

773649 – CIRCULAR AGRONOMICS – General Assembly
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Environmental session

LCA results from CS3

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Objectives

- *Assess environmental impacts and resource use of 20 organic dairy farms from the Austrian „Lungau region“ through life cycle assessment (LCA)*
- *Compare the results to a generic model dairy farm that represents average organic milk production in Austria*
- *Consider two functional units (FUs), i.e., 1 kg energy-corrected milk (ECM) and 1 ha agricultural area for milk production (MP)*



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Model dairy farm (MDF)

Based on input and output data from:

- i. National databases -> Inventory such as animal categories and numbers, farm area, grown crops and utilized types of grassland, and yields of milk, meat, crops and grasslands.*
- ii. Specific models -> Feed ration based on given grown crops and grassland types with supplementation of purchased feedstuffs according to the given milk yield.*
- iii. Expert judgements -> Defining the share of pasture intake and estimating the used infrastructure (i.e., buildings, equipment, and machinery).*



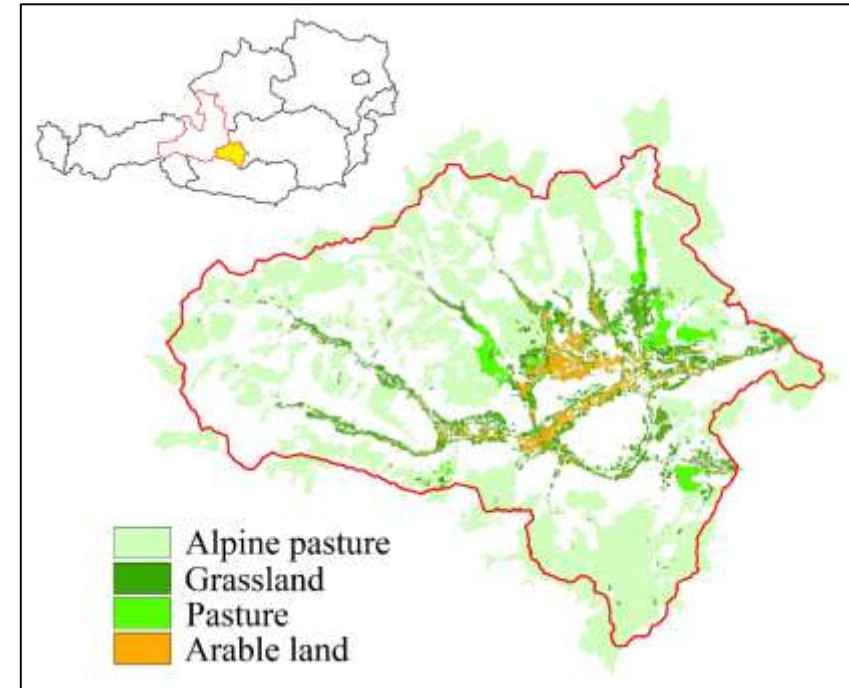
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Management parameters and study region

Extensive management and lower level of productivity

Parameter	Unit	Lungau farms (n=20)			MDF
		Min	Median ± SD	Max	
Farm area	ha MP ^a	2.1	15.2 ± 7.1	28.1	18.2
Stocking rate	dairy cows ha MP ⁻¹	0.5	0.88 ± 0.32	1.90	1.04
Milk production	t ECM ^b	16.3	69.8 ± 41.3	170.5	118.3
	kg ECM dairy cow ⁻¹	4,077	5,433 ± 914	6,847	6,228
	kg ECM ha MP ⁻¹	2,069	5,240 ± 1,889	9,872	6,488
Fed concentrate	kg DM ^c	0	5,524 ± 4,489	14,974	12,105
Purchased roughage	kg DM	0	0 ± 6,559	22,289	0
Purchased animals	kg LW ^d	0	0 ± 472	1,340	1,260
Fuel consumption	kg ha ⁻¹	37	79 ± 27	145	105
Purchased N fertilizer	kg N	0	0	0	124.3
N fertilization	kg ha ⁻¹	46	82 ± 23	137	94

^a ha MP = ha farm area allocated to milk production; ^b ECM = energy corrected milk; ^c DM = dry matter; ^d LW = live weight



Study region and agricultural land use. Source: Grassauer et al., 2022.



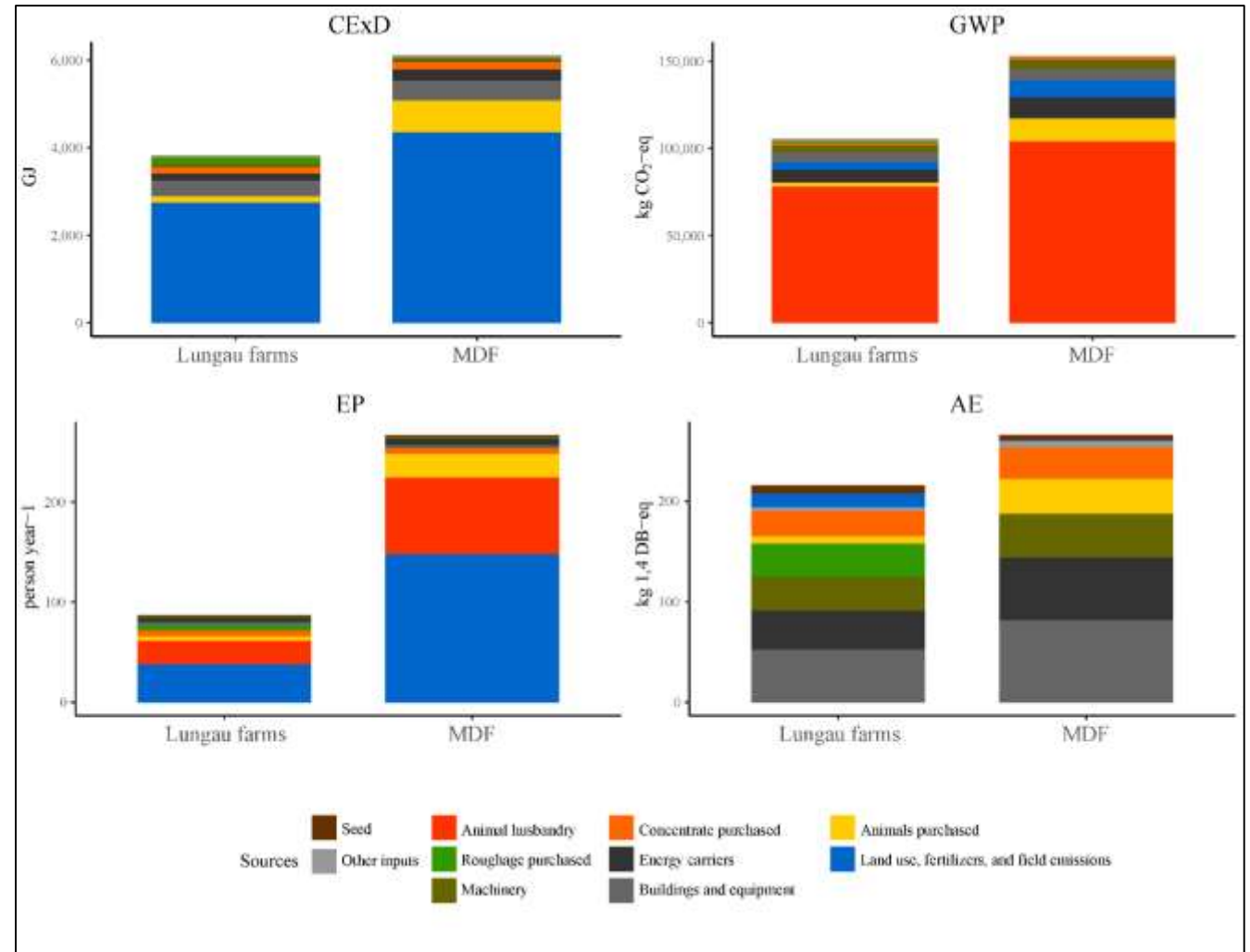
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LCA results (I)

Absolute values for

- i. Cumulative Exergy demand (CExD)
- ii. Global warming potential (GWP)
- iii. Eutrophication potential (EP)
- iv. Aquatic ecotoxicity (AE)

of the 20 Lungau farms (mean value depicted) compared to the MDF.



Source: Grassauer et al., 2022.

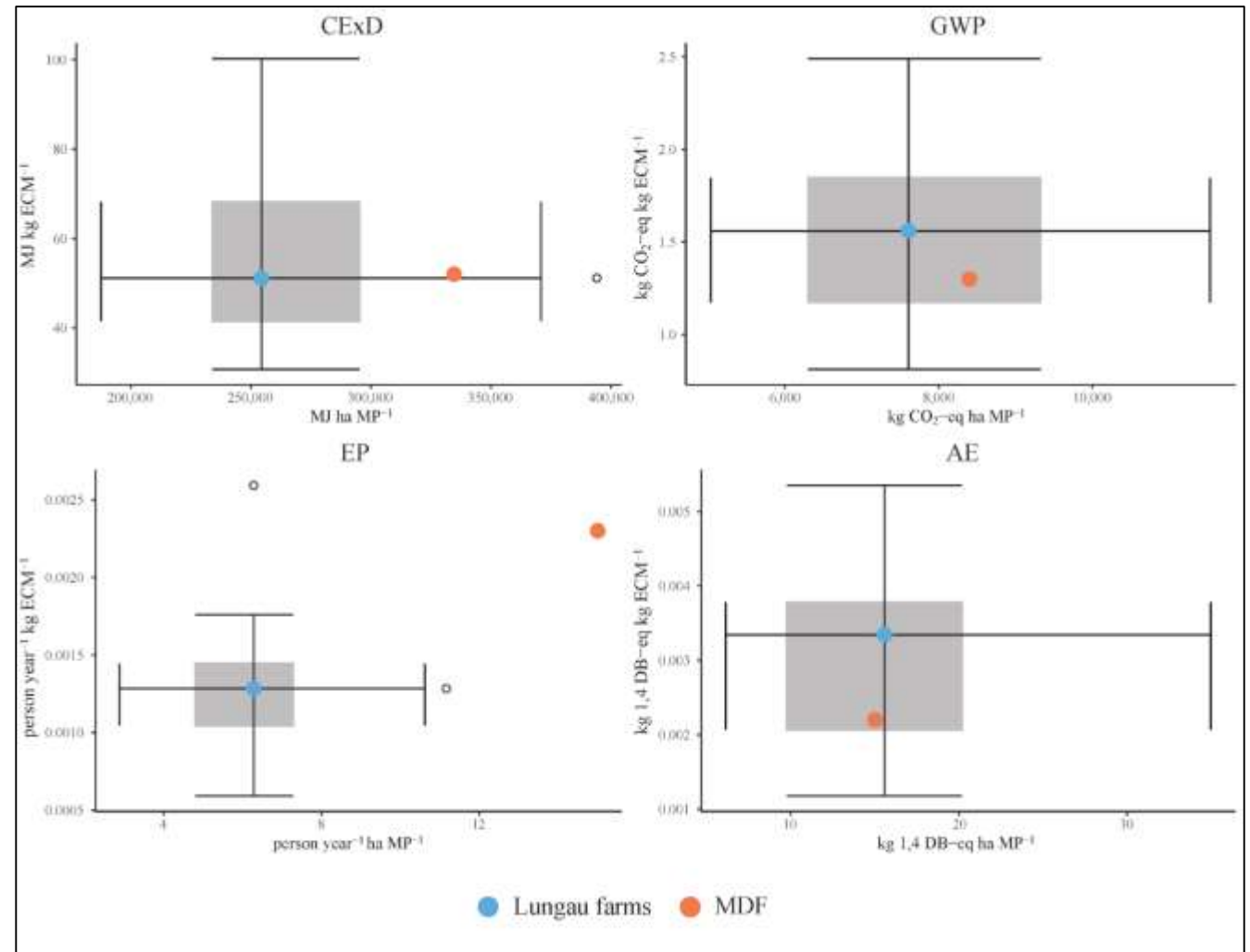
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LCA results (II)

- *Values per kg ECM (y-axis) and per ha MP (x-axis)*
- *Gray area indicates upper and lower quartiles of the 20 Lungau farms*



Source: Grassauer et al., 2022.

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Conclusions

- *Considering 1 kg ECM as FU, Lungau farms are favorable regarding CExD and EP*
- *Considering 1 ha MP as FU, Lungau farms are favorable regarding CExD, EP, and GWP*
- *Despite the extensive management and a low level of production, Lungau farms competitively contribute to food production from an environmental point of view*



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