

Scotland's FBS Carbon Audit

RESAS

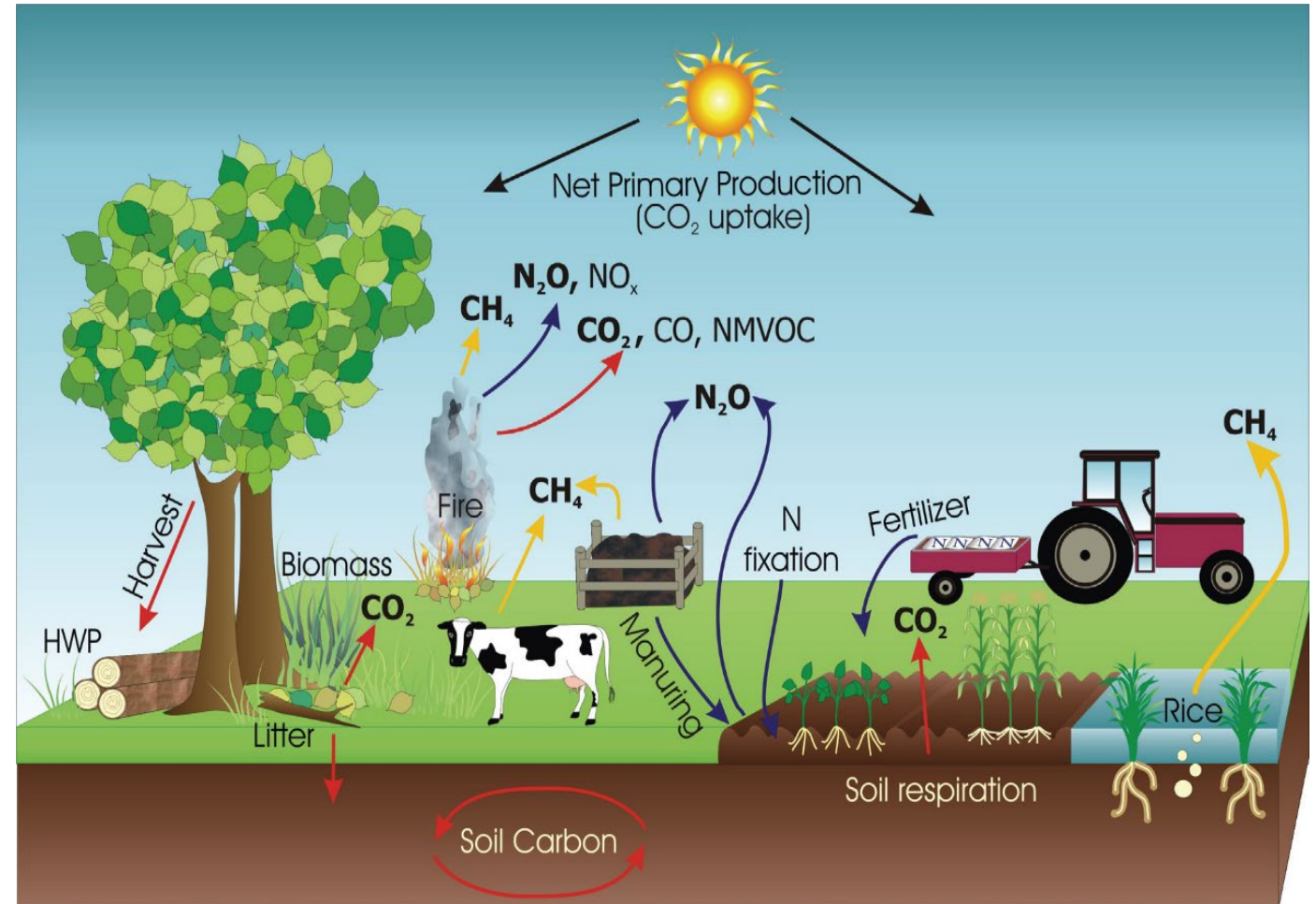
Rural & Environmental Science
and Analytical Services

Scotland Farm Business Survey's preliminary findings from pilot data collection.



Greenhouse gases in agriculture

- Carbon dioxide is the most well known greenhouse gas.
- 1 molecule of Methane has a global warming potential 25x that of a molecule of Carbon dioxide.
- 1 molecule of Nitrous oxide has a global warming potential 298x that of Carbon dioxide.



Scottish GHG

- Scottish agriculture and related land use produced **9.7 MtCO₂e** or around **23 %** of our nations greenhouse gas emissions.
- Agriculture and related land use has now seen a 4 MtCO₂e (29.4 per cent) fall in net emissions since the 1990 baseline year.
 - Reduction of 0.2 MtCO₂e (1.9 per cent) drop between 2016 and 2017.
 - Mainly due to
 - Greater productivity, such as higher milk yields per cow
 - Reduction in the number of cattle and sheep
 - Reduction in the amount of nitrogen fertiliser being applied
 - Reduction in grassland being ploughed for arable production



How do farms vary in their CO₂e emissions?

Why are some farms producing less CO₂e?

Does FBS data relate to farm CO₂e?

Carbon Audit within Farm Business Survey

- Pilot study of 150 farms in 2018-19 (55 farms data in so far)
- Use SAC Consulting's **AgRE Calc** to calculate carbon footprint
 - Calculates resource use efficiency of a farm
 - Emissions are calculated for the whole farm, per enterprise and per unit of saleable product
 - Can be related to economic performance
 - Generation of year on year comparisons
- The methodology consistent with international and national standards

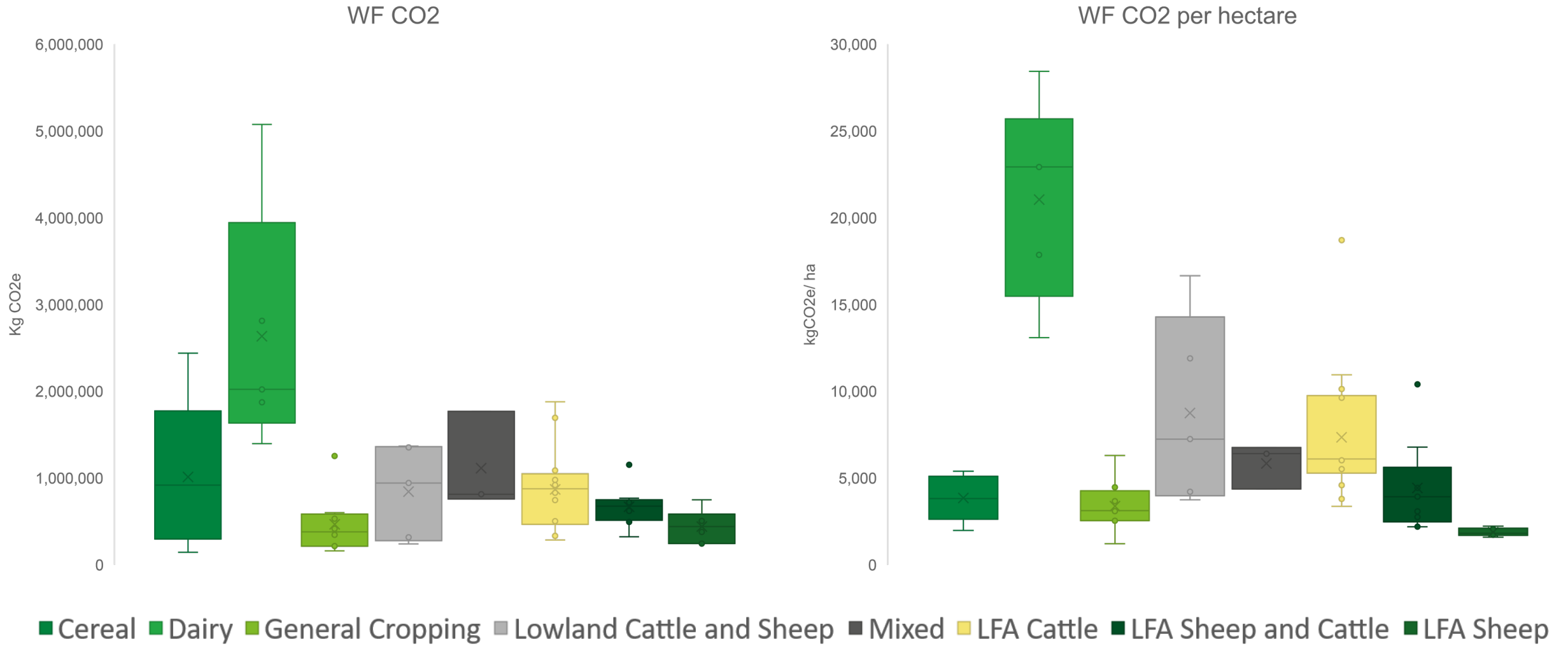
Preliminary Findings

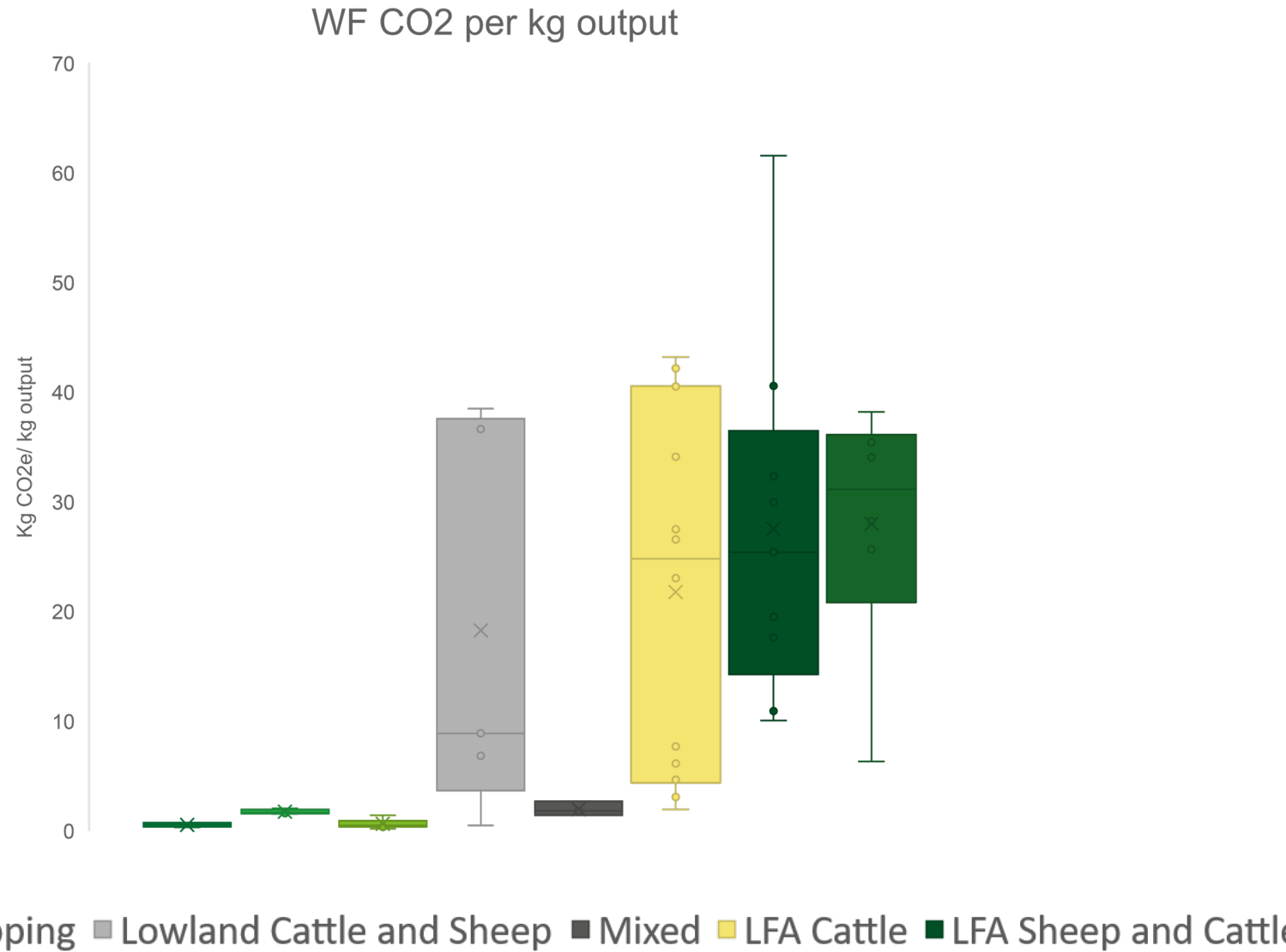
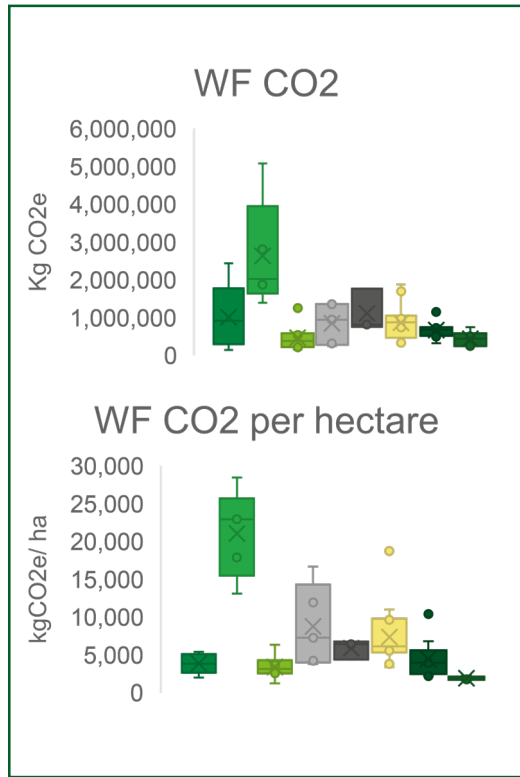


Preliminary findings

On farm (to farm gate) CO₂e emissions by farm type

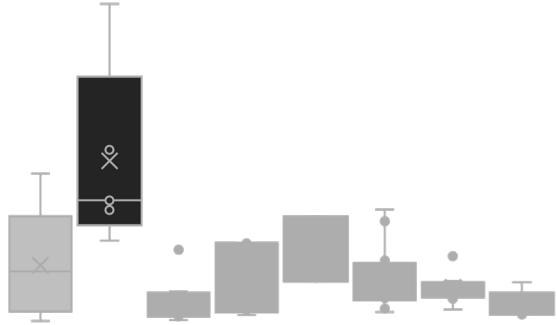
Farm type	Number of farms	Direct CO ₂	Indirect CO ₂	Methane	Nitrous Oxide	Whole farm per kg output	CO ₂ per hectare	Farm & enterprise output	Total CO ₂	Forest CO ₂ e
LFA Specialist Sheep	6	17,236	48,378	281,123	94,195	28	1,871	19,379	440,932	7,209
General Cropping	8	66,567	182,865	73,742	143,576	1	3,373	894,176	466,750	6,970
LFA Sheep & Cattle	9	30,009	107,715	382,212	147,966	28	4,424	37,641	667,903	34,984
Lowland Cattle & Sheep	5	31,655	182,024	438,597	191,292	18	8,747	175,475	843,569	20,038
LFA Cattle	14	37,605	193,141	434,795	201,798	22	7,343	140,676	867,339	122,331
Cereal	5	92,173	441,872	131,587	345,245	1	3,849	1,573,090	1,010,878	17,346
Mixed	3	86,734	307,247	409,449	308,717	2	5,836	651,166	1,112,147	32,670
Dairy	5	108,213	877,864	1,185,932	463,193	2	21,052	1,524,777	2,635,202	46,646





■ Cereal ■ Dairy ■ General Cropping ■ Lowland Cattle and Sheep ■ Mixed ■ LFA Cattle ■ LFA Sheep and Cattle ■ LFA Sheep

Dairy



Manure to soil

6%

Organic manure to soil

12%

Fermentation

36%

Manure management

9%

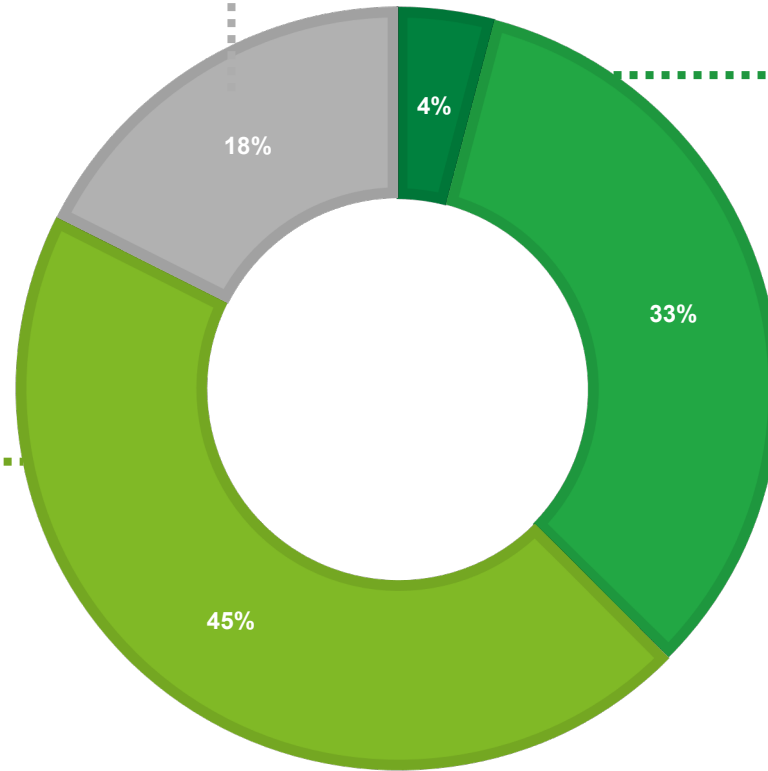
Fertiliser

7%

Feed

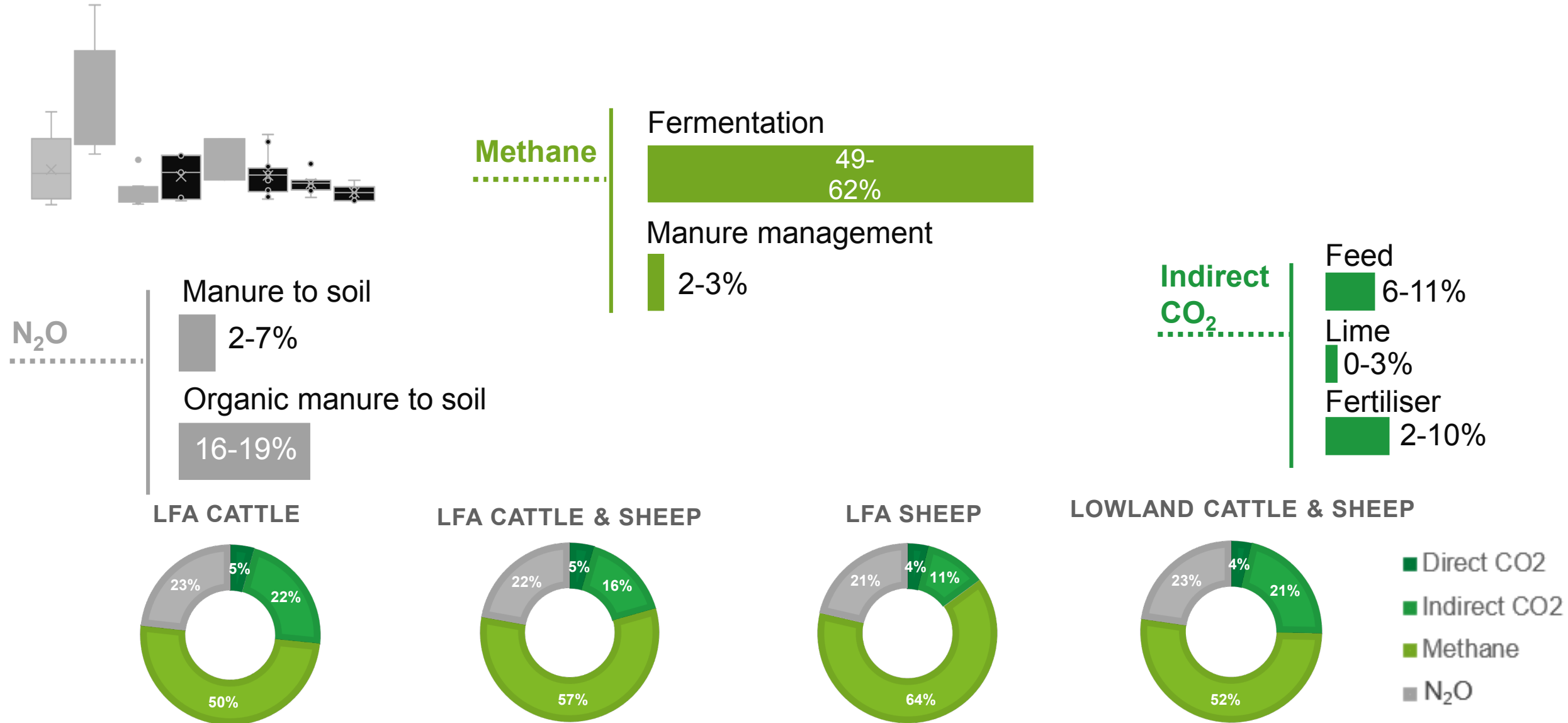
25%

* Small contributions from bedding and lime use

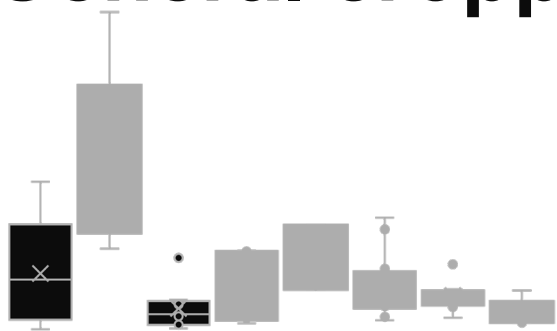


- Direct CO2
- Indirect CO2
- Methane
- N₂O

LFA and lowland sheep and cattle farming



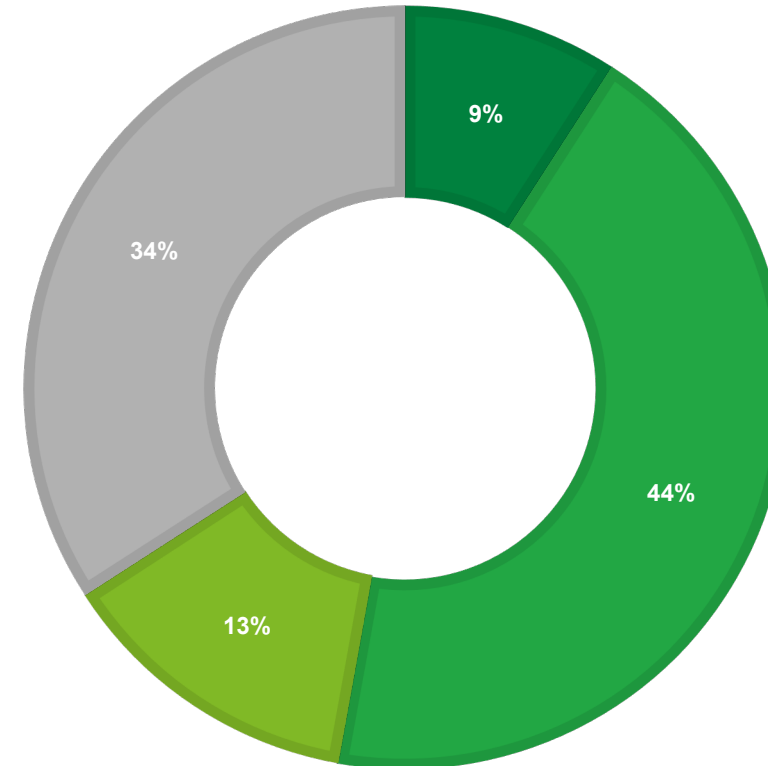
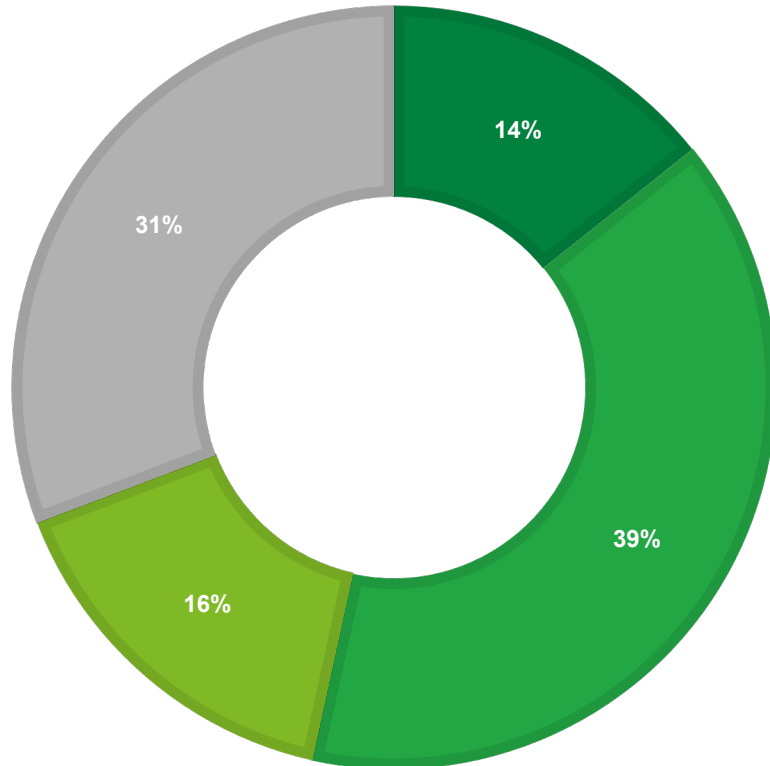
General cropping and Cereal



GENERAL CROPPING

CEREAL

- Indirect CO₂- fertiliser (33%) and lime (11%)
- N₂O – manure to soil (23-29%) and N residuals (5%)



- Direct CO₂
- Indirect CO₂
- Methane
- N₂O

WHOLE FARM CARBON^e diesel



10% General cropping
1% LFA Sheep

Preliminary Analysis

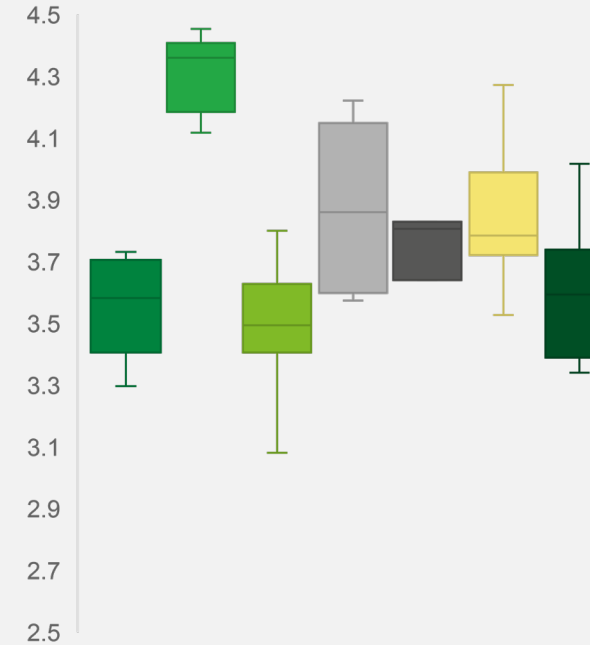
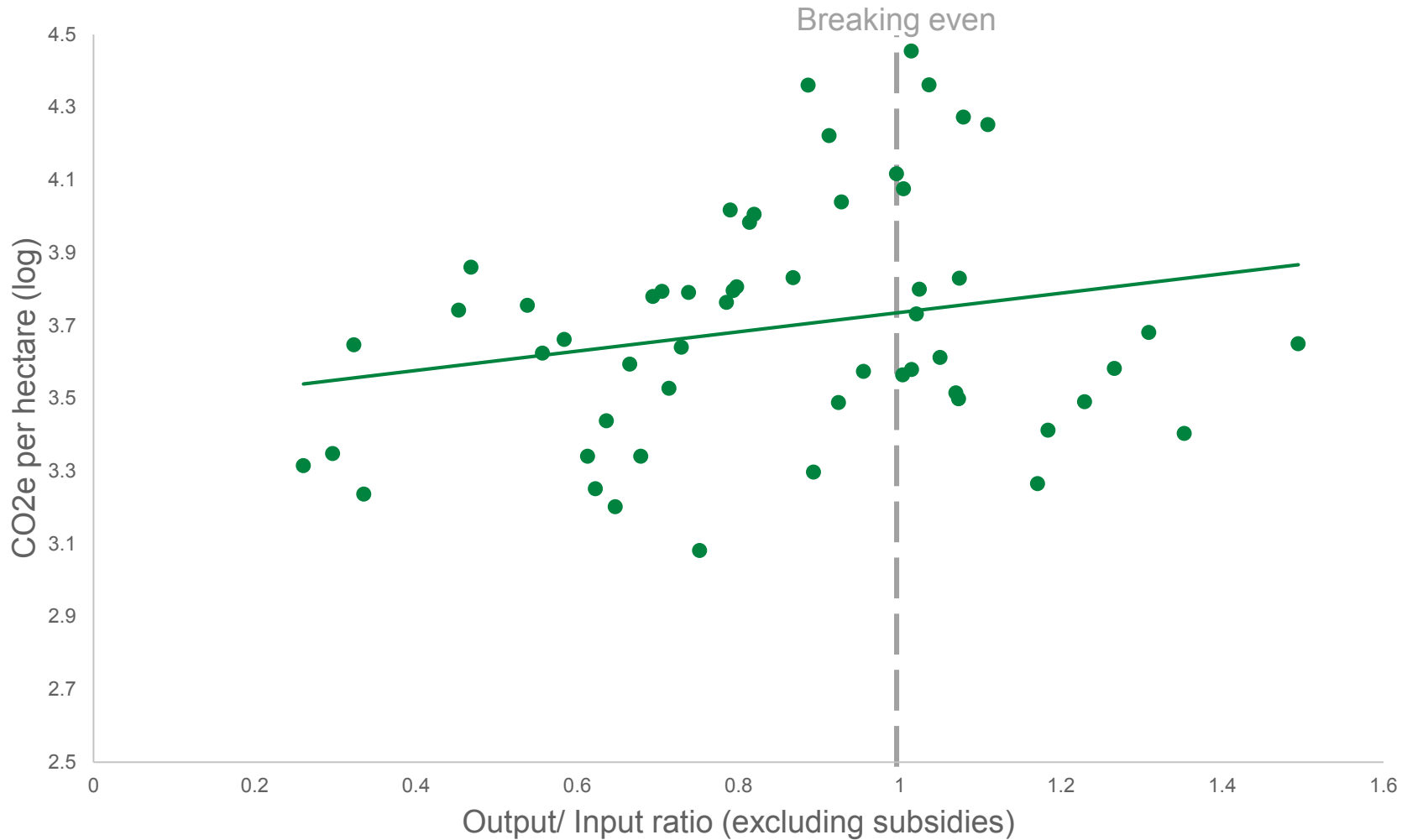
Linear models in R (lmer)

Transformations where required

* Exploratory only (small data set)

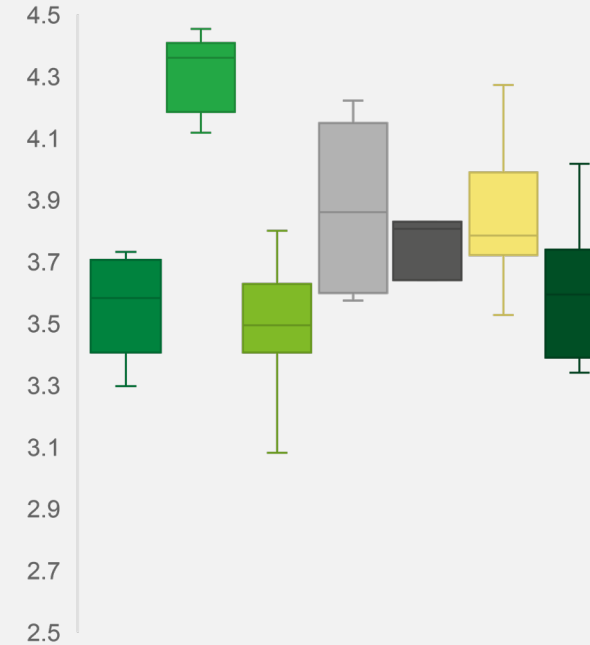
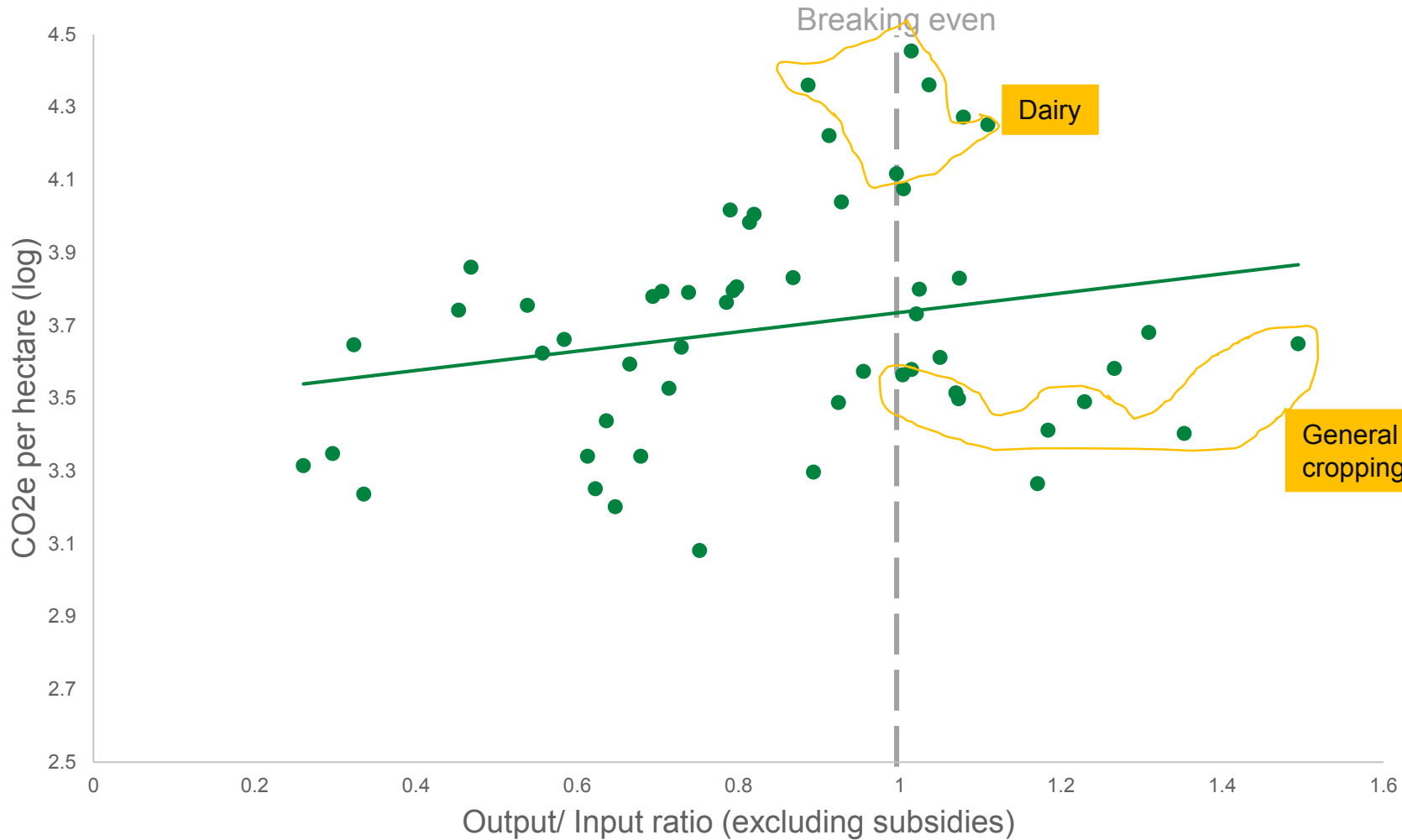
CARBON^e Per Hectare

CO₂e per hectare increases with output/ input ratio (excluding subsidies)



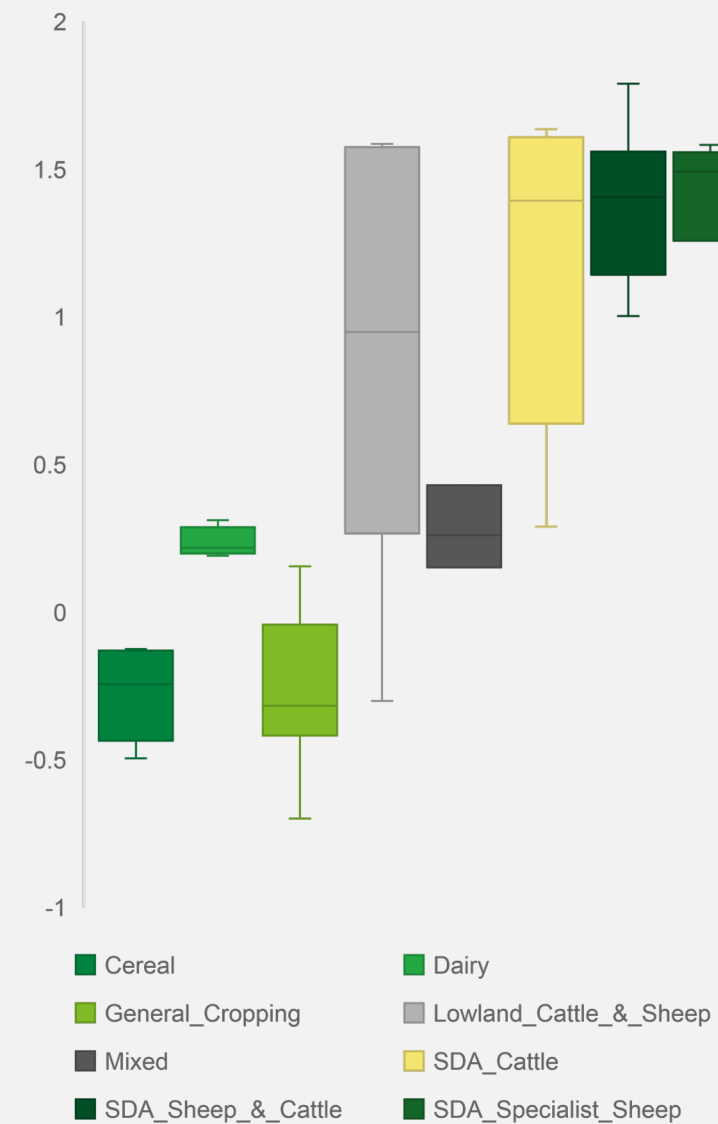
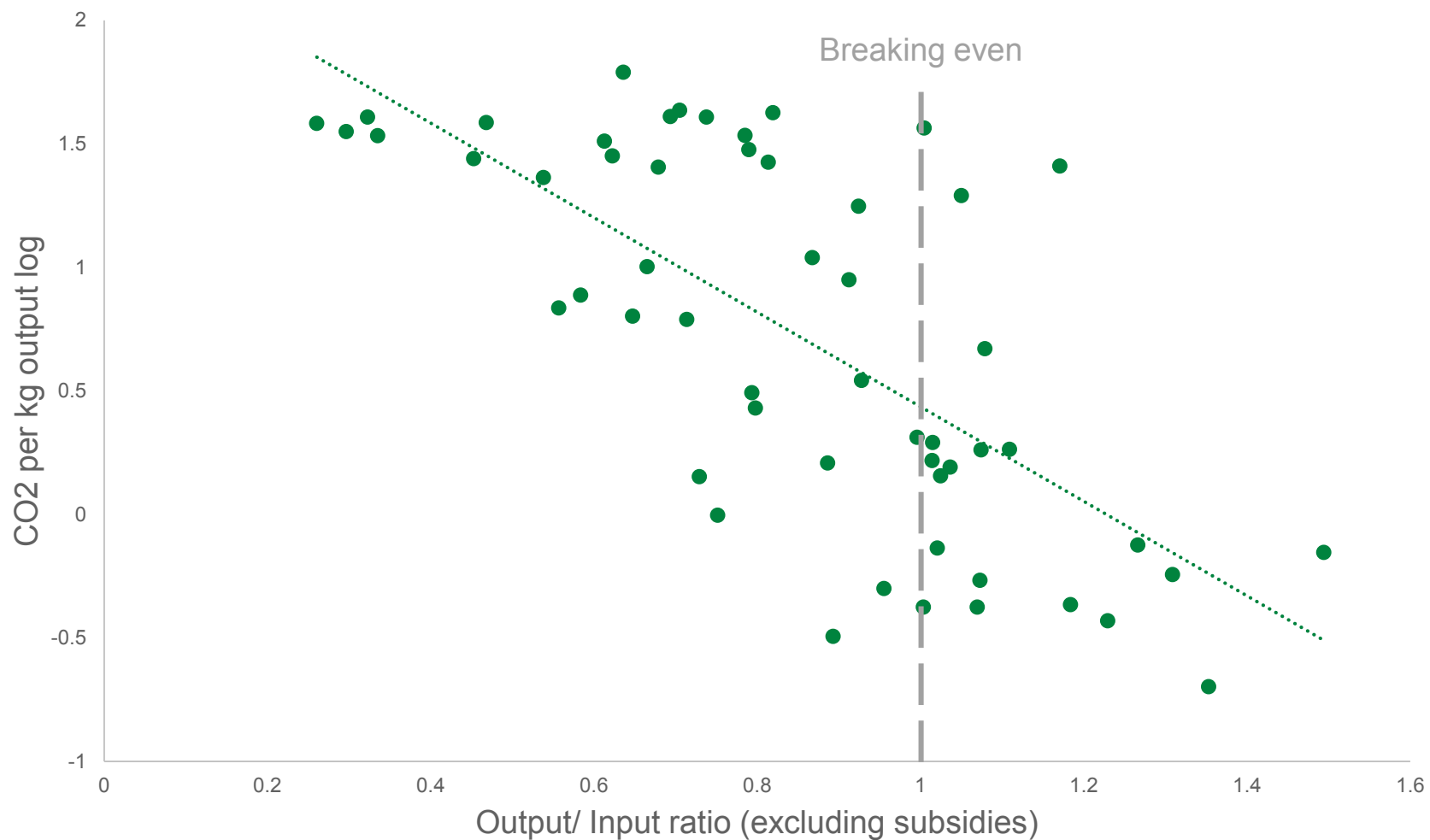
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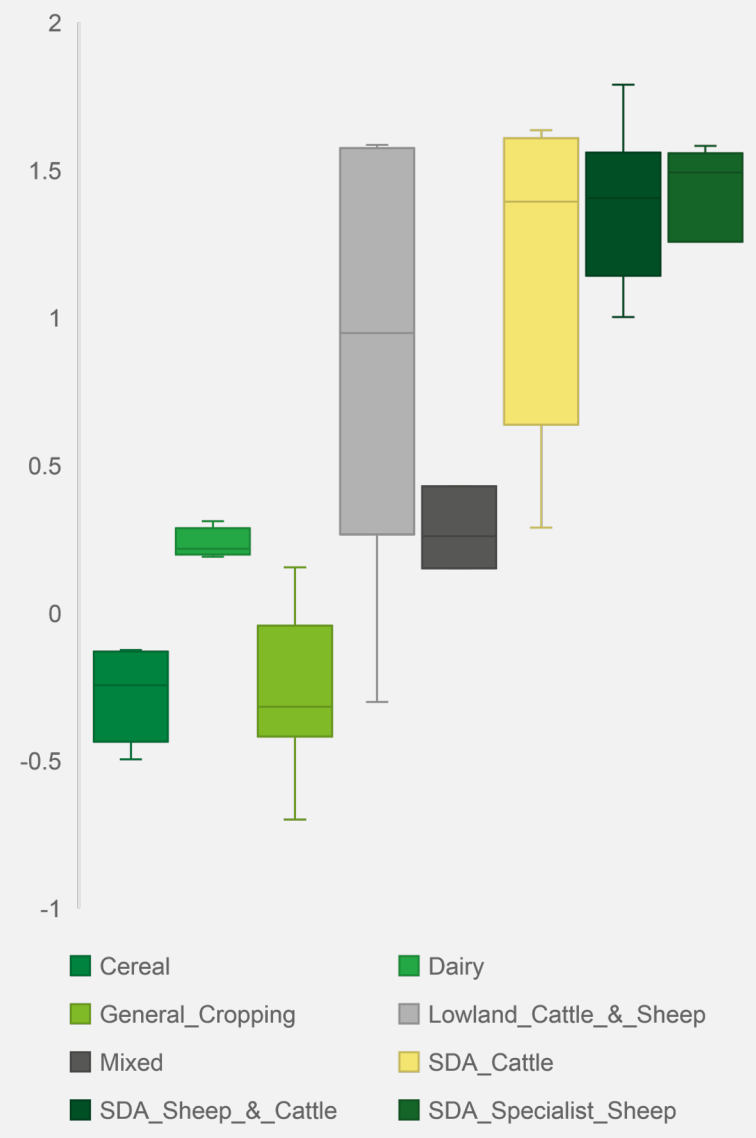
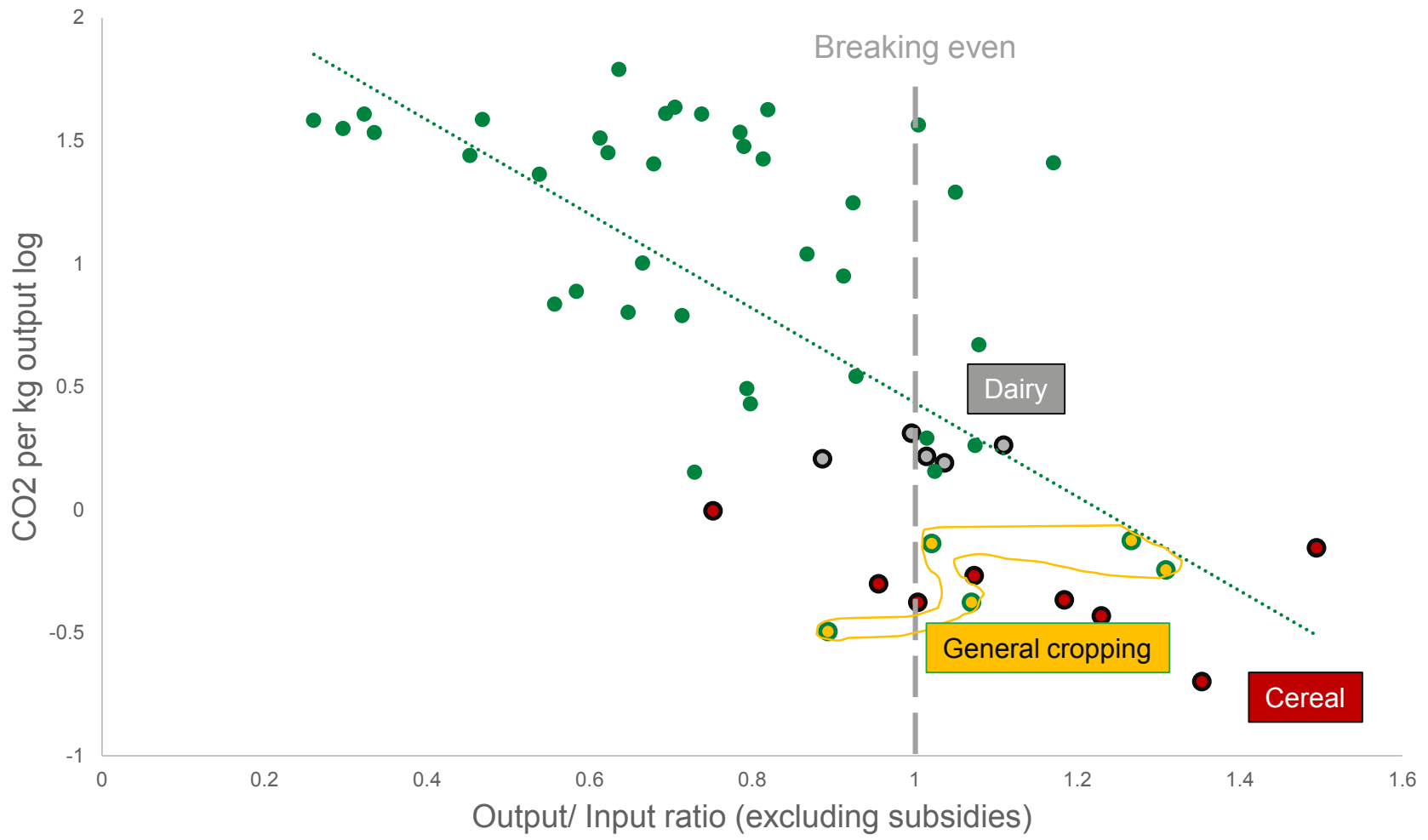
CARBON^e Per Kg Output

CO₂e per kg output relates to farm type and output/ input ratio excluding subs



CARBON^e Per Kg Output

CO₂e per kg output relates to farm type and output/ input ratio excluding subs



Farm type by agricultural parish, 2016

Parishes have been assigned the farm type that has the largest Standard Output (SO) within the parish. Where LFA cattle and sheep is the dominant type, the map shows whether the parish is mainly specialist sheep, specialist cattle or mixed cattle and sheep.



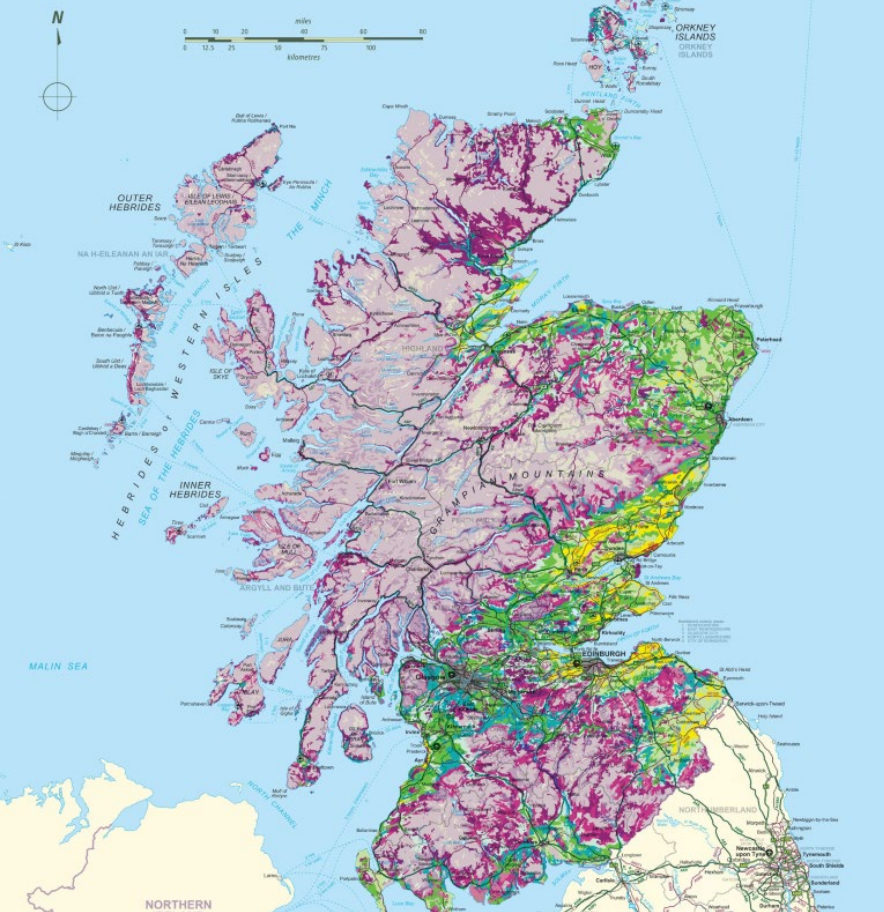
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Land Capability for Agriculture in Scotland



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More to come

Interest from Policy

More data arriving for this year

Positive steps in understanding (at the farm level) how farms differ (and hopefully why) in their CO₂e emissions.

Feedback

How does this compare?

Feedback gratefully received!

Contact the Farm Business Survey Team

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