

Feeding and manure management strategies for GHG mitigation in the Indonesian dairy sector

Webinar 'GHG reduction on smallholder dairy farms in Asia'

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Demand for dairy in Indonesia



- World's fourth most populous nation
- Java: >50% Indonesia's population, 98-99% of dairy cows
- Increasing demand for dairy:
 - Rising per capita dairy consumption (growing population, dietary shifts)
 - National ambition to increase domestic milk production from ~20% to 50% of consumption*, by:
 - increases in national cattle population
 - Increases in productivity

Indonesian dairy sector

- Domestic milk production 1.0 Mt/y
- 0.6 M heads, ~192.000 dairy farms
- Urban/peri-urban



Smallholder farms (~90% cattle, ~77% milk)

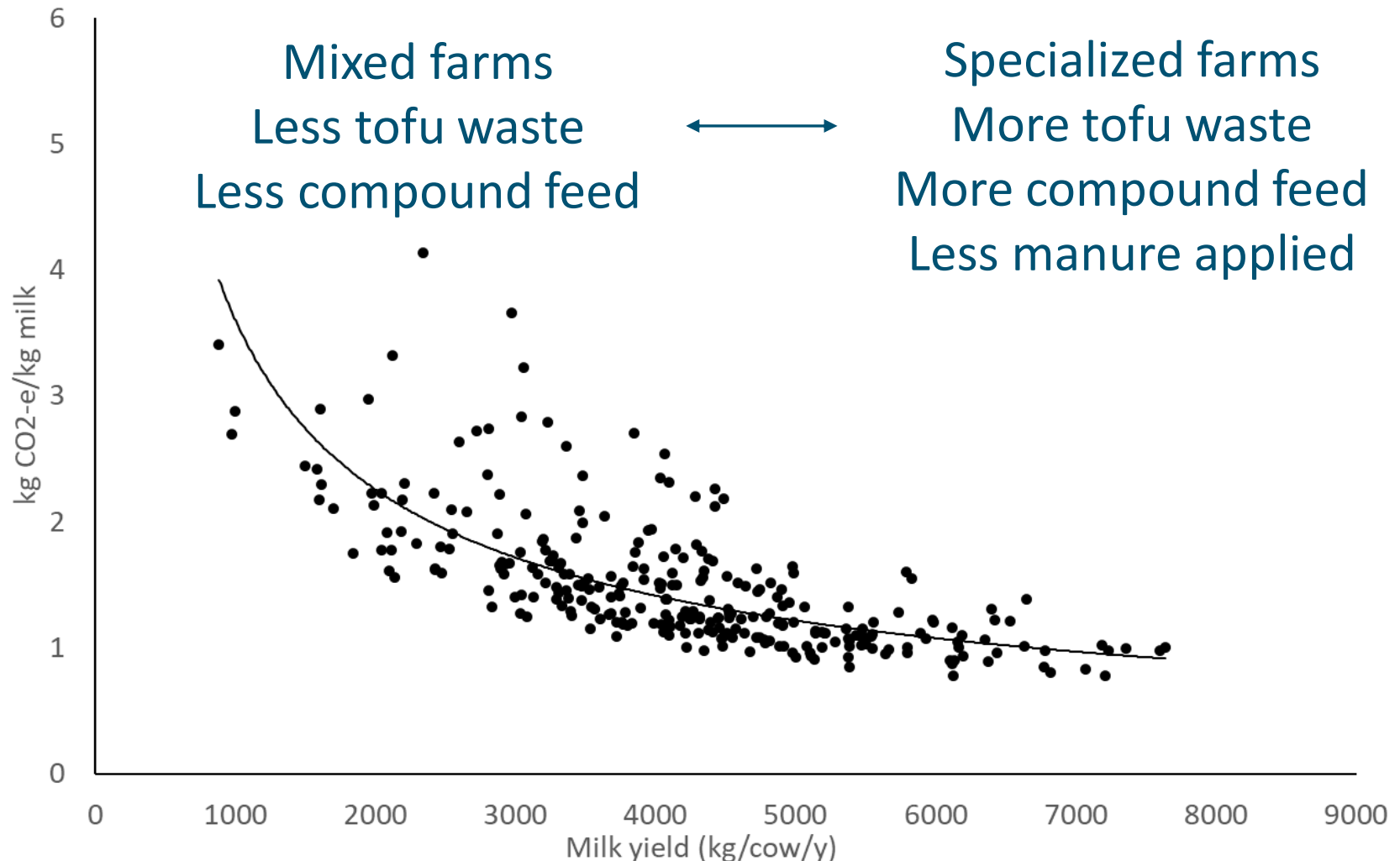
- 3-4 cows, 8-10 L per cow/d, long calving intervals
- Zero-grazing, 0.2-0.3 ha of land
- Disconnection of land and animals
- Feed ration: forage (grass, rice straw), concentrates, industrial by-products, crop residues

Key sustainability issues

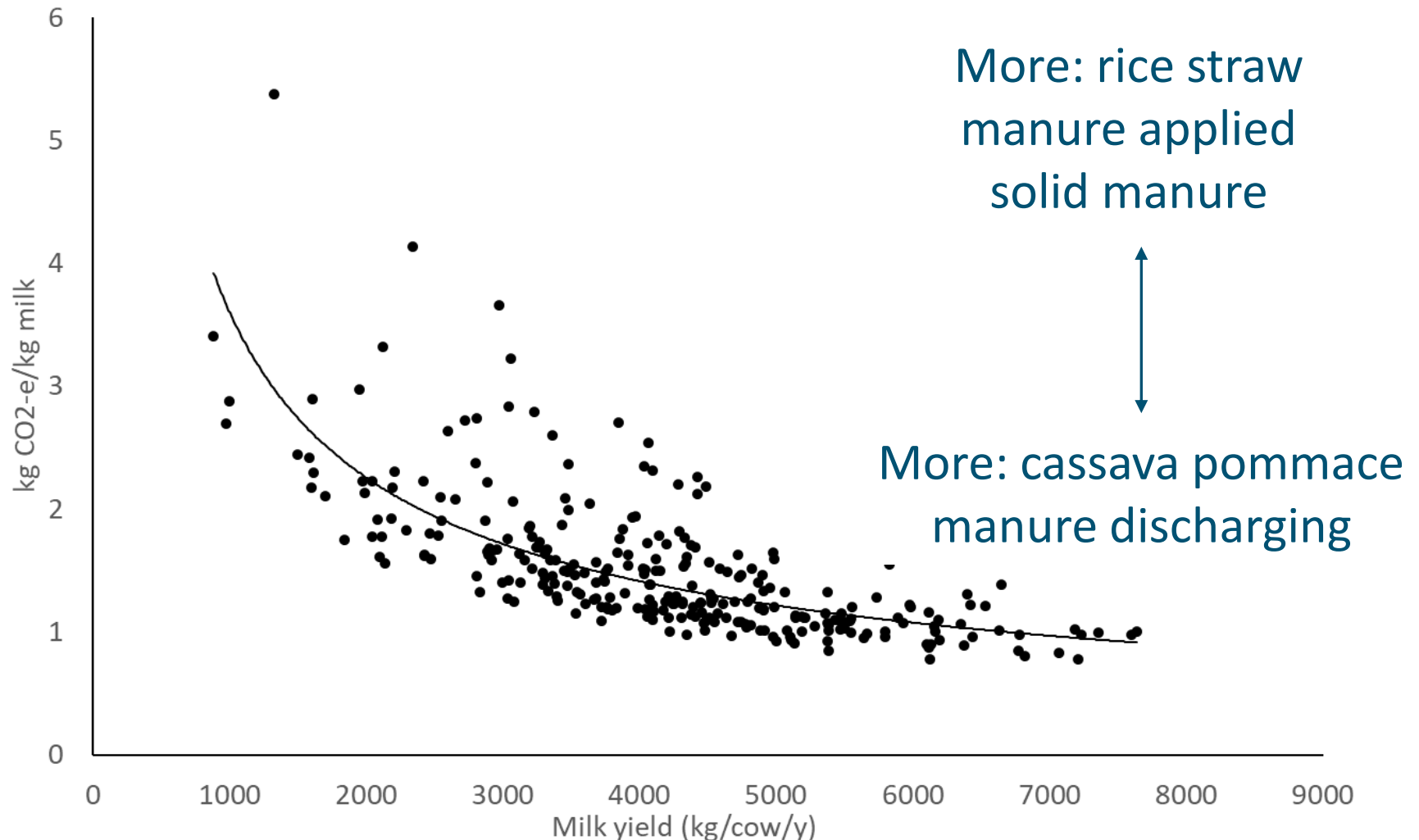
1. Sub-optimal herd productivity and efficiency, causing:
 - low milk and meat output, high feed cost, low margins
 - relatively high GHG emissions per kg milk
 - low resource use efficiency (feed, nutrients)
2. Manure discharging (60-90%) and overfertilization, causing:
 - pollution of local ecosystems and drinking water sources
 - biodiversity loss
 - GHG emissions
 - local nuisance



Relation milk yield and GHG emission intensity



Relation milk yield and GHG emission intensity



Pilot study West Java

- 18 small-scale dairy farms
- Monitoring February 2018 - December 2019
- Feeding interventions:
 - Improved water supply (feed and water trough)
 - Mineral supplementation
 - High quality compound concentrate feed
 - Balanced rations
 - New forage species
 - Fodder conservation: grass and maize silage
- Manure management interventions:
 - Shift from discharging to FYM, composting, or vermi-composting
 - Application on forage or sales to horticulture

Improved quality concentrate feed

- Higher energy and protein content (20% CP per kg), mineral/vitamin pre-mix “Maxcare”
- 31 cows in mid lactation, 3 months
- Increases in milk yield per cow, reproduction, health
- Potential: 40% of enteric methane (Gerber et al., 2013; Knapp et al., 2014)
- Results:
 - Average increase in milk yield: 0.7 kg/cow/d ($P < 0.05$)
 - Average increase in CO₂-eq./kg milk: 9% (processing emissions, N loss fertilization)
 - Potential reduction in CO₂-eq./kg milk: 5-10%

Improving manure management

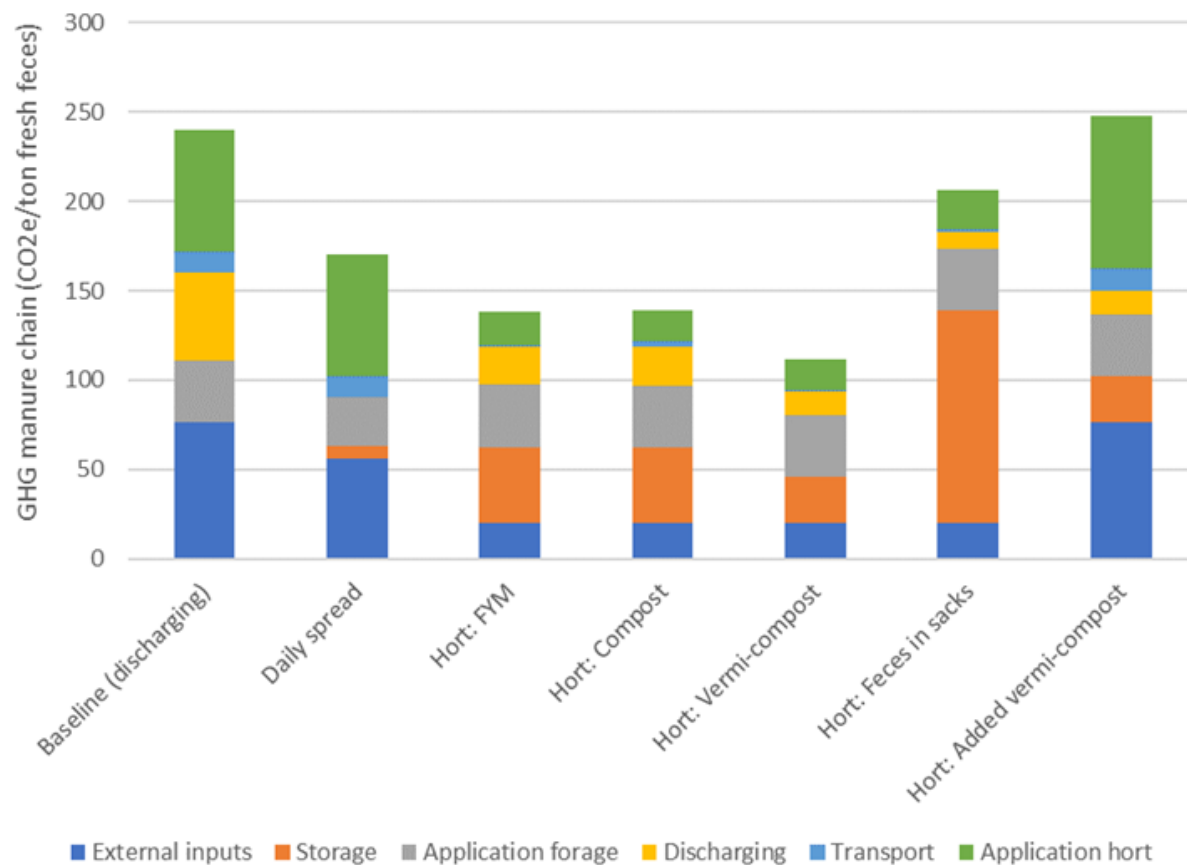
- Introduction of composting and vermi-composting (n=7 and 4 farms)
- Sold or applied on own land for food crop production
- Decrease in amount of feces discharged (46%) and applied to own land for forage (29%; 1420 to 1212 kg N/ha/y)
- Results:
 - 4% lower GHG emissions (0-20%)
 - Synergies local ecosystems, drinking water sources, biodiversity, nuisance



Emissions in manure value chain

1 ton fresh feces:

- N-based replacement of urea in forage production
- Weight-based replacement of chicken manure in horticulture



De Vries et al.,
in prep.

Take home messages

- Increasing milk yield through improved feeding can reduce GHG emission intensity
- Risk of trade-offs: GHG in dairy value chain, local water/air/soil pollution, biodiversity, land use, food-feed competition
- No-regret options: improving efficiency with current resources, (e.g. balanced rations, health, forage/crop management)
- Manure recycling: synergies for environmental issues, few incentives for farmers (little/not profitable, limited enforcement, competition chem. fertilizer)
- Utilization manure dairy sector, other ag sectors

Thank you

<https://www.wur.nl/nl/project/Sustainable-Intensification-of-Dairy-Production-Indonesia.htm>

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