Benchmarking the sustainability performance of pastoral dairy-beef production systems

M. Kearney[1, 2], P. Crosson[1], C. Byrne[1], E. G. O'Riordan[1] and J. Breen[2]

[1]Livestock Systems Research Department, AGRIC, Teagasc, Grange, Dunsany, Co. Meath, Ireland

[2]School of Agriculture and Food Science, University College Dublin, Belfield, Dublin 4, Ireland

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Introduction

- Dairy-beef contribution to total beef output in many countries is substantial
- Limited knowledge regarding performance of commercial dairy-beef farms
- Furthermore, no study exists comparing dairy-beef farms operating at national average performance levels (AVE), farm participating in knowledge transfer programs to improve performance levels (IMP) and experimental blueprint systems on research farms (RES)

Objective

- Quantify and compare key sustainability performance indicators for dairy-beef farms on AVE, IMP and RES farm categories

Materials and methods

- Teagasc National Farm Survey to collect financial data & ICBF for animal performance data AVE farms
- TWENTY20 BEEF CLUB data used for (IMP) farms
  - Knowledge transfer initiative between Kepak and Tirlán
  - Operates on a ‘closed-loop basis’, target 50,000 calves/ year 2024
- Financial and animal performance data for (RES) farms taken from Teagasc Grange
- Range of production systems incorporating 3 breeds (EM, LM & HF), 2 sexes (steer/ heifer) and 3 finishing systems (2nd grazing, 2nd winter & 3rd grazing)
- Three farm categories modelled through GDBSM (Kearney et al., 2022)

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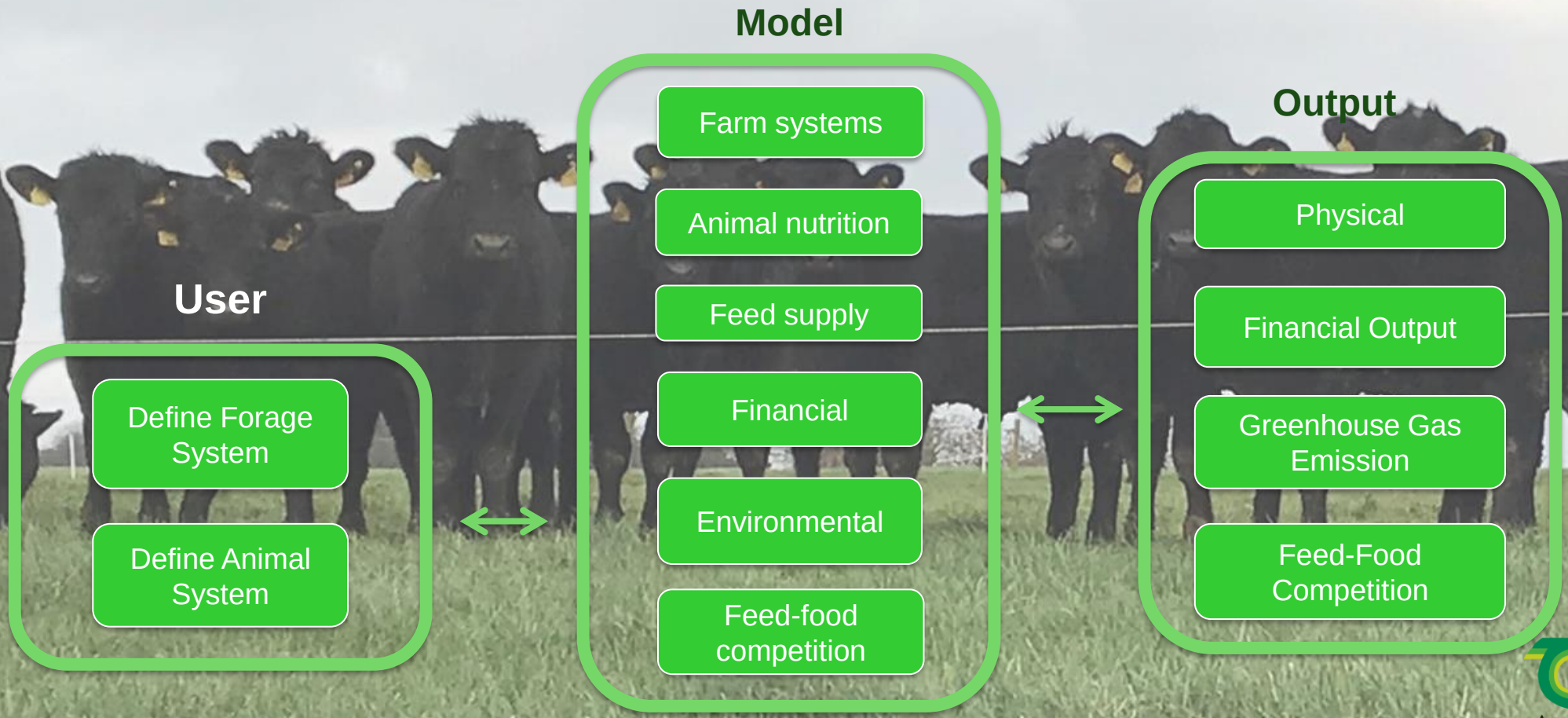
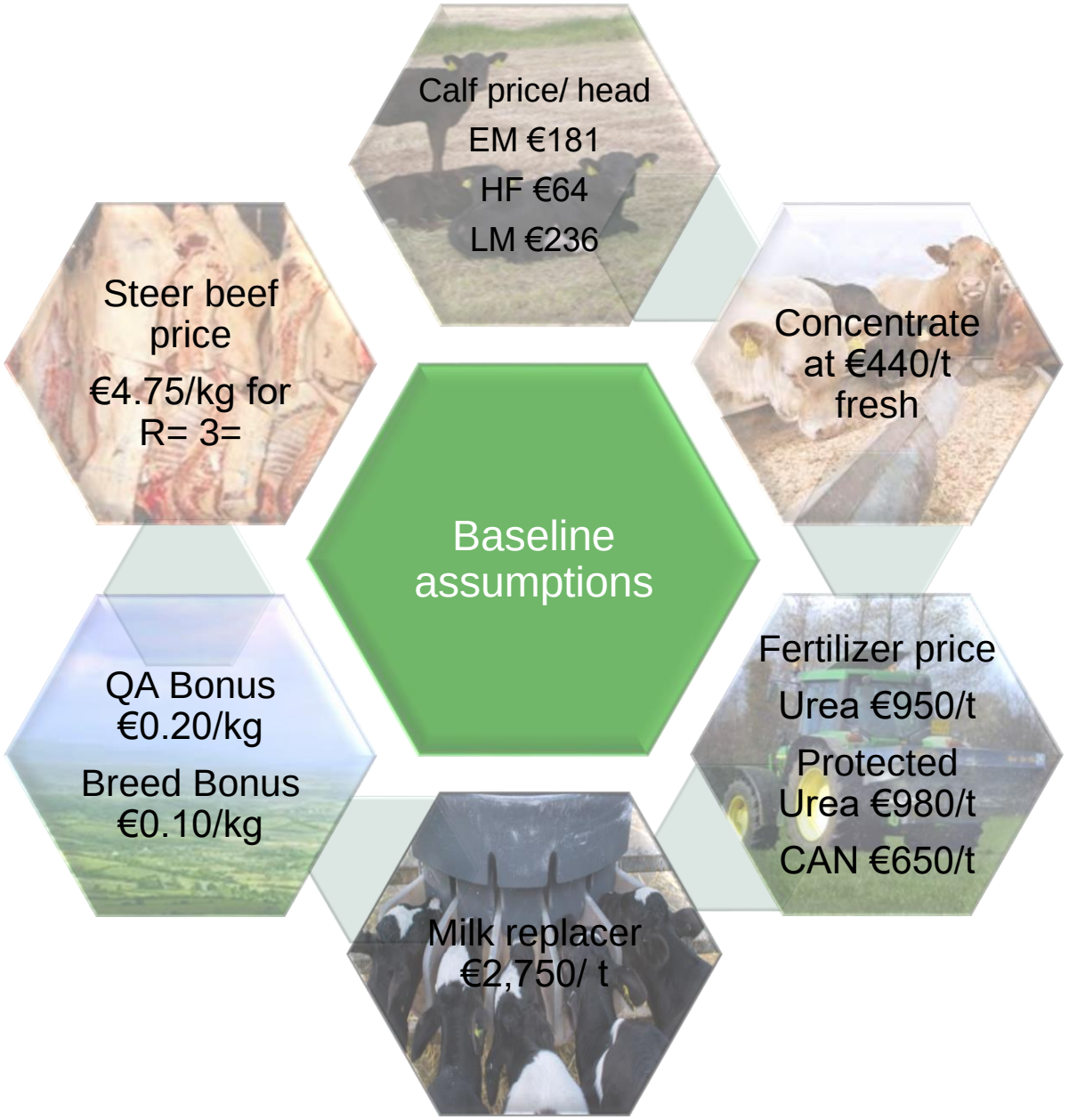
Grange Dairy Beef Systems (GDBSM) Model (Kearney et al., 2022)

Whole farm, steady state, deterministic, simulation model

- Microsoft Excel based
- Operates on a monthly time step




Calf price/ head
EM €181
HF €64
LM €236
Steer beef price
€4.75/kg for R= 3=
Concentrate at €440/t fresh
Baseline assumptions
QA Bonus €0.20/kg
Breed Bonus €0.10/kg
Fertilizer price
Urea €950/t
Protected Urea €980/t
CAN €650/t
Milk replacer €2,750/ t

Physical results

Item	AVE	IMP	RES
Number of farms	76	68	1
Number dairy-beef systems	172	206	5
Farm size (ha)	24	25	13
Cattle sold (head)	41	45	40
Stocking rate (LU/ha)	1.87	1.82	2.70
Age at slaughter (days)	778 (25.6)	732 (24.1)	626 (20.6)
Carcass weight (kg)	308	318	305
Carcass weight per day of age (kg)	0.40	0.44	0.49
Mean carcass grade	O- 3=	O= 3+	O+ 3+
Carcass weight output (kg/ha)	587	623	887

Economics

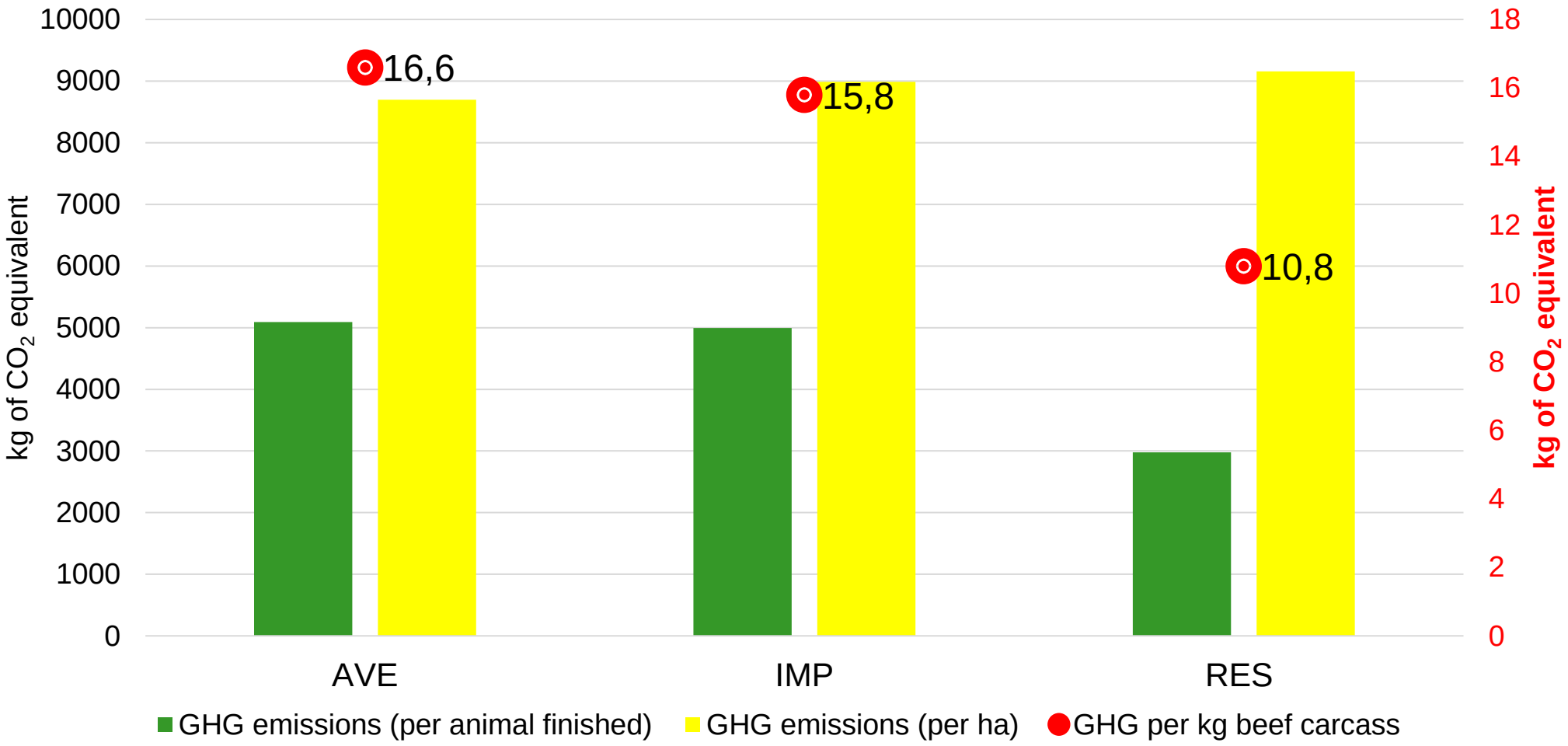
	Per head			Per hectare		
Item (€)	**AVE**	**IMP**	**RES**	**AVE**	**IMP**	**RES**
Gross output	1330	1459	1125	2515	2840	3590
Variable costs	859	872	627	1795	1700	2002
Gross margin	471	587	497	721	1140	1588
Fixed costs	376	403	245	701	785	782
Net margin	95	184	253	185	354	806
Profit per kg beef carcass	0.33	0.57	0.91	-	-	-
Cost per kg beef carcass	4.41	4.40	3.74	-	-	-

Labour

Item	AVE	IMP	RES
Total labour hours per farm	1664	1791	1073
Total labour hours per animal	20	19	13
Number labour units	0.40	0.47	0.33
€/hr	€2.67	€4.94	€9.77
€/ labour unit	€7,690	€13,605	€29,369

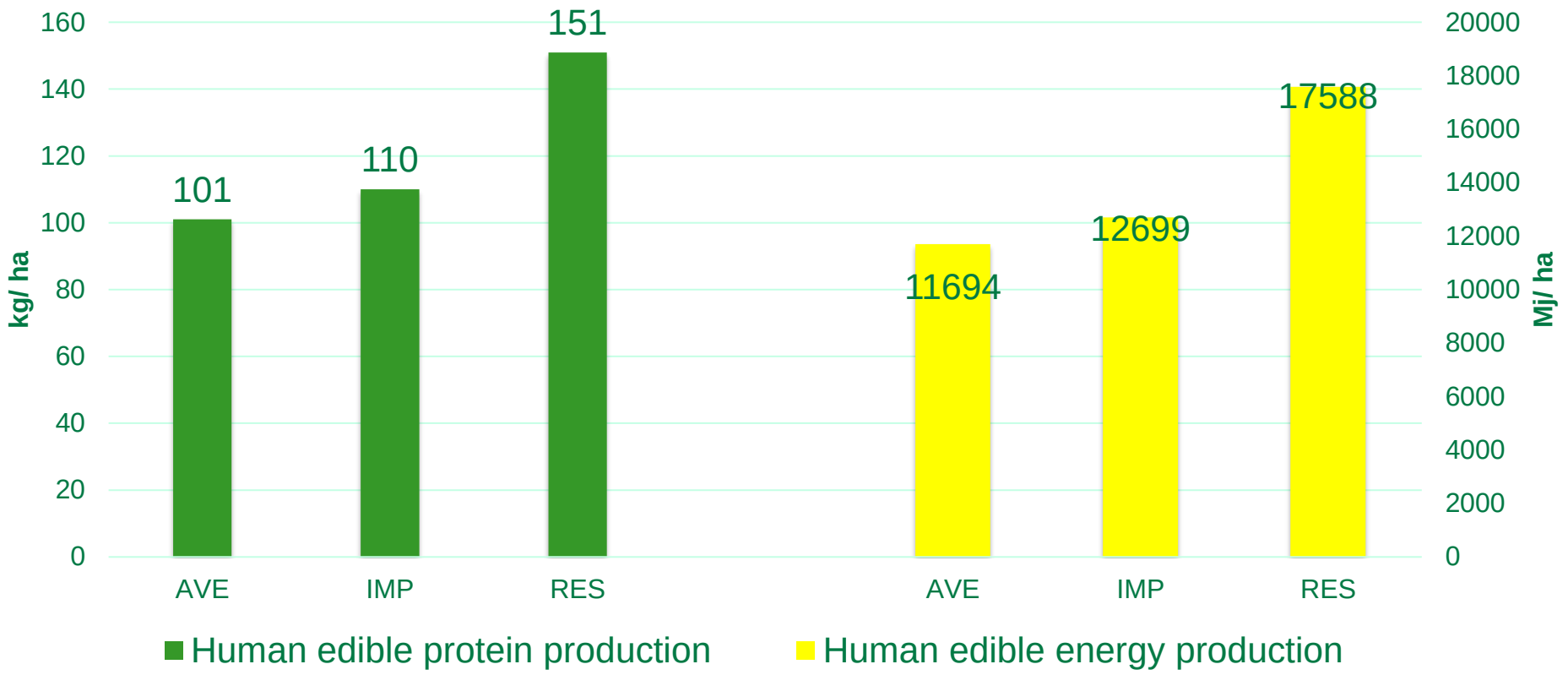
- Farm labour calculation were derived from cumulative net labour input per day

Greenhouse gas emissions



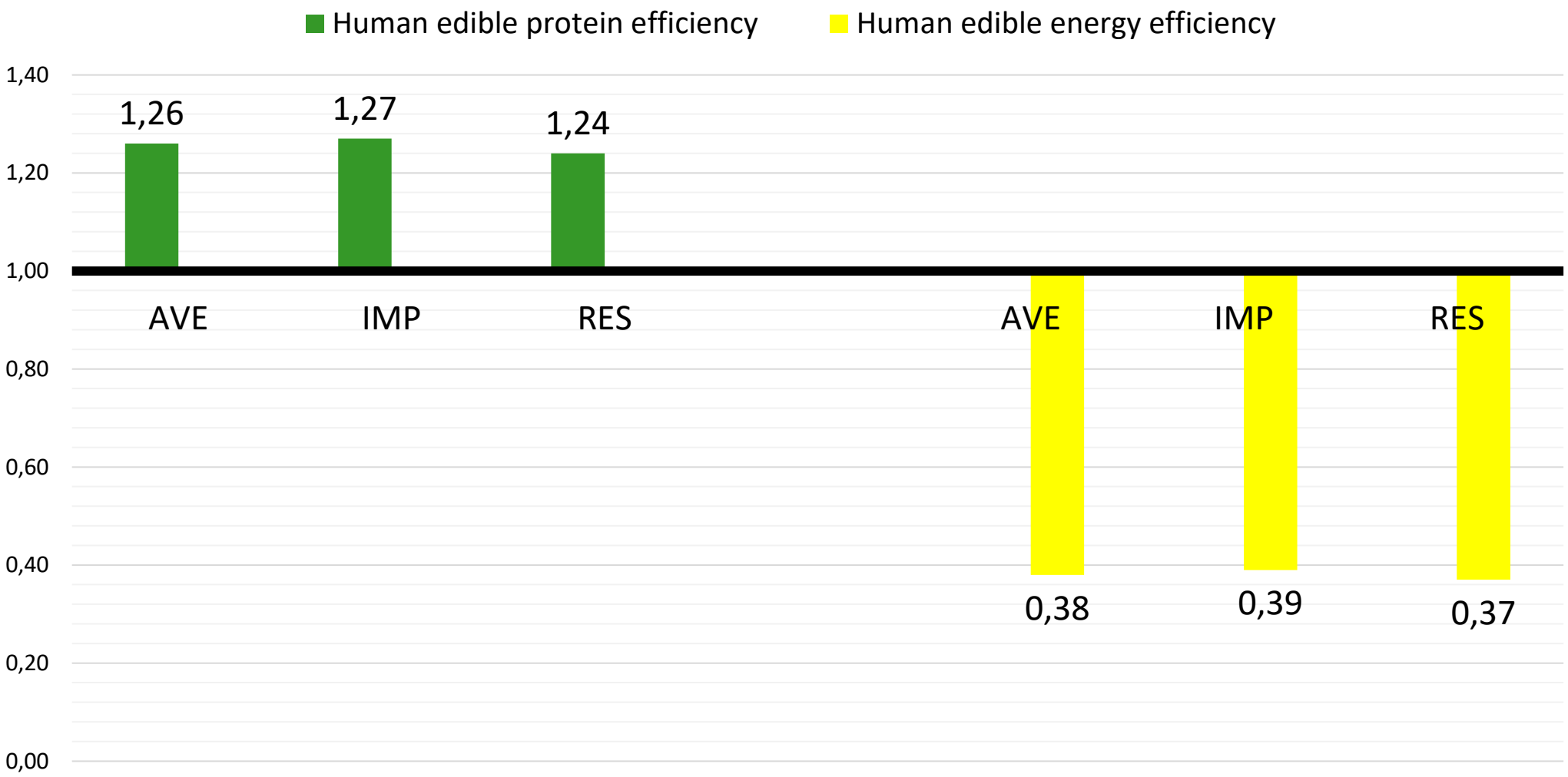
Beef system emissions = enteric methane + manure management + soils + purchased inputs

Human edible protein and energy production



Assumed 1 kg of bovine human-edible meat composed of 158 g of protein and 10.9 megajoules of energy (Mosnier et al., 2021)

Feed-food competition



- Assumed standard industry ration formulation for beef cattle production in Ireland (McGee et al., 2022)

Conclusion

- Key differences between farm categories in relation to age at slaughter, carcass grading and stocking rate.
- Reflected in large range in net margins from €185 (AVE) to €806 (RES) per hectare across the 3 farm categories
- GHG emissions intensity significantly lower for RES compared to IMP and AVE farm categories
- All 3 farm categories were net producers of human edible protein, whilst all farms were net consumers of human edible energy
- Major scope to improve performance on commercial dairy-beef farms thereby increasing farm profitability and feed-food ratios whilst reducing GHG emissions intensity

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Thank you for listening

Mark.Kearney@teagasc.ie

+353 (0)46 906 1141 / +353 (0)87 935 0262

Twitter:

@MarkKearney6

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