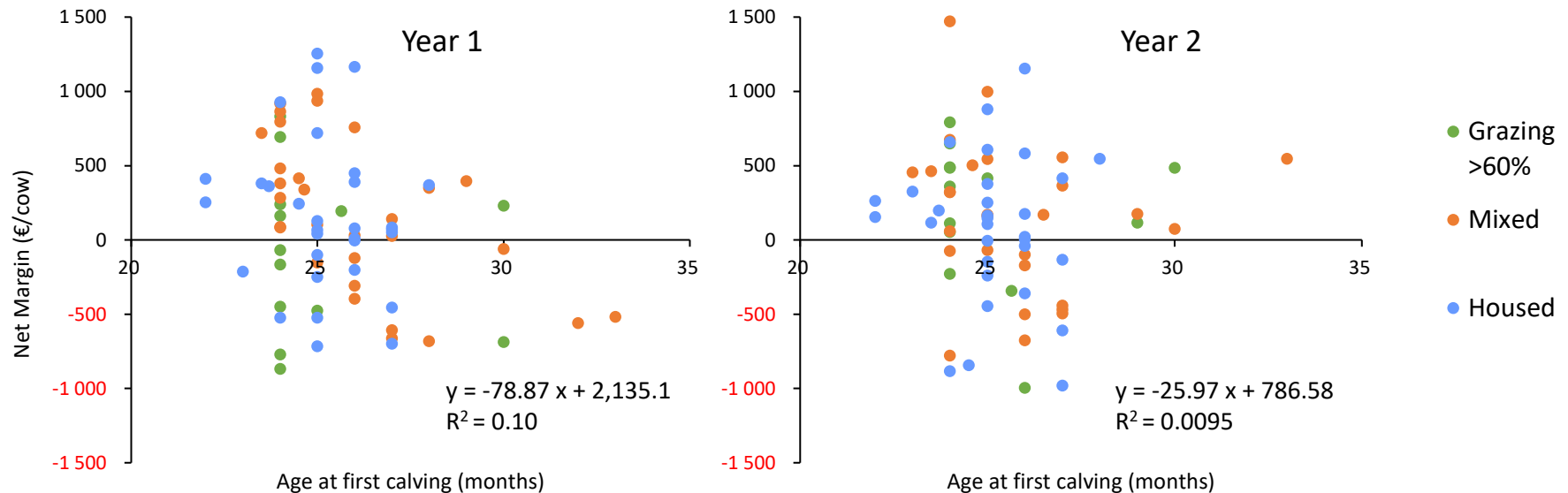
Technical Measures – Breakeven Analysis

- Farms with higher surplus above the breakeven price, yielded higher net margins
- Year 2 – farms required a larger surplus to yield the same net margin as Year 1



Technical Measures – Age at First Calving

- Housed systems appear to control for AFC better, keeping it under 26 months
- Above 26 months, net margins decrease



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D4F Farm Efficiency – DEA Model

- DEA analysis stems from economic research
- Farms are assigned an efficiency score between 0 and 1
 - 1 = most efficient farms
 - Best practice frontier
 - <1 = level of improvement needed to operate efficiently

Farm Efficiency – DEA Model

- DEA analysis stems from economic research
- Farms are assigned an efficiency score between 0 and 1
 - 1 = most efficient farms
 - Best practice frontier
 - <1 = level of improvement needed to operate efficiently
- Two models run on data
- Explored for EU and UK farms

Model 1

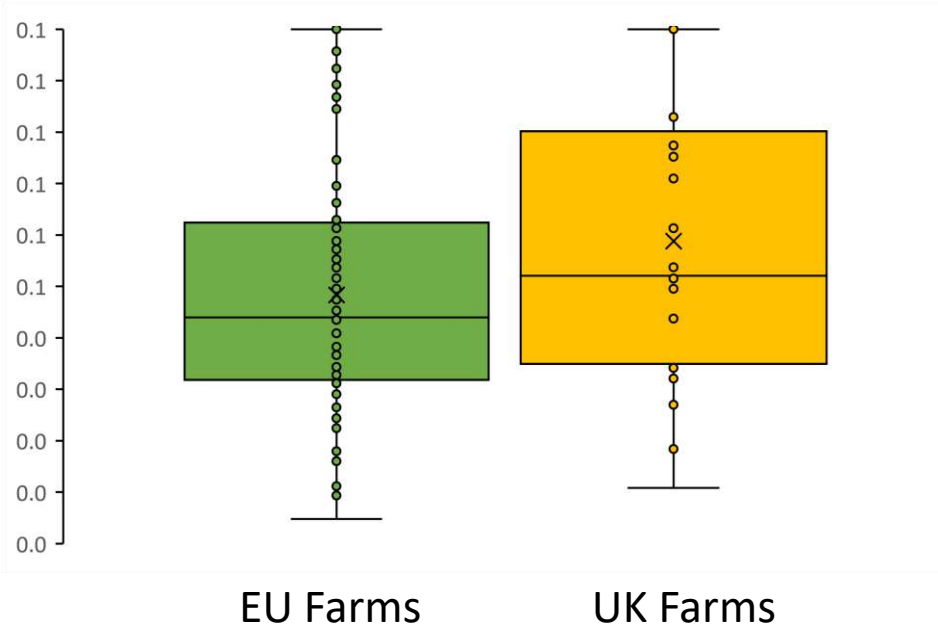
- **Resource efficiency**
 - E.g. land, labour, herd size
- Outputs include yield and composition

Model 2

- **Financial efficiency**
 - Included all revenue streams and variable costs

Resource Efficiency

Model 1 – Resource Efficiency

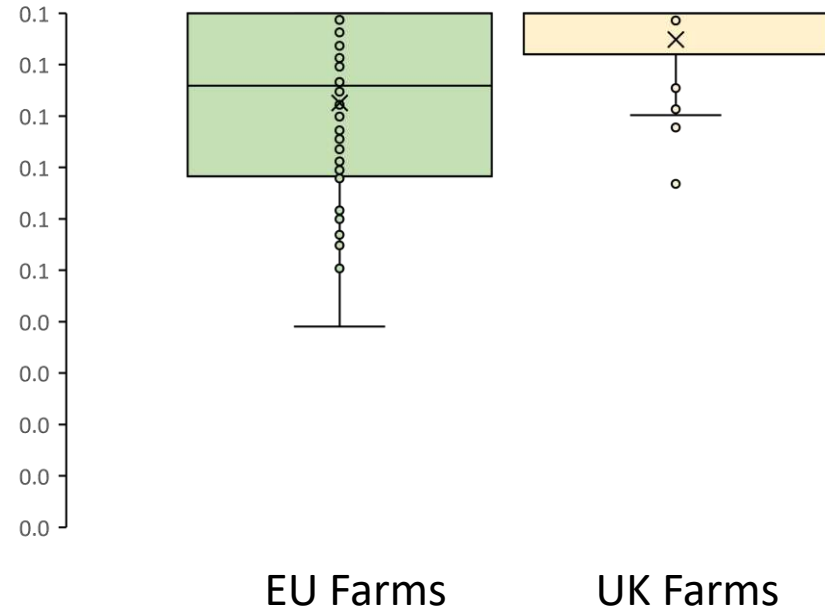


- Best Practice Frontier
 - 9% EU farms (avg. 0.48)
 - 25% UK farms (avg. 0.59)
- Variation within EU and UK farms
 - Some resources are regional
 - e.g., land availability, climate, infrastructure, historical farming practice

Financial Efficiency

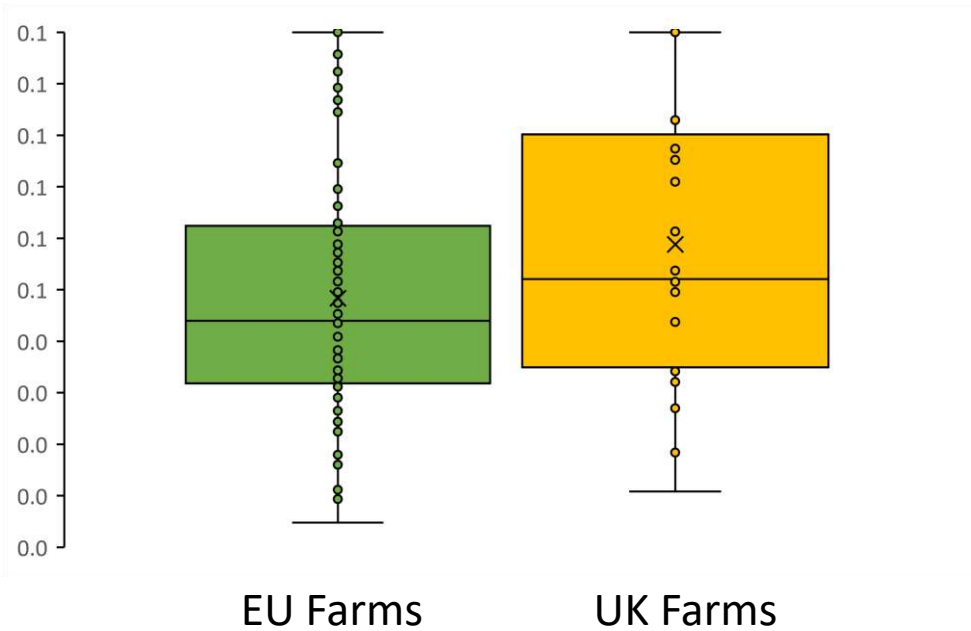
- Best Practice Frontier
 - 35% EU farms (avg. 0.83)
 - 72% UK farms (avg. 0.95)
- Less Variation
 - Farmer focus on farm costs
- UK farms have higher minimum
 - Smaller sample size

Model 2 – Financial Efficiency

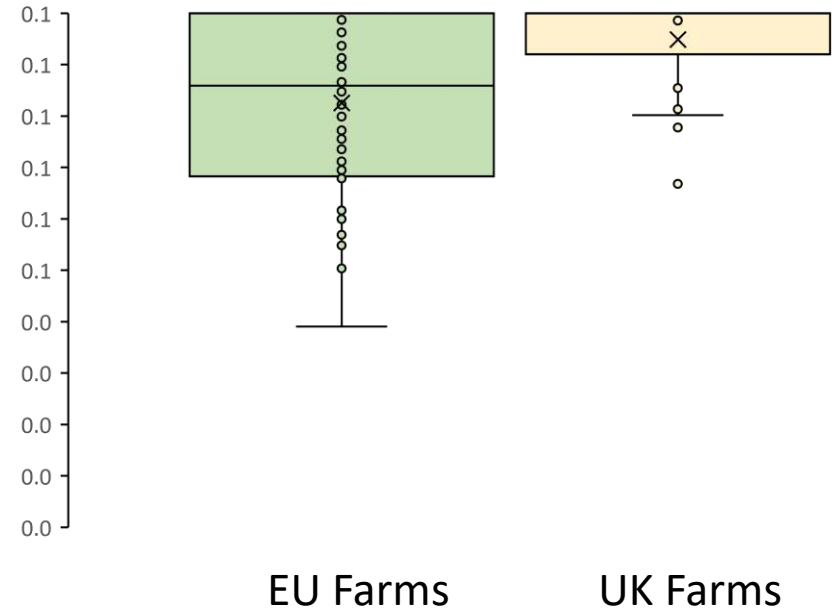


Efficiency Models

Model 1 – Resource Efficiency



Model 2 – Financial Efficiency



Efficiency Models

- Further Analysis
 - Post-hoc test
- Do herd management variables effect farm efficiency?
 - Herd management variables
 - Age at first calving (AFC)
 - 22-26 months
 - Calving interval (CI)
 - <400 days
 - Replacement rate (RR)
 - 20-30%

Variable	AVG	MAX	MIN	SD
AFC (months)	26	33	22	±3.5
CI (days)	397	460	355	±22
RR (%)	27	45	8	±8.6

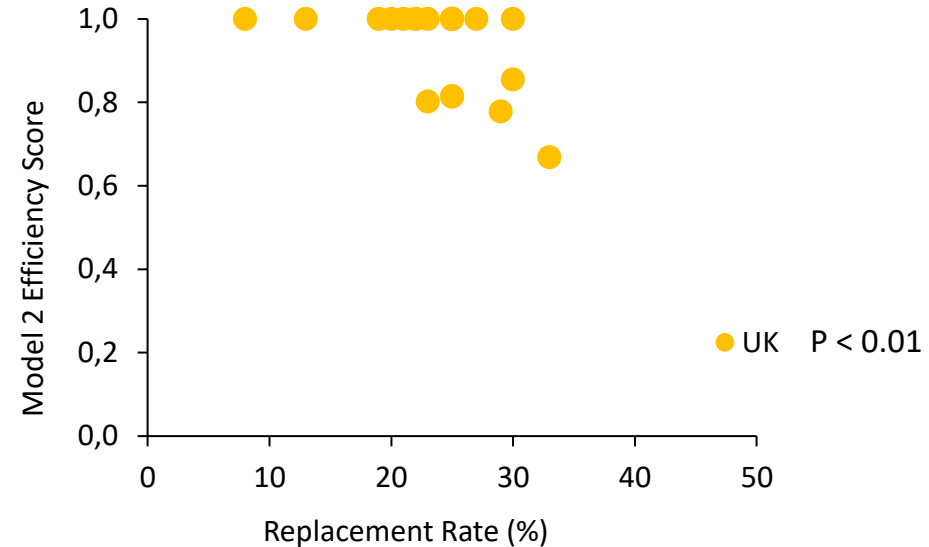
Efficiency Models

- No effect of any herd management variables on Model 1
- AFC and CI had no effect on Model 2

Variable	AVG	MAX	MIN	SD
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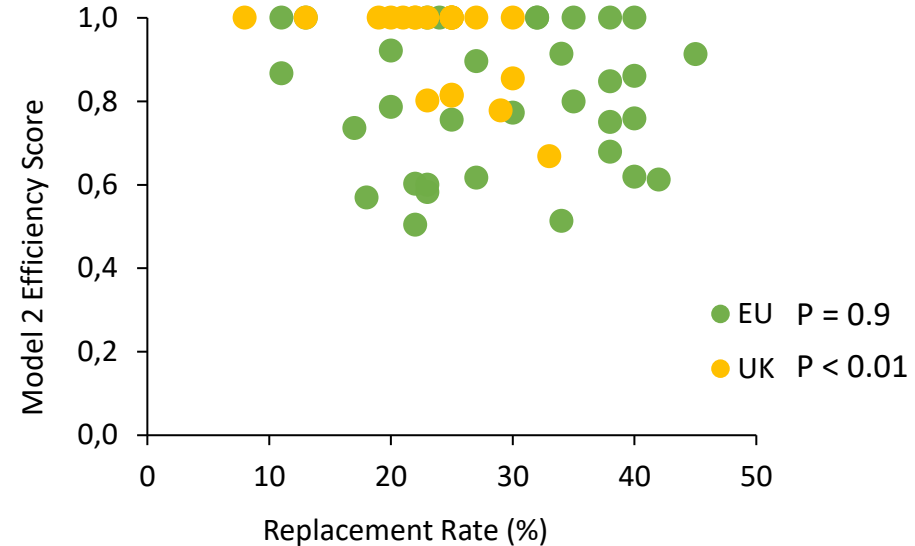
Efficiency Models - Regression

- No effect of any herd management variables on Model 1
- AFC and CI had no effect on Model 2
- RR had an effect on UK farms
 - Increased RR associated with decreased financial efficiency score



Efficiency Models - Regression

- No effect of any herd management variables on Model 1
- AFC and CI had no effect on Model 2
- RR had an effect on UK farms ($P < 0.01$)
 - Increased RR associated with decreased financial efficiency score
 - not EU farms



Efficiency Models – Replacement Rate

RR related to Cattle Costs

- Are UK cattle costs higher?
 - No BUT when looked at as a proportion of
 - Costs
 - Revenue

Cattle Costs	UK	EU
€ per cow	1,137	1,323
% of variable costs	36	33
% of total revenue	38	36

Efficiency Models – Replacement Rate

RR related to Cattle Costs

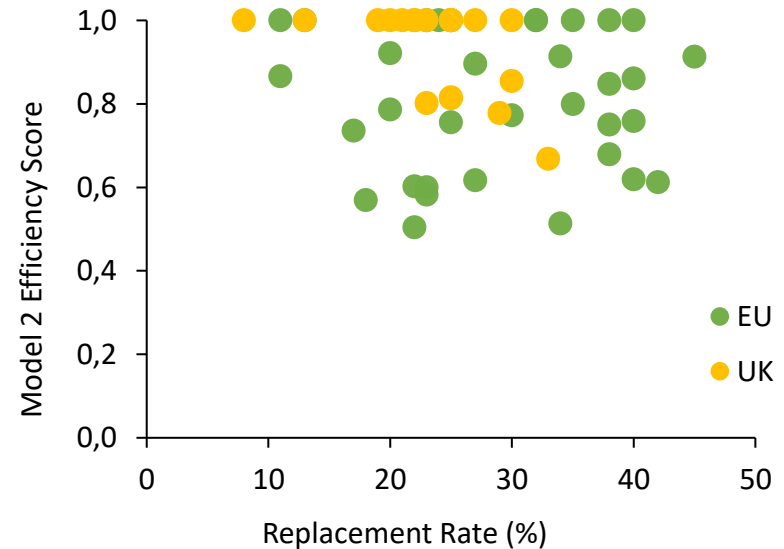
- Are UK cattle costs higher?
 - No BUT when looked at as a proportion of
 - Costs
 - Revenue
- Larger UK herds

Region	No. of Farms	Average no. of Cows
France	21	94
Ireland	10	134
UK	25	265
Portugal	26	174
Spain	20	157

Efficiency Models – Replacement Rate

RR related to Cattle Costs

- Are UK cattle costs higher?
 - No BUT when looked at as a proportion of
 - Costs
 - Revenue
- Larger UK herds
- Smaller sample of UK farms
- Farms are not statistically representative of countries



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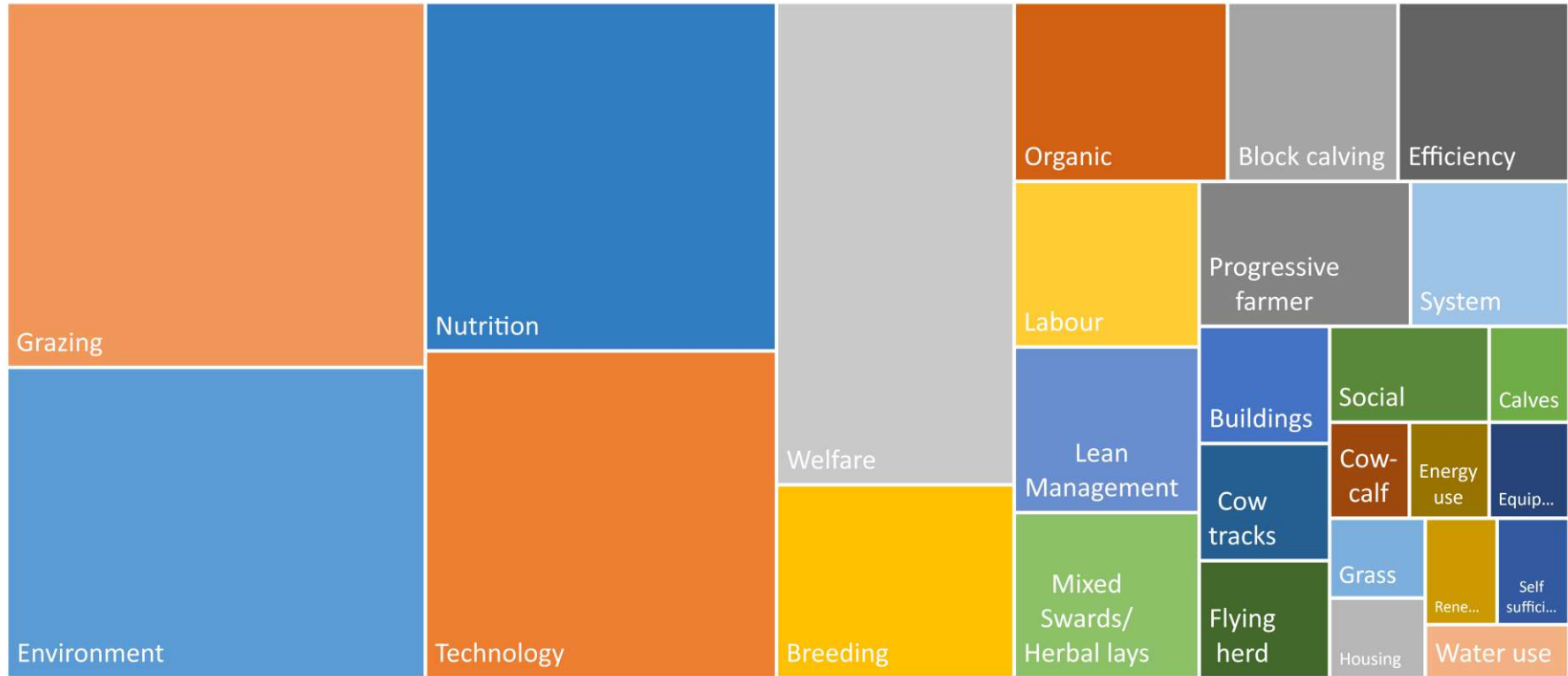


Farm Innovations and Efficiency

- Farms are not statistically representative of countries
 - D4F farms chosen were highly profitable OR innovative
- Categorized Innovations
 - Some farms had more than one
 - Categorized depending on potential impact of innovation



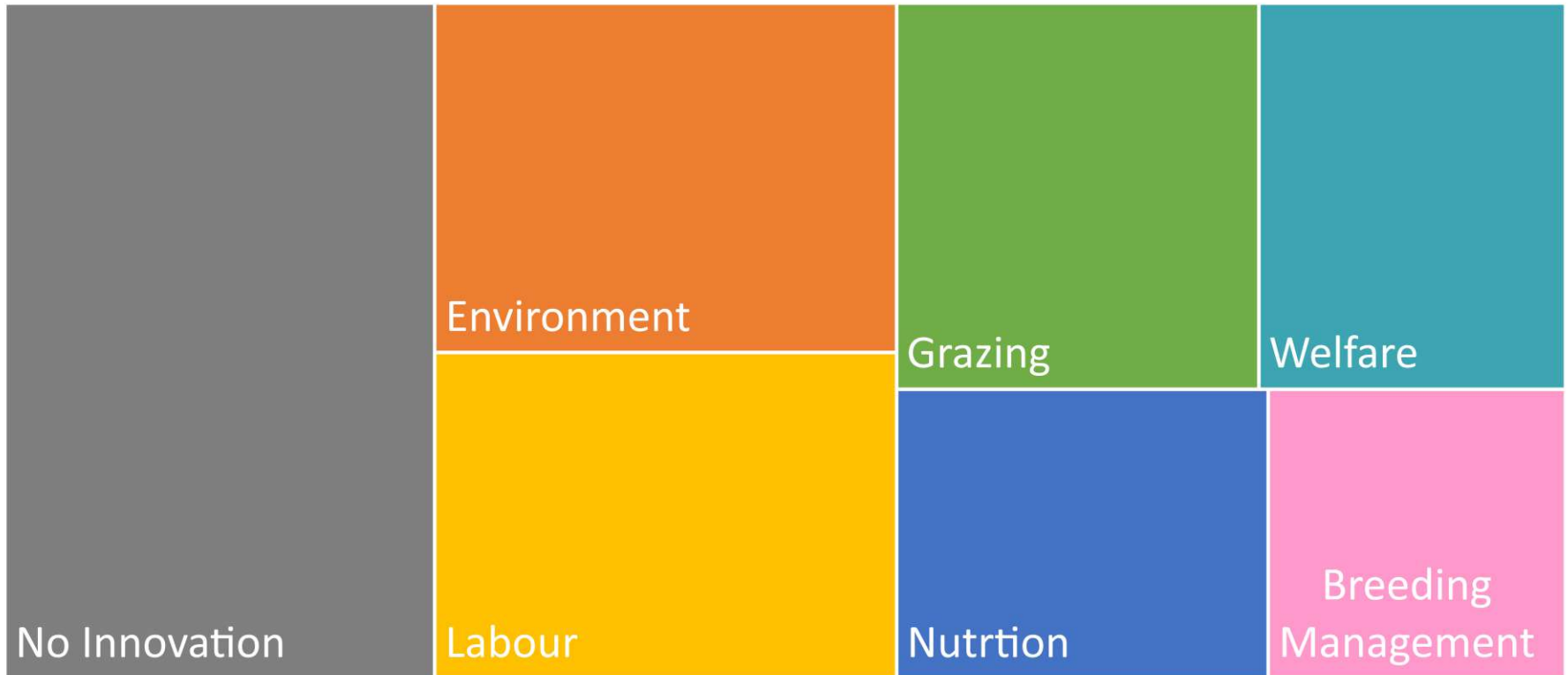
Farm Innovations and Efficiency



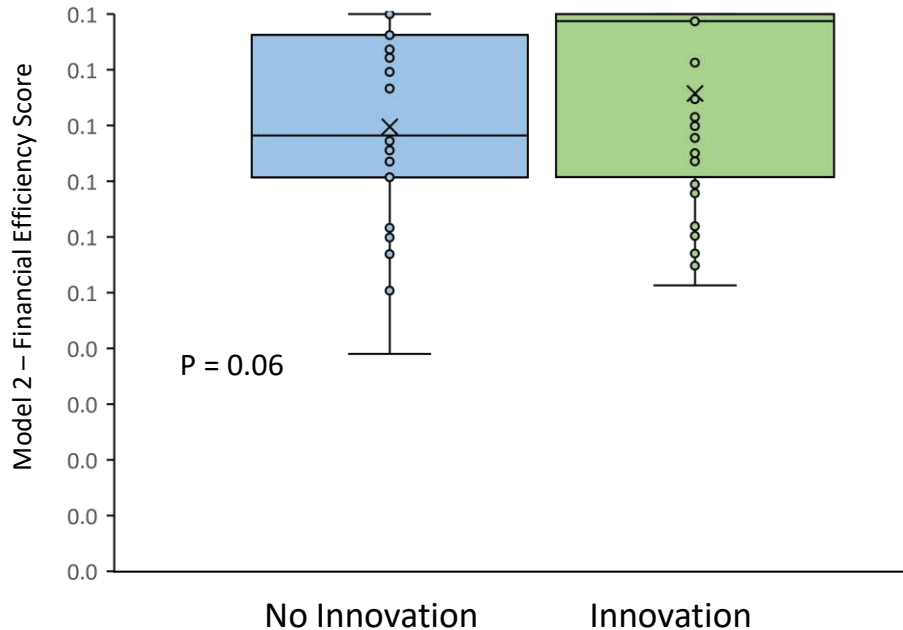
Farm Innovations and Efficiency



Farm Innovations and Efficiency



Farm Innovations and Efficiency



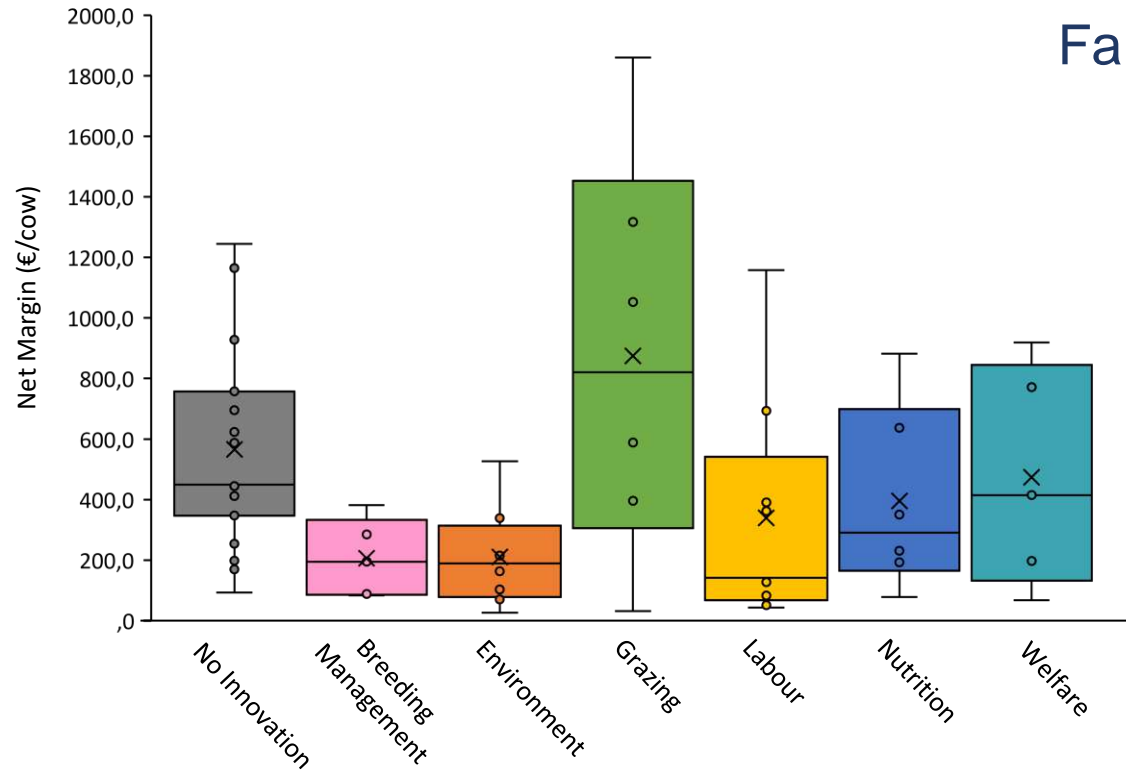
Farms with innovations tend to have higher financial efficiency scores

- Not significant

Farm Innovations and Net Margin

Farms with Positive Net Margin

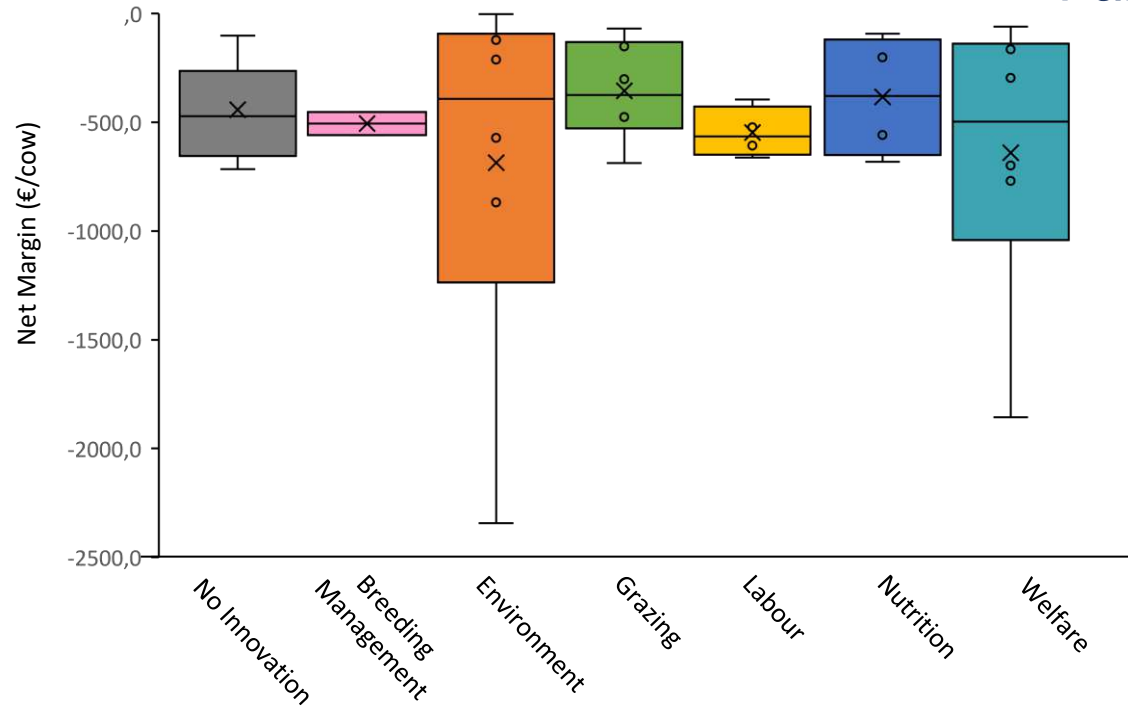
- Grazing innovations have highest average
- Breeding Management and Environment innovations have limited positive net margins
- Labour innovations have lowest average



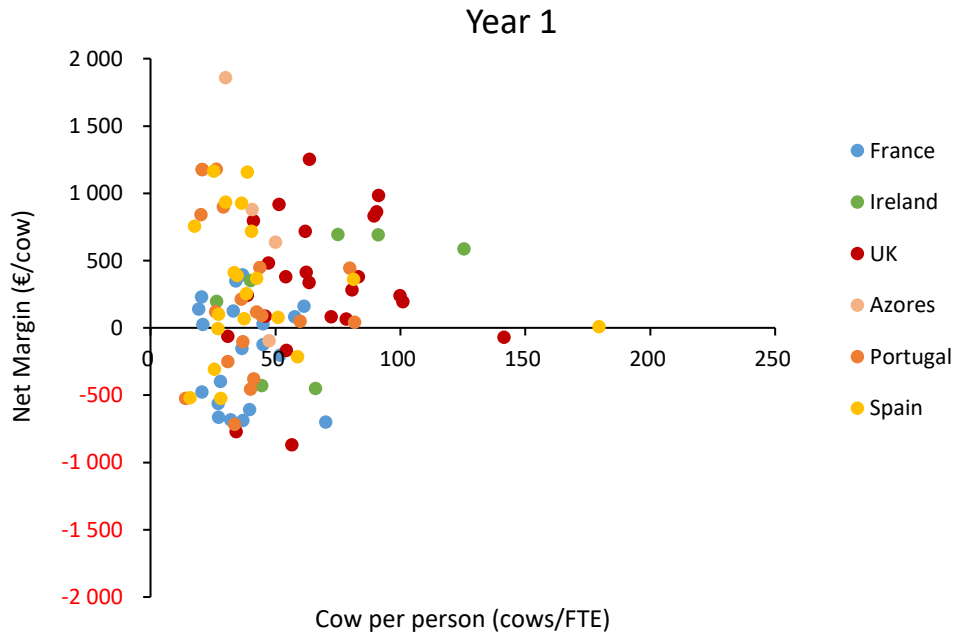
Farm Innovations and Net Margin

Farms with Negative Net Margin

- Labour innovations have consistently lower average



Farm Innovations and Net Margin



Farms with Negative Net Margin

- Labour innovations have consistently lower average
 - Labour Efficiency Technical KPI
 - Less cows per person \neq higher net margins
 - Robot farms categorised as labour innovation

Recap

1. Economic Evaluation of D4F Pilot Farms

- Farmer Case Studies
- Economics and Labour in D4F Farms
 - Higher costs lead to higher revenues, but not higher net margins
 - Variable cost ratios were similar between regions, but Fixed costs differed
 - Farmer control over variable costs
 - Climate, Farming System, Historic influences on fixed costs
 - Technical KPIs
 - Decreasing cows per person does not increase net margin



Dairy-4-Future - Farm Snapshot

	Year 1	Year 2		Diff %
		Year 2	Top 25%	
Profitability Measures - Are we making enough money?				
Full economic costs of dairy production	€ / litre	3,303	3,507	4,768
Total output from dairy production	€ / litre	3,895	3,828	5,885
Full economic net margin of dairy production	€ / litre	48	241	1,217
Output milk yield	%	2	6	20
Breakeven surplus / deficit	€ / litre	0.08	0.05	0.09
Financial Efficiency Measures - Tracking the costs				
Purchased feed including minerals	€ / kg MS	2.0	2.0	2.8
Variable cost ratio	%	72	72	76
Fixed cost ratio	%	28	28	24
Financial cost ratio	%	87	87	88
Depreciation ratio	%	1	1	1
Technical Efficiency Measures - Tracking the physical performance				
Stocking rate - dairy area	cows / ha	1.9	1.9	2.2
Replacement Rate	%	25	25	24
Milk yield per cow	kg MS / cow	10,500	10,500	10,500
Cows per person	cows / FTE	40	40	40
Milk yield per person	kg MS / FTE	420,000	420,000	420,000
Age at first calving	days	280	280	280
Calving interval	days	380	380	380
Milk from heifers per cow	€ / litre	3,200	3,200	3,200



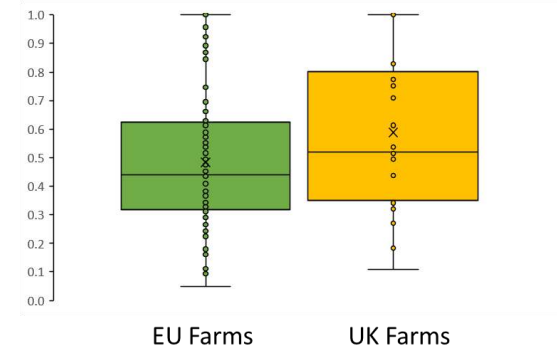
Recap

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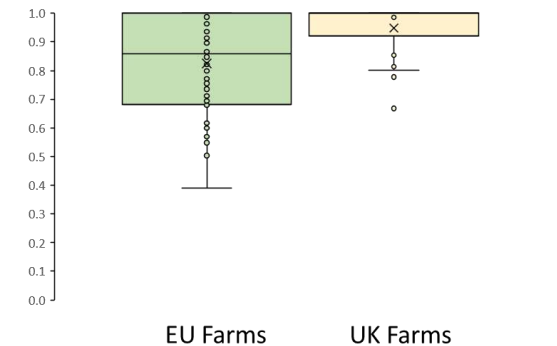
2. Farm Efficiency Scores

- Farms had higher financial efficiency scores compared to resource efficiency
 - Farmer emphasis on costs
 - Can be controlled and monitored
 - Resources not always farmer controlled
 - Regional difference
 - Agrees with Section 1.
- Replacement rate effects financial efficiency in UK, but not in EU
 - Potentially driven by D4F farm selection process

Model 1 – Resource Efficiency



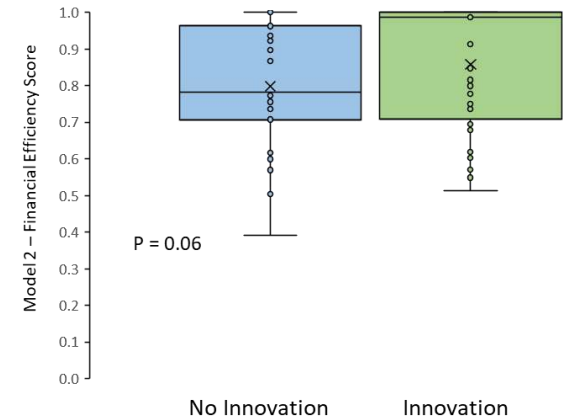
Model 2 – Financial Efficiency



Recap

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- Lots of innovative farms involved in D4F
 - Categorised down to 6 innovations
- Innovative farms tended to have higher financial efficiency scores
- Farms with labour efficiency innovations, on average, had the lowest positive and highest negative net margins
 - May be related to robotic milking





Thank You For Your Attention

