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MIXED FARMING & AGROFORESTRY

LIFE CYCLE ASSESSMENT OF SILVOPASTORAL SYSTEMS

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Life Cycle Assessment is a methodology used to evaluate the environmental impacts of a product or service. However, different allocation choices can lead to different results.

The **objective** is to assess the environmental impacts of producing 1 kg of apples and 1 kg of eggs from cradle-to-gate in the context of high animal density (HD) and low animal density (LD) farms in Austria (**Table 1**), including the **process contribution** to Climate Change in kg CO2-eq.

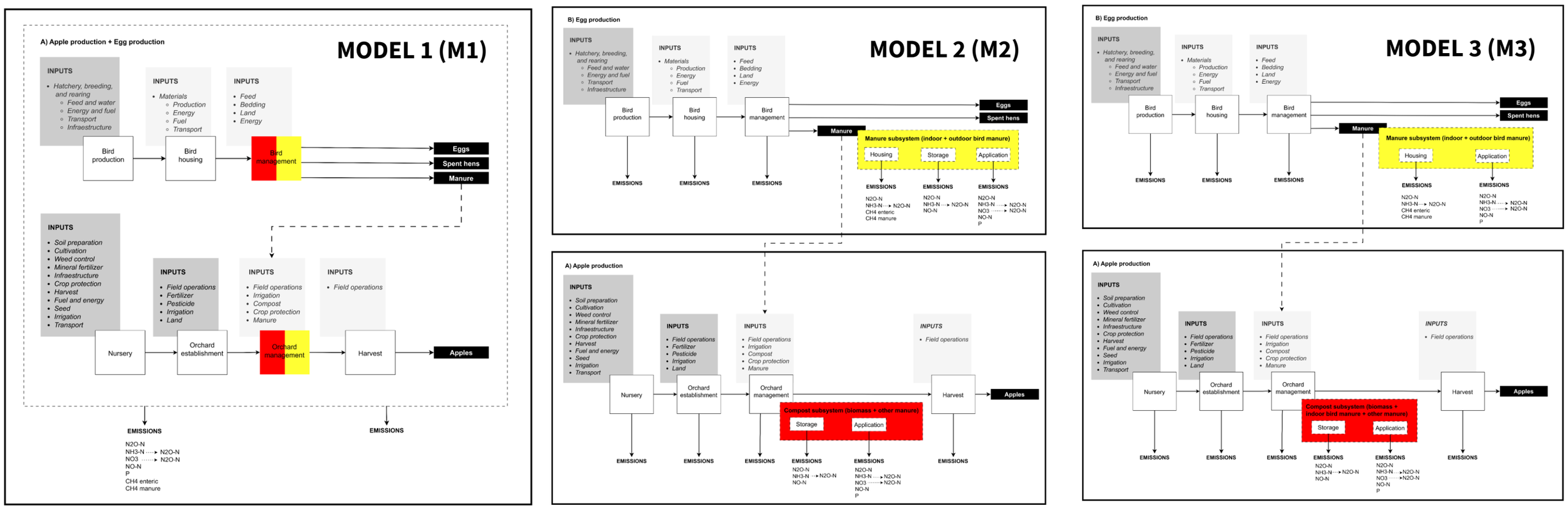
Three modeling approaches were applied at farm-gate to allocate emission burdens associated with manure (i.e., indoor and outdoor bird manure) across three key phases (i.e., housing, storage, and application).

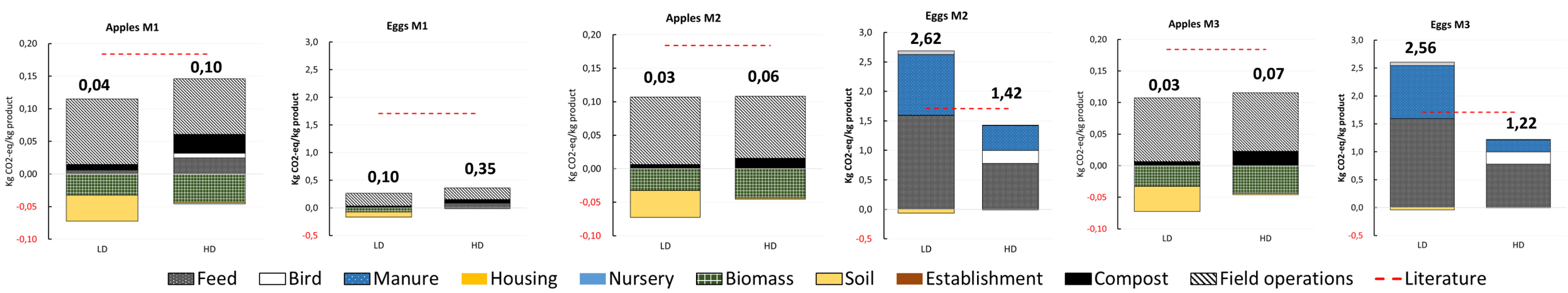
Table 1. Input-Output table

Input	LD	HD
Farm area (ha)	10,4	9,9
Average annual population (#)	133	1208
Birds (kg liveweight yr-1)	332	1812
Pullets	0	225
Roosters	7	38
Concentrated feed intake (kg N animal-1 yr-1)	0,7	0,4
Outdoor feed intake (kg N animal-1 yr-1)	0,02	0,01
Bird manure (kg N animal-1)*	0,59	0,27
Share N in outdoor manure deposition (%)	67	13
Share N in indoor manure deposition (%)	33	87
Compost* (kg N orchard-1)	22	538
Bird manure (kg N orchard-1)	78	327
Outdoor excretion (kg N orchard-1)	52	44
Indoor excretion (kg N orchard-1)	26	283
Other manure (kg N orchard-1)	0	148
Biomass (kg N orchard-1)	96	192
Share N in bird manure in compost (%)	19	42
Share N in other manure in compost (%)	0	25
Share N in biomass in compost (%)	81	33
Field operations (hrs yr-1)	657	640
Irrigation (m3/yr)	830	693
Output		
Apples (kg orchard-1 yr-1)	270000	297000
Eggs (kg yr-1)	825	10303
Birds (kg liveweight yr-1)	199	2416

*before losses during application

Fig. 1. Modeling approaches and results





- **HD** tend to have higher emissions for apples and eggs compared to **LD**.
- **LD** higher egg emissions in M2 and M3 may be due to the tenfold difference in animal population and egg output.
- **M1** favors the secondary economic activity (eggs), resulting in higher emissions for apples and lower emissions for eggs compared to M2 and M3.
- **M2** attributes all bird manure-related emissions to eggs, resulting in higher emissions for eggs compared to M1 and M3.
- **M3** subdivides the emissions burden of apples and eggs between the three phases, reflecting a more balanced approach.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862357