Dairy cows enabling circular production systems

The role of breeding in the transition towards circular agriculture

ICAR 27-04-2021, Anouk E. van Breukelen, A.H. Hoving, R.F. Veerkamp, B.J. Ducro, M.P. de Haan

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Transition towards circular farming

- The ministry of agriculture in the Netherlands calls for a transition towards circular farming
- To achieve a near-to-closed-loop system of resources

Aim

How can breeding ensure cows' health, welfare and production in new farming systems related to resource availability?

Methods

- Workshop with multidisciplinary experts to define characteristics of circular dairy production systems
- Case study on research farm “De Marke”, a dairy farm where innovative measures are designed and tested to minimize nutrient losses

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Results: Definitions of circular farming systems

- Not one system for all, but **tailor-made solutions** for individual farms

- Nine characteristics of circular farming systems:

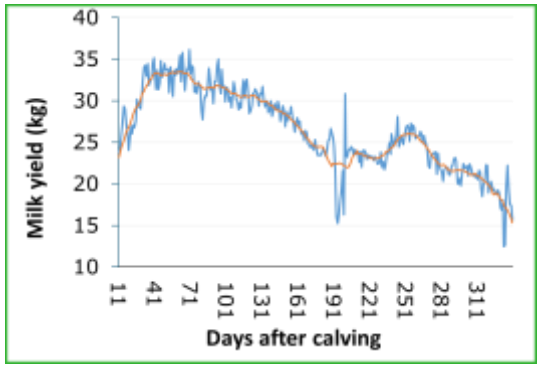
  - Flexible
  - Cooperative
  - Efficient without losses
  - Healthy cows
  - Low input
  - Extensive nature and landscape
  - Multipurpose
  - Pasture based
  - Closed

Results: Definitions of circular farming systems

- Twenty-five cow traits fitting to one or more system definitions, for example:
  - Resilience
  - Methane emissions
  - Longevity
  - Roughage efficiency
  - Grazing behavior

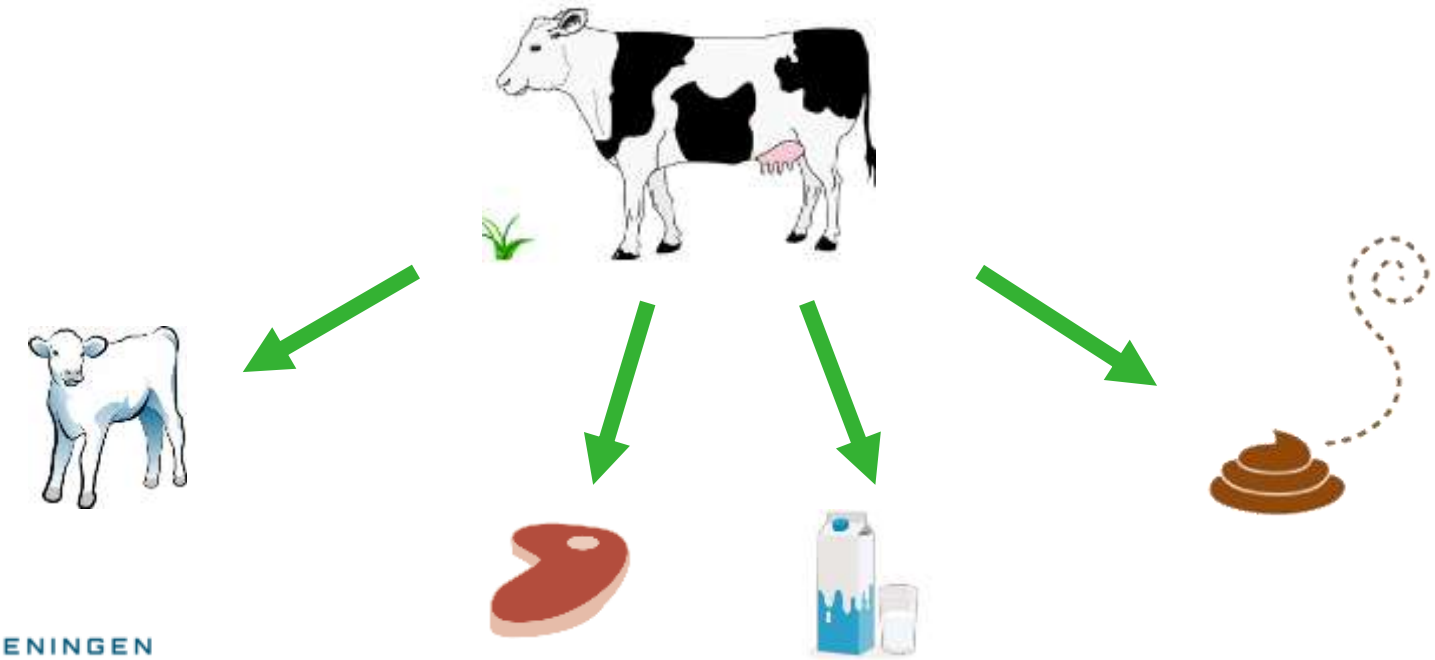
Example: Cooperative

- Regional **cooperation** between dairy farms, arable farms and processing companies
- A **resilient cow** that can cope with large changes in diet



Example: Multipurpose

- The cow does not only provide milk, but also high-quality **meat** and **manure**



Example: Extensive pasture based

- To reduce feed – food competition
- Improving **grazing behaviour**

Example: Extensive with focus on nature and landscape

- The cow **serves** in nature management
- The cow should be able to process **low grade feed** (nature grasses)

Methods: Case study

- Dairy farm “De Marke” with two types of cattle that are managed together
    - Holstein and three-breed rotational cross (Holstein x Viking Red x Montbéliarde)
        - Crossbreeding started in 2010
    - Analyses included 446 lactations between 2014 and 2019 of 187 cows, corrected for parity number and calving season

Results: Case study

- Production
    - Holsteins produced more kg milk, but crosses a higher percentage of fat and protein
- Reproduction
    - Crosses had a shorter time between calvings, and less time between first and last insemination
- Both types of cows performed well at “De Marke”, differences are mostly reflected by the different breeding goals

Conclusions

- The transition towards circularity and resource efficiency calls for flexibility
- Sufficient genetic variation is essential
- Breeding programs can support the performance cows in new environments

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anouk.vanbreukelen@wur.nl